Malibu Creek Ecosystem Restoration Study
Draft Integrated Feasibility Report (IFR) with
Environmental Impact Statement/
Environmental Impact Report (EIS/EIR)
Los Angeles and Ventura Counties, California

Volume I

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Malibu Creek Ecosystem Restoration Study Draft Integrated Feasibility Report with Environmental Impact Statement/Environmental Impact Report (EIS/EIR) Los Angeles and Ventura Counties, California

This Draft Integrated Feasibility Report with Environmental Impact Statement/Environmental Impact Report (Integrated Feasibility Report (IFR)) presents a summary of the planning process, describes the affected environmental resources and evaluates the potential impacts to those resources as a result of constructing, operating and maintaining the Malibu Creek Ecosystem Restoration Study. The primary purpose of the study is to restore aquatic habitat connectivity along Malibu Creek and tributaries, establish a more natural sediment regime from the watershed to the shoreline, and restore aquatic habitat of sufficient quality along Malibu Creek and tributaries to sustain or enhance indigenous populations of aquatic species within the next several decades, allowing for migratory opportunities to about 15 mi of aquatic habitat that have been unreachable for many decades in this Los Angeles and Ventura Counties, California watershed.

The Federal lead agency responsible for implementing the National Environmental Policy Act (NEPA) is the U.S. Army Corps of Engineers, Los Angeles District (USACE). The lead agency responsible for implementing the California Environmental Quality Act (CEQA) is the California Department of Parks and Recreation (CDPR).

A range of measures and preliminary alternatives were developed during the feasibility study process in coordination with CDPR, resource agencies and interest groups, in addition to the No Action Alternative. Action alternatives vary based on modification or removal of Rindge Dam, methods of impounded sediment removal from behind the dam, sediment placement and transport options, and potential modification or removal of additional aquatic habitat barriers upstream of Rindge Dam.

The National Ecosystem Restoration (NER) plan is identified as Alternative 2d1, with removal of the Rindge Dam arch concurrent with trucking of the impounded sediment to several placement sites over 7 years. Shoreline-compatible sediment would be temporarily stockpiled at an upland location until delivery to the shoreline in front of the Malibu Pier parking lot using trucks during non-peak use times, after Labor Day and before Memorial Day, for 3 consecutive construction years. Material not compatible with shoreline placement would be disposed of at the Calabasas Landfill. Several aquatic habitat barriers along the Cold Creek and Las Virgenes Creek tributaries would be modified or removed to provide access to additional miles of quality habitat.

The Locally Preferred Plan (LPP) is Alternative 2b2, and differs from the NER plan by including removal of the Rindge Dam spillway in addition to the dam arch over approximately 8 years. In addition, shoreline compatible sediment would be trucked directly to Ventura Harbor with transport by barge to the nearshore environment off the coast of the Malibu Pier parking lot.

All comments must be received by the contact person below on or before March 27, 2017:

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MALIBU ECOSYSTEM RESTORATION STUDY DRAFT INTEGRATED FEASIBILITY REPORT WITH ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT (EIS/EIR)

Note: The draft Integrated Feasibility Report (IFR) with joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for this study have been integrated into one document to comprehensively meet USACE planning requirements as well as federal and state environmental requirements.

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1.0 EXECUTIVE SUMMARY

1.1 ES.1 Introduction

The U.S. Army Corps of Engineers (USACE), as lead agency under the National Environmental Policy Act (NEPA), and the State of California, Department of Parks and Recreation (CDPR), as lead agency under the California Environmental Quality Act (CEQA), prepared this Integrated Feasibility Report (IFR) to evaluate the federal interest in addressing ecosystem restoration opportunities within the Malibu Creek watershed. This IFR includes Environmental Impact Statement/Environmental Impact Report (EIS/EIR) documentation.

This study is conducted as an interim response to a House of Representatives Committee on Public Works and Transportation 1992 resolution stating "… *in the interest of shore protection, storm damage reduction and other related purposes along the shores of southern California*..." by formulating a focused array of alternatives for ecosystem restoration (other related purposes) within the Malibu Creek watershed that also include measures and qualitative evaluations of benefits to the Malibu shoreline. Future implementation of an environmental restoration project in the Malibu Creek watershed would restore nationally significant aquatic habitat ecosystem function to this region.

This IFR includes documentation of the planning process conducted for this study and the more detailed evaluation and comparison of an array of 21 project alternatives, including a No Action alternative. The IFR is prepared to comply with NEPA, CEQA, and applicable Federal, State and local environmental regulations. An outcome of the planning process is the identification of the National Ecosystem Restoration (NER) plan and the likely Locally Preferred Plan (LPP). Both plans consider ecosystem restoration measures along the lower 8.5 mi of Malibu Creek and additional 9.5 mi of aquatic habitat along the Cold Creek and Las Virgenes Creek tributaries, and methods to deliver and place several hundred thousand cubic yards of sand along the Malibu shoreline or nearshore environment.

1.2 ES.2 Need for the Proposed Project

Malibu Creek, located in Los Angeles and Ventura Counties, California, is an important regional ecological corridor that links Santa Monica Bay, the Malibu Lagoon (one of only two remaining estuaries in Los Angeles County) and riparian systems from the immediate coastal plain with interior plains and valleys. A large portion of the study area is located within the Malibu Creek State Park, and Malibu Lagoon State Beach park units managed by the CDPR. This area is also part of the Santa Monica Mountains National Recreation Area, administered by the National Park Service. The watershed represents a unique opportunity for systemic and sustainable ecosystem restoration in highly urbanized southern California.

The watershed supports a diversity of plant and wildlife species representative of unique biological resources encountered in the transverse ranges of southern California. The unusual geomorphology of Malibu Creek results in a wide variety of habitat types supporting hundreds of native plants and animals. Species have adapted to a climate with cool wet winters and hot dry summers.

The lower 3 mi of Malibu Creek is critical habitat for the endangered (federally listed) southern California steelhead trout currently blocked from accessing former spawning and rearing habitat due to Rindge Dam, a 100-foot high decommissioned water supply dam, and other smaller barriers on upstream tributaries. The construction of the dam arch and concrete spillway was completed in

1926. The former reservoir behind the dam essentially filled with sediment by the mid-1940s, trapping about 780,000 cubic yards of sediment that would have nourished downstream reaches of the creek and the Malibu shoreline. Rindge Dam altered the natural geomorphic, riparian and aesthetic character of Malibu Creek. Pools, riffles, and runs that historically supported steelhead and other fish still exist above the dam. Upstream tributaries have smaller barriers such as culverts and bridges that interrupt connectivity for aquatic species. The barriers have interrupted the sediment transport regime in the watershed, interfered with habitat connectivity for aquatic species including the steelhead, and degraded habitat for aquatic species, as further described in the next section.

There is a need to reconnect the currently segmented aquatic and riparian corridor and to restore natural hydrology and geomorphology of Malibu Creek and tributaries. Restoring aquatic habitat connectivity represents a unique opportunity for systematic and sustainable ecosystem restoration in highly urbanized southern California.

For the purposes of this IFR, steelhead trout were selected as the “keystone” species and the potential impacts and benefits of the various project alternatives were assessed in light of how they would potentially affect this species. Steelhead were chosen because of their anadromous life history which requires that the fish have access to high quality habitat in both the ocean and the creek at various stages. By increasing access to habitat that is able to support this species, many of the other species of concern benefit as well.

The purpose of the proposed project and alternatives is described below.

1.3 ES.3 Problems and Opportunities

Problems addressed for this study include the following:

- Loss of connectivity to good-to-excellent quality aquatic spawning and rearing habitat for migratory species, and disturbances to adjacent riparian habitat due to the construction of Rindge Dam and other upstream road crossings and small dams, isolating reaches of Malibu Creek and tributaries in the watershed.
- Disruption to historic migratory paths for mammals due to the construction of Rindge Dam and other upstream road crossings and small dams, isolating reaches of Malibu Creek and tributaries in the watershed.
- Reduction of natural sediment delivery during storms to reaches of Malibu Creek and tributaries, the Malibu Lagoon, Pacific Ocean shoreline, and nearshore environments for over 90 years due to the construction of several water supply and recreational dams in the watershed.
- Changes to the natural creek slope in the vicinity of Rindge Dam as a result of dam construction and associated sediment deposition have lowered base flow velocities, altering vegetation types and raising water temperatures, adversely affecting the aquatic habitat quality by adding stressors to native species.
- The Rindge Dam spillway and surrounding creek slopes have become an attraction for people who use the bottom of the spillway and nearby high ground as a springboard for jumping into the large pool at the base of the dam.

Opportunities for this study include the potential to:

- Provide for a more natural sediment transport regime in the vicinity of Rindge Dam and along reaches downstream of Malibu Creek to the shoreline.
- Reconnect the aquatic corridor to provide access to additional spawning and rearing habitat to a variety of aquatic species, including the Pacific lamprey, arroyo chub, western pond turtle, and the federally endangered southern California steelhead, among others.
- Restore riparian habitat connectivity along Malibu Creek and tributaries from the Pacific Ocean to the upper watershed to include restoration of migratory corridors for terrestrial animals, including mammals and herptofauna.
- Address non-native species of concern occur within Malibu Creek that crowd out native species by outcompeting for light, water and nutrients, particularly within the Rindge Dam impounded sediment area and near upstream barriers. Non-native species include the giant reed *(Arundo donax)*, fountain grass *(Pennisetum setaceum)*, spurge *(Euphorbia esula)*, and pepperweed *(Lepidium latifolium)*.
- Allow for transport of Rindge Dam impounded sediment to nourish downstream shoreline and nearshore habitats that would have naturally benefited from this material without the dam in-place.
- Decrease potential for human disturbances to aquatic species in alliance with the formulation of other ecosystem restoration measures.

1.4 <u>ES.4 Planning Objectives (NEPA Project Purpose and CEQA Project Objectives) and Constraints</u>

Planning objectives and constraints are based on the problems and opportunities. The planning objectives developed for this IFR planning process are statements of what the alternatives should achieve. The planning objectives for the study are:

- Establish a more natural sediment transport regime from the watershed to the Southern California shoreline in the vicinity of Malibu Creek within the next several decades.
- Reestablish habitat connectivity along Malibu Creek and tributaries in the next several decades to restore migratory access to former upstream spawning areas for indigenous aquatic species and allow for safe passage for terrestrial species from the Pacific Ocean to the watershed and broader Santa Monica Mountains National Recreation Area.
- Restore aquatic habitat of sufficient quality along Malibu Creek and tributaries to sustain or enhance indigenous populations of aquatic species within the next several decades.

Constraints that limited the scope of study include:

- Maintain the downstream baseline condition level of flood risk along lower reaches of Malibu Creek within the Serra Retreat residential community and businesses in the City of Malibu avoiding potential for adverse flood-induced impacts associated with the consideration of upstream ecosystem restoration measures.
- Avoid or minimize adverse impacts to existing aquatic, riparian, lagoon and coastal habitats and species downstream of barriers considered in this study.
- Minimize detrimental impacts to existing water quality parameters in the lower portion of Malibu Creek.
- Avoid modification to ongoing seasonal freshwater discharges from Tapia Water Reclamation Facility into Malibu Creek above Rindge Dam.

1.5 ES.5 Evaluation of Alternatives

A full array of structural and non-structural measures was formulated during the planning process and combined into various alternatives to address the planning objectives. After several iterations of the planning process, project delivery team risk-informed decision-making, and preliminary screening of alternatives, a focused array of alternatives was carried forward for more detailed analysis. The alternatives in the focused array all included removal of the Rindge Dam concrete arch and impounded sediment behind the dam. Methods of removal and timeframes to complete varied based on the different combinations of measures considered for each alternative.

As required by NEPA and CEQA, the No Action (or No Project) Alternative is evaluated in the IFR. For the No Action alternative, the following assumptions were made for the 50-year period of analysis and used for alternative comparisons:

- There will only be minor land use changes within the watershed and around the cities of Malibu and Calabasas. There are no assumed increases in creek discharges during storms beyond current conditions due to land use changes.
- Climate sea level changes will affect the shoreline and there will likely be longer dryer periods and more severe storms.
- The more than 90-year old Rindge Dam arch and spillway remains in-place. No other plans will be implemented to remove some or all of Rindge Dam, although there is likely an increased risk of structural problems over time due to the increasing age of the structure.
- With Rindge Dam filled to capacity with impounded sediment, there is no attenuation of storm flows at the dam and the volume of impounded sediment will remain the same in the future. Aside from a possibility of small volumes of sediment depositing behind the dam between storms, the sediment generated within the watershed during storms will be transported over Rindge Dam to the lower reaches of Malibu Creek and the shoreline.
- Aquatic migratory species remain blocked in lower Malibu Creek and will be limited to the 3 mi below Rindge Dam.
- Downstream Malibu Creek bed elevations will continue to rise (aggrade), increasing the flood risk to the City of Malibu and surrounding communities due to sediment contributed from the watershed during future storms.

There are four primary alternatives included in the focused array: the No Action (Alternative 1) and three action alternatives (Alternatives 2, 3, and 4) with multiple options (sub-alternatives). Alternative 2 options include removal of the Rindge Dam concrete arch and impounded sediment removal using traditional mining methods, and consideration of various shoreline and upland placement options for the impounded sediment. The mostly sands layer of the impounded sediment, an estimated 276,000 cubic yards, would be placed along the Malibu shoreline or nearshore area using trucks (shoreline) or a combination of trucks and barges (nearshore). Other variations for the Alternative 2 options include removal of the dam spillway and the modification or removal of other upstream aquatic barriers on Cold Creek and Las Virgenes Creek tributaries. The overall construction timeframe is estimated to take 7-8 years to complete.

Alternative 3 options include removal of the Rindge Dam concrete arch and impounded sediment over many decades, allowing for storms to erode controlled volumes of the impounded sediment before implementing the next incremental notching of the dam arch, repeating the cycle until the dam arch and sediment is removed. The costs for these alternative options are less than other alternatives and use far less trucks, but there are much greater uncertainties about the time needed to complete construction and potential adverse downstream effects of incremental releases of the impounded sediment, including an increased flood risk to downstream communities. Other variations for the Alternative 3 options include removal of the dam spillway and the modification or removal of upstream barriers. The overall construction timeframe is estimated to take at least two decades, but more likely multiple decades to a century to complete. The large range for construction completion is based on the uncertainties associated with the frequency of storm events of sufficient magnitude that allow for the next cycle of incremental dam concrete arch notching, followed by the timeframe for storms that mobilize and naturally transport the next layer of exposed impounded sediment.

Alternative 4 options are similar to the Alternative 2 options, except the Rindge Dam concrete arch would be lowered an additional 5-ft each winter storm season during the 7-8 year construction cycle to allow opportunities for a controlled volume of the impounded sediment to erode downstream during the storm seasons between mining season operations. These alternative options potentially reduce the number of trucks needed to transport the impounded sediment, but increase the risk of detrimental impacts to downstream reaches of Malibu Creek compared to Alternative 2 options. Other variations for the Alternative 4 options include removal of the dam spillway and the modification or removal of upstream barriers. The overall construction timeframe is estimated to take 7-8 years to complete.

A quantitative model was used to estimate changes to habitat values in the watershed and compare the incremental costs and benefits of implementing alternative measures. Malibu Creek, and Las Virgenes and Cold Creek tributaries, were broken down into 18 reaches to consider no action and action alternatives impacts to aquatic habitat, riparian habitat and natural processes over a 50-yr period. Each of these habitat and processes components had several variables to consider using steelhead as a proxy for numerous other species in regards to adverse and beneficial impacts. Outputs were presented in average annual habitat units, with the range of outputs going from 17-151 average annual habitat units for the array of alternatives.

Costs for each alternative were assessed and considered labor, materials, construction equipment, subcontracts and expendable supplies needed, along with the productivity of the workforce and equipment impacted by site conditions, sequencing of work and hours of operation. An abbreviated cost risk analysis was used to develop contingencies for the alternative cost estimates. The alternatives cost range is from $118-$211 million.

Alternatives also underwent a cost effectiveness – incremental cost analysis to evaluate 192 possible combinations of Rindge Dam and impounded sediment removal, along with consideration of various modifications of upstream barriers on Cold Creek and Las Virgenes Creek.

A system of accounts was used to organize and summarize the effects of alternative plans based on the following categories: National Ecosystem Restoration, Environmental Quality, Regional Economic Development, and Other Social Effects. The results are provided in summary tables in Chapter 4 (section 4.6) of the IFR. Four evaluation criteria for completeness, effectiveness, efficiency and acceptability are used in the screening of alternative plans (Chapter 4).

1 **Table 1.5-1 National Ecosystem Restoration**

Alt #	Alternative	Cost Summary		HE Outputs	
		Total Investment Cost* ($million)	Total Annual Costs ($million)	50-Yr Avg (AAHUs)	Change in AAHU over 'No Action'
1	No Action	$0	$0	620	N/A
2a1	Dam arch & spillway removal – shoreline / upland sediment placement	$163.24	$6.53	666.2	46.2
2a2	Dam arch & spillway removal – nearshore / upland sediment placement	$175.99	$7.03	666.2	46.2
2b1	Dam arch & spillway removal – shoreline/ upland sediment placement - upstream barrier modifications	$174.11	$6.61	772.5	152.5
2b2	Dam arch & spillway removal – nearshore / upland sediment placement - upstream barrier modifications	$186.86	$7.48	772.5	152.5
2c1	Dam arch removal – shoreline / upland sediment placement	$160.84	$6.42	666.2	46.2
2c2	Dam arch removal – nearshore / upland sediment placement	$173.55	$6.93	666.2	46.2
2d1	Dam arch removal – shoreline / upland sediment placement – upstream barrier modifications	$171.71	$6.87	772.5	152.5
2d2	Dam arch removal – nearshore / upland sediment placement – upstream barrier modifications	$184.42	$7.38	772.5	152.5
3a	Dam arch & spillway removal – natural sediment transport – downstream flood risk mgmt	$120.93	$4.87	597.7	Less than 0

Alt #	Alternative	Cost Summary		HE Outputs	
		Total Investment Cost* ($million)	**Total Annual Costs ($million)**	**50-Yr Avg (AAHUs)**	**Change in AAHU over 'No Action'**
3b	Dam arch & spillway removal – natural sediment transport – downstream flood risk mgmt – upstream barrier modifications	$131.80	$5.32	637	17
3c	Dam arch removal – natural sediment transport – downstream flood risk mgmt	$118.31	$4.75	597.7	Less than 0
3d	Dam arch removal – natural sediment transport – downstream flood risk mgmt – upstream barrier modifications	$129.18	$5.20	637	17
4a1	Dam arch and spillway removal - natural sediment transport & shoreline / upland placement – downstream flood risk management	$186.25	$7.46	655.5	35.5
4a2	Dam arch & spillway removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management	$199.68	$7.99	655.5	35.5
4b1	Dam arch & spillway removal – natural sediment transport & shoreline/ upland sediment placement – downstream flood risk management -upstream barrier mods	$197.12	$7.91	761.8	141.8
4b2	Dam arch & spillway removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management -upstream barrier modifications	$210.55	$8.44	761.8	141.8
4c1	Dam arch removal – natural sediment transport & shoreline / upland sediment placement – downstream flood risk management	$183.57	$7.35	655.5	35.5

Alt #	Alternative	Cost Summary		HE Outputs	
		Total Investment Cost* ($million)	Total Annual Costs ($million)	50-Yr Avg (AAHUs)	Change in AAHU over 'No Action'
4c2	Dam arch removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management	$196.95	$7.88	655.5	35.5
4d1	Dam arch removal – natural transport & shoreline / upland sediment placement – downstream flood risk management - upstream barrier modifications	$194.44	$7.80	761.8	141.8
4d2	Dam arch removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management - upstream barrier modifications	$207.42	$8.25	761.8	141.8

1 **Table 1.5-2 Environmental Quality**

Alt.	Water Quality	Noise	Traffic			Air Quality	Biological			Cultural & Historic Resources
			Avg. Daily Truck Trips (~152 days/yr)	Avg. Annual Truck Trips (per yr)			Aquatic Habitat Connectivity Restored (yrs)	Malibu Creek Connectivity to Ocean (mi)		
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A
2a1	Mitigable Class II (Malibu Creek riverine reaches downstream of Rindge Dam) Less than significant Impacts Class III (lagoon)	Mitigable Impacts Class II	25-115	3k-16k	Potentially Significant Impacts Class I Traffic Study Required During PED	Significant Impact (CEQA) NO_x Emissions Class I Less than Significant (NEPA) Class III	7	8.5	Mitigable Impacts Class II	Significant Effect Class I Removal of Rindge Dam
2a2			30-80	2k-11k			8	8.5		
2b1		Significant Impacts Class I	25-115	3k-16k			7	14.8		
2b2			30-80	2k-11k			8	14.8		
2c1		Mitigable Impacts Class II	25-115	3k-16k			7	8.5		
2c2			30-80	2k-11k			8	8.5		
2d1		Significant Impacts Class I	25-115	3k-11k			7	14.8		
2d2			30-80	2k-11k			8	14.8		
3a	Significant Turbidity and Water Quality Impacts Class I	Mitigable Impacts	N/A	1st yr 300-500 total for clearing & hauling veg & building ramp Future yrs, <50 for ramp	Potentially Significant Impacts Class I Traffic Study	Mitigable Class II (CEQA) Less than Significant (NEPA)	Assume 40 yrs (range from 20-100 yrs)	8.5	Potentially Significant Impacts Class I turbidity and	Significant Effect Class I Removal of Rindge Dam &
3b		Significant Impacts						14.8		

Alt.	Water Quality	Noise	Traffic			Air Quality	Biological			Cultural & Historic Resources
			Avg. Daily Truck Trips (~152 days/yr)	Avg. Annual Truck Trips (per yr)			Aquatic Habitat Connectivity Restored (yrs)	Malibu Creek Connectivity to Ocean (mi)		
3c	(creek below the dam and lagoon)	Mitigable Impacts		repair & damsite work	Required During PED	Class III		8.5	sediment transport	Impacts to Serra Floodwall
3d		Significant Impacts						14.8		
4a1	Significant Turbidity and Water Quality Impacts Class I (creek and lagoon)	Mitigable Impacts Class II	25-115	1k-16k	Potentially Significant Impacts Class I Traffic Study Required During PED	Significant Impact (CEQA) NO_x Emissions Class I Less than Significant (NEPA) Class III	7	8.5	Potentially Significant Impacts Class I turbidity and sediment transport	Significant Effect Class I Removal of Rindge Dam & Impacts to Serra Floodwall
4a2			30-80	1k-11k			8	8.5		
4b1		Significant Impacts Class I	25-115	1k-16k			7	14.8		
4b2			30-80	1k-11k			8	14.8		
4c1		Mitigable Impacts Class II	25-115	1k-16k			7	8.5		
4c2			30-80	1k-11k			8	8.5		
4d1		Significant Impacts Class I	25-115	1k-16k			7	14.8		
4d2			30-80	1k-11k			8	14.8		

1 **Table 1.5-3 Other Social Effects**

Alt #	Flood Risk Downstream of Rindge Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
1	Increases with time	N/A	N/A	N/A	-Safety: May require repairs with time - Undesirable recreational attraction causing habitat disturbances	N/A	N/A
2a1	Same as Alt 1	-Recreation: Requires use of Malibu Pier parking lot for non-peak season (12 mos. over 3 yrs.) - Concessionaire and business revenue impacts - Beach access redirected to upcoast / downcoast on either side of parking lot - Increased truck traffic in community	N/A	- Aesthetics: Temp stockpile of mostly sands for up to 3 years. Max height approx. 10 feet. - Adds truck trips to temp store the material, then haul to pier parking lot	Removed	N/A	Traffic: ~ 1,900-8,500 annual truck trips to Calabasas Landfill during construction
2a2	Same as Alt 1	N/A	- Barges working through summer in nearshore area east of the pier - Ven. Harbor truck-to-barge loading adjacent to boat launch ramps	N/A	Removed	N/A	Traffic: ~ 2,200-11,000 annual truck trips to Calabasas Landfill & Ventura Harbor during construction

Alt #	Flood Risk Downstream of Rindge Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
2b1	Same as Alt 1	Same as Alt 2a1	N/A	Same as Alt 2a1	Removed	- Recreation: Temp access needed at LV1 for park access. - Traffic: Piuma Canyon Road CC1 requires traffic controls during const. - Temp	Same as Alt 2a1
2b2	Same as Alt 1	N/A	Same as Alt2a2	N/A	Removed	Same as Alt 2b1	Same as Alt 2a2
2c1	Same as Alt 1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	N/A	Same as Alt 2a1
2c2	Same as Alt 1	N/A	Same as Alt2a2	N/A	Same as Alt 1	N/A	Same as Alt 2a2
2d1	Same as Alt 1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	Same as Alt 2b1	Same as Alt 2a1
2d2	Same as Alt 1	N/A	Same as Alt2a2	N/A	Same as Alt 1	Same as Alt 2b1	Same as Alt 2a2
3a	- Increase flood risk above Alt 1. - Adds 10-ft high floodwalls b/w Cross Creek Br. & PCH	N/A	N/A	N/A	Removed	N/A	Up to 500 trucks first year, and less than 50 for remaining years
3b	Same as Alt 3a	N/A	N/A	N/A	Removed	Same as Alt 2b1	Same as Alt 3a

Alt #	Flood Risk Downstream of Rindge Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
3c	Same as Alt 3a	N/A	N/A	N/A	Same as Alt 1	N/A	Same as Alt 3a
3d	Same as Alt 3a	N/A	N/A	N/A	Same as Alt 1	Same as Alt 2b1	Same as Alt 3a
4a1	- Less increase in flood risk than Alt 3. - Adds 5-ft high floodwalls b/w Cross Creek Br. & PCH	Same as Alt 2a1	N/A	Same as Alt 2a1	Removed	N/A	Traffic: ~ 1,100-8,500 annual truck trips to Calabasas Landfill during construction
4a2	Same as Alt 4a1	N/A	Same as Alt2a2	N/A	Removed	N/A	Traffic: ~ 2,100-11,000 annual truck trips to Calabasas Landfill & Ventura Harbor during construction
4b1	Same as Alt 4a1	Same as Alt 2a1	N/A	Same as Alt 2a1	Removed	Same as Alt 2b1	Same as Alt 4a1
4b2	Same as Alt 4a1	N/A	Same as Alt 2a2	N/A	Removed	Same as Alt 2b1	Same as Alt 4a2
4c1	Same as Alt 4a1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	N/A	Same as Alt 4a1
4c2	Same as Alt 4a1	N/A	Same as Alt 2a2	N/A	Same as Alt 1	N/A	Same as Alt 4a2
4d1	Same as Alt 4a1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	Same as Alt 2b1	Same as Alt 4a1
4d2	Same as Alt 4a1	N/A	Same as Alt 2a2	N/A	Same as Alt 1	Same as Alt 2b1	Same as Alt 4a2

1.6 Comparison of Alternatives and Plan Selection

There were many environmental, social and economic tradeoffs to consider in the array of alternatives, with the common assumption that the removal of Rindge Dam and impounded sediment was the key factor to effectively address the planning objectives. Using traditional mining techniques to remove the impounded sediment allows for completion of the project within 7-8 years, but requires many trucks to travel along Malibu Canyon/Las Virgenes Road and other locations (Alternative 2 and 4 options) at a higher cost than natural sediment transport (Alternative 3 options), that takes many more decades to complete and results in low habitat unit outputs. Adding the modification and/or removal of upstream barriers significantly increased the benefits for a relatively low additional cost. As a result of these considerations and others, USACE identified Alternative 2d1 as the National Ecosystem Restoration (NER) Plan, which is the Tentatively Selected Plan (TSP) in the absence of an approved Locally Preferred Plan (LPP). The non-federal sponsor (CDPR) has indicated plans to formally request consideration of Alternative 2b2 as the LPP.

1.7 National Ecosystem Restoration (NER) Plan

The NER plan includes the removal of the Rindge Dam arch concurrent with the removal of the estimated 780,000 cubic yards of impounded sediment, placement of the impounded sediment along the Malibu shoreline, temporarily utilizing an upland storage site (Site F) for some of the mostly sands (Unit 2) layer of impounded sediment before delivery to the shore, use of the Calabasas Landfill for disposal of the nearly two-thirds of the remaining amount of impounded sediment, and modification to eight partial aquatic habitat upstream barriers on Cold Creek and Las Virgenes Creek tributaries to Malibu Creek.

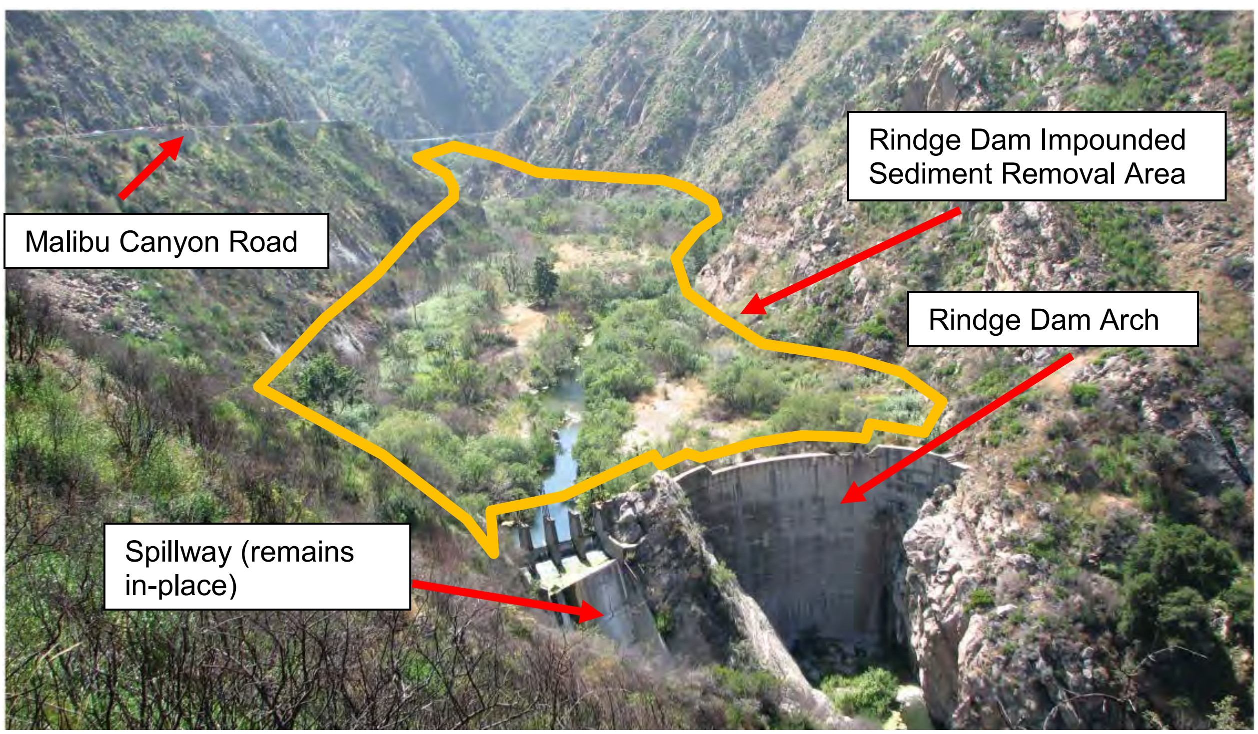


Figure 1.7-1 - NER Plan - Rindge Dam and Impounded Sediment Removal

Depending on the time of year, the mostly sands from the Rindge Dam impounded sediment would either be trucked directly from the site or from a temporary upland storage area (Site F), to be delivered to the Malibu pier parking lot, located on the eastern side of the pier. The material would be placed in the beach fill area in front of the parking lot. Public access would be maintained at the western and eastern side of the parking lot to retain access to beach areas outside the beach fill area. Wave action, currents and tides will quickly disperse sediment, predominantly in a downcoast direction.

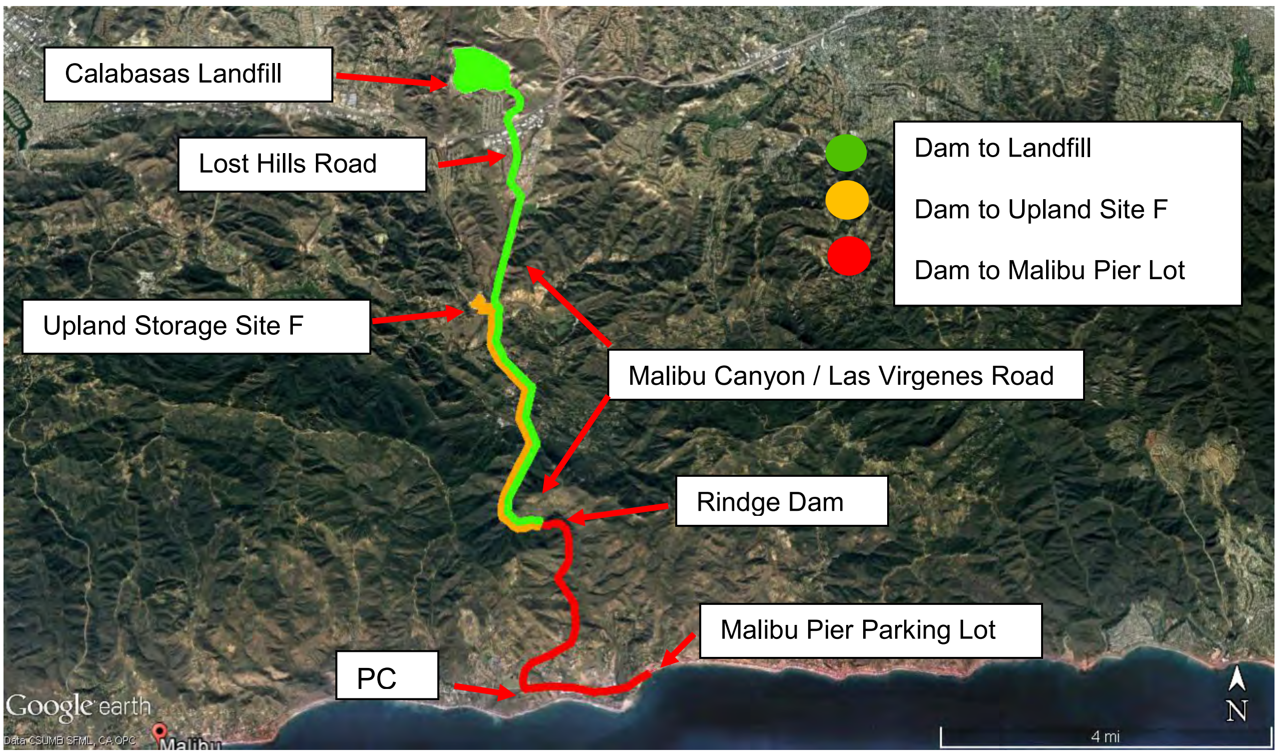


Figure 1.7-2 - Trucking Routes for Rindge Dam Impounded Sediment

The NER Plan is estimated to take 7 years to complete construction. The total cost estimate is about $172 million.

1.8 Likely Locally Preferred Plan

The CDPR has indicated its intent to pursue Alternative 2b2 as the LPP. The likely LPP is similar to the NER Plan in regards to actions described for the Rindge Dam and impounded sediment removal. The strategy for modification and removal of the upstream barriers is also the same as the NER plan. The differences in these plans include the method of transport and placement of the mostly sands, using trucks and barges for nearshore placement, and adding the removal of the Rindge Dam spillway.

The likely LPP allows for direct transport of sediment mined from the Rindge Dam impounded sediment area up Malibu Canyon and Las Virgenes Road, to Lost Hills Road, U.S. Highway 101 and the Ventura Harbor about 41 mi away from the dam. Material would be offloaded from the trucks and placed on barges to be transported to the Malibu shoreline, to the east of the pier. The use of barge allows for more flexibility in the location for placement of mostly sands, reducing risks of habitat and species disturbances during placement activities. As in the NER Plan, nearly two-thirds of the estimated impounded sediment would still be trucked about 7.4 mi each way from the impounded sediment site to the Calabasas landfill.

Habitat Evaluation outputs remain the same as those calculated for the NER Plan, but overall costs increase. The likely LPP construction timeframe is estimated to be 8 years. The total cost estimate is about $187 million.

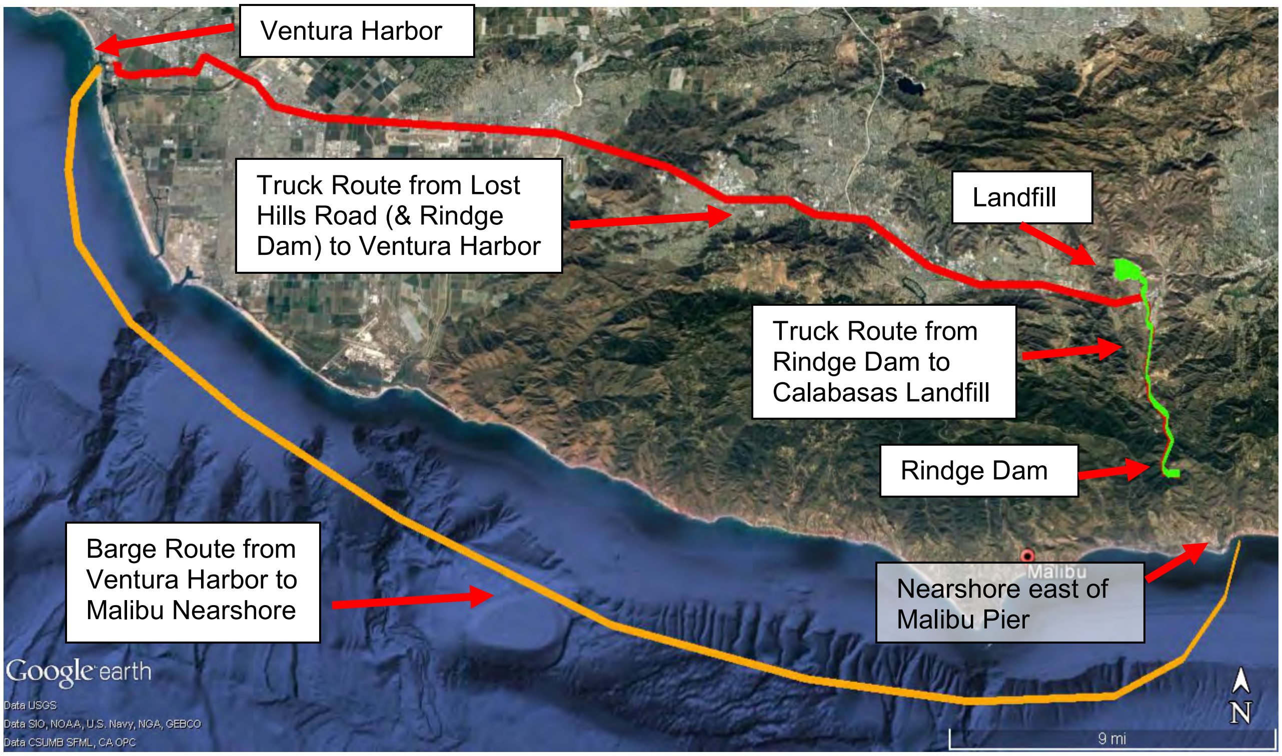
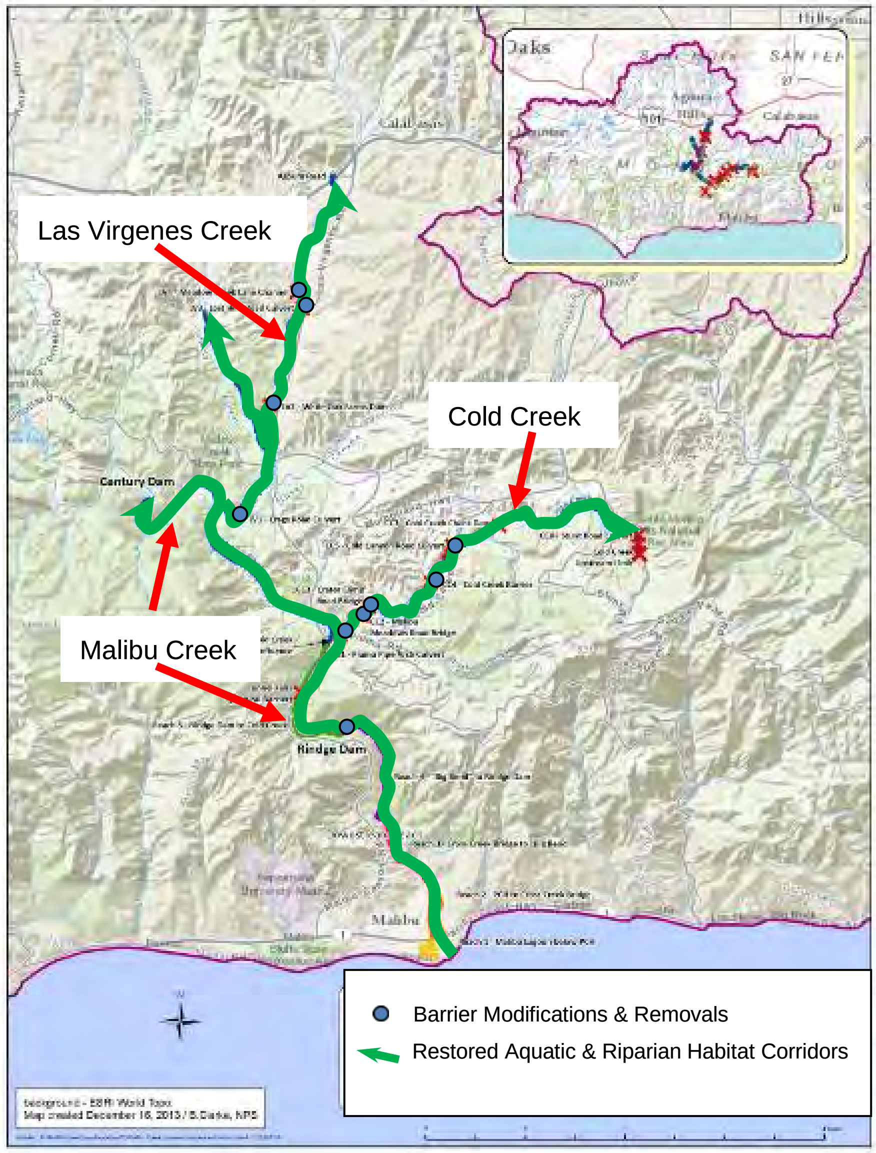


Figure 1.8-1 - Likely LPP Truck to Barge

1.9 <u>Tentatively Selected Plan</u>

Both the NER Plan and likely LPP restore a total of 18 mi of aquatic habitat connectivity within the watershed, from the Pacific Ocean to 8.5 mi upstream on Malibu Creek (at Century Dam), and an additional 9.5 mi of aquatic habitat along Cold Creek and Las Virgenes Creek. Both plans provide an estimated increase of 152.5 average annual habitat units when compared to the No Action alternative. Both remove the Rindge Dam concrete arch and the impounded sediment, and modify or remove other upstream barriers in a similar 7-8 year timeframe. The benefits would be attained at a lower cost for the NER plan, but involve non-peak season use of the Malibu pier parking lot and a temporary upland storage site for about 3 years of the construction timeframe while placing the mostly sands layer of the impounded sediment on the shoreline. The likely LPP avoids any need for temporary storage and use of the Malibu pier parking lot by taking the mostly sands layer to a barge to place in the nearshore environment throughout the construction timeframe. The likely LPP also removes the Rindge Dam spillway, a concrete apron built into a bedrock outcrop adjacent to the dam arch.

The USACE has selected the NER plan as the Tentatively Selected Plan (TSP). The CDPR supports the TSP selection but has also identified interest in a likely LPP. The CDPR is aware of the fiscal responsibility associated with support of the likely LPP, requiring the approximate $16 million difference in cost between the NER plan and likely LPP to be a 100% non-Federal investment. More detailed information on the alternative costs are included in the **Appendix F - Cost Engineering**. Summaries of the NER (TSP) and likely LPP costs and applicable cost-sharing and cost apportionment between the Government and the CDPR are included in Chapter 12.



- **Figure 1.9-1 - Restored Aquatic Habitat Connectivity – NER Plan and likely LPP**

Table 1.9-1 - Federal and non-Federal Apportionment of Total Project First Cost of the NER Plan (October 2016 Price Level)

Item [1]	Federal Cost	%	Non-Federal Cost	%	Total Cost
Ecosystem Restoration					
Construction	$82,814,563	65%	$35,131,154	28%	$117,945,717
LERRDs (100% Non-Fed)[2]	$0	0%	$9,461,303	7%	$9,461,303
PED	$12,422,184	65%	$6,688,869	35%	$19,111,053
Construction Management	$5,548,576	65%	$2,987,695	35%	$8,536,270
Total Project Cost	$100,785,323	65%	$54,269,020	35%	$155,054,343

(1) Based on October 2016 price level, 3.125% interest rate, and a 50-year period of analysis.
(2) Non-Federal Costs for Construction and LERRDS amount to a total 35% contribution.

Table 1.9-2 - Federal and non-Federal Apportionment of Total Project First Cost of the Likely Locally Preferred Plan (October 2016 Price Level)

Item [1]	Federal Cost	%	Non-Federal Cost	%	Total Cost
Ecosystem Restoration					
Construction	$85,749,641	65%	$36,711,580	28%	$122,461,221
LERRDs (100% Non-Fed)[2]	$0	0%	$9,461,303	7%	$9,461,303
PED	$13,338,932	65%	$7,182,502	35%	$20,521,434
Construction Management	$5,958,057	65%	$3,208,184	35%	$9,166,241
Sub-Total Project Cost Share Amount	$105,046,629	65%	$56,563,570	35%	$161,610,199
Additional Non-Fed Construction Costs					
Spillway Removal & Additional Barging Costs	$0	0%	$4,887,309	100%	$4,887,039
Total Project Cost	$105,046,629		$61,450,879		$166,497,238
(1) Based on October 2016 price level, 3.125% interest rate, and a 50-year period of analysis. (2) Non-Federal Costs for Construction and LERRDS amount to a total 35% contribution.					

1.10 Next Steps in the Planning Process

Comments provided on these alternative plans during the public draft review period, and other comments on the IFR and technical appendices, will be considered by the USACE and CDPR. After the close of the public review (and other concurrent reviews), the USACE will prepare for the Agency Decision Milestone meeting, when feedback on any significant comments and impacts to the NER Plan (and TSP) and likely LPP will be presented to a panel of USACE senior leaders. A decision will be made at that meeting regarding the selection of a plan to carry forward for feasibility-level design in order to complete the feasibility study and recommend to Congress for authorization.

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1 INTRODUCTION

The U.S. Army Corps of Engineers, Los Angeles District (USACE) in conjunction with the State of California, Department of Parks and Recreation (CDPR) and other interests (stakeholders) are conducting an ecosystem restoration feasibility study of the Malibu Creek watershed (watershed) along Malibu Creek and tributaries and the Malibu shoreline. Detailed investigations have been conducted in lower portion of watershed, specifically, areas upstream and downstream of an obsolete water supply dam on Malibu Creek known as Rindge Dam.

This study describes the Federal and State interest in restoration of the aquatic ecosystem along portions of Malibu Creek and tributaries based on identification of significant resources using input provided by multiple agencies and the interested public during the study. This chapter presents information on the study authority; the lead agencies preparing this integrated feasibility report and environmental impact statement/environmental impact report (EIS/EIR); the scope and content of the study, a summary of public involvement, and introductory information on the study area.

1.1 Background

CDPR was interested in Federal participation in this study due to the complexity of the challenges related to addressing measures that include significant modifications to Rindge Dam and potential release of some or all of the impounded sediment, and in order to ensure that alternatives developed are complete and comprehensive, particularly related to downstream impacts to the environment and development. A Feasibility Cost Sharing Agreement (FCSA) was signed between the CDPR, the non-Federal sponsor for the study, and the Department of the Army on July 30, 2001, initiating the feasibility phase of the study. The cost of the feasibility phase study is shared equally between the USACE and the CDPR.

For decades, the CDPR and stakeholders have been interested in pursuing the modification to, and possible removal of, Rindge Dam, located in Malibu Creek State Park. The evaluation of alternatives for addressing the ecological damage caused by Rindge Dam provides an important opportunity to achieve potential long-term restoration of Malibu Creek. Like most dams, Rindge Dam and its impoundment significantly affect stream habitat for southern California steelhead trout and other aquatic species by fragmenting habitat and disrupting ecosystem function (Heinz Center 2002). Access to miles of high quality stream habitat necessary to the species would remain blocked, and the steelhead would remain confined to a small habitat area below the Rindge Dam and thus remain vulnerable to all watershed disturbances, such as catastrophic fire, toxic spills, or other disasters.

Resource agencies and other agencies generally agree that steelhead would benefit if Rindge Dam and all of its impounded sediment were removed. However sediment removal is a costly and complex issue. If not handled properly, dam removal can pose a substantial though temporary flood risk resulting from the downstream movement of sediment and the associated potential for increased flooding or damage to existing habitat (Heinz Center 2002).

Rindge Dam has also restricted the flow of sediment downstream to replenish in-stream gravels and beach sand. With economically important Santa Monica Bay beaches eroding, the use of Rindge Dam sediments to nourish the shoreline and the nearshore environment creates a unique “win-win” ecological and economic nexus that may achieve multiple public benefits.

1.2 Study Authority

The Malibu Creek watershed ecosystem restoration feasibility study is prepared as a partial response to the Resolution adopted by the House Committee on Public Works and Transportation, dated February 5, 1992, which reads as follows:

> Resolved by the Committee on Public Works and Transportation of the United States House of Representatives, that the Board of Engineers for Rivers and Harbors is requested to review the report of the Chief of Engineers on Point Mugu to San Pedro Breakwater, California Beach Erosion Control Study, published as House Document 277, Eighty-third Congress, Second Session, and other pertinent reports, to determine whether modifications of the recommendations contained therein are advisable at the present time, in the interest of shore protection, storm damage reduction, and other purposes along the shores of Southern California from Point Mugu to the San Pedro Breakwater and nearby areas within Ventura County and Los Angeles County, California.

No projects have been authorized to date based on this resolution.

> The PDT addressed problems in the Malibu Creek watershed, formulating and evaluating measures and plans in consideration of "…other purposes along the shores of Southern California…"

1.3 Study Purpose and Scope

This study is prepared as an interim response to the study authority. The purpose of the study is to investigate ecosystem restoration opportunities within the Malibu Creek watershed to the nearby Pacific Ocean shoreline, specifically addressing aquatic and riparian ecosystem habitat connectivity problems and potential restoration of a more natural sediment transport regime. The scope of the study focuses on water resources within the lower portion of the watershed that were impacted by the construction of dams, roads and other infrastructure that resulted in disruptions to the natural sediment transport regime, migratory delays, and partial to complete barriers to historic spawning and rearing habitat for aquatic species and terrestrial species.

1.4 Guiding Regulations

This report is an Integrated Feasibility Report (IFR) and joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR, part of the IFR). This IFR includes the alternatives analysis and identification of a National Ecosystem Restoration (NER) Plan. The IFR also identifies that the CDPR has indicated intent to pursue a Locally Preferred Plan (LPP).

This IFR was conducted in accordance with National Environmental Policy Act (NEPA) (42 United States Code [USC] Section 4321 et seq.) in conformance with the Council for Environmental Quality ((CEQ) Regulations for Implementing NEPA (40 Code of Federal Regulations [CFR] Part 1500 et seq.) and the USACE NEPA Implementation Procedures (33 CFR Part 230), as well as USACE policies including, but not limited to the Principles and Guidelines for Water Resources and ER 1105-2-100, Planning Guidance Notebook (22 April 2000), and Guidance for Conducting Civil Works Planning Studies, (Dec 1990).

The document also meets the requirements of the CEQA (California Public Resources Code [PRC] Section 21000 et seq.) and the Guidelines for Implementation of the CEQA of 1970 (CEQA Guidelines) (14 California Code of Regulations [CCR] Section 15000 et seq.).

This IFR also includes technical appendices that support the plan formulation and evaluation process. Technical appendices provide detailed information on studies related to the survey, hydrologic, hydraulic and sediment transport analyses, geotechnical investigations, coastal, design and structural engineering, cost estimating, economic evaluation, and real estate investigations.

The USACE is the lead Federal agency for this study under NEPA. The CDPR is the lead agency under CEQA. The USACE and CDPR are preparing this document as an IFR, including a joint EIS/EIR, in the interest of efficiency and to avoid duplication of effort.

This IFR describes the affected environmental resources and evaluates the potential impacts to those resources as a result of constructing, operating and maintaining a Malibu Creek ecosystem restoration project. The EIS/EIR components of the IFR will be used to inform decision makers and the public about the environmental effects of a possible Malibu Creek ecosystem restoration project.

1.4.1 *National Environmental Policy Act*

NEPA was enacted by Congress in 1969 and requires federal agency decision makers to document and consider the environmental implications of their actions. When a federal agency determines that a proposed action could result in significant environmental effects, an EIS is required. The purpose of an EIS is to provide full and fair discussion of anticipated significant environmental impacts. The EIS must also inform decision makers and the public of the reasonable alternatives that would avoid or minimize significant impacts or would enhance the quality of the human environment. An EIS is both a disclosure document and a tool used by federal officials in conjunction with other relevant material to plan actions and make decisions.

This EIS/EIR sections of the IFR focus on the significant environmental effects and their relevance to the decision-making process for the alternatives. NEPA requires the federal lead agency to rely on a “scientific and analytical basis for the comparison of alternatives” (40 CFR Section 1502.16) in making its decisions.

1.4.2 *California Environmental Quality Act*

CEQA was enacted by the California legislature in 1970 and requires public agency decision makers to consider the environmental effects of their actions. When a state or local agency determines that a proposed project has the potential to significantly affect the environment, an EIR is required. The purpose of an EIR is to identify significant effects of a proposed project on the environment, to identify alternatives to the project, and to indicate the manner in which those significant effects can be mitigated or avoided. A public agency must mitigate or avoid significant environmental impacts of projects it carries out or approves whenever it is feasible to do so. If significant impacts cannot be avoided or mitigated, the project may still be carried out if the approving agency finds that economic, legal, social, technological, or other benefits outweigh the unavoidable significant environmental effects.

Environmental impacts, as defined by CEQA, include physical effects on the environment. In this document, the term is used synonymously with the term environmental effects under NEPA. The CEQA Guidelines (Section 15360) define the environment as follows:

The physical conditions which exist within the areas which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance.

This definition does not include economic impacts (e.g., changes in property values) or social impacts (e.g., a particular group of persons moving into an area). The CEQA Guidelines (Section 15131[a]) state, "economic or social effects of a project shall not be treated as significant effects on the environment." However, economic or social effects are relevant to physical effects in two situations. In the first, according to Section 15131(a) of the CEQA Guidelines, "an EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes to physical changes caused in turn by the economic or social changes." In other words, if a physical impact leads to an economic impact, which then leads to another physical impact, that ultimate physical impact must be evaluated in the EIR. In the second instance, according to Section 15131(b) of the CEQA Guidelines, "economic or social effects of a project may be used to determine the significance of a physical change caused by a project."

As with economic or social impacts, psychological impacts are outside the definition of the term "environmental." While not specifically discussed in the CEQA Guidelines, the exclusion of psychological impacts was specifically affirmed in a 1999 court decision (National Parks and Conservation Association v. County of Riverside 71 Cal. App. 4th 1341, 1364).

In view of these legal precedents, the CDPR is not required to treat economic, social, or psychological impacts as significant environmental impacts absent a related physical effect on the environment. Therefore, such impacts are only discussed to the extent necessary to determine the significance of the physical impacts of the recommended plan and its alternatives.

1.4.3 *Responsible, and Trustee Agencies*

Several other agencies have special roles with respect to the TSP and likely LPP, and may use this IFR as the basis for their decisions to issue any approvals and/or permits that might be required. Section 15381 of the CEQA Guidelines defines a responsible agency as:

> …a public agency which proposes to carry out or approve a project, for which a lead agency is preparing or has prepared an EIR or negative declaration. For the purposes of CEQA, the term "responsible agency" includes all public agencies other than the lead agency which have discretionary approval power over the project.

Additionally, Section 15386 of the CEQA Guidelines defines a trustee agency as:

> …a state agency having jurisdiction by law over natural resources affected by a project which are held in trust for the people of the state of California.

Responsible and trustee federal, state, and local agencies that may rely on this IFR in a review capacity or as a basis for issuance of a permit for the project, or for related actions include USACE, CDPR, California Department of Fish and Wildlife; National Marine Fisheries Service, U.S. Department of Fish and Wildlife, Regional Water Quality Control Board, California Coastal Commission, Los Angeles County Department of Beaches and Harbors, City of Malibu, the City of Calabasas, and the California State Lands Commission.

1.5 Integrated Feasibility Report Organization

The content for this IFR was established based on applicable laws, USACE regulations and guidelines, professional judgment regarding the nature of the project, Appendix G of the CEQA Guidelines, and USACE standard NEPA practices. Impacts are described under each of the environmental resource areas in Chapter 5. Detailed technical and additional background information are provided in the appendices.

To help the reader navigate this IFR, an overview of the contents and purpose of each section is provided below:

- Section 1 - Introduction: identifies the authorizing legislation, study background, an overview of the study area and environmental setting, and prior studies and reports. The structure of this section is closely linked to the typical Feasibility Study contents, but contains information necessary for an EIS/EIR.
- Section 2 – Project Purpose and Need, Problems and Opportunities, and Objectives and Constraints: establishes the purpose and need, planning objectives and criteria, planning constraints.
- Section 3 - Affected Environment/Existing Environmental Setting: describes the existing, potentially affected environment in the Malibu Creek study area. These include topography, water and sediment quality, aesthetics, recreation, air quality, noise, biological and cultural resources, etc. Regulations specifically applicable to each issue are noted. This section is consistent with NEPA terminology, but corresponds to the description of Existing Conditions under CEQA.
- Section 4 – Alternative Plans/Plan Selection: sets out the plan formulation with and without project, identifies alternatives subject to preliminary screening and secondary screening, and lists alternatives eliminated from further consideration and design features incorporated into alternatives. The focused array of feasible alternatives fully evaluated in the EIS/EIR is described in more detail via text, tables, and figures.
- Section 5 - Environmental Consequences: discloses the potential consequences of implementing each of the alternatives in the focused array. Mitigation measures are identified, if applicable. This section is consistent with NEPA terminology, but corresponds to Impact Analysis under CEQA.
- Section 6 – Cumulative Project Impacts: evaluates the potential impacts associated with implementation of each alternative in combination with other past, present and reasonably foreseeable projects.
- Section 7 – Effects Found Not to be Significant: provides information regarding impacts that were determined to be insignificant during the scoping process.
- Section 8 – Unavoidable Adverse Environmental Impacts: includes a summary of significant adverse effects to resources as a result of project alternatives.

- Section 9 – Environmental Compliance and Commitments: presents how the project is either compliant with applicable regulations or will achieve compliance before the project is implemented
- Section 10 – Other NEPA/CEQA Required Analyses: includes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity, irreversible of irretrievable commitments of resources involved, and growth inducement and consistency with applicable general plan and policies.
- Section 11 – Public Involvement and Agency Coordination: describes public involvement and agency coordination during the feasibility study.
- Section 12 – Plan Implementation: presents the Federal and non-Federal responsibilities for implementation of the NER Plan and likely LPP.
- Section 13 – Recommendation: identifies the TSP and next steps for the study.
- Section 14 – Preparers and Reviewers: lists USACE and CDPR participants.
- Section 15 – List of Acronyms and Abbreviations: summary of USACE and other acronyms and abbreviations.
- Section 16 - References: reports used in support of the study.
- Section 17 – Index: search index for keywords and phrases in the document.
- Appendices: There are a total of 17 appendices with more detailed technical information.

1.6 Study Scope

The scope of this feasibility study includes use of a six step plan formulation process, working with the CDPR, stakeholder interests, resource agencies, and the public to identify water resources problems and needs related to Malibu Creek and tributaries and surrounding habitat, land use and watershed interests. Part of the process is to review prior studies and reports and gather new information to create an existing inventory and forecast of future conditions ("baseline" or "no action") related to the public concerns, problems and needs. Alternative plans are formulated, evaluated and compared to each other and the baseline conditions to select a plan of action for ecosystem restoration.

1.7 Prior Studies, Reports, and Existing Projects

The Malibu Creek watershed and Malibu Lagoon are subjects of extensive management studies. These studies are managed and directed by a number of local technical task forces (Malibu Creek Watershed Executive and Advisory Council, Steelhead Restoration Task Force, Malibu Lagoon Task Force, and this study's Technical Advisory Committee). A more complete list of prior studies conducted by these groups and others are included in **Appendix J**. Reports on file at USACE include a 1995 Bureau of Reclamation Appraisal Report on the Removal of Rindge Dam prepared for the CDFW and a Heal the Bay (HTB) habitat and aquatic barrier assessment for the Malibu Creek watershed.

1.7.1 *Reconnaissance Study*

Under the Energy and Water Development Appropriations Act of 1998 (P.L. 105-62), the USACE received funding to undertake a reconnaissance study of ecosystem restoration and shoreline protection in the Malibu Creek Watershed. The reconnaissance phase of the study resulted in the finding that there was a federal interest in continuing the study into the feasibility phase. The reconnaissance report found:

Since ecosystem restoration appears justified and is a high priority budget output and that ecosystem restoration is the primary output of the alternatives to be evaluated, there is Federal interest in conducting the feasibility study. There is also Federal interest in other related outputs of the alternatives, such as beach nourishment, possible recovery of Federally-listed endangered species (steelhead) and limited recreation (hiking trails) that could be developed within the existing policy. Based on the preliminary screening of alternatives, there appears to be potential project alternatives that would be consistent with Army policies, costs, benefits, and environmental impacts (USACE, 2001).

1.7.2 *Existing Projects*

There are no existing federal projects in the study area. Several non-federal restoration projects in the vicinity of downstream reaches of Malibu Creek have been constructed since the beginning of the study, including the Malibu Lagoon Habitat Enhancement Project, the Malibu Legacy Park Project, and the Cross Creek Bridge Project. Two projects have been constructed above Rindge Dam in Malibu Creek (removal of a dry weather crossing near the confluence with Las Virgenes Creek) and the Cold Creek tributary (small dam). There are also multiple active projects along the length of Malibu Creek and some tributaries, including removal of an old roadway along Cold Creek, removal of invasive giant reed (Arundo donax) and invasive fish along Malibu Creek and its tributaries, and removal of invasive crayfish along Las Virgenes Creek. These restoration projects have improved habitat connectivity, biodiversity, and water quality, while also providing recreation and education opportunities to the local community.

Construction of the Malibu Lagoon Habitat Enhancement Project was completed by the CDPR in 2013. The western portion of the lagoon had experienced poor tidal circulation, and as a result, the low dissolved oxygen levels threatened the fish and wildlife species and promoted the proliferation of harmful bacteria. The project removed sediment and recontoured the western channel to improve tidal circulation through the area. Non-native invasive plants were removed, and native plant species were planted in areas temporarily impacted by construction.

The City of Malibu's Legacy Park Project, located in the Civic Center area of Malibu on the other side of Pacific Coast Highway from the Malibu Lagoon, is a multi-benefit project for the environment and the community. The project addresses four critical issues: (1) bacteria reduction in stormwater treatment, (2) nutrient reduction in wastewater management, (3) restoration/development of riparian habitats, and (4) the development of an open space area for passive recreation and environmental education. The Malibu Legacy Park Project involved the design and construction of a stormwater filtration and disinfection facility directly benefiting Malibu Lagoon by improving incoming water quality. This facility can process up to 1,400 gallons per minute of stormwater runoff prior to being released to Malibu Creek and Malibu Lagoon.

1.8 Scoping Process, Public Involvement and Issues

Throughout the environmental process and during the preparation of this IFR, the USACE and CDPR have solicited input on key issues and concerns from public agencies, stakeholder and interest groups, and the general public. The public scoping process was designed to help determine the range of issues addressed in the IFR and through the plan formulation process. Stakeholder meetings assisted in defining concerns about the TSP. The different aspects of public scoping include the Notice of Preparation (NOP) consistent with CEQA and Notice of Intent (NOI) consistent with NEPA, public scoping meetings, and stakeholder coordination. Early and open consultation with relevant agencies, organizations, and individuals assisted in defining the scope of this IFR.

The USACE and CDPR held a public scoping meeting on May 29, 2002, at the Las Virgenes Municipal Water District Training Room in Calabasas, California. Comments from this meeting and public correspondence have been used to identify problems and opportunities. Appendix A includes a transcript of the May 2002 public workshop and associated public comments.

Meetings have continued throughout the years with two primary groups meeting consistently in support of this feasibility study: the Project Delivery Team (PDT) and the Technical Advisory Committee (TAC). The PDT is comprised of representatives from the USACE and the Sponsor, utilizing engineers, scientists, technicians and other specialists to assist in analysis and risk-informed decision making. Other partners that have contributed funding to the non-federal share of study costs include the CDPR, California State Coastal Conservancy, Santa Monica Bay Restoration Commission (SMBRC), Los Angeles County Wildlife Conservation Board, Regional Water Quality Control Board, and Mountains and Restoration Trust.

The TAC was formed to provide a forum for communication and exchange of ideas between multiple agency representatives that aided in the study progression. The TAC is not subject to the Federal Advisory Committee Act (1972 Public Law 92-463, as amended). The TAC is a diverse group of resource agencies and stakeholder representatives that include the following representatives:

- US Army Corps of Engineers (USACE)
- California State Department of Parks and Recreation (CDPR)
- Cal Trout
- California Coastal Commission (CCC)
- California Coastal Conservancy (SCC)
- California Department of Fish and Wildlife (CDFW)
- California Regional Water Quality Control Board (RWQCB)
- California Trout
- Caltrans
- City of Calabasas
- City of Malibu
- Heal the Bay
- Las Virgenes Municipal Water District (LVMWD)
- Los Angeles County Department of Public Works (LADPW)
- Los Angeles County Dept. of Beaches and Harbors (LADBH)
- Malibu Surfing Association (MSA)
- Mountains Recreation and Conservation Authority (MRCA)

- Mountains Restoration Trust (MRT)
- National Marine Fisheries Service (NOAA, NMFS)
- National Park Service (Santa Monica Mountains National Recreation Area - SMMNRA)
- Pepperdine University
- Resource Conservation District of the Santa Monica Mountains (RCDSMM)
- Santa Monica Bay Restoration Commission
- Santa Monica Baykeeper
- Serra Retreat Community (Serra Canyon property owners)
- Southern California Coastal Water Research Project
- Surfrider Foundation
- The Bay Foundation
- U.S. Fish and Wildlife Service (FWS)
- U.S. Geologic Survey (USGS)
- University of California Cooperative Extension
- University of California Los Angeles (UCLA)
- Consultants
- Public interests

The TAC has actively participated in the planning process throughout the study and collaborated on the problem identification, collection of existing information, surveys and modeling, formulation, comparison and evaluation of the array of alternatives, and plan selection.

In April 28, 2016, in accordance with Section 106 of the National Historic Preservation Act and the CEQA, the USACE and CDPR gathered input on the focused array of alternatives developed for this study and the potential effects on cultural resources of interest to the Native American community. This consultation meeting was part of the scoping process to inform the USACE and CDPR of issues to consider when preparing this IFR.

1.9 Study Area / Project Area

The Malibu Creek watershed is located approximately 30 miles (mi) west of downtown Los Angeles, California. Approximately two-thirds of the watershed is located in northwestern Los Angeles County and the remaining one-third is in southeastern Ventura County. The watershed drainage area is approximately 110 square miles (mi^2) and includes areas of the Santa Monica Mountains and Simi Hills. Elevations in the watershed range from over 3,100 ft (ft) at Sandstone Peak in Ventura County to sea level at Santa Monica Bay (**Figure 1.9-1**). It is the largest coastal watershed in the Santa Monica Mountains, and is encompassed by one of the largest areas of protected open space left in southern California, the Santa Monica Mountains National Recreation Area (SMMNRA), managed by the National Park Service.

Tributary creeks, typically within steep mountainous canyons, converge to form Malibu Creek at Malibou Lake, a private residential and recreational community. Malibu Creek runs along the base of Malibu canyon in a generally southern route for about 10 mi before draining into Malibu Lagoon and the Pacific Ocean. Primary tributary flows into Malibu Creek in the lower portion of the watershed are from Las Virgenes Creek and Cold Creek. Stokes Creek and Liberty Canyon Creek are tributaries to Las Virgenes Creek, while Dark Canyon Creek is tributary to Cold Creek. A variety of streambed modifications are evident throughout the watershed, particularly in the upper, urbanized areas. However, the majority of the streambed in the area of study remains unimproved (i.e., is not armored with stone or concrete on bank or bed), though at times natural meanders of the creeks are constricted by roads and other development.

Malibu Canyon Road/Las Virgenes Road is the primary north/south route through the watershed, running generally parallel to Malibu Creek from Pacific Coast Highway (PCH, Highway 1) to the San Fernando Valley, past Interstate Highway 101 (Hwy 101). This route is one of the only major traffic arteries through the Santa Monica Mountains that connects the coastal (PCH) and valley (Hwy 101) routes.

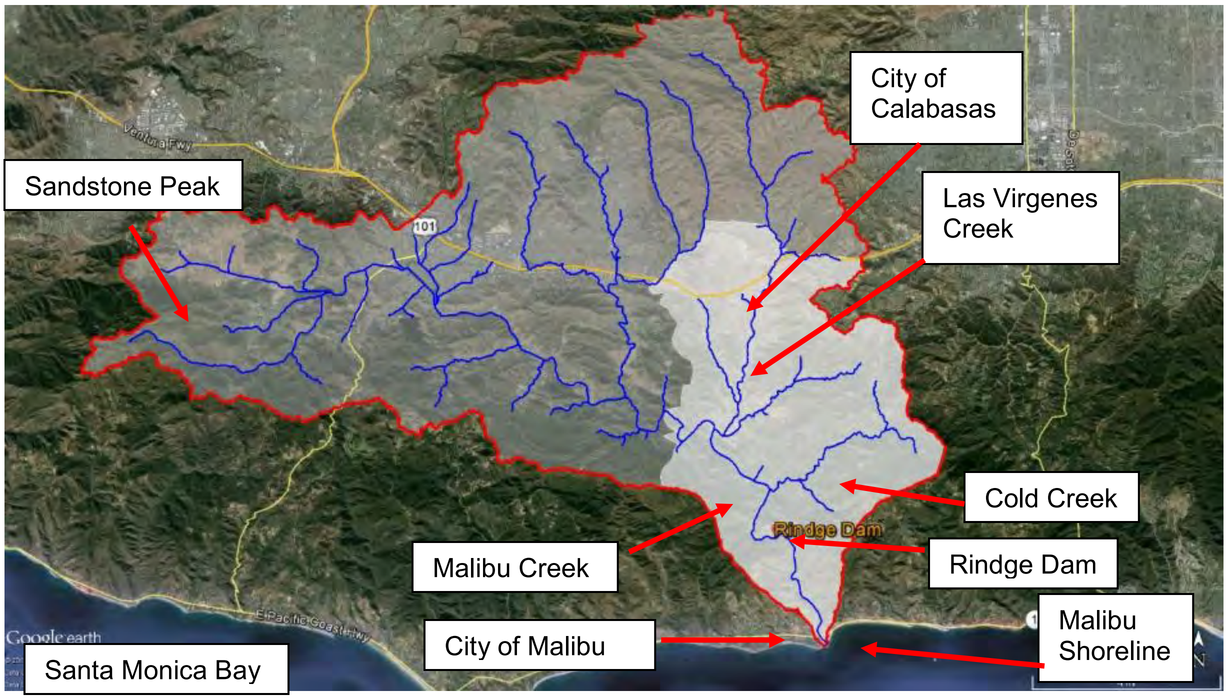


Figure 1.9-1 Malibu Creek Watershed Study Area and Project Area (Shaded)

The study area also includes shoreline and nearshore locations outside the watershed. The middle circle highlights the project area in relation to the Malibu Creek State Park portion of the SMMNRA. This shaded project area in the **Figure 1.9-2** includes the lower reaches of Malibu Creek including Malibu Lagoon, and Cold Creek and Las Virgenes tributaries above Rindge Dam. The project area is largely located on State lands bounded Malibu Creek State Parks and Malibu Lagoon State Beach which are managed CDPR. The entirety of the project area falls within the boundaries of the SMMNRA. Beach and nearshore areas within the study area extend from Thornhill Broome Beach in Ventura County to Las Tunas/Topanga Beach. A portion of the Ventura Harbor area was also included in the study area.

The study area is within California's 33rd Congressional District represented by Congressman Ted Lieu (D). A small portion of the northeastern part of the watershed is within California's 30th Congressional District represented by Congressman Brad Sherman (D). The western portion of the watershed is within California's 26th Congressional District represented by Congresswoman Julia

Brownley (D). California's senators are Senator Dianne Feinstein (D) and Senator Kamala Harris (D).

Figure 1.9-2 Santa Monica Mountains National Recreation Area and Study Area

1.10 Summary of Existing and Future Without Project (Baseline) Conditions

1.10.1 *Land Use*

Over two-thirds of the watershed is currently undeveloped, and projected to remain that way for the 50-year period of analysis, with one-third of that - over 30 mi^2 - protected as open space by state, Federal, and other agencies. Nearly 13 mi^2 of that area is the Malibu Creek State Park and Malibu Lagoon State Beach, managed by the CDPR. The park boundary extends from Malibu Lagoon, along Malibu Creek and several tributaries within and outside of the project area, connecting to other protected Federal lands in the SMMNRA portions of the Santa Monica Mountains.

The watershed includes the cities of Malibu, Calabasas and Westlake Village and other areas that have been modified by residential development, reservoirs, and agricultural operations. Several dams and lakes have been constructed in the watershed for water supply and recreation: Eleanor Dam in 1881, Sherwood Dam in 1904, Crags Dam in 1913, Malibou Dam in 1923, Rindge Dam in 1926, and Westlake Dam in 1965.

Flow in Malibu Creek is perennial (year-round), although some areas experience subsurface flow during the dry season in both the upper and lower reaches. The riparian corridor remains largely undeveloped and within protected areas. Development is located in the lower portion of Malibu Creek and Malibu Lagoon in the City of Malibu and the Serra Retreat community, the lower portion of Cold Creek is encompassed by low density residential development, and the upper reaches of Las Virgenes Creek is within the City of Calabasas, near Highway 101. Developments include road crossings within Malibu Creek and road crossing and culverts along tributaries. Though Malibu

Creek runs through developed portions of the cities of Calabasas and Malibu, much of the riparian corridor itself remains undeveloped.

Future land use changes will largely occur within the developed Malibu and Calabasas communities based on existing land use plans, with slight increases in residential development in other private lands. 40 mi^2 of the watershed is projected to be developed with no more than one dwelling per 20 acres. Therefore future changes are not expected to alter infiltration or the intensity of discharge and timeframe for delivery of storm runoff to Malibu Creek and tributaries. Other areas within the watershed are unlikely to experience land use changes based on existing topography that is comprised of a combination of steep slopes, ridgelines, and existing stringent coastal restrictions on development.

1.10.2 *Malibu Creek Watershed Aquatic / Riparian Habitat and Species*

More than 5,000 species of animals, fish, birds and plants make their home in Santa Monica Bay and watershed. Santa Monica Bay is part of the National Estuary Program, a network of voluntary community-based programs that safeguards the health of important ecosystems across the country. Malibu Creek is an important regional corridor linking Santa Monica Bay to Malibu Lagoon, one of the last two remaining estuaries in Los Angeles County, and riparian systems from the immediate coastal plain to interior plains and valleys within California State Parks and the SMMNRA. As such, the Malibu Creek watershed represents a unique opportunity for systemic and sustainable environmental restoration in highly urbanized southern California.

The Santa Monica Mountains supports a remarkable biodiverse wildlife community considering its close proximity to one of the largest urban areas of the United States. The Santa Monica Mountains are reported to support over 450 vertebrate species, including 50 mammals, 384 species of birds, and 36 reptiles and amphibians. The unusual geomorphology of Malibu Creek results in a wide variety of habitat types supporting hundreds of native plants and animals, including numerous state and federal special status species. Federally recognized threatened and endangered species include, but is not limited to: southern California steelhead trout (*Oncorhynchus mykiss irideus)*, the tidewater goby (*Eucyclogobius newberryi*), western snowy plover *(Charadrius alexandrines nivosus)*, CA least tern *(Sterna antillarum browni)*, and least Bell's vireo *(Vireo bellii pusillus)*. Important wildlife movement corridors support the continued survival of terrestrial animals, including mountain lions (*Puma concolor*), bobcats (*Lynx rufus*), badgers (*Taxidea taxus*) and mule deer (*Odocoileus hemonius*) (Penrod et al. 2006). In addition, state special status species include: Arroyo chub (*Gila orcuttii*), Pacific lamprey (*Entosphenus tridentatus*), California newt (*Taricha tarosa*), and western pond turtles (*Actinemys marmorata*) (Swift et al. 1993). A complete list of species is included in the Chapter 3 biological section of this IFR.

Aquatic and riparian habitat along Malibu Creek and tributaries are expected to remain relatively similar to present conditions in the future without project condition since a large amount of the area is already under the management and oversight of the Sponsor and the National Park Service in the SMMNRA. Based on TAC review of past and present habitat mapping, aerial photography, and field surveys, it is expected that the percent coverage of exotic and invasive species will increase slightly in reaches of Malibu Creek and tributaries if management measures are not implemented. Despite the generally good quality habitat, the presence of Rindge Dam and smaller upstream barriers interfere with aquatic habitat connectivity, wildlife movement and sediment transport, and these barriers would be expected to remain in the future without project condition.

Malibu Creek is one of the last remaining habitats that support the federally endangered steelhead trout. Steelhead are ocean-going forms of rainbow trout that are native to Pacific coast streams from Alaska south to northwestern Mexico (Moyle 1976). The population of steelhead in the Southern California Distinct Population Segment (DPS) is listed as endangered under the Endangered Species Act, and a California Species of Special Concern, and has adapted to survive the semi-arid climates and the rainfall pattern of southern California. The population is currently known from San Luis Obispo County south to San Mateo Creek watershed in San Diego County (NMFS, 1997; Wong, 2004). Currently, the three-mile stretch of Malibu Creek below Rindge Dam is listed as critical habitat for steelhead (NMFS, 2005).

For the purposes of the integrated report, steelhead was selected as the “keystone” species. Steelhead were chosen because of their anadromous life history which requires that the fish have access to high quality habitat in both the ocean and the creek at various stages. There is a wealth of information regarding steelhead for this watershed and region, and ongoing research that assisted the PDT and other members of the Technical Advisory Committee (TAC) in their analyses. In 2012, NMFS identified Malibu Creek steelhead as a high priority (Core 1) population for recovery based on regional significance, both spatially and genetically, and the capacity of the watershed to respond to recovery actions. The potential impacts and benefits of the various project alternatives were assessed in light of how they would affect this species. By improving access to habitat that is able to support steelhead, many of the other species of concern benefit as well.

1.10.3 *Habitat Evaluation*

The TAC determined that a key element of any restoration alternative for Malibu Creek is addressing aquatic habitat and aquatic connectivity, with steelhead as an indicator species. Equal consideration was given to multiple species habitat needs, as well as other important features of a healthy ecosystem, including riparian habitat quality, wildlife linkages, hydrology, and sediment regime. Three primary ecosystem components were considered to be equally important for the study’s Habitat Evaluation (HE) modeling: aquatic habitat value, riparian habitat value, and natural processes, with each component made up of two or more quantifiable variables. For the purposes of the HE, it was important to review the changes in the creek profile from one target year to another. Hydrodynamic model runs showed areas where substantial erosion or deposition of materials within a reach would affect aquatic and riparian habitat values.

> Habitat changes in regards to the extent and composition of native and non-native vegetation, as well as overall habitat conditions, reflect the TAC assessment and use of model data, accessible published studies, use of extensive local knowledge, and reliance on both aerial and on-the-ground site field surveys.

1.10.4 *Rindge Dam*

Rindge Dam is located approximately three miles from the mouth of Malibu Creek. The dam is located in a steep narrow canyon gorge that is difficult to access from the only thoroughfare, Malibu Canyon/Las Virgenes Road. The Rindge family built the dam as private water storage and supply facility for the Rindge family ranch and other business concerns between 1924 and 1926. The dam is a concrete arch structure 102 feet (ft) in height with an arc length of 140 ft at its crest (excluding the spillway and bedrock outcrop), and 80 feet at its base. The dam is 2-ft thick at the crest and 12-ft thick at the base. The height from the top of the arch structure to bedrock is approximately 108 ft. The center weir section of the arch is 5 ft lower than the raised ends (El. ~293 ft). Both ends of the dam crest featured five steps, each step measuring 12 in. The top of dam elevation is approximately 298 ft, and the elevation just downstream from the dam is about 185 ft. An 8-in steel pipe, located approximately 34 ft down from the crest of the dam, provided water from the reservoir down the canyon to the Malibu plain, and the Adamson House by Malibu Lagoon. The cost of the dam at the time of construction was estimated to be $152,928 (CA Dept. of Public Works, Division of Water Resources, 1929).

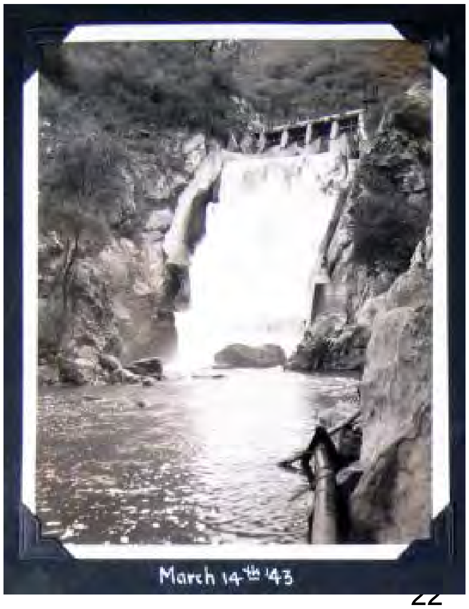
Photo 1.10-1 – Rindge Dam Arch & Spillway

A gated spillway was built into the rock outcrop on the western side adjacent to the arch dam abutment. The spillway crest elevation is approximately 285 ft. The spillway had four radial gates, each measuring 11 ft high by 8 ft wide, and had a maximum capacity of 7,000 cubic feet per second (cfs). During normal seasonal operations, the gates were raised (open) during the rainy winter months and lowered to the closed position during the summer to maintain maximum reservoir capacity during peak agricultural use.

Photo 1.10-2 - Malibu Lagoon and Shoreline

Photo 1.10-3 – Rindge Dam Arch & Spillway – 2005 Storm (5-10 yr event)

By 1945, the spillway gates had been damaged and the original storage capacity of the reservoir reduced from 574 ac-ft to about 75 ac-ft but continued to serve as a source of irrigation for the Malibu Water Company into the early 1960s. In 1945, consulting engineers (Taylor and Taylor) suggested letting the dam act as a sediment trap, dredge sediment to restore storage capacity, provide other means to divert water into the downstream supply pipeline, or cut a large diameter hole (approximately 10 ft) at the base of the dam to evacuate sediment



The reservoir, though essentially filled with sediment by the mid-1940s, continued to serve as a water supply district for the Malibu community into the early 1960s. By 1963, sales of irrigation water had dropped due to increases in residential development, and the reservoir had become filled with sediment, rendering the distribution system inoperable. In June 1966, the Malibu Water Company petitioned the California Public Utilities Commission (CPUC) to abandon and discontinue irrigation service to its customers claiming that silting of the dam's reservoir made water delivery impossible (CPUC 1967:1). In January 1967, the CPUC ordered the Malibu Water Company to abandon the dam and attendant distribution system (CPUC 1967). Thus, the dam was decommissioned in 1967. The property was purchased by the CDPR and is now part of Malibu Creek State Park. The CDPR monitors and maintains the dam as part of state park property.

Photo 1.10-4 – Rindge Dam Spillway, 1943 – Courtesy of Jim Edmonson

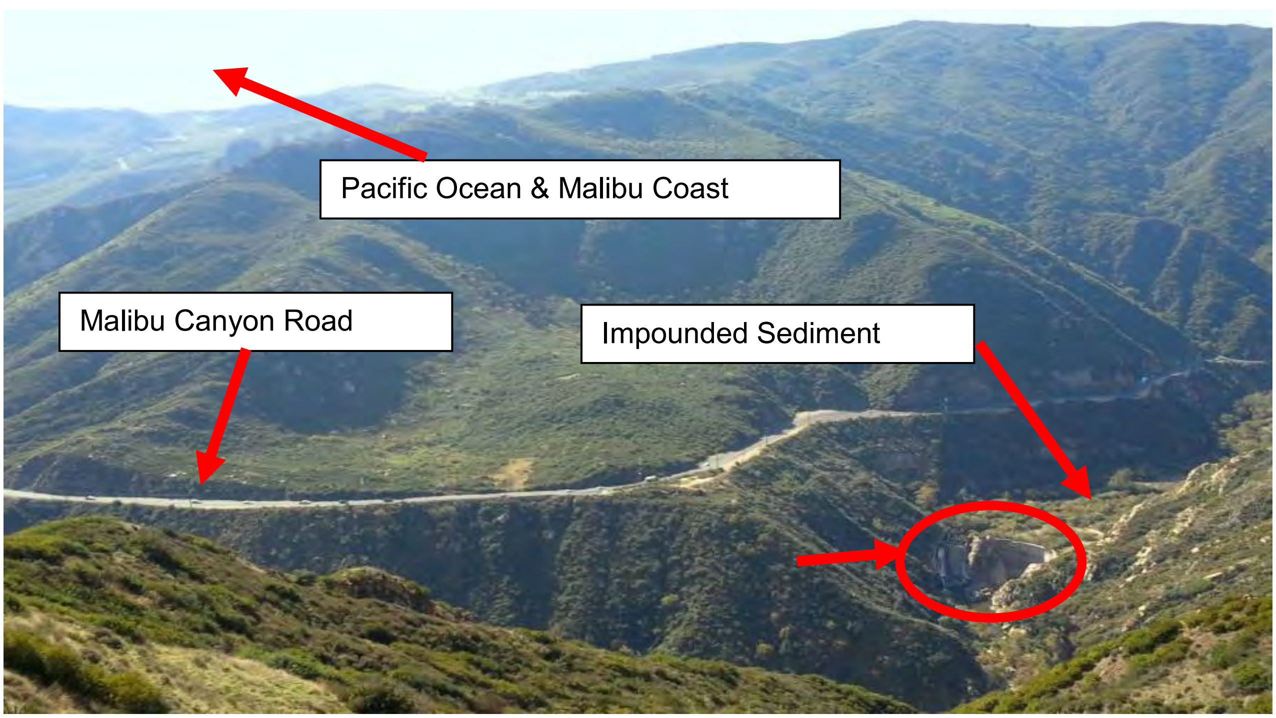


Photo 1.10-5 – Rindge Dam and Malibu Canyon Road

Due to the dam height and impounded sediment, Rindge Dam presents a major barrier for aquatic species to upstream spawning and rearing habitat. No reservoir currently exists behind Rindge Dam and the approximately 780,000 cubic yards (cy) of sediment impounded behind the dam has filled to the crest of the dam, about 100 feet above the elevation of the original streambed. Although the PDT initially assumed that Rindge Dam was still accumulating sediment, further investigations and modeling confirmed that the dam has reached its storage capacity with the current volume of impounded sediment. During peak events, the entire flow in Malibu Creek overtops the dam's crest transporting sediment eroded from the watershed to downstream reaches of Malibu Creek and the ocean. During other low flow regimes, the dam is expected to temporarily collect small volumes of additional sediment in future years until relatively frequent return frequency storms once again mobilize and transport the temporarily deposited sediment to downstream reaches of Malibu Creek and the ocean. If Rindge Dam had not been constructed, the impounded sediment that deposited in the former reservoir area would have been transported to downstream reaches of Malibu Creek, the lagoon and the ocean to nourish shoreline and nearshore areas without the dam in-place.

> Rindge Dam is part of the more than the estimated 84,000 dams in the nation that are owned and managed by either state governments, regional authorities or private entities, such as utility companies. According to the American Society of Civil Engineers, only 4 percent of those nation's dams are owned and operated by the federal government.

Although Rindge Dam is now 90 years old, the dam arch and spillway are assumed to remain intact in the future without project condition. A cursory level structural field investigation was conducted in the early years of the feasibility study. There is a likelihood of continued deterioration due to its age, but the risk of that alone leading to catastrophic failure of the arch structure is low. The dam arch is no longer subject to dynamic water loading with no reservoir pool behind it for many decades. The impounded sediment places a static load on the arch. Seismic activity could result in a catastrophic failure of the dam arch and although the downstream detrimental consequences of such an event could be significant, the risk of that occurring is relatively low.

The spillway has a cantilevered portion of concrete that extends out from the bedrock at the bottom of the spillway. That portion is now perched well above the elevation of the plunge pool at the base of Rindge Dam based on decades of erosion and ungated flows over the spillway. That lower portion may fail within the next several decades, altering flow patterns from the top to the base of the dam. There are ongoing safety concerns about young adults accessing the spillway, and their continued disturbance to critical habitat for steelhead is likely at the large pool at the base of the dam.

1.10.5 *NRHP Evaluation of Rindge Dam*

This study included a 2005 National Register of Historic Places (NRHP) evaluation of Rindge Dam (Statistical Research, Inc.). The evaluation states that NRHP is the official list of cultural resources recognized for their national, state, and local significance in American history, architecture, archaeology, engineering, and culture, and worthy of preservation. To be eligible for listing in the NRHP, a cultural resource must meet one of the four significance criteria defined by Title 36, Part 60, of the Code of Federal Regulations (36 CFR 60), which reads as follows: The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and

- that are associated with events that have made a significant contribution to the broad patterns of our history; or
- that are associated with the lives of persons significant in our past; or
- that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- that have yielded, or may be likely to yield, information important in prehistory or history.

There is also a general requirement that properties be older than 50 years. The results of the evaluation indicate that Rindge Dam exhibits historic integrity despite damage to the dam and the loss of regulating mechanisms associated with the operation of the spillway. The structure retains its integrity of design, workmanship, and materials, and is still recognizable today as an example of an early-twentieth-century constant-radius arch dam. Lastly, Rindge Dam retains integrity of association and thus conveys its historical significance as a privately-funded initiative by Mrs. Rindge to provide water for agricultural and domestic uses. Rindge Dam is considered eligible for listing in the NRHP under criteria b and c. Listing the property in the NRHP does not preclude removal of the dam arch or spillway, although Historic American Engineering Record documentation would be recommended.

1.10.6 *Rindge Dam Impounded Sediment*

The former Rindge Dam reservoir is entirely full of sediment; the surface is a series of large gravel bars with the creek meandering through them. Approximately 276,000 cy of beach-nourishment-type sand is estimated to be retrievable of the estimated 780,000 cy of sediment impounded behind the dam The sand-dominant sediment unit ("Unit 2") comprises nearly half the total volume of sediment and contains about 73% sand, 22% silt, 5% gravel and rock. Unit 2 is overlain by a gravel-dominant layer (Unit 1) and underlain by a silt-clay dominant layer (Unit 3). Units 1 and 3 each comprise roughly 25% of the overall sediment volume. Pre-reservoir alluvium is not present in large quantities and is presumed best left in place for natural riparian and stream-bottom substrate. USACE environmental testing shows all materials sufficiently contaminant free to be used for beach nourishment, although additional confirmatory sampling and testing for deleterious materials during construction is assumed for alternatives that include shoreline placement of Rindge Dam impounded sediment. The sand-dominant layer and the silt-clay dominant layer, based on regulatory-criteria-based environmental testing, are suitable for upland disposal, so any possible upland disposal application, such as agriculture, landfill cover, wasting in landfills, sale of materials, and impounding and stabilizing within the canyon walls, could be considered viable from a regulatory standpoint. Testing of the gravel-dominant layer was not undertaken, but previous testing of it by a private firm found it to be lacking in commercial value due to durability limitations.

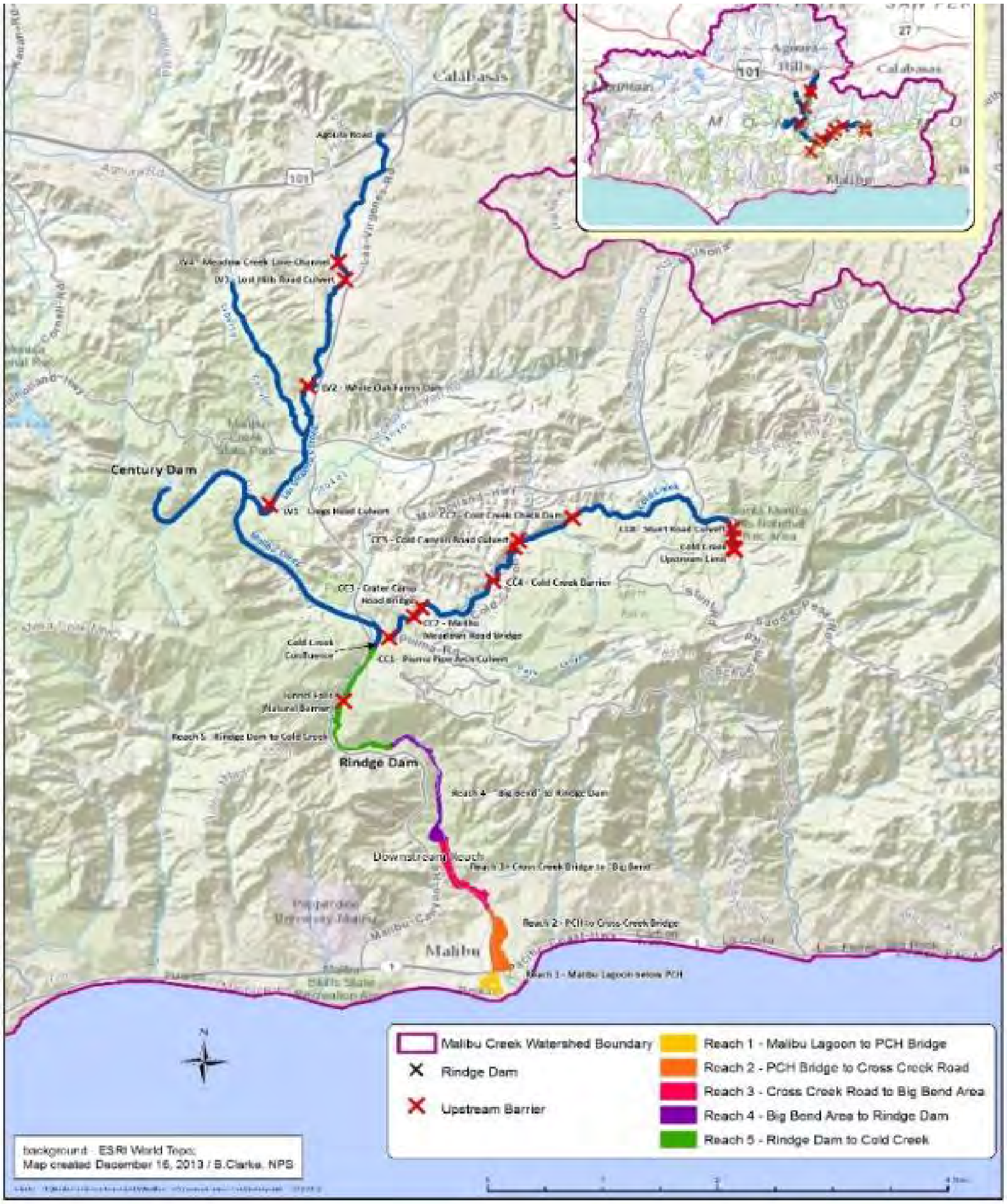
1.10.7 *Other Tributaries and Partial Aquatic Barriers*

In 2005, Heal the Bay (HTB, Abramson and Grimmer, 2005) conducted a fish barrier survey in the Malibu Creek watershed, identifying potential impediments to steelhead migration during moderate to high flow events, or are not passable altogether. This study, and several additional field studies identified a total of 37 partial and/or total barriers to aquatic habitat connectivity upstream of Rindge Dam. All of the aquatic barriers are within the Malibu Creek watershed, including two other large dams on Malibu Creek (Century and Malibou Dams, 5 and 6.9 mi upstream of Rindge Dam) outside the study area, small check dams, and concrete aprons and culverts under bridges. All three of the large dams in the watershed have accumulated and impounded sediment over the decades since construction. Malibou Dam, a recreation and water supply dam, constructed in 1923, is considered the modern upstream terminus of Malibu Creek. None of these dams have any significant impact on larger flood events. A variety of other streambed-modifications are particularly evident in the upper urbanized areas. In the past, several other dams and lakes have been constructed in the upper watershed for water supply and recreation including: Eleanor Dam in 1881, Sherwood Dam in 1904, Crags Dam in 1913, and Westlake Dam in 1965. Other aquatic barriers include culverts, road crossings and concrete-lined channels, in addition to the dams listed above.

The list of barriers includes 6 natural features (bedrock outcrops and waterfalls) that are considered partial or total barriers. Tunnel Falls is a series of pools and small falls formed by the bedrock outcrop located adjacent to the Malibu Canyon Road tunnel near Rindge Dam. Tunnel Falls is a partial barrier to fish passage, only during low flow conditions. Moderate to high flows allow for sufficient pool depths, resting velocities and jump heights for fish to migrate upstream and downstream. A large waterfall at the upper end of Cold Creek is considered a total barrier.

A 2008 watershed habitat assessment was conducted along the Cold Creek and Las Virgenes Creek tributaries to Malibu Creek for this study, including review of ten man-made barriers considered to be limiting factors to habitat access for steelhead and other aquatic species along thirteen upstream reaches of the creek and tributaries. An additional three tributary streams to Cold Creek and Las Virgenes Creek were also initially considered in the study: Dark Canyon Creek, Stokes Creek, and Liberty Canyon Creek; but were not carried forward due to the existing habitat quality and lack of available water. This survey was used to prioritize barriers, based on the amount of modification needed to address a barrier and the extent and quality of habitat that could be reconnected to lower reaches.

Figure 1.10-1 Upstream Tributaries, Aquatic Barriers, and Study Reaches: Malibu, Las Virgenes and Cold Creeks



During the study period, one upstream barrier in the project area (dry weather road crossing not included in **Table 1.10-1**) was removed on Malibu Creek upstream of the Las Virgenes Creek confluence by non-Federal entities. The Cold Creek barrier CC7, a small dam, was also removed by non-Federal entities during the study period, and removal of the CC4 barrier (small check dam) is nearly complete. Existing condition assumptions considers these barriers as removed. Based on research and discussions with the TAC, no other upstream barriers have been identified by other parties for removal or modification for restoration of aquatic habitat connectivity outside of this study. Therefore, all other barriers are assumed to remain for future without project condition considerations.

Table 1.10-1 Upstream Barriers Initially Analyzed – Malibu, Cold & Las Virgenes Creeks

Barrier ID	Name	Barrier Type	Barrier Severity	Barrier Description
Malibu Creek				
MC2	Tunnel Falls	Large waterfall	Passable high flows	Natural, steep tiered 10-ft tall cascade
MC3	Century Dam	Dam	Not passable	45 ft high, 10 ft wide, 122 ft long
Cold Creek				
CC1	Piuma Culvert	Culvert	Not passable	Pipe arch culvert at Piuma Road with corrugated aluminum at top and concrete bottom. 11 ft high, 12 ft wide, 46 ft long.
CC2	Malibu Meadows Road	Stream crossing	Passable high flows	Malibu Meadows Road bridge with concrete lined walls and bottom; outlet is a free-fall into a pool. 4 ft high, 28 ft wide, 40 ft long
CC3	Crater Camp	Stream crossing	Not passable	Crater Camp Road wooden bridge with concrete lined walls and bottom; outlet is a free-fall into a pool, 3 ft high, 11 ft wide, 46 ft long
CC4	Cold Creek Barrier	Dam	Passable moderate/high flows	30-ft long concrete dam. 2 ft wide, 2.5 ft high, 2-ft jump height, when measured. (removed)
CC5	Cold Canyon Road Culvert	Culvert	Not passable	25-ft diameter, 130 ft long large corrugated pipe culvert with concrete bottom at Cold Canyon Road; Short concrete apron into large boulder/bedrock pool at outlet, jump height when measured was 7 ft.
CC6	Unnamed	Large waterfall	Passable high flows	Natural, stepped plunge pools; average height 3 ft; average pool depth approximately 1.5 ft
CC7	Cold Creek Check Dam	Dam	Passable moderate/high flows	Old 30-ft wide check dam: a barrier during low flows. Barrier is 6 ft long and 3.5 ft high, with a jump height of 1.3 ft, when measured (removed)
CC8	Stunt Road Culvert	Culvert	Not passable	6-ft diameter, 104 ft long corrugated culvert with rebar/concrete along bottom; concrete crumbling; rebar rusted and bent; rust hole in culvert at outlet end; located at Stunt Road crossing
CC9	Unnamed	Large waterfall	Passable high flows	Natural, 5 ft high, 22 ft wide, 5 ft long waterfall
Las Virgenes Creek				

Barrier ID	Name	Barrier Type	Barrier Severity	Barrier Description
LV1	Crags Culvert	Stream crossing	Not passable	6-ft diameter, 31-ft long double barrel culvert road crossing at Waycross Road
LV2	White Oak Dam	Dam	Passable high flows	6 ft high, 87 ft wide, 6 ft long diversion dam with notch
LV3	Lost Hills Road Culvert	Box culvert	Not passable	23 ft high, 61 ft wide, 241 ft long box culvert with 4- 14-ft by 14-ft openings; silted in - lots of cattails, rabbitsfoot grass; nutsedge, etc.
LV4	Meadow Creek Lane	Drop structure	Not passable	!4-ft wide concrete culvert with failing tailwater walls (falling into stream)
LV5	Agora Road Concrete Channel	Concrete channel	Not passable	450-ft long, 40-ft wide concrete channel bordered by fifteen ft vertical concrete walls
LV6	101 Concrete Channel	Concrete channel	Not passable	4250-ft long, 26 ft wide concrete channel with vertical sides and flat bottom

1.10.8 *Malibu Lagoon and the City of Malibu*

Malibu Lagoon is a brackish water estuarine lagoon located below the Pacific Coast Highway Bridge, connecting the creek to the Santa Monica Bay portion of the Pacific Ocean. It is approximately 33 acres in its present form with recent restoration work completed on a portion of the lagoon. The lagoon is home and refuge for several listed species. Malibu Lagoon is assumed to remain relatively stable in the mix of current habitats, although maintenance is likely required by the Sponsor to maintain certain open water areas and channels in the recently restored area. Fine sediment transported from Malibu Creek will temporarily deposit in the lagoon, but much of that will flush through the system to the ocean during larger and less frequent storms.

Photo 1.10-6 - Malibu Lagoon and Shoreline

The City of Malibu is located both east and west of the creek and Malibu Lagoon. There are private residences located adjacent to Malibu Creek in the Serra Retreat community, about 2 mi downstream from Rindge Dam and near Malibu city center. Surfrider Beach and Malibu Pier are located to the east of Malibu Lagoon, and this area continues to be a culturally significant surf mecca for generations. The Malibu Colony, another community of private residences, runs parallel to the beachfront to the west of Malibu Lagoon. Pepperdine University is located nearby, and other commercial development is located along the PCH, running parallel to the Pacific Ocean.

1.10.9 *Shoreline and Nearshore Areas*

The shoreline is a mix of public and private use, with residences located immediately upcoast of Surfrider Beach, and a mix of commercial and residential use downcoast of the beach and Malibu Pier. The nearshore environment is a mix of sand and rocky-bottom habitat, with some of the rocky habitat supporting large kelp beds that support a diverse amount of species. Field surveys were conducted in June 2016 to map habitat areas and marine biological resources along a 3.5 mi stretch of Malibu shoreline from Carbon Canyon Road on the east to 1.5 mi west of Malibu Creek and the 20 foot mean-lower-low-water (MLLW) depth contour. A total of 325 acres of seafloor was mapped by employing sidescan sonar, down-looking sonar technology, remote video, and photographs to identify marine habitat types, identify bottom types (e.g., rock, sand), identify aquatic vegetation (e.g., kelp, eelgrass, surf grass, algae), identify any large objects (wrecks, debris, etc.), and anticipated resources that are known from or potentially present within the identified survey area. Biological characteristics of the study area were also compared to available information.

> Survey results assisted in identification of habitat types and biological resources that may be more susceptible to seasonal and long-term effects of turbidity associated with measures that deliver Rindge Dam impounded sediment to the Malibu Creek shoreline or nearshore areas via trucks and/or barges. Areas with predominant rocky bottom habitat, giant kelp, eelgrass or surfgrass are to be avoided.

East of Malibu Pier, the shoreline was generally sandy beach with intermittent rocks on the beach and in the surfline at both the west and east ends of the beach. The majority of the subtidal habitat was sand at depths between 0 and -35 ft. Giant kelp beds were mapped on reefs primarily located west of Malibu Pier. A second smaller bed was located offshore of Carbon Canyon. Giant kelp is considered a Habitat Area of Particular Concern (HAPC) for Fisheries Management Plan (FMP) Species under the Magnuson-Stevens Fishery Conservation and Management Act.

Surfgrass *(Phyllospadix torreyi and P. scouleri)* is a sensitive rocky intertidal and subtidal plant because it provides protective cover and nursery habitat for many invertebrates and fish some of which are commercially important including California spiny lobster (Engle, 1979). Like giant kelp, it is considered a HAPC for FMP Species. Surfgrass is susceptible to seasonal and long-term effects of burial and high turbidity. Its sensitivity is also related its susceptibility to long-term damage because it is a very slow growing species. Surfgrass was observed on low relief bedrock reef upcoast of Malibu Point at a depth of -15 ft MLLW and has been reported to occur in several locations (between survey Areas 1-3) based on historical CDFW habitat maps. Its depth distribution is between the lower intertidal zone and approximately -20 ft MLLW. Surfgrass was not observed on the underwater video east of Malibu Point. Eelgrass, another HAPC for FMP species, was not encountered within the study area. It is located in the sandy subtidal habitat at depths between -26 and -33 ft outside of Area 1 upcoast of Malibu Point (Merkel & Associates, 2015)

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Figure 1.10-2 - Malibu Shoreline Nearshore Habitat Characterization

Surfrider Beach is located at the mouth of the lagoon and is a world-renowned surfing destination. The historic Adamson House is located adjacent to the lagoon and beach, and had been a direct recipient of Rindge Dam water in early decades after construction of the dam.

A deficit of sand to the shoreline has accrued during the four decades (mid-20s to 60s) when the dam reservoir was capturing sediments. Sediments impounded upstream of Rindge Dam would have naturally washed out to the ocean if the dam was never constructed, with the sand fraction and cobbles supplying sediments to the littoral and the shoal at the mouth of Malibu Creek. Fine sediments would have dispersed and settled in the offshore. Alongshore currents resulting from approaching waves distributes the littoral drift both updrift to the west but predominantly downdrift to the east to nourish beaches between Malibu and Santa Monica.

The shoreline is expected to remain fairly stable and a similar mix of habitat and bottom substrates in the future without project condition. Seasonal and long-term cycles of erosion and deposition along the shoreline are anticipated. Climate change and sea level rise is not expected to significantly alter the lagoon or the shoreline boundary based on low, intermediate and high sea level change scenarios considered for the study (per Engineering Regulation (ER) 1100-2-8162).

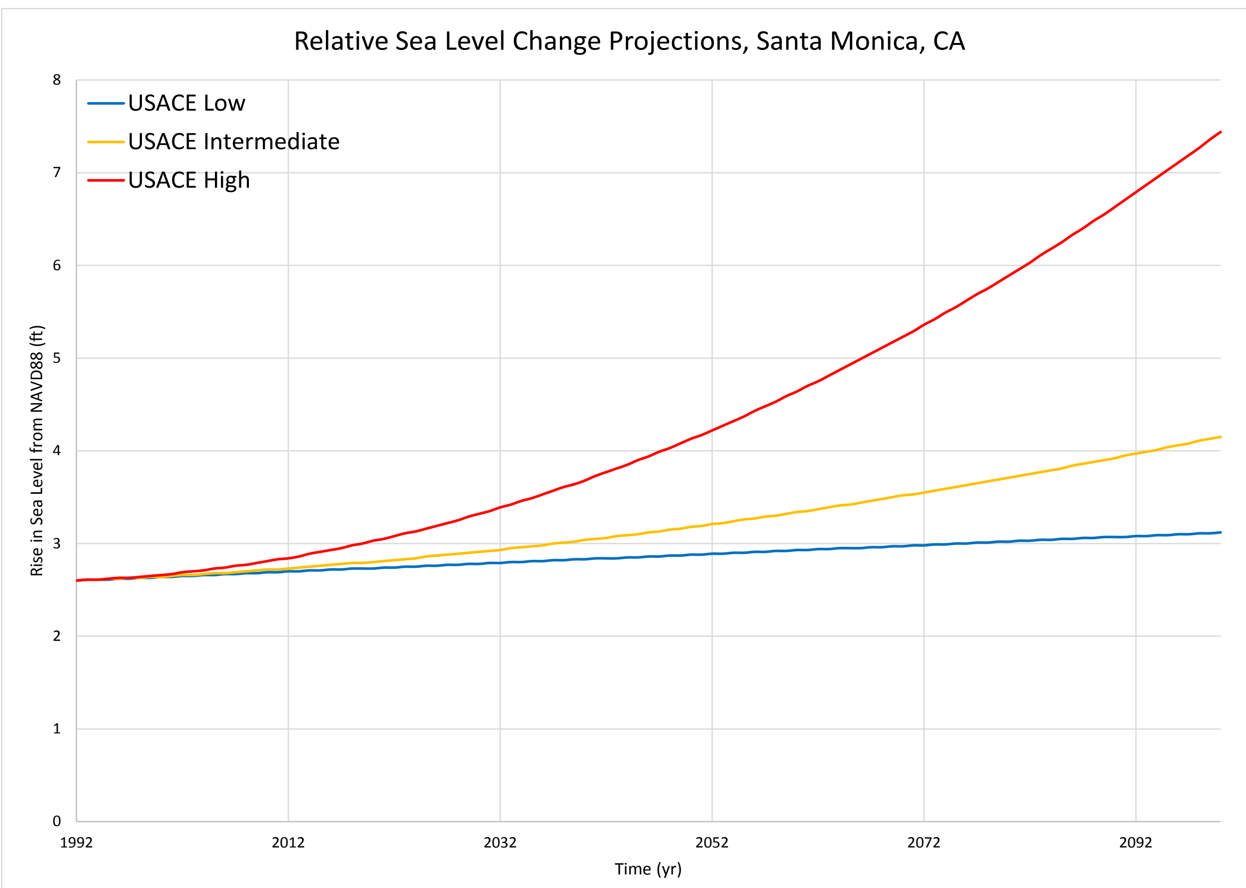

Figure 1.10-3 - Sea Level Change Scenarios (from NAVD88 reference)

Figure 1.10-4 Malibu Lagoon Future Without Project Condition Sea Level Change Scenarios (NAVD88 reference)

1.10.10 *Flood Risks – Downstream Reaches of Malibu Creek*

Existing flood risks and potential for future without- and with-project increases in flood risk were understood to be a concern to downstream residents and resources. An analysis of existing and future without project condition was developed using the USACE Hydrologic, Hydraulic and Sediment Transport models to assess the potential for changes to flood risk in Malibu Creek reaches below Rindge Dam. In the future without project condition, part of the No Action alternative, more coarse-grained sediment will be transported beyond Rindge Dam than prior decades and will deposit in downstream reaches raising the elevation of the channel invert. This will increase the risk of flooding to downstream residences and commercial structures as the system recovers from the impact of dam construction 90 years ago.

Although the focus of the study is ecosystem restoration, the economic analysis included a structure inventory using hydrodynamic model results and associated uncertainties in exceedance probability and stage discharge relationships. Outputs of these models were used to characterize the existing and future without project condition flood risks along Malibu Creek reaches below Rindge Dam. Results were also used to compare with model runs for alternatives that allowed for natural transport of some or all of the impounded sediment behind Rindge Dam. The primary area of potential existing condition flooding developed for use for this study only is outlined by the 0.2 annual chance of exceedance (ACE) event (or “500-year”) floodplain shown in **Figure 1.10-2**. More information is included in **Appendix B**.

A site survey of floodplain properties was conducted in 2005 for the economic analysis. There are 137 parcels in the Serra Retreat and City of Malibu 0.2% ACE floodplain. Residential structures in this area are generally of excellent constructional quality. Commercial structures at risk include various retail establishments. The total depreciated replacement value of property in the floodplain (2007 price levels) is estimated at about $116 million.

A risk-based analysis was used to evaluate without project flood damages in the study area utilizing the HEC-FDA computer program. Based upon the results of the flood damage analysis completed in 2007, equivalent annual damages (EAD) to structures and contents were estimated at about $1,145,000. The EAD are significant given the small number of structures (95) in the floodplain. The flood damages for the without project conditions increase over time due to increased sedimentation in Malibu Creek. Future housing growth in the damage area is assumed to be minimal. Therefore, the EAD value is not expected to increase due to future development. EADs/costs for cleanup, temporary housing/relocation costs, and private vehicle damages are estimated at about $90,000. These damages/costs represent less than 8 percent of total equivalent annual damages.

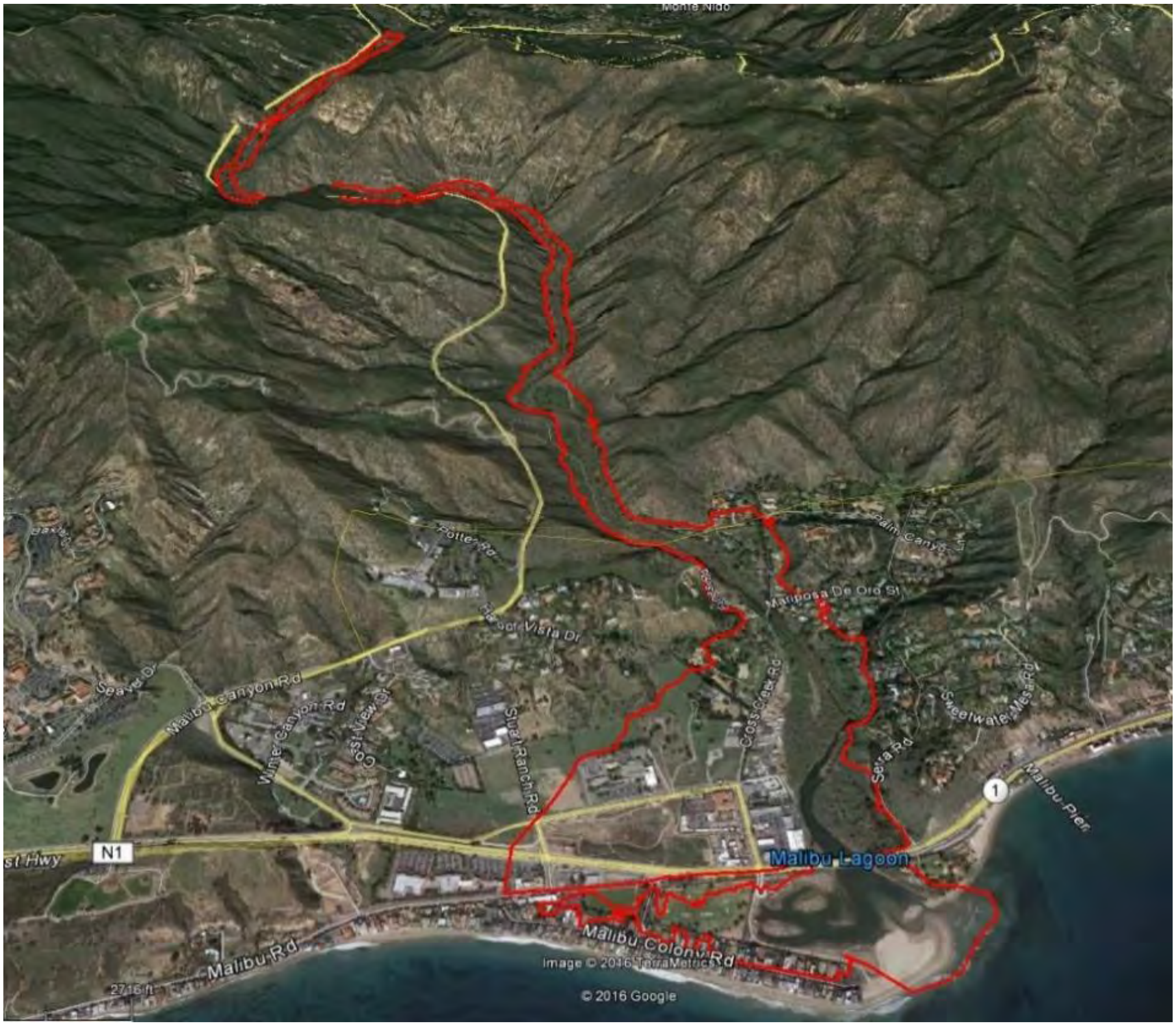

Figure 1.10-5 - 0.2% (500-Year) Chance Exceedance Floodplain Map (developed for use for this study only)

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2.0 RESOURCE SIGNIFICANCE, PROBLEMS AND OPPORTUNITIES, NEED FOR AND OBJECTIVES OF THE PROJECT, AND CONSTRAINTS

2.1 Plan Formulation

USACE planning process is based on principles, standards and procedures that guide water resources development at the national level and are articulated in the Principles and Guidelines (P&G, 1983) established in *The Economic and Environmental Principles for Water and Related Land Resources Implementation Studies*. It involves a six-step iterative approach to plan formulation and evaluation, as defined in USACE planning guidance Engineering Regulation (ER) 1105-2-100:

- Specification of the water and related land resource problems and opportunities (relevant to the planning setting) associated with Federal objectives and specific state and local concerns.
- Inventory, forecast, and analysis of water and related land resource conditions within the planning area relevant to the identified problems and opportunities.
- Formulation of alternative plans.
- Evaluation of the effects of alternative plans.
- Comparison of alternative plans.
- Selection of a recommended plan based upon the comparison of alternative plans. (Department of the Army 2000; P&G Section III 1.3.2(a)).

Iterative steps were often reviewed and revised during this study as more information became available, risk-based decisions were made, and increased level of detail was provided on the focused array of alternatives, resulting in the identification of the Tentatively Selected Plan and likely Locally Preferred Plan.

2.2 Identification of Problems and Opportunities

2.2.1 *Public Concerns*

Throughout the reconnaissance and feasibility phases of this study, public and agency concerns have been identified through a series of meetings, emails, phone calls and written correspondence. The development of the study problems and opportunities are a direct result of the public and agency concerns. A list of agencies involved is included in Appendix A. A Project Delivery Team (PDT) comprised of USACE and CDPR staff, other agencies and consultants worked closely with members of the multi-agency and public Technical Advisory Committee (TAC) to seek input and feedback throughout the planning process. The general public concerns used to develop the problems and opportunities are summarized below. A list of public comments and responses to the feasibility study and the initial public workshop and scoping meeting is contained in Appendix A.

- Habitat Changes and Restoration of the Aquatic Corridor - Physical barriers, including but not limited to Rindge Dam, fragment available aquatic and terrestrial habitat and are major impediments to migration, blocking access to spawning and rearing habitat for steelhead and other aquatic and terrestrial species.
- Altered Surface Water Flow - Historical changes in flow conditions and the effect these changes may have on stream hydraulics and aquatic restoration potentials.

- Environmental Protection – The existing native and sensitive habitats may require better protection. There was particular concern about possible adverse impacts to Malibu Lagoon prior to the restoration project.
- Water Quality - Specific parameters of concern include, among others, temperature, dissolved oxygen levels, potentially high nutrient loading, and water velocity. Improved water quality in the creek could potentially reduce stresses on steelhead and other aquatic species. Water quality in the lagoon and surf zone was also of concern.
- Flooding – Some development downstream of Rindge Dam reservoir is currently subject to sporadic flooding events. Concern was expressed over a potential increase in flooding if the dam was removed even though the existing reservoir area behind Rindge Dam is completely filled with sediment and the dam currently provides no attenuation of flows.
- Dam Safety - The current and future stability of the dam was questioned, particularly by residents in the Serra Retreat community, the City of Malibu and by parties involved in the restoration of Malibu Lagoon.
- Water Supply - The original intent of the Rindge Dam reservoir was to provide water supply for agricultural purposes. The dam was decommissioned for this purpose in 1967. There were concerns about restoration of the water supply function proposed by certain interests with the understanding that there is not currently any water storage available behind Rindge Dam.
- Bank Erosion - Concerns were raised over the potential to increase bank failures through partial or full removal of Rindge Dam, potentially increasing sediment loading in Malibu Creek and Malibu Lagoon or undermining existing infrastructure.
- Sediment Supply - Rindge Dam has performed as a sediment trap and may have caused excessive erosion in certain downstream reaches. However, sediment deposition in the pre-restored Malibu Lagoon was having a detrimental effect although the respective sediment contribution from fluvial and tidal sources, as well as lagoon hydrodynamics, remained unclear.
- Beach Nourishment - Potential beneficial uses of the accumulated beach compatible sediment behind the dam may include nourishing the downstream beaches to protect development from coastal storm damage.
- Historical Value of Rindge Dam – Several members and friends of the Rindge family expressed concerns about the potential loss of Rindge Dam and the significance of the structure in the early 20th century development of the area.
- Extent of Historic Steelhead Runs – Historic photographs from fishermen and verbal accounts indicate that steelhead were historically present upstream of Rindge Dam and Tunnel Falls, located just over a mile upstream of the dam. Rindge family members have argued that steelhead historically were not able to migrate above tunnel falls, although the falls are only considered a migratory barrier during low flow conditions. A Heal the Bay Barrier Assessment states that Tunnel Falls are comprised of a series of pools and small falls (jumps) that allow for upstream and downstream migratory passage during moderate to high flows. No other reports have been found that corroborate that steelhead may have been limited in their ability to migrate further up Malibu Creek, beyond Tunnel Falls.
- Lack of Diversity of Species in the Surf Zone – A longtime resident, biologist, surfer, and member of the Surfrider Foundation expressed concerns about the loss of biodiversity in the surf zone over the last 50 yrs. Where it was once easy to identify 60 to 70 species during low tide over several hours at the rocky bottom habitat near the mouth of Malibu Creek and Lagoon, there is now only about a quarter of those species present. The

assumption is too much freshwater and poor water quality could be killing marine creatures that once inhabited the rocky bottom strata.

- Potential Cost of a Project – Costs, particularly for removal of Rindge Dam, could be significant and should be minimized wherever possible without sacrificing the study restoration goals and objectives.
- Public Participation During the Study Process – Many stakeholders expressed interest in remaining actively involved in the planning process including being kept aware of the study progress.

2.2.2 *Problems*

Problem statements were developed for this integrated report in response to some of the public and agency concerns and were used to develop the study objectives and constraints. Several public concerns, including water supply and lack of diversity of species in the surf zone were considered in the baseline inventory and forecast, but were deemed beyond the scope of this study. The following problem and opportunity statements were developed in response to the public, Sponsor, resource agencies, and TAC concerns, and were used to develop the study objectives and constraints:

- Loss of connectivity to good-to-excellent quality aquatic spawning and rearing habitat for migratory species, and disturbances to adjacent riparian habitat due to the construction of Rindge Dam and other upstream road crossings and small dams, isolating reaches of Malibu Creek and tributaries in the watershed.

Fragmentation of ecosystems in southern California, the Santa Monica Mountains and in particular, the Malibu Creek watershed have adverse implications for the viability of remaining isolated aquatic, riparian, and other terrestrial species. Restoring aquatic habitat access at Rindge Dam, the largest barrier in the watershed would more than double the available habitat, restoring access to high quality habitat. Many more miles of good to excellent quality aquatic habitat along the major tributaries to Malibu Creek above Rindge Dam could also be accessible to migratory species by addressing other road culverts, small dams and crossings throughout the watershed.

- Disruption to historic migratory paths for mammals due to the construction of Rindge Dam and other upstream road crossings and small dams, isolating reaches of Malibu Creek and tributaries in the watershed.

Malibu Creek and surrounding riparian habitat formerly offered safe passage for small and large mammals from the ocean to inland plains and valleys in the Santa Monica Mountain range and beyond. These historic routes were blocked 3 mi upstream from the ocean after the construction of Rindge Dam. Other roads and dams constructed in the upper portion of the watershed further fragmented migratory paths for mammals and isolated riparian habitat, forcing mammals to use roads as bypasses. Construction of the Malibu Canyon/Las Virgenes Road provided a route for mammals to migrate around Rindge Dam, otherwise surrounded by steep canyon slopes, although road kills are relatively common as a consequence of that use. Road strikes include deer and the occasional mountain lion.

- Reduction of natural sediment delivery during storms to reaches of Malibu Creek and tributaries, the Malibu Lagoon, Pacific Ocean shoreline, and nearshore environments for over 90 years due to the construction of several water supply and recreational dams in the watershed.

Rindge Dam reached capacity for trapping and impounding sediment that is transported downstream during storm events many decades ago. The past loss of sediment transport to downstream reaches of Malibu Creek and the Malibu shoreline caused more scour within these areas, blocked nutrient reach fine sediment, and reduced beach widths. It is estimated that it will take approximately 100 more years before pre-dam natural transport is restored to the lower reaches of the Malibu Creek watershed below Rindge Dam, and the lagoon and shoreline. Over time, the creek bed elevation is expected to rise below Rindge Dam with coarse-grained sediment transported over the dam during the storms, nourishing the creek, lagoon and beach/nearshore areas.

Century Dam, located about four miles upstream from Rindge Dam on Malibu Creek has also trapped a smaller, but relatively significant amount of sediment. Malibou Dam, located an additional 1.9 mi upstream from Century Dam has also trapped some sediment, but is maintained as a recreation lake and residential community. For various reasons, these dams are considered outside of the scope of this study.

- Changes to the natural creek slope in the vicinity of Rindge Dam as a result of dam construction and associated sediment deposition have lowered base flow velocities, altering vegetation types and raising water temperatures, adversely affecting the aquatic habitat quality by adding stressors to native species.

Sediment deposition behind Rindge Dam has changed the natural slope of the creek, both upstream and downstream of the dam, slowing the flow velocity due to the flatter slope. The sediment deposition has also increased the width of the canyon bottom, resulting in decreased water depths. This increases water temperatures, increases algal growth and lowers dissolved oxygen levels. The reach immediately downstream of the dam has degraded to a more armored layer, possibly decreasing the amount of large vegetation that could grow in the reach, thereby increasing water temperatures.

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- The Rindge Dam spillway and surrounding creek slopes have become an attraction for people who use the bottom of the spillway and nearby high ground as a springboard for jumping into the large pool at the base of the dam.

There are concerns regarding both the safety of these people and the disturbance to the spillway pool's critical habitat that support steelhead and other species. Measures have been implemented by CDPR to patrol and limit access to the site, however the area is still accessed enough to consider this an ongoing problem.

2.2.3 *Opportunities*

Opportunities for this study include the potential to:

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- Provide for a more natural sediment transport regime in the vicinity of Rindge Dam and along reaches downstream of Malibu Creek to the shoreline.
- Reconnect the aquatic corridor to provide access to additional spawning and rearing habitat to a variety of aquatic species, including the Pacific lamprey, arroyo chub, southwestern pond turtle, and the federally endangered southern California steelhead, among others.

- Restore riparian habitat connectivity along Malibu Creek and tributaries, from the Pacific Ocean to the upper watershed, to include restoration of migratory corridors for terrestrial animals, including mammals and herptofauna.
- Address non-native species of concern occur within Malibu Creek that crowd out native species by outcompeting for light, water and nutrients, particularly within the Rindge Dam impounded sediment area and near upstream barriers. Non-native species include the giant reed *(Arundo donax)*, fountain grass *(Pennisetum setaceum)*, spurge *(Euphorbia spp)*, and pepperweed *(Lepidium latifolium)*.
- Allow for transport of Rindge Dam impounded sediment to nourish downstream shoreline and nearshore habitats that would have naturally benefited from this material without the dam in-place.
- Decrease potential for human disturbances to aquatic species in alliance with the formulation of other ecosystem restoration measures.

<u>Malibu Creek General Plan</u>

The Malibu Creek State Park General Plan (amended 2004) identifies multiple goals to protect and enhance riparian and aquatic habitats, wildlife corridors, sensitive species such as steelhead trout, and cultural resources. The General Plan calls out several goals and guidelines that support the purpose and need of this project. Key items are listed below.

- **Goal Natural Resources-4 (NR-4):** Protect, restore, and perpetuate native wildlife populations significant to the Park and the wider region.
- **Goal NR-5:** Protecting biocorridors and enhancing the movement of wildlife through the Park is essential to the survival of local species. The Park will work to maintain and enhance the dispersal and movement of native animals within and beyond Park boundaries.
  - **Guideline NR-5.3:** The riparian corridors in the Park encompass unique assemblages of vegetation and wildlife. Protect and enhance these important habitat movement corridors throughout the Park.
  - **Guideline NR-5.4:** Undertake efforts to enhance steelhead habitat and improve habitat connectivity through the Park.
- **Goal Cultural Resources (CR-1):** Identify, protect, and interpret the archaeological resources within the Park.
  - **Guideline CR-1.9**: Evaluate the potential effects of work by outside agencies upon the cultural and natural resources of the Park.

2.3 National Objectives

Several Federal agencies, including the USACE, follow the P&G with the intent to ensure proper and consistent planning by Federal agencies in the formulation and evaluation of water and related land resources implementation studies. The national or Federal objective of water and related land resources planning is to contribute to national economic development (NED) consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements (P&G, 1983). Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation. Therefore, contributing to NED is always a goal for USACE studies.

The USACE has another national objective for ecosystem restoration in response to legislation and administration policy. This objective is to contribute to the nation's ecosystems through ecosystem restoration, with contributions measured by changes in the amounts and values of habitat.

2.4 Need for and Objectives of the Project

As articulated in the problem statements above, Malibu Creek is an important regional ecological corridor that links Santa Monica Bay, the Malibu Lagoon (one of only two remaining estuaries in Los Angeles County) and riparian systems from the immediate coastal plain with interior plains and valleys. A large portion of the study area is located within the Malibu Creek State Park, and Malibu Lagoon State Beach park units managed by the CDPR. This area is also part of the Santa Monica Mountains National Recreation Area, administered by the National Park Service. The watershed represents a unique opportunity for systemic and sustainable ecosystem restoration in highly urbanized southern California.

The watershed supports a diversity of plant and wildlife species representative of unique biological resources encountered in the transverse ranges of southern California. The unusual geomorphology of Malibu Creek results in a wide variety of habitat types supporting hundreds of native plants and animals. Species have adapted to a climate with cool wet winters and hot dry summers.

The lower 3 mi of Malibu Creek is critical habitat for the endangered (federally listed) southern California steelhead trout currently blocked from accessing former spawning and rearing habitat due to Rindge Dam and other smaller barriers on upstream tributaries. The construction of the dam arch and concrete spillway was completed in 1926. The former reservoir behind the dam essentially filled with sediment by the mid-1940s, trapping sediment that would have nourished downstream reaches of the creek and the Malibu shoreline. Rindge Dam altered the natural geomorphic, riparian and aesthetic character of Malibu Creek. Pools, riffles, and runs that historically supported steelhead and other fish still exist above the dam. Upstream tributaries have smaller barriers such as culverts and bridges that interrupt connectivity for aquatic species. The barriers have interrupted the sediment transport regime in the watershed, interfered with habitat connectivity for aquatic species including the steelhead, and degraded habitat for aquatic species.

There is a need to reconnect the currently segmented aquatic and riparian corridor and to restore natural hydrology and geomorphology of Malibu Creek and tributaries. Restoring aquatic habitat connectivity represents a unique opportunity for systematic and sustainable ecosystem restoration in highly urbanized southern California.

The project purpose is stated in the form of planning objectives. The planning objectives developed for this study state the intended purpose of the planning process, identify what the USACE and CDPR partnership wants to achieve with the alternatives and accomplish with a plan, while avoiding violating the constraints stated below. The planning objectives are to:

1. Establish a more natural sediment transport regime from the watershed to the Southern California shoreline in the vicinity of Malibu Creek within the next several decades.
2. Reestablish habitat connectivity along Malibu Creek and tributaries in the next several decades to restore migratory access to former upstream spawning areas for indigenous aquatic species and allow for safe passage for terrestrial species from the Pacific Ocean to the watershed and broader Santa Monica Mountains National Recreation Area.

3. Restore aquatic habitat of sufficient quality along Malibu Creek and tributaries to sustain or enhance indigenous populations of aquatic species within the next several decades.

2.5 Planning Constraints

The PDT considered public concerns and problem statements, and study opportunities and objectives to limit choices on what is studied and identify what is beyond the extent of this planning study. The constraints unique to this study limit the choices that are made during development of alternative measures and plans and include the following:

- Maintain the downstream baseline condition level of flood risk along lower reaches of Malibu Creek within the Serra Retreat residential community and businesses in the City of Malibu avoiding potential for adverse flood-induced impacts associated with the consideration of upstream ecosystem restoration measures.
- Avoid or minimize adverse impacts to existing aquatic, riparian, lagoon and coastal habitats and species downstream of barriers considered in this study.
- Minimize detrimental impacts to existing water quality parameters in the lower portion of Malibu Creek.
- Avoid modification to ongoing seasonal freshwater discharges from Tapia Water Reclamation Facility into Malibu Creek above Rindge Dam.

2.6 Planning Considerations

Planning considerations that have guided the feasibility study process include the following:

- Rindge Dam will continue to obstruct migratory species from reaching the upstream portion of the watershed, thereby limiting terrestrial wildlife movement and the amount of spawning and rearing habitat available to steelhead and other aquatic species.
- Due to dams and other diversions, the littoral cell that nourishes beaches in the Santa Monica Bay will continue to experience a net deficit in sediment and beach erosion will continue to occur.
- Migratory barriers must be prioritized with downstream barriers first. To obtain full benefit, modification or removal of upstream barriers can only occur after the preceding barrier is deemed passable.
- Lessons-learned from other past and future aquatic habitat barrier removal projects within the watershed will assist in the formulation and evaluation of measures and plans for upstream barriers, including design and construction methods, monitoring and adaptive management, and cost estimates.
- Opportunities to educate the public on the historical importance of Rindge Dam will be included in the array of alternatives by considering the incorporation of signs or plaques along Malibu Canyon Road stopping points.

2.7 Inventory and Forecast – Resource Significance

Information gathered by the PDT during the study, including an inventory of existing conditions and forecast of future without project conditions, is included in Chapter 1 study area and existing and future without project conditions discussions. This information was prepared in consideration of relevant public concerns and problems and opportunities, reflecting what data is important for meeting the study objectives and avoiding the constraints. The inventory and forecast (baseline conditions) is used as a basis for the formulation of management measures and alternative plans, evaluation of the effects of alternative plans, and for comparison to the No Action (baseline) to action alternatives. Details of the PDT inventory and forecast of resources are included in the IFR appendices. A summary of the formulation, evaluation and comparison of alternatives is included in Chapter 4 of the IFR.

Resources of significance to the Malibu Creek watershed, their importance to the existing condition and forecasts, and needs to consider in the formulation of management measures and alternative plans are briefly described in **Table 2.7-1**:

Table 2.7-1 Resource Significance

TECHNICAL RECOGNITION	
Habitat Scarcity	Global – Study area is within the rare Mediterranean ecosystem that covers only 2% of the Earth's land surface but accounts for 20% of all known plant species (Kaufman 2003).
	Western Hemisphere – The western riparian ecosystem is one of the rarest habitat types in North America (Krueper 1995).
	United States – Western cottonwood-willow forest is one of the rarest and most endangered forest types in the U.S. (Noss & Peters 1995).
	Southwest – Due to arid Mediterranean climate, riparian areas are critical ecosystem as they occupy a very small area but support the majority of the region's biodiversity (Levick 2008).
Biodiversity – Special Status Species	California has the highest total number of species of plants and animals, including native species not found anywhere else, than any other state in the U.S. (Stein et al. 2000).
	The California Floristic Province has been declared a global biodiversity hotspot and is one of the world's 25 most biologically rich and threatened terrestrial ecoregions. Hotspots must contain at least 1,500 species of endemic vascular plants, and lost at least 70 percent of its original habitat (Myers et al. 1999).
	One of the world's 25 most biologically rich and threatened terrestrial ecoregions (Myers et al. 1999).
	California ranks number one in the United States for endemic (native) plants, amphibians, reptiles, mammals, and freshwater fish species that are unique to the state. Approximately 61% of the plants in the California occur nowhere else in the world. Approximately 50% of bird species and mammals in the United States are found in California (Bittman et al. 2003).
	Approximately 80 percent of all wildlife use the riparian ecosystem at some life stage, with over 50 percent of bird species nesting primarily in riparian habitats (Krueper 1993). The abundance and diversity of riparian vegetation, as compared to uplands areas, is key in providing food, shelter, water, breeding habitat, and movement corridors.
	Chaparral, grass and forbs, and coastal sage scrub are the major plant communities that dominate the study area, occurring predominately on the hillsides while mixed riparian and alluvial scrub habitat occurs along the riparian zone of Malibu Creek. The vegetation in the study area provides a variety of habitat types, including sensitive riparian and emergent wetland habitats. A total of 695 species of vascular plants from 108 families have been documented to date from the Santa Monica Mountains.
	The Santa Monica Mountains supports a remarkably abundant wildlife community. The Santa Monica Mountains are reported to support over 450 vertebrate species, including 50 mammals, 384 species of birds, and 36 reptiles and amphibians.
	Lower Malibu Creek is designated critical habitat for the southern California steelhead DPS (Distinct Population Segment) and supports several special status plant and animal species, including steelhead.

Status & Trends	The study area is in one of the top 25 global hotspots experiencing rapid biodiversity loss (Stein et al. 2000).
	Only 45,000 mi^2 of the California Floristic Province (or 25%) remains out of 183,000 mi^2 of the historic extent of vegetation (CEPF website).
	A total of 31% of plant and animal species at risk within the United States are found within California. This figure includes 32% of plant species, 41% of mammals, and 29% of reptiles at risk (Bittman et al. 2003). Less than 10% of wetlands' surface area remains in California, a 90% loss compared to wetland loss of 50% in the rest of the country (Dahl 1990).
	Over 90 percent of southern California's coastal region riparian habitat including Valley Foothill riparian habitats (Faber et al. 1989), and over 95 percent of California's wetlands and freshwater marsh, have been lost (Dahl 1990).
	The construction of the dam arch and concrete spillway was completed in 1926. Rindge Dam altered the natural geomorphic, riparian and aesthetic character of Malibu Creek. There is a need to reconnect the currently segmented aquatic and riparian corridor and to restore natural hydrology and geomorphology of Malibu Creek and tributaries.
	Prior to dam construction, Malibu Creek served as aquatic corridor providing access to spawning and rearing habitat to a variety of aquatic species, including the Pacific lamprey, arroyo chub, western pond turtle, and the federally endangered southern California steelhead, among others.
Connectivity	River channels in arid regions provide wildlife movement corridors essential to species survival due to the continuous chains of vegetation that wildlife can use for cover and food (Levick et al.2008).
	Rindge Dam and other upstream road crossings and small dams disrupt aquatic connectivity barring migratory fish and amphibian species and limiting their distribution.
	Rindge Dam interrupts historic migratory paths for terrestrial species, including mammals forcing them to use roads as bypasses, resulting in increased fatalities due to road strikes.
Hydrologic & Geomorphic Character	The Malibu Creek watershed is very dynamic. The flow in Malibu Creek and its tributaries can vary rapidly. Portions of the upper watershed are highly urbanized. Runoff from urban watersheds is characterized by high flood peaks of short duration that result from high-intensity rainfall on watersheds that have a high percentage of impervious cover. Malibu Creek has not been channelized, but short reaches along some of the tributaries have been improved. Runoff originating in the upper watershed flows at high velocities.
	Despite artificial water supplied by the Tapia Wastewater Treatment plant, portions of Malibu Creek below Rindge Dam go dry during summer months leaving a series of isolated pools in which aquatic species can survive.

INSTITUTIONAL RECOGNITION	
National Marine Fisheries Service	The removal of Rindge Dam has been identified as a high priority action critical to steelhead recovery in NMFS's Southern California Steelhead Recovery Plan. The NMFS strongly supports the project.
Environmental Protection Agency	The USEPA supports the projects goals of restoring Malibu Creek as an aquatic and wildlife corridor, including the beneficial reuse of sand on area beaches.
U.S. Fish and Wildlife Service	The USFWS supports implementation of the project that includes restoration of an important, historical wildlife corridor and includes plan for the removal of non-native plant and animal species and restoration with California native species.
Regional Conservation Agencies	The California Department of Fish and Wildlife, California Coastal Commission, California Department of Parks and Recreation all support the project and its goals.
PUBLIC RECOGNITION	
Surfrider Foundation	Surfrider supports the removal of Rindge Dam and the restoration of the sediment and hydrologic regime of the Malibu Creek system restoring hydraulic connectivity from the Santa Monica Mountains to the sea restoring sand flows to help maintain down coast beaches.
Heal the Bay	Surfrider supports the removal of Rindge Dam and the restoration of the sediment and hydrologic regime of the Malibu Creek system restoring hydraulic connectivity from the Santa Monica Mountains to the sea restoring sand flows to help maintain down coast beaches.
Scholarly & Media Attention	Malibu Creek, its degradation and potential restoration, have been the subject of increasing scholarly attention, news and magazine stories, inspiring local and national artists, filmmakers, authors and poets.

- ***Future without project condition land use changes are not expected to alter creek flows within the Malibu Creek watershed.***

With little anticipated land use changes due to increases in the density or distribution of future development, and with much of the watershed under management and protection of the CDPR and NPS, the hydrologic, hydraulic and sediment transport modeling results for this study are only impacted by climate change assumptions. Coarse sediment eroding from the watershed will be transported during storms to lower reaches of Malibu Creek resulting in creek bed elevations generally aggrading (rising) over time. Rindge Dam will not trap additional sediment, aside from small volumes between storms that will be mobilized during the next moderate-to-large storm.

- ***Malibu Creek is an important regional corridor for a variety of species.***

Malibu Creek links Santa Monica Bay, the Malibu Lagoon (one of only two remaining estuaries in Los Angeles County) and riparian systems from the immediate coastal plain with interior plains and valleys of both CDPR and the SMMNRA. As such, the watershed represents a unique opportunity for systemic and sustainable ecosystem restoration in highly urbanized southern California. Connectivity is currently severely limited by the presence of Rindge Dam and other upstream barriers.

- ***The Malibu Creek watershed supports a diversity of plant and wildlife species representative of unique biological resources encountered in the transverse ranges of southern California.***

The unusual geomorphology of Malibu Creek results in a wide variety of habitat types supporting hundreds of native plants and animals. Species listed in Chapter 1 and elsewhere in the IFR and appendices have adapted to a climate with cool wet winters and hot dry summers.

- ***Malibu Creek is one of the last remaining habitats that support steelhead in the region.***

For the purposes of this IFR, steelhead trout were selected as the “keystone” species and the potential impacts and benefits of the various project alternatives were assessed in light of how they would potentially affect this species. Steelhead were chosen because of their anadromous life history which requires that the fish have access to high quality habitat in both the ocean and the creek at various stages. By increasing access to habitat that is able to support this species, many of the other species of concern benefit as well.

Steelhead in Malibu Creek were considered to be the southernmost population when the species was federally listed in 1997 (NMFS 2007). Malibu Creek has been identified as a Core 1 population, indicating its high priority for recovery based on factors such as intrinsic potential for recovery, regional significance both spatially and genetically, and the capacity of the watershed to respond to recovery actions (NMFS 2012). The removal of Rindge Dam has been identified as a high priority action critical to steelhead recovery (NMFS 2012).

- ***Restoring aquatic habitat connectivity represents a unique opportunity for systematic and sustainable ecosystem restoration in highly urbanized southern California.***

Dam removal results in restoration of aquatic and terrestrial wildlife across the current dam and sediment impound areas and allows for the removal of non-native species. The former Rindge Dam reservoir filled with sediment by the 1950s, and effectively prevents the free movement of steelhead and other aquatic species from travelling up and down the stream. The dam has interrupted the natural sediment transport of Malibu Creek, and has altered the natural geomorphic, riparian and aesthetic character of Malibu Creek. Reaches of Malibu Creek downstream of Rindge Dam to the ocean have been starved of sediment and sands for decades.

The PDT used past studies, limited and ongoing field surveys and analyses, including models and a habitat evaluation to assess existing and future without project conditions at Rindge Dam. Development of these tools were integral to the formulation and evaluation of management measures and alternative plans. Restoring habitat connectivity at Rindge Dam offers opportunities to beneficially utilize some of the impounded sediment for shoreline or nearshore nourishment, compensating for some of the loss of sediment recharge to these areas and lower reaches of Malibu Creek after decades of sediment trapping behind Rindge Dam.

3.0 AFFECTED ENVIRONMENT/EXISTING ENVIRONMENTAL SETTING

3.1 Introduction

A significant amount of document and field research was required to inventory and forecast baseline conditions regarding the affected environment and the existing environmental setting for this study. The PDT, comprised of members from the USACE, the CDPR, the TAC, and consultants, researched prior documents, conducted field surveys, prepared models and evaluations, and interim and final work products, making risk-informed decisions throughout the planning process. The PDT, TAC and numerous other agency representatives met to discuss and coordinate findings to support the preparation of this feasibility report. Many prior studies have been conducted in specific areas of this watershed for multiple purposes, including lagoon restoration and development of alternative plans to address what to do with Rindge Dam. These prior studies were used where applicable, and are listed in the reference section. New studies for this feasibility effort include geotechnical field investigations of impounded sediments behind Rindge Dam, a dam structural field survey, a cultural resources study of the dam, topographic mapping and bathymetric mapping of the lagoon, aerial photography, detailed vegetative surveys of the lower watershed, species surveys and monitoring, hydrologic, hydraulic and sediment transport modeling, lagoon (estuarine) modeling, upper watershed habitat and species field surveys of Malibu Creek and tributaries, surveys of nearshore ocean habitat in the vicinity of Malibu, and additional studies of upstream barriers.

This information is used to evaluate and compare alternative plans developed for this study. A summary of baseline conditions is included below.

3.2 Earth Resources

3.2.1 *Topography*

Malibu Creek runs through Malibu Canyon, which contains steep to very steep sloping hills. Elevations in the Malibu Creek watershed range from over 3,100 ft at Sandstone Peak in Ventura County to sea level at Santa Monica Bay. The topography of the creek flattens as it continues downstream (**Figure 3.2-1**). Malibu Creek has been sectioned into six different reaches in support of this study as described in Section 1.9. Colored areas along Malibu Creek in **Figure 3.2-2** depict the approximate location of the 100-year floodplain. The Malibu Creek and tributary reaches upstream of Reach 6 are similar in character to Reach 6.

3.2.2 *Geology*

The Santa Monica Mountains and Simi Hills are part of the Transverse Ranges. They were formed through a process of deposition, erosion, volcanic activity, and tectonic forces. Approximately 135 million years ago, the ocean covered the area where the Santa Monica Mountains are located. Over millions of years, sediments settled on the ocean bottom, and eventually through pressure and chemical processes, were transformed into sedimentary rocks (shale and sandstone) that compose most of the area (Jorgen 1995). These sedimentary rocks were tectonically uplifted through time and compose most of the slopes that descend to Malibu Creek. Because of inherent weaknesses in the sedimentary rocks, the slope of which they are composed are susceptible to landsliding.

Figure 3.2-1 Topography Characteristics of the Project Vicinity

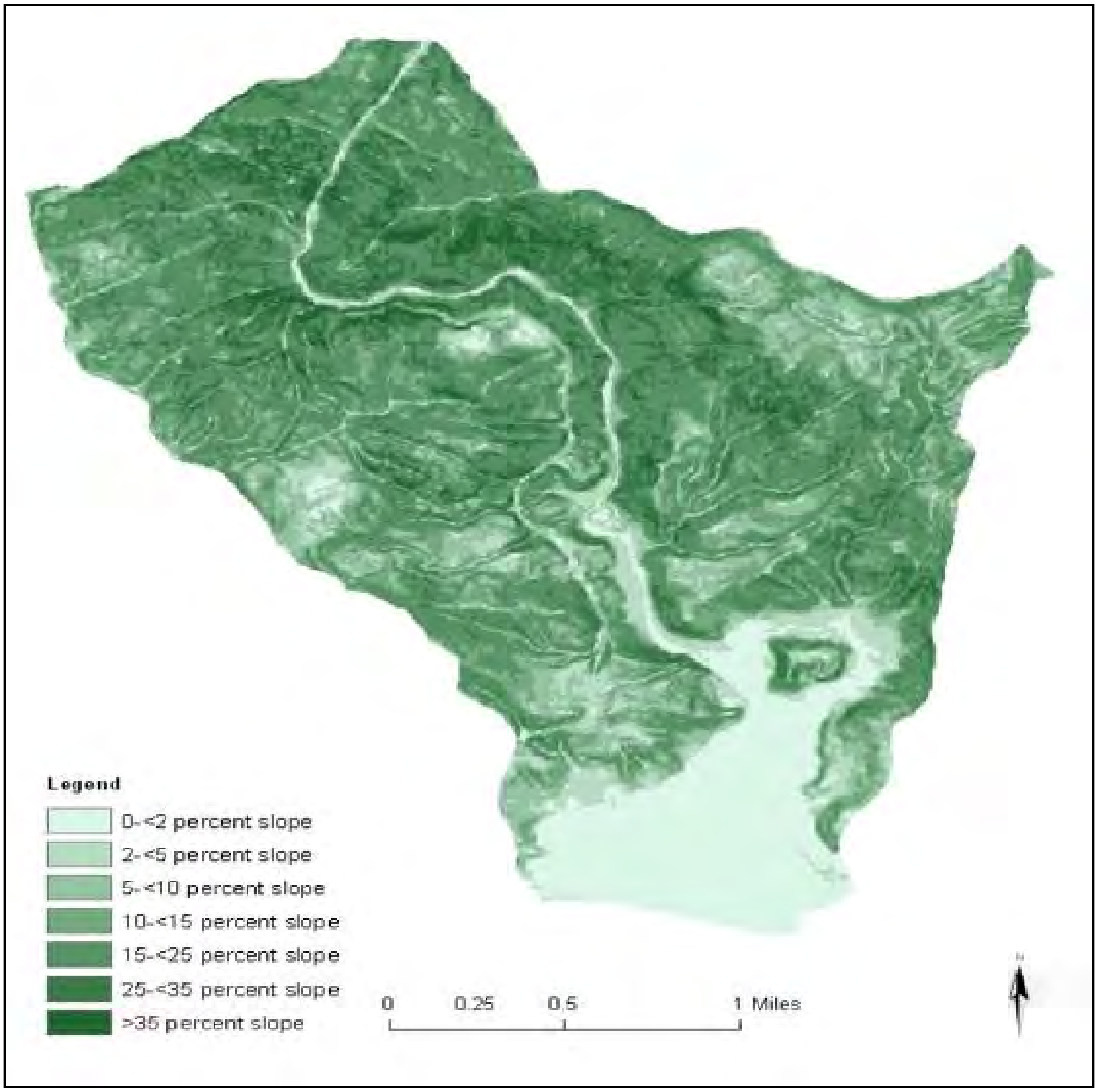


Figure 3.2-2 Slope Characteristics of the Project Vicinity

The greatest volume of rock mass in the Malibu Creek watershed is composed of young sandstone, shale, and volcanic flows that occurred from 10 to 20 million years ago during the Miocene Epoch (Warshall, et al. 1992). The distinctive black-gray and reddish volcanic rocks in the watershed are known as the Conejo Volcanics. It was not until four million years ago that northward pushing tectonic forces caused the Santa Monica Mountains to thrust their way out of the ocean (Warshall et al.1992), forming the east to west trending transverse ranges. Steep and rugged mountains along with low valleys intermittently placed characterize the Santa Monica Mountains. The geologic structures of these mountains are faults and folds attributed to the plate tectonics of the meeting of the North American Plate and the Pacific Plate (NPS, 2002). Erosion of the volcanic and sedimentary rocks created sediments that were deposited by flowing water, filling valleys and streambeds with alluvial soil. This alluvial layer is 30 ft deep in portions of the streambeds and canyon bottoms and tapers off rapidly to less than 4 ft up canyon slopes (MCWNRP 1995).

3.2.3 *Soils*

The soils in the Malibu Creek watershed are susceptible to high erosion rates. This is due to a combination of climate, topography, vegetation, and soil structure. Mediterranean climates tend to have the highest sediment yields (Levy and Korkosz 1997). Soils in the area are derived from sandstone, shale, volcanic and igneous rock, and from alluvium composed of a mixture of rock sources that compose the Santa Monica Mountains. Soil types determine the amount of water storage and the ability to absorb and filter runoff within the watershed. The Malibu Creek watershed contains 40 soil mapping units in the Los Angeles County portion and 38 soil mapping units in the Ventura County portion of the watershed (MCWNRP 1995).

Much of the Malibu Creek watershed's soils are considered highly erodible. Increased dry weather flow, unstable stream banks, fires, construction, and poorly-graded hillsides all contribute to the watershed's existing sedimentation and erosion problems. In addition, a number of landslides descend to Malibu Creek, and landslide debris also tend to be highly erodible. These problems include increased turbidity, some bank erosion just upstream of PCH and deposition within the lagoon area. Brush clearing practices and roadside maintenance activities where dirt and debris are left on the side of the road and/or up-slope of creeks also increase sediment loads to receiving waters. During seasonal high flow conditions (primarily during the rainy season), the impacts of sedimentation and erosion are especially pronounced.

3.2.4 *Dam Site and Impounded Sediments*

The Rindge Dam foundation and both abutments are set into bedrock, based on the original design drawings from the 1920s. Except on the canyon floor, bedrock was exposed at the surface of much of the damsite prior to construction of the dam. That condition remains today on the canyon walls above the impoundment. Additional site specific geologic information can be found in Section 3 of Appendix D.

The reservoir has fully filled with impounded sediment. That impounded sediment is 94+ feet thick at the dam face, thinning to less than 5 feet at the upstream end of the reservoir. This impounded sediment buries bedrock, thin soils, and pre-dam alluvium. In 2002, USACE undertook drilling and sampling of the impounded sediment behind Rindge dam to classify sediment grain size, allow estimating of sediment quantities by sediment type, and to assess whether any environmental contaminants are present in the sediment. Eight boring sites were chosen throughout the former reservoir area where large amounts of deposition were expected. All the borings were drilled entirely through impounded sediment and into bedrock. The USACE Soils Testing Laboratory conducted gradation analysis of sediment classification testing. Sediment quality tests were run at the Navy Regional Environmental Laboratory. The boring sites are shown in the **Figure 3.2-3**.

Drilling of the impounded sediment revealed a thin (2- to 10-ft-thick) layer of pre-dam alluvium, including cobbles and boulders, along the Malibu Creek channel alignment, below the impounded sediment, and directly overlying bedrock. Considering pre-dam geomorphology and the widening of the canyon immediately upstream of the dam footprint, this 2- to 10-ft-thick layer likely is the thickest accumulation of pre-dam Malibu Creek channel alluvium within the site boundary. Bedrock underlying the pre-dam alluvium is a light brown to gray, medium to fine-grained, weakly to moderately cemented Sespe Formation sandstone, with a minor amount of gravel-sized clasts. This sandstone was not observed to be fossiliferous.

Currently, the geotechnical assessment estimated that 780,000 cy of sediment is impounded behind the dam. For the purposes of this study, the 780,000 cy estimate was used for impounded sediment transport calculations, whether transport occur naturally or by mechanical means.

The impounded sediment was defined by three distinct layers defined by the USACE. The uppermost layer (Unit 1) is composed of fluvial deposition which contains sand, gravel, cobbles and larger rocks and is the layer that continues to erode and aggrade during storm events with overall increases in deposition occurring in the future. The sand-dominant (Unit 2) sediment, which underlies Unit 1, comprises nearly half the total volume of impounded sediment and contains about 73% sand, 22% silt, 5% gravel and rock. The Unit 2 sediment would be the likely source of sediment for beach nourishment. Unit 2 is underlain by a silt-clay dominant layer (Unit 3). Units 1 and 3 each comprise roughly 25% of the overall sediment volume. Unit 1, if processed, might supply 60,000 cy of additional sand. Pre-reservoir alluvium (Unit 4) is not present in large quantities and is presumed best left in place for natural riparian and stream-bottom substrate. Volume calculations and sediment composition are shown in **Table 3.2-1 and Table 3.2-2.**

Table 3.2-1 Impounded Sediment Quantities

	Avg. Depth (ft)	Unit 1 (cy)	Unit 2 (cy)	Unit 3 (cy)	Totals
Block 1	94	30,000	60,000	110,000	200,000
Block 2	80	130,000	210,000	120,000	460,000
Block 3	44	40,000	60,000	0	100,000
Block 4	20	10,000	0	4,000	10,000
Totals*		210,000	340,000	230,000	780,000

* Apparent discrepancies in totals are due to rounding. Blocks are discrete sediment estimate areas as shown in **Figure 3.2-3**.

Table 3.2-2 Estimated Sediment Composition (weighted average)

	Unit 1	Unit 2	Unit 3
% Sand	51%*	73%	22%
% Silt & Clay	4%*	22%	78%
% Other	45%*	5%	<1%

*Percentage does not take into account cobbles and larger stone.

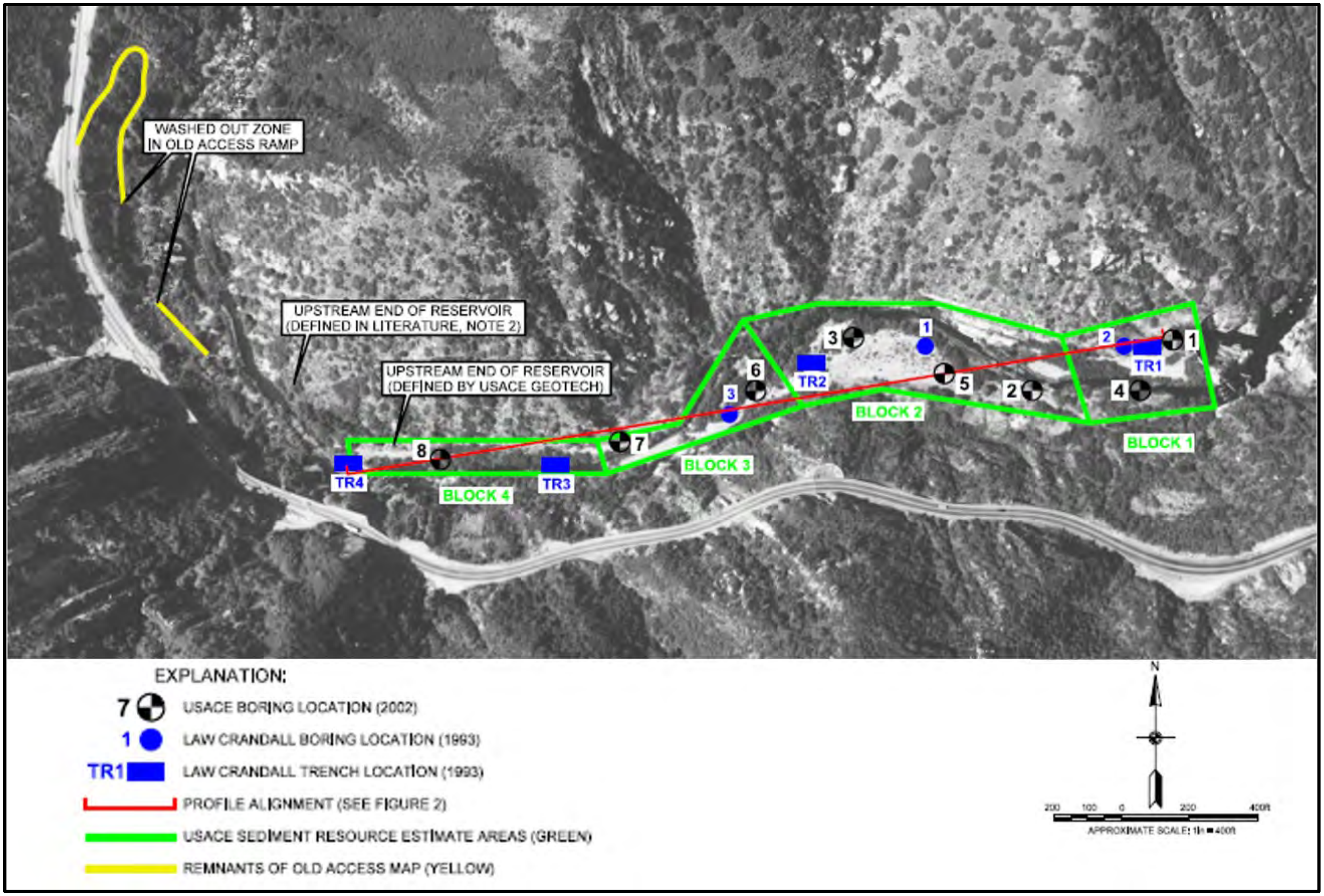


Figure 3.2-3 Extent of Rindge Dam Impounded Sediment

Unit 1 represents the high-energy storm flow deposition in a fluvial environment. With the reservoir pool now gone due to infilling, nearly all sand and finer materials wash over the dam in storm flows. Only the coarse material (gravel and larger) is dense enough to be deposited under such energies, and this deposition is by scour and fill. Units 2 and 3 were deposited into the former reservoir pool, essentially into a standing lake of water. This has been a reducing environment and the sediments are mostly fine-grained, black or gray in color, and have a sulfurous smell. Unit 3 was deposited in deeper water than Unit 2 with some mixing in areas.

The environmental sampling regime on the sediment impounded behind Rindge Dam was designed with consideration of the possible uses and/or means of storage of the various types of sediment. The USACE conducted chemical testing of soil samples taken from the study of the impounded sediment. These samples were tested for 89 analytes, which, if are not present or are below acceptable levels can be used for certain storage options. Of the post reservoir sediment that was tested, none of the units contained levels of contaminants that exceed SQG (sediment quality guidelines).

Both Units 2 and 3 are chemically suitable for upland storage so any possible upland storage application, such as agriculture, landfill cover, wasting in landfills, sale of materials, and impounding and stabilizing within the canyon walls, could be considered viable from a regulatory standpoint. No hazardous contaminants were identified. The overall test results for the ocean placement suite of analytes were favorable, suggesting that portions of the impounded sediment could be used for beach nourishment, offshore placement, or other marine placement options. Although test results indicate that the impounded sediment is acceptable for either upland storage or ocean placement, USACE suggested additional testing for oil and grease, organic content, and grain size. **Appendix D** has detailed information on the sampling protocols and environmental testing results.

3.2.5 *Seismic and Other Geologic Hazards*

Seismicity

Southern California is a highly active tectonic region where strong ground shaking is caused by earthquakes on nearby or distant faults. The seismic effects that could be expected are ruptures along fault lines, structural damage caused by ground shaking, and liquefaction caused by earthquakes. These effects are the result of the strains produced by the collision of the North American and Pacific Plates. The Transverse Ranges fault system consists generally of blind reverse and thrust faults (NPS, 2002).

The project site is located in the general proximity of several active and potentially active faults, but is not located within an Earthquake Fault Zone. The two closest regional faults to the study area are: 1) the San Andreas Fault, a major, active, tectonic boundary fault, with significant annual movement, and the capability to produce significant earthquakes in the future, and, 2) the east-west trending Malibu Coast Fault, which is about 2 mi south of the dam site (**Figure 3.2-4**; Dolan et al. 2000).

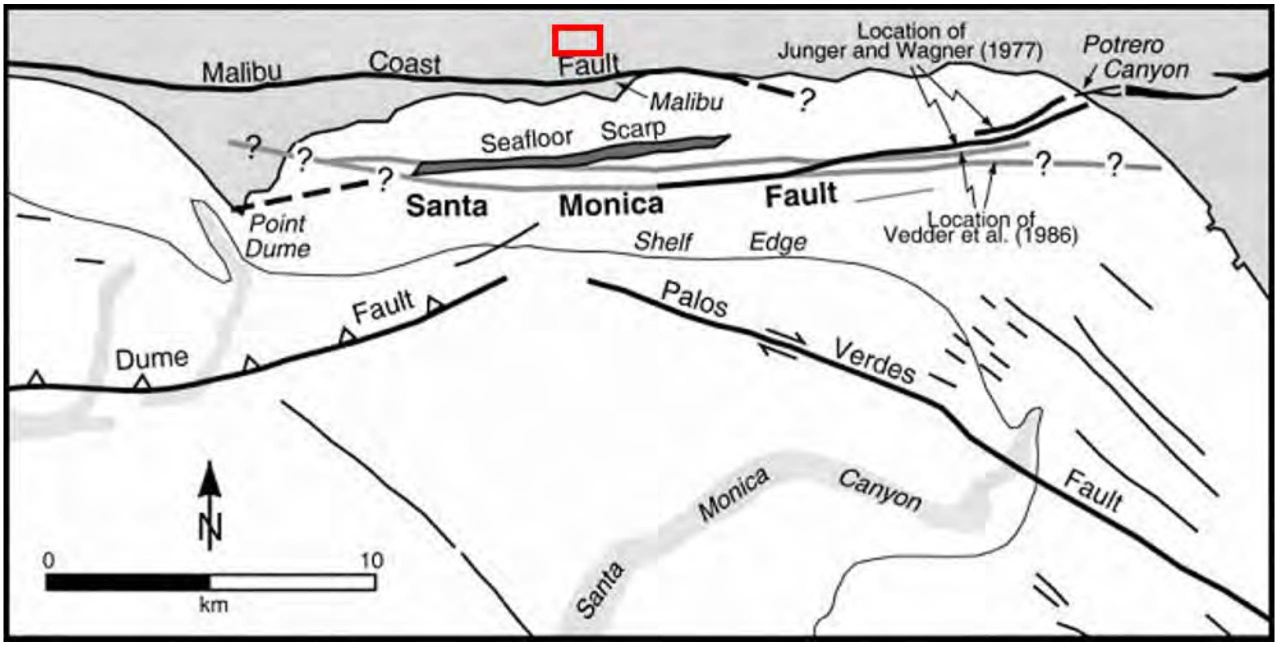


Figure 3.2-4 Faults in the vicinity of Malibu Creek with the approximate location of the project area outlined in red

Alquist-Priolo zones are zones where fault studies are required prior to construction because of the likely presence of known active faults. In these zones, additional recommendations may be necessary if an active fault is found to pass through the project site (Alquist-Priolo Earthquake Fault Zoning Act [PRC Section 2621.5]). The California Division of Mines and Geology has mapped one such zone in the area. The City of Malibu is listed as an affected city according to this mapping.

<u>Landslides</u>

The entire study area has been classified as a landslide risk zone (California Division of Mines and Geology, 2001). Quaternary landslides, some very large, are within and adjoining the study area. One such very large landslide is southeast of Rindge Dam but is not contiguous with it or with the impounded sediment. Two other landslides are on the canyon slopes above the southern reservoir canyon walls. Another landslide is beneath the existing canyon-bottom access ramp, a ramp which would have to be used to remove the impounded sediment. Other landslides may be identified during the design phase or during the process of impounded sediment removal. These landslides most likely developed during the last glacial epoch when sea level was as much as 200 ft lower than it is today and annual rainfall was much higher. During this period, soil and rock strength were at their minimum, and erosion had over steepened canyon slopes, resulting in slope instability and landsliding.

Today, the recognized landslide features are generally considered in a state of quasi-equilibrium. Increased rainfall and localized erosion can and has resulted in the reactivation of the existing landslides. Two obvious Malibu Creek channel deflections align with landslides, one beneath the canyon-bottom access ramp and the other a mile downstream of the dam. Both stream deflections can be seen on the oldest topographic mapping available for the site (1903 US Geological Survey topographic map of the Calabasas 1:62,500 scale quadrangle map, by USGS). Landslide zones, defined by the California Department of Conservation, in the watershed are displayed in **Figure 3.2-5**.

<u>Liquefaction</u>

Due to the local groundwater and soil conditions, liquefaction is another threat in the project area. Liquefaction is the process in which granular materials temporarily act as a fluid instead of a solid, which can cause permanent ground displacements. Liquefaction zones in the watershed are displayed in **Figure 3.2-5.** While **Figure 3.2-5** does not show the area of Rindge Dam as being in a liquefaction zone, this map was produced prior to the Tapia Water Treatment Plant came online. Current site conditions suggest that material behind Rindge Dam may be liquefiable due to the presence of shallow groundwater and fine grained sands.

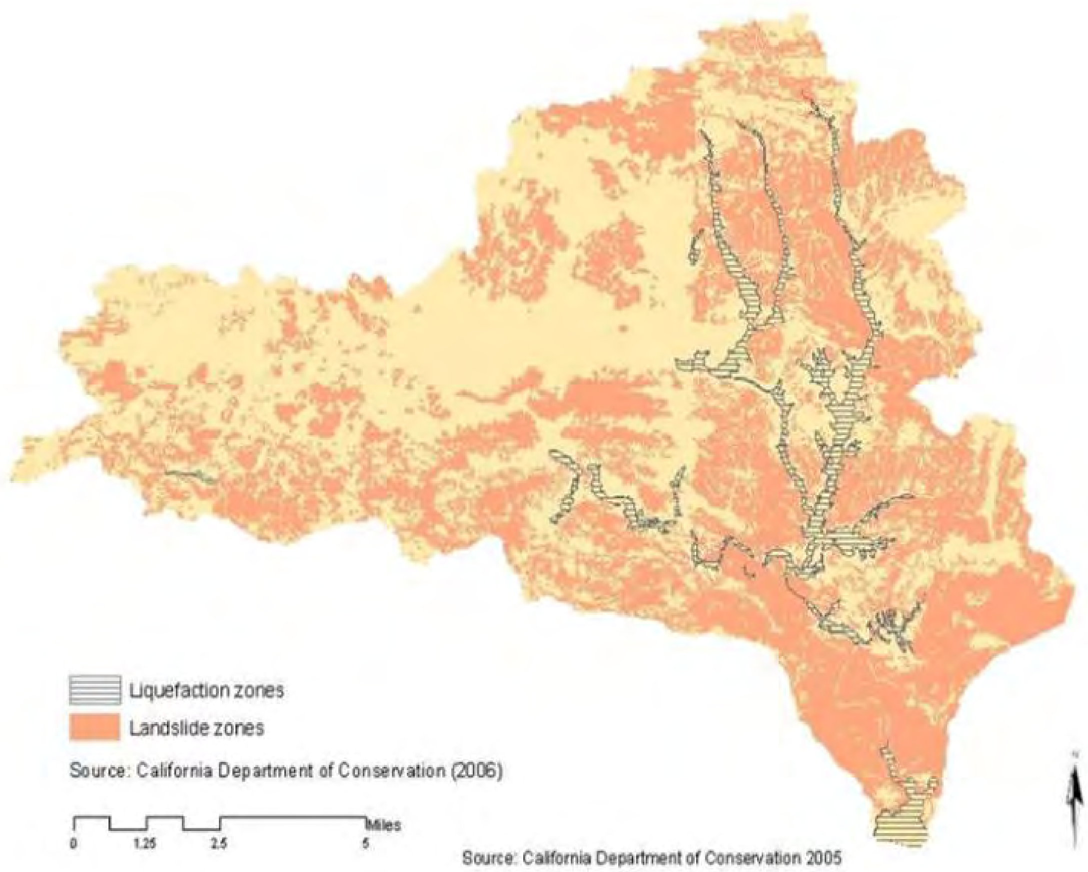


Figure 3.2-5 Landslide and Liquefaction Zones in the Malibu Creek Watershed

3.3 Water Resources and Water Quality

3.3.1 *Hydrologic, Hydraulic and Sediment Transport Studies*

USACE methods, analyses and models were used to develop the hydrologic, hydraulic and sediment transport analyses for this study to evaluate existing and future conditions, and for evaluation of alternative plans. Multiple simulation and calibration exercises have been conducted during the development of the models. In general, model development included use of existing available rain and stream gage information, storm patterns and intensities, future land use plans, documentation of past storm events, and other tools such as detailed topographic mapping, as-built drawings of bridges and road crossings. This information has been used to model the timing, duration and frequency of flood flows at different locations in the watershed for various storm events. Low flow conditions that are the predominant flow patterns for the bulk of each year are also included in the hydrologic studies. The hydrologic and hydraulic models are used in association with field sampling for sediment characterization and other data to prepare a comprehensive sediment transport model.

The development of the models also includes an analysis of risk and uncertainty in the data being used and the general assumptions being made to support the modeling effort. A detailed discussion of these topics is included **Appendix B**.

Runoff

The study area of Malibu Creek is undeveloped through the canyon reaches, but the creek is narrow and steep. In the mountains, runoff concentrates quickly from the steep slopes; hydrographs show that the stream flow increases rapidly in response to effective rainfall. High rainfall rates, in combination with the effects of shallow surface soils, impervious bedrock, fan-shaped stream systems, steep gradients, and occasional denudation of the area by fire, result in intense debris-laden floods. Flows originating in the upper watershed flow through the lower canyon portion of the study area at high velocities, upstream and downstream of Rindge Dam. The bed slope decreases and the overbank area increases where Malibu Creek emerges from the canyon about a mile below Rindge Dam resulting in a reduction in flow velocities and a potential increase in sediment deposition.

The flow in Malibu Creek and its tributaries can vary rapidly. Portions of the upper watershed are highly urbanized. Runoff from urban watersheds is characterized by high flood peaks of short duration that result from high-intensity rainfall on watersheds that have a high percentage of impervious cover. Flood hydrographs from single storm events are typically of less than 12 hours duration and are almost always less than 48 hours duration. Water supply and recreation dams and lakes in the watershed do not have any significant impact on larger flood events.
There are some short reaches of Malibu Creek tributaries that have been armored, primarily near road and bridge crossings. Two bridge crossings are located between Rindge Dam and the Pacific Ocean. These are the PCH Bridge and the Cross Creek Bridge. PCH Bridge crosses Malibu Creek approximately 1,200 ft upstream from the ocean. The Cross Creek Bridge is about 0.6 mi upstream from PCH. Extensive development occurs along the lower portions of Malibu Creek. Several businesses and communities are located in areas where flooding has previou

sly occurred (**Section 4.8).** Many of these developments are within the existing Federal Emergency Management Act (FEMA) 100-yr flood plain. Malibu Lagoon is situated at the confluence of Malibu Creek at the Pacific Ocean.

Sedimentation and Erosion

Much of Malibu Creek watershed's soils are considered highly erodible. Increased dry weather flows; unstable stream banks, fires, construction, and poorly-graded hillsides all contribute to the watershed's existing sedimentation and erosion problems. Brush clearing practices and roadside maintenance activities where dirt and debris are left on the side of the road and/or up-slope of creeks also increase sediment loads to receiving waters. During seasonal high flow conditions (primarily during the rainy season), the impacts of sedimentation and erosion are especially pronounced.

Imported, Reclaimed, and Treated Water

Importation of water began in the late 1960s. About 18,000 acre-ft (af) of water is imported into the Malibu Creek watershed each year. The imported water is purchased from the Metropolitan Water District of Southern California. The water is brought into the watershed via a system of pipes and reaches the creek after it has been used. The main uses are domestic, landscape irrigation, and some agricultural irrigation.

The TWRF is located adjacent to Malibu Creek approximately 4.5 mi upstream from Malibu Lagoon. The facility is jointly owned by the Las Virgenes Municipal Water District and Triunfo Sanitation District. This facility treats municipal wastewater primarily from the cities and unincorporated areas of the upper watershed. The combined service area is approximately 100,000 ac with 90,000 residents in the Santa Monica Mountains. Tapia has a processing capacity of 16 MGD (about 25 cfs), but currently operates at approximately 9 MGS (about 14 cfs). The facility is currently exploring ways to increase recycling and to reduce reclaimed water discharge into the watershed.

Scheduled releases of reclaimed water occur only between 15 November and 15 April during the wet season. The TWRF discharged tertiary treated water year-round to the creek between 1984 and 1997, augmenting the summer flows. Currently, TWRF, under its permitting requirements from the RWQCB (RWQCB 2005) has been prohibited from discharging into Malibu Creek during the dry season, from April 15 to November 15 of each calendar year, with exceptions that include:

- Treatment plant upset or other operational emergencies,
- Storm events, and
- The existence of minimal streamflow conditions that require flow augmentation in the Malibu Creek to sustain endangered species. (RWQCB 2005: 10).

The NMFS, USFWS, and CDFW have expressed concern over the summer discharge prohibition because of potential adverse modification of habitat suitable for steelhead. Based on NMFS recommendations, RWQCB permitting requirements for TWRF now mandate monitoring creek flow so that a streamflow of 2.5 cfs over Rindge Dam and past Cross Creek Road can be maintained through augmentation from the treatment facility (RWQCB 2005: 11).

Hydrologic Studies

Malibu Creek is typical of coastal southern California streams in that it exhibits typically steep gradients and is dominated by a flashy flow regime (Faber et al. 1989), where the river stage rises and falls abruptly within a hydrologic event. Malibu Creek records were reviewed to determine the maximum daily flow from 1931-2002, 24,200 cfs, and the minimum flow, 0 cfs. The highest instantaneous peak flow is 33,800 cfs for the period of record (water yrs 1935, 1980, 1990, and 1993 not available), evidence of the flashy nature of Malibu Creek and tributaries with most of the runoff passing through the watershed in two to three days. The average daily flow was 27.1 cfs. The computed results using 68 yrs of record indicated a mean peak discharge of 1,420 cfs.

A discharge-frequency analysis was performed on the Malibu Creek stream gage using the Hydrologic Engineering Center's Flood Frequency Analysis (HEC-FFA) computer program. Discharge-frequency relationships were developed for six locations corresponding with the previously described reaches along Malibu Creek using the contributing watershed drainage area. In general, flood events are characterized by their frequency of occurrence based on peak discharges. When evaluating sediment transport, the total volume of flow over the duration of a storm and runoff event is generally more important than the peak flow. Therefore, hydrographs were also generated that accounted for both the peak and the daily flow discharges for specified return-frequencies. These are referred to as "balanced hydrographs." The purpose of using a balanced hydrograph is to evaluate the sediment transport capacity of the channel using a realistic estimate of volume. The balanced hydrographs were determined for peak flows, and 1-day through 5-day flows for the same return period frequencies identified for the flood frequency analysis.

Low Flow Conditions

Historically, lower reaches of Malibu Creek were virtually devoid of surface flow during the dry summer months. Some of those conditions may be attributable to water diversions such as Rindge Dam. Now flows within Malibu Creek are predominantly perennial due to other water sources resulting from storm runoff, local runoff, imported water, and permitted reclaimed water discharge.

Table 3.3-1 Return-frequency discharges in cubic feet per second for designated reach locations on Malibu Creek below Cold Creek

Designated Reach Control Points on Malibu Creek						
Return-frequency Interval	Below Cold Creek	Rindge Dam	Big Bend Pool	Cross Creek Bridge	Pacific Coast Hwy	Pacific Ocean
2-yr event	1,780	1,800	1,830	1,850	1,860	1,860
5-yr event	7,640	7,750	7,840	7,940	7,980	7,980
10-yr event	14,500	14,700	14,900	15,100	15,100	15,100
20-yr event	23,200	23,500	23,800	24,100	24,200	24,200
50-yr event	37,200	37,700	38,200	38,700	38,800	38,900
100-yr event	49,200	49,900	50,500	51,100	51,400	51,400
200-yr event	62,300	63,200	64,000	64,800	65,000	65,100
500-yr event	80,600	81,700	82,800	83,800	84,100	84,200

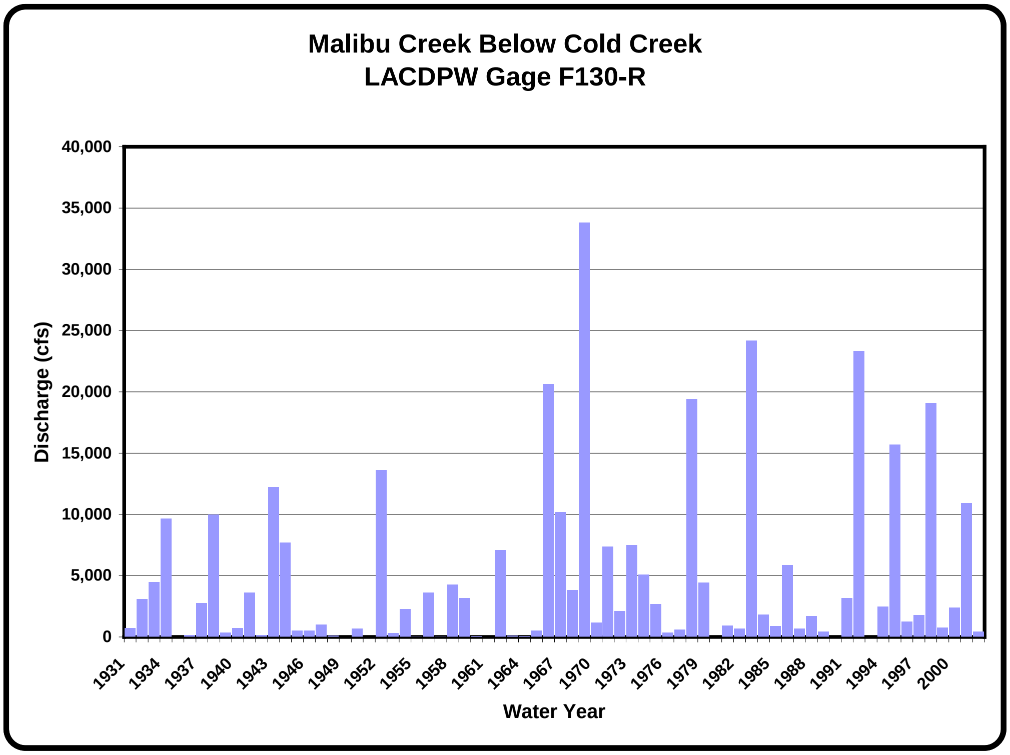


Figure 3.3-1 Peak Flows for Malibu Creek below Cold Creek

<u>Hydraulic Studies</u>

The USACE HEC-RAS 5.13.20 program was utilized to simulate water surface profiles and flood inundation areas for the 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-yr return period events. The flood inundation analysis assumed no difference between the existing and future without-project potential flood threat. For reaches 1 and 2, and the lower portion of reach 3, there are structures prone to flooding under the 5- to 500-yr return period events. Inundation maps and water surface profiles are presented in **Appendix B**.

Digital terrain models and ortho-rectified photographs for the project reaches were developed based on a May 12, 2002 aerial survey flight. Microstation CADD, terrain models and supporting GIS-based hydraulic tools were used to develop cross sections, stream lines, and flowpaths for the hydraulic models. Cross sections were constructed at approximately 500-ft intervals along the project reach with additional intermediate cross sections at key locations.

Channel roughness coefficients (Manning's n-values) were estimated using aerial photographs of Malibu Creek, previous studies in the Malibu Creek and similar watersheds, along with a widely accepted USGS publication from Barnes (1987), in addition to engineering judgment based on published studies of streams in southern California and field reconnaissance.

Sediment Transport Studies

Sediment transport modeling for Malibu Creek was developed using the HEC-6T computer program (version 5.13.20, Feb 2003). This one-dimensional model was used to quantify potential deposition or erosion along the creek, based on the hydrograph for the period of record (1931-2005) for specific return-frequency intervals and the channel geometry used for the hydraulic modeling. The existing and future no action (baseline) conditions assume Rindge Dam will remain in place and continue to fill with sediment.

Seven locations were identified for sediment sampling and development of gradation curves. Sampling sites were located approximately 0.25 to 0.75 mi apart along Malibu Creek. Samples were collected from 0 to 2 ft in depth and laboratory grain-size analyses were performed on the samples. In addition, an in-situ particle count was performed for larger sized particles. The laboratory results and in-situ particle counts were then combined and the bed gradation data were entered in to HEC-6T input file.

Eight additional reservoir boring samples of the impounded sediment behind Rindge Dam were used to classify sediment grain size, allow estimating of sediment quantities by sediment type, and to assess whether any environmental contaminants are present in the sediment. The upper 0-3 ft of the data was used for the baseline conditions sediment transport model.

The results of the 75 yr period-of-record simulation show that the upstream end of the study reach (river station 231+98 to 245+00) would experience up to 9.7 ft of degradation. Bedrock outcrops exist between river station 212+56 and 227+81, therefore, this reach would remain relatively stable. Up to 12.3 ft of deposition would occur downstream from river station 176+74 to 202+71. The reservoir immediately upstream of the dam would experience up to 7.3 ft of degradation (river station 163+26 to 173+89). Similarly, up to 9.8 ft of degradation would occur immediately downstream of the dam (river station 126+89 to 160+92). Downstream of the canyon, where the floodplain widens, up to 14.3 ft of deposition would occur (river station 51+17.6 to 124+44). From Cross Creek Bridge to the PCH Bridge, up to 9.7 ft of deposition would occur (river station 13+20.8 to 49+00.6). In the lagoon, up to 2.7 ft of deposition would occur (river station 5+50.6 to 8+39.8). **Figure 1.10-1** shows the reach extents.

3.3.2 *Malibu Lagoon*

Malibu Lagoon is one of the two last remaining estuaries in Los Angeles County. It is a small shallow water embayment, covering approximately 33 ac. The lagoon is a remnant of a once more extensive group of estuaries within the Southern California region, from Point Conception to the international border with Mexico. The lagoon has been severely degraded due to urbanization of the Malibu Creek watershed. Increased sedimentation, instream structures, loss of habitat, loss of tidal prism, mechanical breaching of the mouth, encroaching development, heavy recreational use, and eutrophication are some of the difficult conditions encountered in the lagoon.

Figure 3.3-2 Malibu Lagoon

Figure 3.3-3 Malibu Lagoon 1938 - Courtesy of Air Photo Archives

Malibu Lagoon Habitat Enhancement Project

The first phase of the Malibu Lagoon Habitat Enhancement project, a project initiated by the CDPR and HTB through grants from the California State Coastal Conservancy (SCC) and State Water Resources Control Board was completed (April 2008) and Phase II was completed in March 2013. Phase 1 relocated the asphalt parking lot further away from the lagoon and closer to PCH. Additionally, the footprint of the parking lot was substantially reduced while still maintaining the same number of parking spaces and providing separate areas for bus parking. The parking lot is two acres smaller, surfaced with crushed shale for permeability, and was designed with three bio-swales that capture, treat and infiltrate a 3.2 in 24-hour storm event. More than 3,000 native plants were planted in the parking lot. Additionally, to addressed urban runoff that would flow directly into the lagoon the redesigned parking lot is now equipped with storm drain filters which treat flows in excess of the 3.2 in 24-hour storm event. Numerous other improvements have also been made such as the educational/interpretive node, additional picnic and sitting areas, a new shower (donated by Malibu Surfing Association and Santa Monica Baykeeper), additional bus parking, and a new bicycle rack. The design and parking lot construction made great efforts to use environmentally friendly building materials (HTB website, Malibu Times, Feb 13, 2008).

Phase II includes additional habitat restoration within the lagoon. The former lagoon area was used as a dumpsite for fill in the 1920's through the 60's by Caltrans, and baseball fields were constructed there by the late 1960's (later moved to Bluffs Park). In 1983 the CDPR created three narrow tidal channels roughly situated at 90 degrees to the main tidal influence. A boardwalk system with bridges that spanned the three channels was also installed. The 1983 channel configuration, high elevations, and boardwalk system created a situation of poor circulation, muted tidal inundation, and the inability to scour fine sediments and organic decaying matter. The lagoon was filling at a rate of 1 in per yr. The 1983 project suffered from extremely low levels of dissolved oxygen, poor species richness and diversity of fish, invertebrates, bi-valves, and crustaceans.

The Phase II restoration reconfigured the three channels into a single wider main channel with three tributary channels or branches. The profile of the reconfigured lagoon was significantly lowered to mean sea level up to 2 ft above mean sea level where the previous channels were elevated from 3 to 7 ft above sea level. The boardwalk system was removed, the main channel was oriented to face more directly into the tide and 4 islands were created to enhance bird habitat, bird nesting opportunities, and to focus prevailing winds to increase wind driven circulation during closed conditions. The new visitor trail system is located around the perimeter of the lagoon and minimizes conflicts between visitors and wildlife.

This Integrated Report does not include measures to restore or enhance Malibu Lagoon due to actions occurring in support of the completed enhancement project. Instead, the Integrated Report includes evaluation of impacts to the lagoon to ensure that the recommended plan does not adversely impact the lagoon restoration or the long-term health of the lagoon (**Figure 3.4-4).**

Figure 3.3-4 Malibu Lagoon Habitat Enhancement Project

<u>Malibu Lagoon Hydrodynamic and Sediment Studies</u>

In the lagoon area, the tidal boundary assumed for the simulation was the limiting factor in the analysis. As a result, modeling was performed considering three separate analyses for tidal boundary conditions (Mean Higher High Water (MHHW), tidal variation weighted average, and tidal boundary hourly variation) as well as a seasonal weighting factor to reflect the presence or absence of the sand bar at the estuary mouth. Modeling results forecasting bathymetric changes to the lagoon over a one-yr period using 2004 data and the hydrograph over the same year compared well with the bathymetric survey results from 2005.

Profiles developed from 2004 bathymetry indicate bed elevations varied from 1.0-ft (1.5 ft mean lower low water (MLLW)) on the west to about 3.9 ft (4.6 ft MLLW) at the central lagoon with a relatively flat bed from the central lagoon to the ocean. The elevations reflect sediment deposition near the end of the lagoon due to inlet closure and high tide blocking effects. The mean tide level (MTL) and mean high water level (MHW) are about 2.9 ft and 4.8 ft above MLLW, respectively. Therefore, the ocean tides have to exceed MTL in order to move into the lagoon. Hence, the seawater resident time in the lagoon is less than half of a tidal cycle during lagoon inlet open seasons.

The lagoon hydrodynamics, sediment transport and deposition, and ecological and biological variations are seasonally dependent. The lagoon closure process is induced by relatively active alongshore and cross-shore sediment transport in the summer when Malibu Creek is relatively dry and the delivered flow is not strong enough to keep the inlet open. The inlet closure time normally begins in May and ends in October. The lagoon inlet typically reopens in November when the rainy season begins and the upstream watershed generates larger storm flows. At the same time, winter waves traveling from the northwest refract into the offshore area of Malibu, significantly reducing the wave energy transferred to the nearshore area to support sediment transport. As a result of strong upstream flow and weak downstream nearshore sediment transport capability, the lagoon inlet naturally opens to interact with the ocean.

The western portion of the lagoon was formed by fluvial deposits and is embedded with a few small, shallow, connecting channels. Fine sediments have accumulated in this area due to its poor circulation and shallow water depth. The eastern lagoon is also characterized by a very small shallow-water wetland.

The lagoon hydrodynamics are dominated by flood flows originating from the Malibu Creek watershed and tidal flow entering from the lagoon inlet. The flow rates of Malibu Creek vary from 3 to 10 cfs in the dry seasons to a 33,000 cfs peak during the rainy seasons. The flow velocities for an open system during wet seasons range from 0.3 to 3.3 ft/s, and reduce to 0.16 ft/s during the dry season for a closed system. For an open system, the estimated daily tidal inflow (two tidal cycles) is about 26,000 cy of water, assuming a two hour tidal cycle duration. The flow velocities generated in the lagoon are very small due to the shallow depth and relatively wider lagoon width, from 0 to 3.3 ft/s.

The sediment delivered from Malibu Creek to the Lagoon was estimated by taking the impounded sediment stored behind Rindge Dam (~ 780,000 cy) divided by the number of years required to fill up the dam's former reservoir (~ 34 yrs between 1926 to 1960). The calculated annual sediment transport rate was about 23,000 cy. It was estimated that less than 5% (1,150 cy) of the fluvial transported sediment (23,000 cy) contributed to the total annual deposition rate.

The sediment influx from the Lagoon inlet was estimated by taking the inflow volume and multiplying by the concentration of incoming sediment. The calculated annual sediment influx was about 18,700 cy (26,159 cy x 2 parts per thousand (ppt) x 358 lunar days). These sediments are largely beach sands. Based on the distribution of flow rates inside the Lagoon, it was further estimated that about 10% (1,870 cy) to 15% (2,805 cy) of the incoming sediment were deposited and accumulated around the western and eastern shallow water areas, and the remaining 85% (15,900 cy) to 90% (16,840 cy) were deposited in the central Lagoon and nearby inlet areas and then transported back out of Lagoon by the immediately following ebb flows or strong outgoing flood flows.

Most of the deposited sediments are trapped in the western and eastern lagoon areas, particularly near the lagoon boundaries where the velocities are extremely small. Sediment deposition profiles measured in the western arm (Sutula et al. 2004) indicate that, for the areas close to the inlet, about 80% of the deposited sediments are sands and 20% are fines, mostly contributed by creek flows (Moffat & Nichol 2004).

3.3.3 *Coastal Dynamics*

The important parameters controlling coastal processes are tides, water levels (including storm surge, wave set-up, El Nino events and sea level rise), waves and currents. The following sections describe the general characteristics in the extended project area. Additional detail on coastal dynamics within the study area can be found in **Appendix B**.

Tides, Water Levels, and Waves

Tides along the Malibu coastline are of the mixed semi-diurnal type. Typically, a lunar day consists of 2 high and 2 low tides each of different magnitude. The lower low normally follows the higher high by about 7 to 8 hours, whereas the next higher-high (through lower-high and higher-low waters) follows in about 17 hours.

Storm surge is the sea level rise induced by barometric pressure depletion and strong wind stress acting on the water surface. In the southern California coastal zone, due to its narrow continental shelf, storm surges rarely exceed 3 ft, with average heights below 1 ft for two to six days (U. S. Army 1991).

Wave set-up is the sea level rise generated by the wave-breaking-induced "pile-up" of water mass in the breaker zone. This water level change is a function of beach slope, breaking wave height and angle. In general, steeper beach slopes generate larger wave set-ups. The order of magnitude of wave set-up is about 10% of the breaking wave height. An approximate 3 ft wave set-up elevation can be estimated for the study area.

Departures from the astronomical tides can occur during strong El Nino episodes. These meteorological anomalies are characterized by low atmospheric pressures and persistent onshore winds. Tidal data from 1905 through 1983 indicates five of these episodes (1914, 1930 through 1931, 1941, 1957 through 1959 and 1982 through 1983). Further analysis suggests that these events have an average return period of 14 yrs with 0.2 ft tidal departures lasting for two to three years. The added probability of experiencing more severe winter storms during El Nino periods increases the likelihood of coincident storm waves and higher water elevations. The record water level of 8.35 ft MLLW, observed at San Diego in January 1983 includes an estimated 0.8 ft of surge and seasonal level rise (Flick and Cayan, 1984).

Sea Level Rise Related to Global Warming

Global sea levels are rising mainly as a result of an increase in global temperatures linked to an increase in greenhouse gas (GHG) emissions. An increase in global temperatures impacts sea levels in the oceans in two main ways, ocean water expands as temperatures increase raising sea levels and land ice melts increasing the volume of water in oceans (NRC, 2012). Recent research indicates land ice sheet melt was responsible for 65% of global sea level rise between 1993 and 2008 (NRC, 2012). Other human related activities that impact global sea levels include pumping groundwater for use that ultimately is conveyed to the ocean increasing sea levels and storing water in reservoirs decreasing flows to the ocean lowering sea levels (NRC, 2012). Contributions of groundwater withdrawal and reservoir storage to global sea level change are not well understood due to limited data and inadequate models, but are thought to have equally opposite effects (NRC, 2012).

Throughout the 20^{th} century, the Intergovernmental Panel on Climate Change (IPCC) estimated global average yearly sea levels rise based on worldwide tidal gage measurements at 0.067 in ± 0.02 in (NRC, 2012). For the ten year period 1993-2003 yearly sea level rise was estimated at 0.12 in ±.023 in based on satellite altimetry measurements confirmed by tide gage records with more recent records showing this higher rate of sea level increase (NRC, 2012). This increase cannot be entirely contributed to global warming at this time due to a lack of data as natural climate cycles also impact sea levels on long term scales spanning decades and greater (NRC, 2012).

In the recent past sea level rise could not be predicted with confidence using current models as the role of ice sheets, glaciers, and heat uptake by the oceans were not fully understood (Vermeer and Rahmstorf, 2009). This is illustrated by the fact that observed sea level rise was 50% greater than models had predicted for the periods 1990-2006 and 1961-2003 (Vermeer and Rahmstorf, 2009). The fourth and latest assessment from IPCC released in 2007 did not present an upper limit for sea level rise attributed to ice flow changes as impacts of melting ice in glaciers and polar caps could not be modeled with confidence at the time. In the interim multiple projections have been further developed to analyze global sea level rise.

Multiple Federal agencies and agencies of coastal states are engaged in efforts to understand and reduce impacts related to sea level rise. At the Federal level, the USACE has a history of collaborating with other Federal agencies and national and international experts on understanding sea level rise and mitigating for potential impacts. The USACE has recognized sea level change impacts relative to its projects since 1986 when it published its guidance on the issue. Its most recent update, “Incorporating Sea-Level Change Considerations in Civil Works Programs”, Engineering Circular 1165-2-211, was issued in 2009 (USACE, 2011). In 2008 California Governor, Arnold Schwarzenegger issued Executive Order S-13-08 to create statewide consistency in planning for sea level rise and coastal impacts and requested the National Research Council (NRC) to create a California Sea Level Rise Assessment Report (CSLC, 2009). California was ultimately joined by other western states, Oregon and Washington, and multiple Federal agencies, including the USACE, to sponsor preparation of a sea level rise assessment for the west coast.

Global sea level rise projections are not uniform throughout the world as sea level rise projections will vary dramatically based on a myriad of influential factors that are relative to a particular geographic location. Along the West coast historic tidal gage data indicates most gages located north of Cape Mendocino, California illustrate that sea level has been declining over the past 6 to 10 decades, while sea level gages south of this point indicate sea levels have been rising (NRC, 2012). Factors playing a role in these differences include climate patterns, location of melting ice sheets and glaciers, seismic activity, and water and hydrocarbon pumping from subsurface locations (NRC, 2012). These factors can either exacerbate or decrease the overall localized effects of global sea level rise. Land based factors are causing the coast south of Cape Mendocino to sink at an average annual rate of approximately 0.039 in/yr and the coast north of Cape Mendocino is rising between 0.059 to 0.118 in/yr (NRC, 2012).

The NRC study used a combination of methodologies and projections to develop global sea level rise projections. These projections were then applied at the regional levels for California, Oregon, and Washington factoring in unique characteristics of the regions that would impact local sea level rise levels. Global sea level rise projections estimated in the NRC study indicate global sea levels will rise 3.1 to 9.1 in by 2030 above 2000 levels, 7.1 to 18.9 in by 2050, and 19.7 to 55.1 in by 2100 (NRC, 2012). Uncertainties result in the ranges and are a reflection of the level of future GHG emissions which in turn impact other factors (NRC, 2012).

For the California coast south of Cape Mendocino sea levels are estimated in the NRC study to rise by 1.6 to 11.8 in by 2030 above 2000 levels, 4.7 to 24 in by 2050, and 16.5 to 65.7 inches by 2100. In contrast, north of Cape Mendocino for Washington, Oregon, and part of California sea level rise ranges over the base year 2000 are: - 1.6 (decrease) to 9.1 in by 2030, - 1.2 (decrease) to 18.9 in by 2050, and 3.9 to 56.3 in by 2100. The range of uncertainties for the most part represents uncertainties regarding future ice losses and the constant rate of vertical land motion for the projection period (NRC, 2012). The larger ranges for regional sea level rise in comparison to global sea level rise are attributed to use of more factors at the regional level (NRC, 2012). California, south of Cape Mendocino, has a slightly higher maximum sea level rise in comparison to global sea level rise projections mainly resulting from land subsidence (NRC, 2012).

At the state level, sea level rise has the potential to impact coastal communities and infrastructure, including transportation, electrical utilities and power plants, storm water systems, wastewater systems and outfalls, and wetland areas (CSLC, 2009). Sea level rise is most dangerous and destructive when coupled with the additive effects of storm surges, large waves, and astronomical high tides during El Nino events (NRC, 2012). In the past sea levels on the West coast have temporarily exceeded sea level rise projections for 2100 (NRC, 2012). Additionally, if climate change increases the number of storm events and their severity in the future, there is the potential for greater impacts in coastal areas, however, there is uncertainty regarding the impacts of climate change on storm events for the West coast (NRC, 2012).

Sea level rise coupled with storms will also impact shorelines and coastal marshes and mudflats. Coastline retreat will occur with sea level rise of up to several meters per year with rates increasing as sea level rises and will further increase if waves become higher (NRC, 2012). Benefits provided by marshes and mudflats will be impacted by sea level rise unless these areas build elevation with sediment deposits and can move further inland (NRC, 2012). Marshes and mudflats provide for storage of storm water and dampen wave height and energy (NRC, 2012). The NRC study indicates storms in central and southern California occur with enough frequency to potentially allow marshes and mudflats to sustain their benefits through the projected 2030 and 2050 sea level rise levels. In 2100, these areas will not be able to maintain themselves unless there is additional room to move inland, sediment supplies are high, and uplift or low levels of subsidence occurs (NRC, 2012).

While, the NRC study is not localized enough to project impacts at Malibu Lagoon and surrounding coastal areas, it does provide insight regarding potential future coastal impacts in the area. Sea level rises may alter the flow patterns into and out of Malibu Lagoon, altering the salinity and subsequent plant and wildlife species composition overtime. Habitat quality would shift in coastal regions as coastal watersheds are subject to higher levels of salinity in response to saltwater entering surface and groundwater (NMFS, 2012). If inadequate sediment flows cannot be maintained, the Lagoon may potentially shrink or disappear if it cannot raise its elevation. Rises in sea level will affect estuaries confined by development that prohibits the inward migration of their boundaries (NMFS, 2012). The Lagoon’s ability to move further into the shoreline is impacted by upstream development east of the PCH and the steepness of canyon walls. This would prevent a loss of a potential steelhead rearing area. Coastal estuaries closed off by sandbars, similar to Malibu Lagoon allow juveniles to grow at a rate allowing migration to the ocean after their first year and tend to be larger than steelhead reared in freshwater (NMFS, 2012).

<u>Waves</u>

The study area is somewhat sheltered from deep water ocean waves by the effect of the shoreline projections at Point Dume to the west and the Palos Verdes Peninsula to the south. As a result, the area is primarily exposed to a wave window bounded on the north by Santa Rosa Island and on the south by Catalina. **Figure 3.3-5** shows the exposure window to be between 265º and 180°.

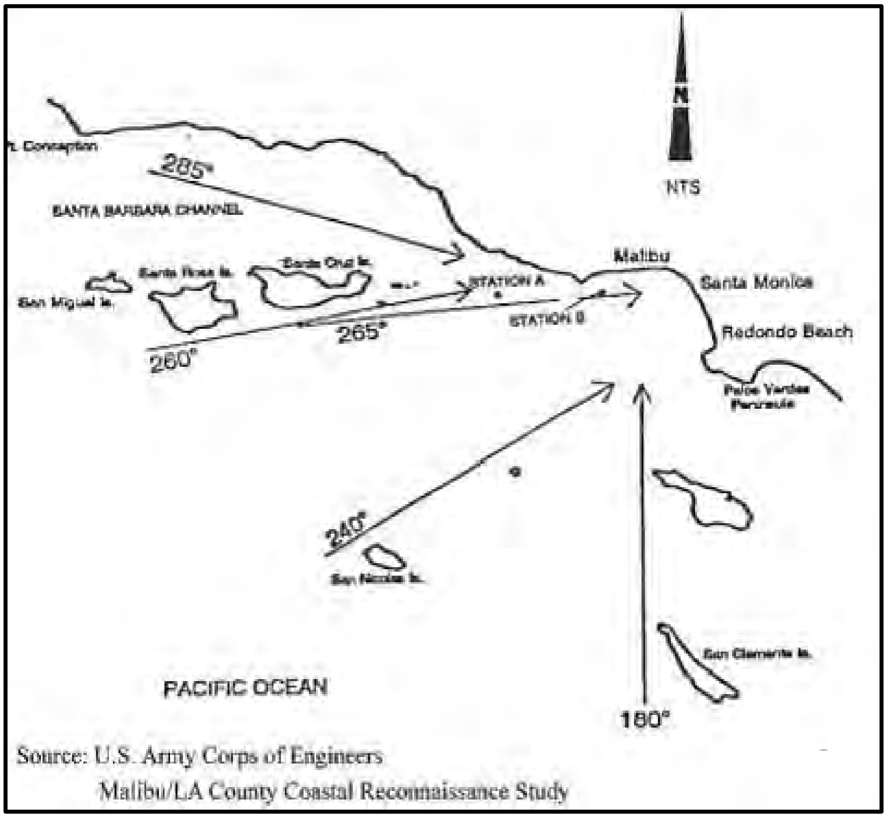


Figure 3.3-5 Wave Exposure

Wind waves and swell are produced by six basic meteorological patterns. These include extra tropical storm swells in the northern hemisphere (north or northwest swell), wind swells generated by northwest winds in the outer coastal waters (wind swell), westerly (west sea) and southeasterly (southeast sea) local seas, storm swells of tropical storms and hurricanes off the Mexican coast, and southerly swells originating in the southern hemisphere (southerly swell). Among these waves generated by the six meteorological patterns, the southerly swells in summer and the west sea in winter impact the Malibu shoreline most. These waves transform from deep water to shallow water and break in the surf zone generating an eastward alongshore current that transports sediment along the Malibu shoreline.

The deep water unsheltered significant wave statistics were calculated based on a hindcasted data set of extra tropical and tropical storm-generated waves during the period 1904 to 1983 and on measured data at the Begg Rock wave gauge from 1984 through 1988. The transformation of deep water significant wave to the 40 ft depth of the Malibu near shore area were performed by O'Reilly (O'Reilly and Guza, 1991) through wave refraction, diffraction and shoaling processes to generate shallow water significant wave statistics.

Table 3.3-2 Unsheltered Deep Water Wave (Ho) & Transformed Shallow Water Wave (Ht) Characteristics in feet and meters (USACE, 1993)

Return Period (year)	Deep Water - Santa Monica Bay – ft (m)	Shallow Water - Malibu Shoreline – ft (m)
2	3.69 (12.1)	1.80 (5.9)
5	4.76 (15.6)	2.38 (7.8)
10	5.73 (18.8)	2.77 (9.1)
25	7.13 (23.4)	2.35 (11.0)
50	8.32 (27.3)	3.78 (12.4)
100	9.57 (31.4)	4.18 (13.7)

It was found that the Malibu shoreline is most impacted by storm swell propagating to the area from about 260º to 235º. An event of March 1, 1983 was particularly devastating to the southern California coast. The waves that impacted the beach areas were largely due to long-period west-southwest swells. Wave refraction effects of the Malibu shoreline between Point Dume and the City of Santa Monica limits has resulted in much lower wave heights than elsewhere along the coast because of the significant divergence effects caused by the more acute shoreline orientation.

Currents

The ocean current regime in the extended study area is a combination of a tidal, wind driven and wave-breaking-induced components. Limited measurements taken in 1983 recorded peak tidal current speeds of about 0.71 ft/s with mean flows of less than 0.5 ft/s within Santa Monica Bay. The onshore currents travel in a northeast direction toward the study area during flood tides and offshore currents reverse direction during ebb tides.

Longshore currents in the coastal zone are driven primarily by waves impinging on the shoreline at oblique angles. This wave-generated current is the major factor in littoral transport. Typical summer swell traveling from a southwest direction toward the west-east facing shoreline produces an eastward drift current in the surf zone. Winter storm waves traveling from the northwest and west directions are sheltered, so little wave energy refracts into the study area to generate an eastward drift current. Overall, eastward currents roughly 0.33 to 0.49 ft/s would result in net eastward sediment transport in the Study area.

Cross-shore currents exist throughout the Study area, particularly at times of high surf. These currents tend to concentrate at creek mouths and structures, but can occur anywhere along the shoreline in the form of rip currents and the return flows of complex circulation cells. To date, information is limited on the quantification of these currents and their effect on sediment transport. Consequently, their significance to the long-term sediment budget and coastal processes of the Study area is unclear.

Fluvial Influences on Coastal Areas

The Malibu shoreline is exposed to waves traveling from west to southwest directions toward east to northeast directions. The resultant longshore currents generated from breaking waves in the nearshore zone move from west to east and create an almost unilateral eastward movement of sand along the beaches. Hence, the net sediment transport direction within this littoral cell is eastward. The sand and sediment is eventually directed off shore at the Palos Verdes headlands and is intercepted by the Redondo Submarine Canyon and into the deep water of the Santa Monica basin.

Although the sand supply has been cut off by the urbanization of the Los Angeles basin and the damming of many rivers, the Santa Monica littoral cell has continued transporting sediment to the south and down the Redondo Submarine Canyon.

3.3.4 *Sediment Sources*

The major sediment source for the littoral zone within the study area is fluvial transport. The fluvial sources include streams originating in the larger Santa Monica Mountains watershed between Point Mugu and Santa Monica Canyon. Handin (1951) estimated the potential for coarse sediment (sand) yield based on an appraisal of the geologic characteristics of the drainage area, and further estimated an annual coarse sediment delivery rate of about 2,500 cy/mi^2 of drainage area. This unit rate was applied to estimate an annual sediment delivery rate of 150,000 cy for the Santa Monica Mountains watershed, of which 60,000 cy and 90,000 cy were calculated for the areas west and east of Point Dume shoreline segment, respectively (USACE 1994).

Malibu Creek contains a natural drainage area of approximately 110 mi^2. As a result of 5 reservoirs, 102.1 mi^2 of the drainage area were regulated, leaving only 3.6 mi^2 located at the lower 3 mi of the creek uncontrolled. This reduced the annual coarse sediment delivery rate to 9,000 cy (3.6 mi^2 x 2,500 cy/mi^2) for the downstream area of the Malibu Creek drainage.

An upstream annual coarse sediment delivery rate of about 6,900 cy was calculated based on the estimated amount of coarse sediments (234,000 cy collected behind the Rindge Dam over a period of 34 yrs (between 1926 to 1960)). These coarse sediments (234,000 cy) or beach compatible materials were estimated at about 30% of the total sediments (780,000 cy) stored in the Rindge Dam impoundment (USACE 2005).

In summary, the total annual coarse sediment delivery rate of Malibu Creek, accounting for the upstream (6,900 cy) and downstream (9,000 cy) sediment transport rate, is about 15,900 cy without interception from Rindge Dam. This delivery rate is about 11% of the total coarse sediment delivery rate of 150,000 cy from the Santa Monica Mountains watershed.

The historical supply of sediment in the watershed has already been altered by human activities. Both Los Angeles County and California Department of Transportation (Caltrans) have constructed catch basins west of Santa Monica Canyon that intercept sediment and debris. It was estimated that a total of approximately 185,000 cy sediments were intercepted by the five debris basins located in Trancas Canyon and Caltrans catch basins, of which 25% (or about 46,000 cy) of the intercepted material was assumed beach compatible and not placed back to the littoral transport zone. This effect reduces the estimated annual fluvial delivery rate from 150,000 cy to 104,000 cy from the Santa Monica Mountains watershed to the study area. Under this assumption, the Malibu Creek annual coarse sediment delivery rate (15,900 cy) becomes approximately 15% of the adjusted total coarse sediment fluvial delivery rate (104,000 cy) from the Santa Monica Mountains watershed. It is also noted that a 10% interception rate of the upcoast littoral transport from west of

Point Dume through the Dume Submarine Canyon was assumed (USACE 1994). This assumption was based on communications with local divers and the nearshore physical characteristics.

3.3.5 *Sediment* Budget

Sediment budget for the nearshore study area is not well understood due primarily to the lack of coastal process data west of Topanga Canyon and the history of frequent shoreline modifications that have occurred in Santa Monica Bay since the early 1900s. However, the limited volumetric changes computed between the shoreline segments by the USACE in 1948 and the energy flux for longshore sediment drift calculated provide a reasonable estimate of sediment budget for the shoreline reach between Point Dume and the Santa Monica city limit. It was estimated that sediment input to this study area is 120,000 cy/yr from the net output of the upcoast littoral drift cell (**Figure 3.3-6**). Additional annual sediment sources contributing to this littoral cell include 90,000 cy fluvial transport, 40,000 cy beach erosion, and 15,000 cy artificial fill, for a total of an additional 145,000 cy/yr. Because no sediment loss is estimated, the net sediment transport out of this cell is 265,000 cy/yr. The calculated range of annual net littoral transport rate for this cell is about 150,000 to 250,000 cy (USACE 1994).

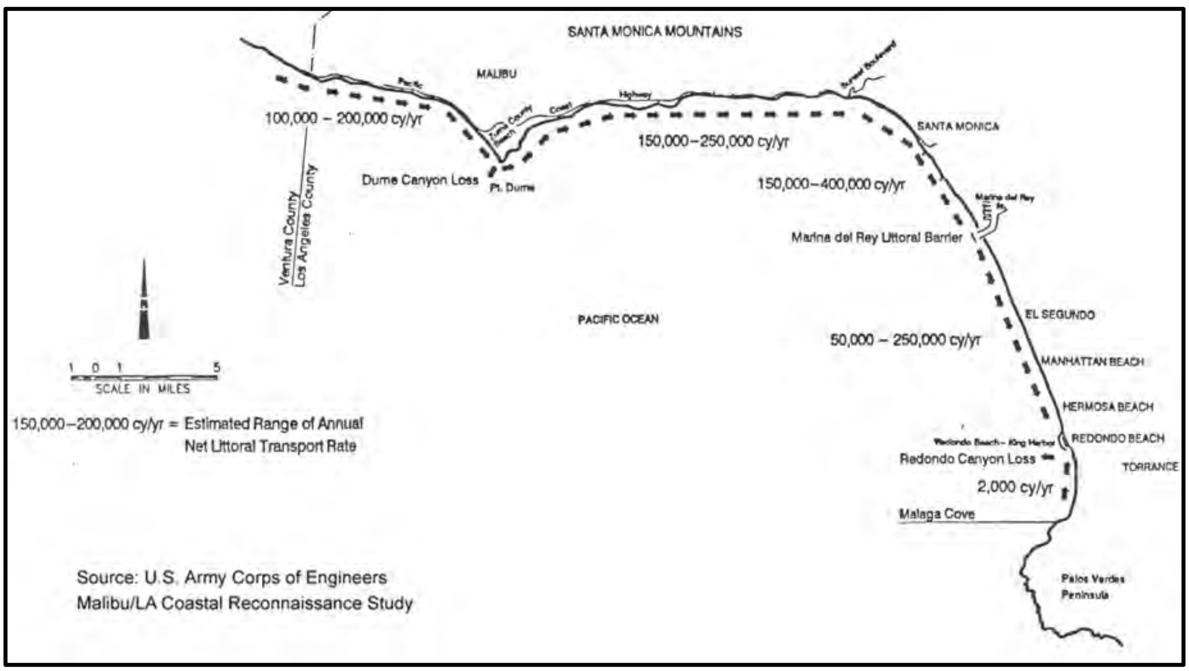


Figure 3.3-6 Estimated Coastal Sediment Transport Volumes

After 1920, Caltrans and Los Angeles County constructed many debris basins to control sediment transport in the study area. This has resulted in the interception of about 46,000 cy/yr coarse sediment that otherwise would have been transported to the littoral transport zone as described above. This reduces the annual sediment supply from 145,000 cy to about 100,000 cy. If we take the estimated larger net annual littoral transport rate of 250,000 cy into consideration, a potential annual deficiency of 150,000 cy of sediment supply may occur along the Malibu coastline due to development and interception. Higher rates of erosion could occur during years of high littoral transport potential and low rainfall. This deficit would be compensated for by erosion of existing beaches at a rate of an estimated 1 cy or more per lineal foot of beach.

3.3.6 *Shoreline Changes*

Shoreline changes within the study area are almost entirely due to the effects of sediment supply deficiencies, development encroachment, shoreline structure construction and artificial beach nourishment that have occurred since the early 1900s. Aerial oblique photographs flown over the Malibu coastline in 1924 show that the beaches were narrow and in many cases not much different than today. However, between 1924 and the late 1940s the shoreline was altered by construction of the PCH and numerous private residences seaward of the road's right-of-way. For the past 70 yrs, an undocumented volume of material has been deposited in the littoral zone during construction and as part of recurring slide and debris basin maintenance practices to keep the thoroughfare clear.

The limited beach profile data west of Topanga Canyon suggests that most of the beach areas have not altered much from their relatively narrow and sediment limited condition before 1928 that has been legally defined as the last time of natural shoreline.

Because the thin beaches are heavily dependent on fluvial discharge, it is believed that the shoreline recedes in response to low sediment yield years and recovers temporarily after episodes of higher rainfall and stream flow. This section of the shore is cross-shore dominant as winter conditions typically erode the thin veneers of sand and severe storms temporarily cause scour down to the general bedrock shelf elevation of 0 to +2 ft MLLW. Existing development, road right-of-ways and resistant bluffs limit shoreline recession. Limited data suggests that the lower lying road fills at Corral, Las Tunas and Castellemmare experience episodes of slope sloughing during severe storm incidents. Between 1971 and 1989, it is estimated that an average retreat of about 1 ft/yr occurred along these sections.

Flows and sediment transport from Malibu Creek affect beaches to the east of the Malibu Lagoon by adding sediment into the Santa Monica littoral cell, an alongshore flow current that transfers along beaches in a west to east direction from Malibu to south of the Palos Verdes headlands. The imbalance of deposition and erosion has resulted in a net loss of sand across the coast and created erosion problems along most of the Santa Monica Bay.

3.3.7 *Water Quality*

The California Water Code establishes policy for water quality for State and regional water resources. The Malibu Creek watershed is under the jurisdiction of the RWQCB Region 4. The RWQCB adopted a water quality control basin plan in June 1994. The Basin Plan was designed to preserve and enhance water quality and protect the beneficial uses of waters located within the Los Angeles Region. The Basin Plan also identifies beneficial uses for specific water bodies located within the region and establishes water quality standards for the water bodies.

Existing beneficial uses shared by Malibu Creek, Malibu Lagoon, and Surfrider Beach include: water contact recreation; non-contact water recreation; wildlife habitat; rare, threatened, or endangered species habitat; migration of aquatic organisms; spawning, reproduction, and or early development habitat; and wetland habitat. In addition to the above, Malibu Creek has existing beneficial uses of both warm and cold freshwater habitat and potential beneficial uses that include municipal and domestic supply and industrial service supply. Malibu Lagoon has the additional existing beneficial uses of estuarine and marine habitats; and Malibu Beach has the additional existing beneficial uses of commercial and sport fishing; marine habitats; and shellfish harvesting. (RWQCB 2005)

Section 303 (d) of the Clean Water Act requires States to identify waters that do not or are not expected to meet applicable water quality standards. On July 25, 2003, the U.S. Environmental Protection Agency approved the RWQCB's most recent list of impaired waterbodies to include: four urban lakes (Lake Sherwood, Westlake Lake, Lake Lindero and Malibou Lake), three tributaries including Las Virgenes Creek, Lindero Creek, and Medea Creek, and Malibu Creek, Lagoon and Beach. Malibu Creek impairments include coliform, fish barriers, nutrient levels, unnatural scum and foam, sedimentation/siltation and excessive trash. Malibu Lagoon has been listed for impairments such as benthic effects, coliform levels, enteric viruses, eutrophic conditions, pH (possible sources might be septic systems, storm drains, and birds), shellfish harvesting advisory, and swimming restrictions (RWQCB 2005). The eutrophic conditions within Malibu Lagoon are exacerbated during the summer by the closing of the lagoon from the Pacific Ocean. Surfrider Beach at the mouth of the lagoon is listed for beach closures and DDT (fish consumption advisory), high coliform count, and polychlorinated biphenyls (PCBs) (fish consumption advisories) (RWQCB 2005).

A Total Maximum Daily Load (TMDL) is a determination of the amount of a pollutant, from point, nonpoint, and natural background sources, including a margin of safety, which may be discharged to a water-quality-limited water body. TMDLs must be developed for the pollutants of concern which impact the water quality of water bodies on the 303(d) list. Coliform, pathogens, nutrients, eutrophic conditions, and scum and foam received a high priority for development of TMDL limits from the RWQCB.

The Los Angeles County Department of Public Works (LACDPW) monitors surface water quality at the Malibu Creek Monitoring Station (S02) located at the existing stream gage station (Stream Gage No. F130-R) near Malibu Canyon Road, south of Piuma Road. The Las Virgenes Municipal Water District also monitors all releases from its facilities.

HTB has been conducting water quality testing throughout Malibu Creek Watershed since 1998 in 20 separate locations. Four testing sites are within the vicinity of Rindge Dam to the lagoon, two are located upstream with one at the Cold Creek confluence and another closer to the dam (Test Sites 15 and 2). Site 15 is located at the Malibu Creek stream gauge and Site 2 is located at the outlet of Cold Creek and marks the upper limit of the project vicinity. The third site (Test Site 1) is about two miles downstream of Rindge Dam monitoring runoff from surrounding communities as well as discharge from the TWRF. A fourth site (Test Site 20) is located downstream of the PCH bridge within the Malibu Lagoon. Testing was generally conducted on a monthly basis for all of these sites. Locations of test sites are shown in **Figure 3.3-6**.

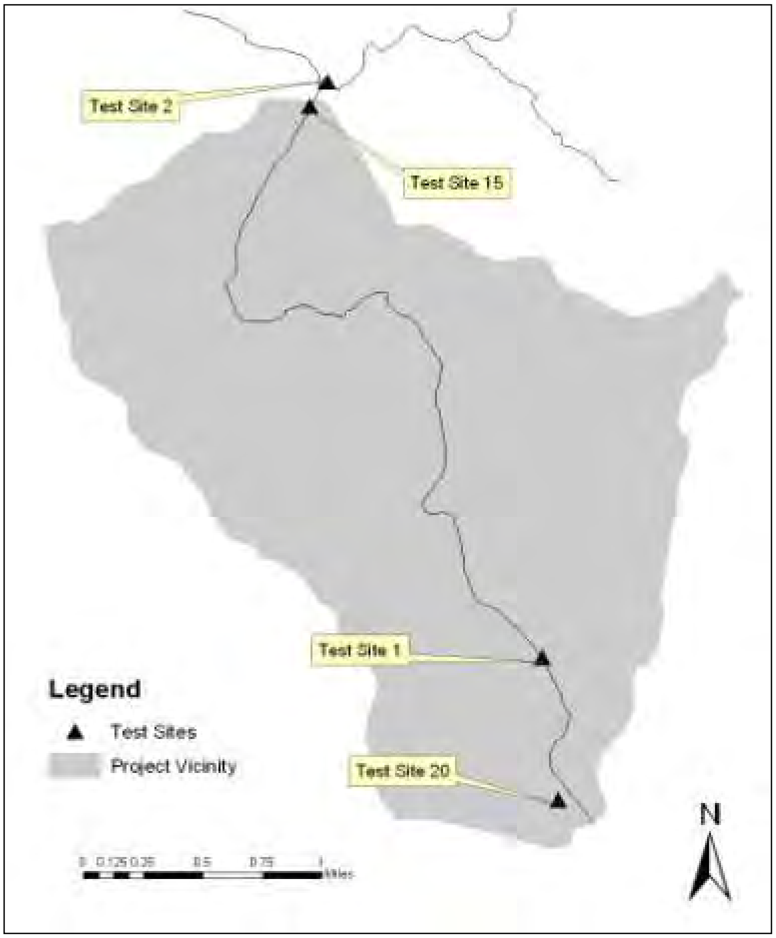


Figure 3.3-7 - Water Quality Testing Locations (Heal the Bay 2005)

Details on flow rates, air and water temperature, turbidity, conductivity, pH, dissolved oxygen (DO), ammonia, nutrients (nitrogen and phosphorus) and bacteria levels (enterococcus, *E. coli*, and total coliform) are from the Heal the Bay Stream Team testing conducted from 11/7/98 to 9/12/04.. Nutrients are an existing problem and a TMDL for total nitrogen and total phosphorus has been established by EPA in 2003. Overall, all areas within the watershed were deemed acceptable for the mean annual EPA DO concentration target of 7 mg/L, showing adequacy in supporting aquatic life, although some individual samples since 1998 testing had non-acceptable levels for short periods of time. Turbidity has been an issue during and after storm events, particularly at Malibu Lagoon due to the high concentration of fine sediments settling there. Bacteria levels are a problem in several locations in the study area. The residential and commercial communities around Malibu Lagoon have been using septic systems and could contribute to problems in the area.

Table 3.3-3 - Average Monthly Water Temperature for Project Vicinity (oF)

	Site 2	Site 15	Site 1	Site 20
January	52.84	64.94	56.60	58.28
February	53.79	59.90	57.80	57.43
March	53.45	65.04	59.03	62.69
April	54.62	63.87	60.40	63.64
May	58.37	66.52	66.02	69.90
June	62.31	66.81	69.31	71.67
July	64.94	68.45	72.28	76.69
August	64.43	69.58	69.80	77.10
September	63.89	68.54	70.55	74.75
October	62.09	64.04	67.82	69.76
November	56.58	62.85	67.85	61.46
December	52.56	62.95	56.76	58.10

<u>Turbidity</u>

Turbidity is a measure of water clarity designated by assigning level of Nephelometric Turbidity Units (NTU). Turbidity can be increased due to natural effects such as erosion, changes in light intensity, and wave action. High turbidity indicates poor water clarity. The overall background turbidity in Malibu Creek tends to decrease with distance upstream based on data from the Heal the Bay Stream Team (**Table 3.3-4**). The highest mean level of turbidity was found in Malibu Lagoon while the lowest was found at the Cold Creek confluence with Malibu Creek throughout the testing period. Turbidity has been an issue during and after storm events, particularly at Malibu Lagoon due to the high concentration of fine sediments settling there.

Table 3.3-4 Turbidity Levels in the Study Area in NTUs

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	16.0	36.4	39.5	30.9
Mean	0.9	2.3	1.7	5.3
Low	0.005	0.3	0.005	1.2

<u>Conductivity</u>

Conductivity in water is the relationship of concentrations of solids to water. As water comes into contact with various substances they dissolve and concentrate in the water. Concentrations of solids are measured in microsiemens per centimeter and salinity. Measurements in fresh water are done in microsiemens while measurements in salt water are done with salinity. High conductivity levels in freshwater commonly result in the same effects as excessive turbidity, i.e., decreased levels of dissolved oxygen. Salt water contains higher concentrations of solids than fresh water. Conductivity levels will increase in the winter within Malibu Lagoon as the beach breaches and allows salt water to enter the system.

Table 3.3-5 Conductivity (microsiemens)

	Site-2 (Cold Creek Confluence)	Site-1 (Malibu Creek at PCH)
High	2890	3690
Mean	1376	1884
Low	939	1204

pH

pH is a relative measure of alkalinity and acidity. The reading of pH refers to a scale of 0 to 14 in which 7 is neutral. Readings that are between 7 and 0 are alkaline, while readings greater than 7 are acidic. Pollutants throughout a waterbody can alter pH values and water quality and thus can affect species that inhabit the area. The most downstream testing site, Malibu Lagoon, recorded the largest range between high and low pH of 1.8 units, while the most upstream site Cold Creek recorded the lowest range between high and low pH of 1.0 units as shown **Table 3.3-6**.

Table 3.3-6 pH Levels at Sites within the Study Area

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	8.4	8.4	8.8	9.3
Mean	7.86	7.86	8.09	8.31
Low	7.4	6.7	7.2	7.5

Dissolved Oxygen

Dissolved oxygen (DO) levels need to be adequate to support aquatic life. Mean annual concentrations of dissolved oxygen are targeted at a minimum of 7 mg/L for all areas within the Malibu watershed. Overall, all areas within the watershed were deemed acceptable for the mean annual EPA DO concentration target of 7 mg/L, showing adequacy in supporting aquatic life, although some individual samples since 1998 testing had non-acceptable levels for short periods of time. Testing for dissolved oxygen was completed at test Site 1 (Malibu Creek at PCH) on 72 occasions between 11/7/98 and 9/12/04 in which 11 samples were under EPA-established levels. Site 2 (Cold Creek confluence) was tested 63 times throughout the testing period in which six of the samples were under the EPA standards. Site 15 (Tapia stream gauge) was tested 65 times throughout the monitoring period and non-acceptable levels were found in three samples. Site 20 (Malibu Lagoon) was tested 73 times and non-acceptable levels of dissolved oxygen were found in five samples as show in **Table 3.3-7.**

Table 3.3-7 Dissolved Oxygen Concentrations (mg/L)

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	12.08	15.7	19.68	19.99
Mean	9.48	10.6	10.96	10.99
Low	3.95	5	2.81	5.6

<u>Ammonia</u>

Levels for ammonia concentration are dependent on pH and temperature. EPA standard levels for ammonia toxicity for Malibu Creek were created using pH data collected at the Tapia stream gauge between 1995 and 1998. Two sets of target levels were established using acute and chronic criteria. Acute levels were created using higher pH data levels, 90th percentile of collected data, while chronic levels were created using data collected within the 50th percentile. Acute target levels for Malibu Creek concerning ammonia toxicity were establishes at 2.59 mg/L while chronic levels were established at 1.75 mg/L as show in **Table 3.3-8.**

Table 3.3-8 Ammonia Levels within the Study Area (mg/l)

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	0.97	0.005	7.05	0.20
Mean	0.06	0.005	0.21	0.01
Low	0.005	0.005	0.005	0.005

Mean levels were all below the mean target levels established by the EPA for all testing sites throughout the monitoring period. All of the samples taken were underneath acceptable the EPA acute target levels aside from one sample taken at Site 1.

<u>Nutrient Levels</u>

Excessive nutrient levels throughout the Malibu Creek watershed have increased the amount of algal growth. While algal growth provides feeding opportunities for aquatic life, excessive algal growth can create algal mats and eutrophic conditions where levels of dissolved oxygen are low. This has the potential to decrease the beneficial aquatic uses. Corollary effects of the decay of algal formations are nuisance impairments such as odors and creation of scum/foam. Sources of nutrients within the Malibu Creek watershed include discharges from Tapia Water Reclamation Facility, runoff from residential and commercial areas, runoff from agricultural areas, erosion, and golf course irrigation and fertilization. A nutrient TMDL for Malibu Creek for total nitrogen and total phosphorous was developed and established by EPA in March 2003. The EPA TMDL includes a numeric target for total nitrogen of 1 mg/L during the summer (April 15 to November 15) and a winter numeric target of 8 mg/L (RWQCB 2005). The EPA also established a 0.1 mg/L numeric target for total phosphorous during the summer. Based on recent studies, the RWQCB is currently proposing a new TMDL numeric target of 1 mg/L for total nitrogen during both summer and winter seasons.

Nitrogen

Nitrogen containing compounds act as nutrients in streams and rivers. Inorganic nitrogen can cause oxygen depletion in fresh water. Inorganic nitrogen may exist in the free state as a gas (N2), or as nitrate (NO3), nitrite (NO2), or ammonia (NH3). High levels of nitrates in water can have negative effects on aquatic life. The RWQCB had established acceptable nitrate levels from 3.5 to 6 mg/L (**Citation).** Monthly testing for nitrate between November 7, 1998 and September 12, 2004 showed levels in excess of RWQCB levels in 12 samples at testing Site 1 (Malibu Creek at PCH; n=74) and no samples at testing Site 2 (Cold Creek confluence; n=65). Monthly testing for nitrate from November 10, 1998 to October 6, 2004 at testing Site 15 (Tapia Stream Gauge; n=65) and at testing Site 20 (n=73) resulted in 13 samples and 0 samples, respectively, that exceeded RWQCB standards.

Table 3.3-9 Nitrate Levels within the Study Area (mg/L)

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	2.510	12.000	13.050	5.700
Mean	0.580	3.180	2.760	1.180
Low	0.005	0.005	0.005	0.005

Phosphate

Phosphate stimulates the growth of plankton and aquatic plants. While this growth can increase fish population by providing food sources, an excess in phosphate levels may cause unrestrained growth of aquatic plants that deplete dissolved oxygen. This condition is known as eutrophication. Phosphorus levels throughout Malibu Creek are determined from the quantity of orthophosphate in water. The currently adopted recommended monthly average for levels of phosphorous by the California State Water Resources Control Board is 0.1 mg/L throughout both summer and winter seasons.
All of the mean values of all of the testing sites exceed State levels for the monitoring period November 7, 1998 to September 12, 2004. Site 1 (Malibu Creek at PCH) was tested 74 times during the monitoring period and all samples were in excess of EPA levels. During this monitoring period Site 2 (Cold Creek confluence; n=65) had 56 samples; Site 15 (n=65) had 58 samples; and Site 20 (n=73) had 56 samples that were above the RWQCB recommended monthly average.

Table 3.3-10 Phosphate Levels within the Study Area (mg/L)

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	0.620	2.200	4.800	1.200
Mean	0.240	2.160	1.980	1.190
Low	0.005	0.005	0.330	0.005

Bacteria Levels

High levels of fecal coliform and *E. coli* result in exceedance of water quality standards, pose risks to aquatic and terrestrial life, and have significant impacts on recreational uses throughout this area. Heal the Bay tested for *Enterococcus*, *E. coli* and total coliform. Bacteria levels are a problem in several locations in the study area. The residential and commercial communities around Malibu Lagoon have been using septic systems and could contribute to problems in the area. Other sources of coliform bacteria throughout the project area include runoff and animal waste.

Enterococcus

Enterococcus levels are an indicator of fecal contamination in water. Elevated *Enterococcus*, fecal coliform bacteria, levels indicate that the water has been contaminated with fecal matter from man or other animals, or both. Fecal contamination is an indicator of potential health risks for those exposed to contaminated water. Fecal contamination can occur from sewage or non-point-source human and animal waste. Within the study area, lower density residential and commercial areas around Malibu Lagoon use septic systems. The existence of septic systems can be a contributing factor to elevated levels of fecal coliform. The total number of septic systems in the watershed was estimated at 2,300 in the mid-1990s.

The EPA and the California Department of Health Services have established TMDL levels for *Enterococcus*. EPA has established TMDL level target at 35 Most Probably Number colony forming unit (MPN) cfu/100ml as a mean and a single sample level of 104 MPN cfu/100ml for a single sample. California Department of Health Services has established TMDL levels 61 MPN cfu/100ml for a single sample.

Both sites 1 and 2 had levels above EPA mean target levels for *Enterococcus* during the monitoring period. Site 1 was tested on 56 occasions during the monitoring period and five of the samples were above EPA acute target levels. Site 2 was tested 52 times and 29 of the samples were above acceptable levels. Sites 15 and 20 were not tested for *Enterococcus.*

Table 3.3-11 Enterococcus Levels within the Study Area (MPN cfu/100ml)

	Site-2 (Cold Creek Confluence)	Site-1 (Malibu Creek at PCH)
High	1690.000	1236.000
Mean	192.470	75.210
Low	5.000	5.000

E. coli

EPA has established TMDL target levels for *E. coli* at 126 MPN cfu/100ml as a mean and 235 MPN cfu/100ml for a single sample. E. coli has the ability to grow at higher temperatures than other types of fecal bacteria. Elevated levels of *E. coli* demonstrate a potential health risk to those exposed. Sites 2, 15 and 20 were above mean target levels for *E.coli* during the monitoring period. Site 1 was tested 30 times for *E. coli*, and 2 of the samples were above EPA standards for a single sample. Site 2 was tested 20 times and seven of the samples were above acceptable levels. Site 15 was tested 64 times and nine of the samples were above single sample levels. Site 20 was tested 73 times and 20 of the samples were above acceptable levels.

Table 3.3-12 E. coli Levels within the Study Area (MPN cfu/100ml)

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	1354.0	1700.0	288.0	2200.0
Mean	234.0	173.5	67.3	538.3
Low	5.0	5.0	5.0	0.0

Total Coliform

EPA has determined TMDL target levels for total coliform at 1,000 MPN cfu/100ml for mean levels and 10,000 MPN cfu/100ml for a single sample. Total coliform bacteria are microorganisms that live in the intestines of both cold and warm blooded animals.

All of the testing sites exceeded EPA mean target levels for total coliform throughout the testing period. Site 1 (n=29), Site 15 (n=64) and Site 20 (n+66) were tested throughout the monitoring period and 7, 3, and three samples respectively were above acceptable levels. Site 2 (n=25) was tested 25 times and none of the samples were above EPA levels for single samples of total coliform.

Table 3.3-13 Total Coliform Levels within the Study Area (MPN cfu/100ml)

	Site-2 (Cold Creek Confluence)	Site-15 (Tapia Stream Gauge)	Site-1 (Malibu Creek at PCH)	Site-20 (Malibu Lagoon)
High	9804.0	30000.0	24193.0	30000.0
Mean	2922.0	2973.0	7294.0	2911.0
Low	173.0	110.0	528.0	0.0

Groundwater

The receiving groundwater basin for Malibu Creek is the Malibu Valley Groundwater Basin (Department of Water Resources Basin No. 4-22). The basin is a small alluvial basin located along the Los Angeles County coastline. The basin is bounded by the Pacific Ocean on the south and by non-water-bearing Tertiary age rocks on all remaining sides. The basin has a surface area of approximately 610 ac.

Groundwater is found principally in Holocene alluvium which consists of clays, silts, sands, and gravels. Thickness of the alluvium ranges from 90 ft at the upper end to more than 140 ft at the lower end (DWR 1975). The Malibu Coast fault crosses the valley but is not a groundwater barrier (DWR 1975).

Near the coastal areas, including Malibu Lagoon, groundwater can be found in alluvium, beach deposits, and terrace deposits at a depth of only a few ft and varies due to tidal and seasonal hydrological changes. Inland and upstream of these areas as the soil types change to consolidated rock the depth of groundwater can increase to several hundred feet. The main source of groundwater recharge within the upstream portions of the study area is groundwater flow from upper areas of the watershed. Other sources of groundwater recharge include localized percolation of rainfall, streamflow, irrigation runoff, and effluent from domestic septic systems.

The general quality of groundwater in the area has degraded from background levels. At one time groundwater provided public water supply but since has been contaminated by seawater intrusion and other pollutants. Seawater intrusion occurred in 1950, and again in 1960, when seawater advanced 0.5 mi inland (DWR 1975). In agricultural areas fertilizers and pesticides degrade ground water when waters containing such substances seep into the subsurface. There are also many areas that are on septic systems within the study area. Overloaded or improperly placed septic tanks can seep into ground water and elevate levels of nitrogen and pathogenic bacteria, which can pose health risks to those exposed. A study conducted by Stone Environmental in 2004 identified 70 onsite wastewater treatment systems (OWTS), or septic systems, that were overlaying the alluvial aquifer and contributing nitrogen to Malibu Creek and Malibu Lagoon. Another 161 systems were identified as potentially contributing bacteria to Malibu Creek and Malibu Lagoon. Nitrogen concentrations in 30% of the monitoring wells used in the study were above the State standard of 10mg/L. Bacteria were present in wells that were both affected and not affected by OWTS. Areas of groundwater that were shallow were found to be more significantly influenced by bacteria from sources other than OWTS. The study concluded that stormwater entering ground water systems was the major contributor to elevated bacteria levels in the study area, while wastewater, OTWS, were the major contributor to elevated nutrient levels, such as nitrogen.

Existing beneficial uses include agriculture supply. Potential beneficial uses include municipal and domestic supply and industrial service supply.

3.4 Biological Resources

Biological resources located in this area are typical of plant and wildlife species encountered in the transverse ranges of southern California and are adapted to a climate with cool wet winters and hot dry summers. Rainfall occurs primarily between October and March with the heaviest rainfall located on the steep mountain faces while beach areas receive substantially less rainfall. This climatic condition provides for a variety of plant communities that support diverse and species-rich flora and fauna.

Many of the areas discussed below are relatively undisturbed and represent habitats defined as Sensitive Environmental Resource Areas (SERAs) (LADRP 2014) for purposes of habitat protection and land use planning.

The information in this section is based largely on existing information on the vegetation, fish, and wildlife within the Santa Monica Mountains, the Malibu Creek watershed, and in the study area as reported in Abramson and Olson (1998), Dillingham (1989), Natural Resource Conservation Service (NRCS 1995), and National Park Service (NPS 2002). This information is applicable to the study area of Malibu Creek watershed and other areas, such as the shoreline and nearshore areas, as noted.

3.4.1 *Regulatory Setting*

<u>Federal Laws and Regulations</u>

Clean Water Act (CWA)

The CWA has provisions for protecting biological resources within the aquatic environment through identification of beneficial uses and prohibitions on fill of wetlands or other Waters of the U.S. (WoU.S.). The primary functions of the CWA in protecting biological resources in this instance are to ensure that any impacts to wetlands or WoU.S. are compensated for and to provide a framework for ensuring that water quality is maintained or improved.

Endangered Species Act (ESA)

The Endangered Species Act (ESA) protects threatened and endangered species by prohibiting Federal actions that would jeopardize the continued existence of such species or result in destruction or adverse modification of any critical habitat of such species. If effects to listed species are anticipated, Section 7 of the Act requires consultation regarding protection of such species be conducted with the U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) prior to project implementation. (16 USC 1531, 1536).

Fish and Wildlife Coordination Act (FWCA)

The purposes of the FWCA include recognizing the contribution of wildlife resources to the nation, acknowledging the increasing public interest and awareness of wildlife resources, and ensuring that wildlife conservation receives due consideration in water resources development programs (16 USC 661). Under the FWCA, the FWS provides its recommendations to the USACE to consider.

Migratory Bird Treaty Act (MBTA)

The MBTA implements various treaties and conventions between the U.S. and Canada, Japan, Mexico, and Russia for the protection of migratory birds. Under the act, taking, killing or possessing migratory birds, their nests, or eggs, is prohibited.

Executive Orders

Several Executive Orders relating to biological resources would need to be complied with as future planning and implementation of any of the proposed restoration measures take place. Relevant EOs include the following:

- *Invasive Species*—EO 13112, issued on February 3, 1999, helps prevent the introduction of invasive species and provides for their control and minimizes the economic, ecological, and human health impacts that invasive species cause.
- *Protection of Wetlands*—EO 11990, issued on May 24, 1977, helps avoid the long-term and short-term adverse impacts associated with destroying or modifying wetlands and avoiding direct or indirect support of new construction in wetlands when there is a practicable alternative.
- *Migratory Birds*—EO 13186, issued on January 10, 2001, promotes the conservation of migratory birds and their habitats and directs Federal agencies to implement the Migratory Bird Treaty Act.
- *Protection and Enhancement of Environmental Quality*—EO 11514, issued on March 5, 1970, supports the purpose and policies of NEPA and directs Federal agencies to take measures to meet national environmental goals.

State Laws and Regulations

California Endangered Species Act, Sections 1600-1607

The California Endangered Species Act focuses on protecting all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation.

California Fish and Wildlife Code, Sections 1600-1607

Sections 1600 through 1607 which regulate work that would substantially divert, obstruct, or change the natural flow of a river, stream, or lake; that would substantially change the bed, channel, or bank of a river, stream, or lake; or that would use material from a streambed.

The Porter-Cologne Water Quality Control Act also applies to biological resource protections.

3.4.2 *Vegetation Surveys and Mapping*

Santa Monica Mountain National Recreational Area (SMMNRA) National Park Service (NPS) staff conducted vegetation mapping for the study in 2004 in conjunction with vegetation classification and mapping that they were conducting for the Santa Monica Mountains (NPS 2005). Vegetation was classified utilizing rapid bioassessment and vegetation classification developed by Sawyer and Keeler-Wolf (1995) and the California Native Plant Society.

Photo interpretation and field investigation were used to map natural vegetation of lower Malibu Canyon (ridgeline to ridgeline) from PCH to 1.5 mi above Rindge Dam. The minimum mapping unit was 0.5 hectare. In addition, information from the photo interpretation was field-verified within approximately 500 ft on either side of Malibu Creek from PCH to 1.5 mi above Rindge Dam, approximately the confluence with Cold Creek. A record of invasive, exotic species and uncommon or rare plant species encountered during the surveys was also generated.

Vegetation communities were delineated as field drawn polygons onto geo-referenced and ortho-rectified aerial image field maps that were developed with Geographic Information System (GIS) software by Geo InSights, Inc. Field-collected vegetation community information was digitized into GIS and used to generate vegetation community mosaics that depict the vegetation communities within the study area.

Chaparral, grass and forbs, and coastal sage scrub are the major plant communities that dominate the study area, occurring predominately on the hillsides while mixed riparian and alluvial scrub habitat occurs along the riparian zone of Malibu Creek **(Figure 3.4-1)**.

3.4.3 *Riparian Corridor*

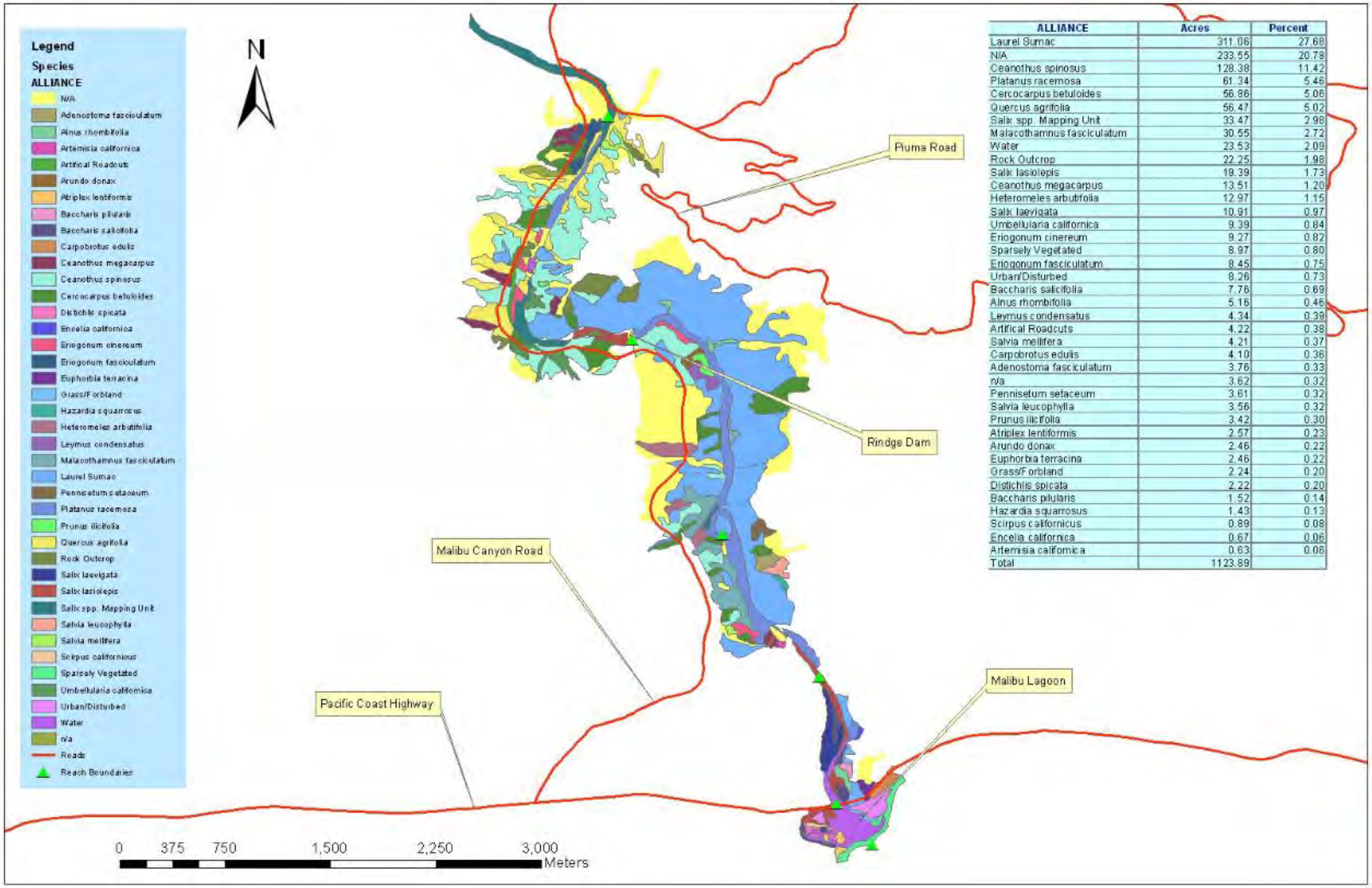
Riparian Vegetation

The following discussion focuses on the Malibu Creek riparian corridor. Riparian communities are situated along stream courses and adjacent stream banks and require moist, bare mineral soils for germination and establishment, much like the conditions following periodic flooding (Holland 1986), and are a transition between the aquatic plant community and the upland plant community. The riparian zone is a classic example of an ecological “edge” where the density and diversity of plants and animals tend to be higher in the border, or edge, between two communities (in this case the aquatic and upland communities) than in either of the communities (Faber et al. 1989). Undisturbed riparian corridors are rare in southern California, owing to development alongside streams and channelization for flood risk reduction.

Riparian vegetation is dynamically related to hydro-geomorphic factors. Where slopes are steep, water scours the streambed. Major storms can produce sediment-laden flows that dislodge large portions of the riparian vegetation and alter the stream channel. Where gradients are low, alluvial material is deposited, thereby providing areas where pioneer, seral vegetation can become established. If the interval between stream-altering flows is several years, rapidly growing riparian vegetation can mature into dense riparian canopies.

Non-Native Vegetation

The non-native, invasive giant reed Arundo (*Arundo donax*) colonizes the floodplain within Malibu Creek and has been demonstrated to effectively exclude many native species. Within active channels, scouring action removes Arundo, as well as native woody vegetation before maturation. However, in lower flood terraces that may be washed over by floodwaters but not necessarily scoured, existing populations of Arundo and other vegetation can survive. Once established, populations of Arundo can out-compete and displace native vegetation in a number of ways including depleting existing water and overcrowding native vegetation. Arundo spreads by lateral rooting and can quickly colonize an area to create a mono-species stand. Arundo increases by 20% in overall cover within 25 yrs, then by another 20% overall cover after 50 yrs. Several local agencies and organizations have programs underway to control the spread of Arundo within the Malibu Creek watershed and the Santa Monica Mountains generally. Long-term success of these programs is unknown at this time.



ALLIANCE	Acres	Percent
Laurel Sumac	311.06	27.68
N/A	233.55	20.78
Ceanothus spinosus	128.38	11.42
Platanus racemosa	61.34	5.46
Cercocarpus betuloides	56.86	5.06
Quercus agrifolia	56.47	5.02
Salix spp. Mapping Unit	33.47	2.98
Malacothamnus fasciculatum	30.55	2.72
Water	23.53	2.09
Rock Outcrop	22.25	1.98
Salix lasiolepis	19.39	1.73
Ceanothus megacarpus	13.51	1.20
Heteromeles arbutifolia	12.97	1.15
Salix laevigata	10.91	0.97
Umbellularia californica	9.39	0.84
Eriogonum cinereum	9.27	0.82
Sparsely Vegetated	8.97	0.80
Eriogonum fasciculatum	8.45	0.75
Urban/Disturbed	8.26	0.73
Baccharis salicifolia	7.76	0.69
Alnus rhombifolia	5.16	0.46
Leymus condensatus	4.34	0.39
Artifical Roadcuts	4.22	0.38
Salvia mellifera	4.21	0.37
Carpobrotus edulis	4.10	0.36
Adenostoma fasciculatum	3.76	0.33
n/a	3.62	0.32
Pennisetum setaceum	3.61	0.32
Salvia leucophylla	3.56	0.32
Prunus ilicifolia	3.42	0.30
Atriplex lentiformis	2.57	0.23
Arundo donax	2.46	0.22
Euphorbia terracina	2.46	0.22
Grass/Forbland	2.24	0.20
Distichlis spicata	2.22	0.20
Baccharis pilularis	1.52	0.14
Hazardia squarrosus	1.43	0.13
Scirpus californicus	0.89	0.08
Encelia californica	0.67	0.06
Artemisia californica	0.63	0.06
Total	1123.89	

Figure 3.4-1 - Habitat Map

Other aggressive non-native species of concern include fountain grass (*Pennisetum setaceum*), spurge (*Euphorbia spp*), and pepperweed (*Lepidium latifolium*). These non-natives crowd out native species by outcompeting for light, water, and nutrients. Due to their rapid spread, non-native species are generally assumed to increase by 10% overall cover within 25 yrs and another 10% overall cover after 50 yrs.

Malibu Creek Stream Reaches

Malibu Creek Riparian Corridor Upstream of Rindge Dam (Stream Reach 5)

Malibu Creek in general is typical of streams in southern California coast range mountains in that it exhibits typically steep gradients and is dominated by a flashy precipitation regime (Faber et al. 1989). "Flashy" signifies that the river stage rises and falls abruptly within a hydrologic event. The most predominant vegetation type within the upper river corridor is western sycamore (*Platanus racemosa*) and willow (*Salix* sp.) with pockets of coast live oak (*Quercus agrifolia*).

The current reservoir area behind Rindge Dam is completely filled with sediment. The area is currently highly disturbed with sparse riparian vegetation. The reservoir area is mostly vegetated with arroyo willow (*Salix lasiolepis*) and the exotic fountain grass (*Pennisetum setaceum*). The predominant vegetation surrounding the former reservoir is greenbark ceanothus (*Ceanothus spinosus*) and mountain mahogany (*Cercocarpus betuloides*).

Malibu Creek Riparian Corridor Downstream of Rindge Dam (Stream Reaches 4-2)

The most predominant vegetation type just below the dam in the river corridor (Reaches 4 and 3) is western sycamore (*Platanus racemosa*). Further downstream (Reach 2), the river corridor is dominated by arroyo willow and red willow (*Salix laevigata*) with some patches of sycamore, alder (*Alnus rhombifolia*), Coyote brush (*Baccharis pilularis*), and mulefat (*B. salicifolia*). **Photo 3.4-1and Photo 3.4-2** show typical views of habitat downstream of Rindge Dam.

Upland Vegetation in the Malibu Creek Watershed

Upland plant communities are dominated by plant species that do not require a permanent source of water (xerophytes). These communities typically require only seasonal precipitation to obtain adequate water for growth and reproduction. Upland vegetation classes observed in the surveyed portion of Malibu Creek are described below.

The major non-urban upland vegetation communities within the watershed include grasslands/forbland (California annual grassland and ruderal grassland), chaparral (chamise, sumac, sumac-black sage, and sumac-ceanothus series), Coastal (sage) scrubs (e.g., black sage, white sage, mixed sage, and coyote brush series), and woodlands (California walnut and coast live oak series). See **Figure 3.4-2** and **Table 3.4-1** (Heal the Bay Stream Team data from 11/7/98 to 9/12/04).

Chaparral in the Malibu Creek area consists of a variety of plants that thrive in poor, dry, sandy, rocky soils. Chaparral is the most dominant vegetation community of the uplands, comprising 65% of the total. Plant species associated with this habitat include but are not limited to, ceanothus (*Ceanothus* spp.), chamise (*Adenostema fasciculatum*), currant (*Ribes* spp.), fuchsia-flowered gooseberry (*Ribes speciosum*), black sage (*Salvia mellifera*), purple sage (*Salvia leucophylla*), holly-leaf cherry (*Prunus ilicifolia*), holly-leaf redberry (*Rhamnus ilicifolia*), laurel sumac (*Malosma laurina*), mountain mahogany (*Cercocarpus betuloides*), poison oak (*Toxicodendron diversilobum*), scrub oak (*Quercus berberidifolia*), sugar bush (*Rhus ovata*), and toyon (*Heteromeles arbutifolia*) (CSP 2003). Chamise and laurel sumac are the most common chaparral species present.

Photo 3.4-1 - Big Bend Area 1.75 Miles Downstream of Rindge Dam

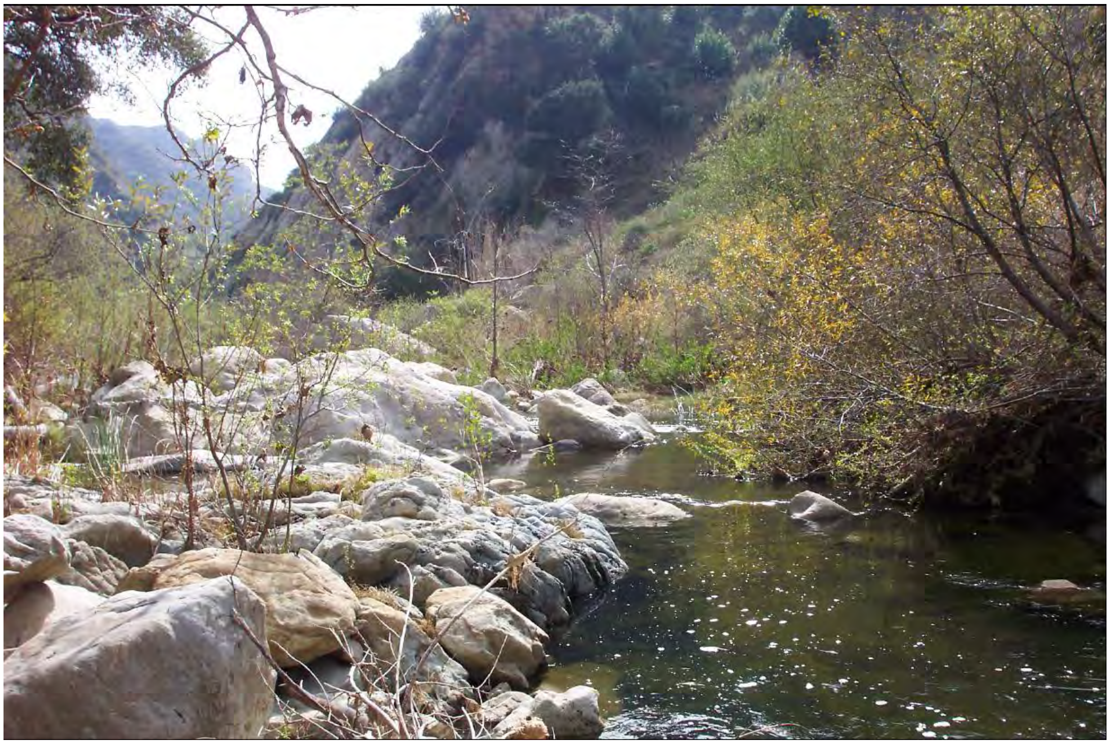


Photo 3.4-2 - Malibu Creek Habitat Downstream of Rindge Dam

About 4% of the upland area consists of coastal sage scrub vegetation, which includes buckwheat (*Eriogonum* spp.), sages (*Salvia* spp.), yucca (*Yucca whipplei*), and cacti (various species). Coastal sage scrub in the Malibu Creek area occurs on xeric sites (areas that receive only a small amount of moisture with shallow soils). Sage scrub species are typically drought-deciduous plants with shallow root systems. Coastal sage scrub is considered a sensitive habitat by the CDFW (Holland 1986) because this community's relatively few remaining acres supports an extremely high number of sensitive species (CSP 2003).

Table 3.4-1 Major Upland Plant Communities in the Malibu Creek Project Study Area

Plant Community	Area (Acres)	Percent
Chaparral	2,104	65
Urban	620	19
Woodland	318	10
Coastal Scrub	148	4
Grass / Forbland	59	2
Total Mapped Area	3249	100

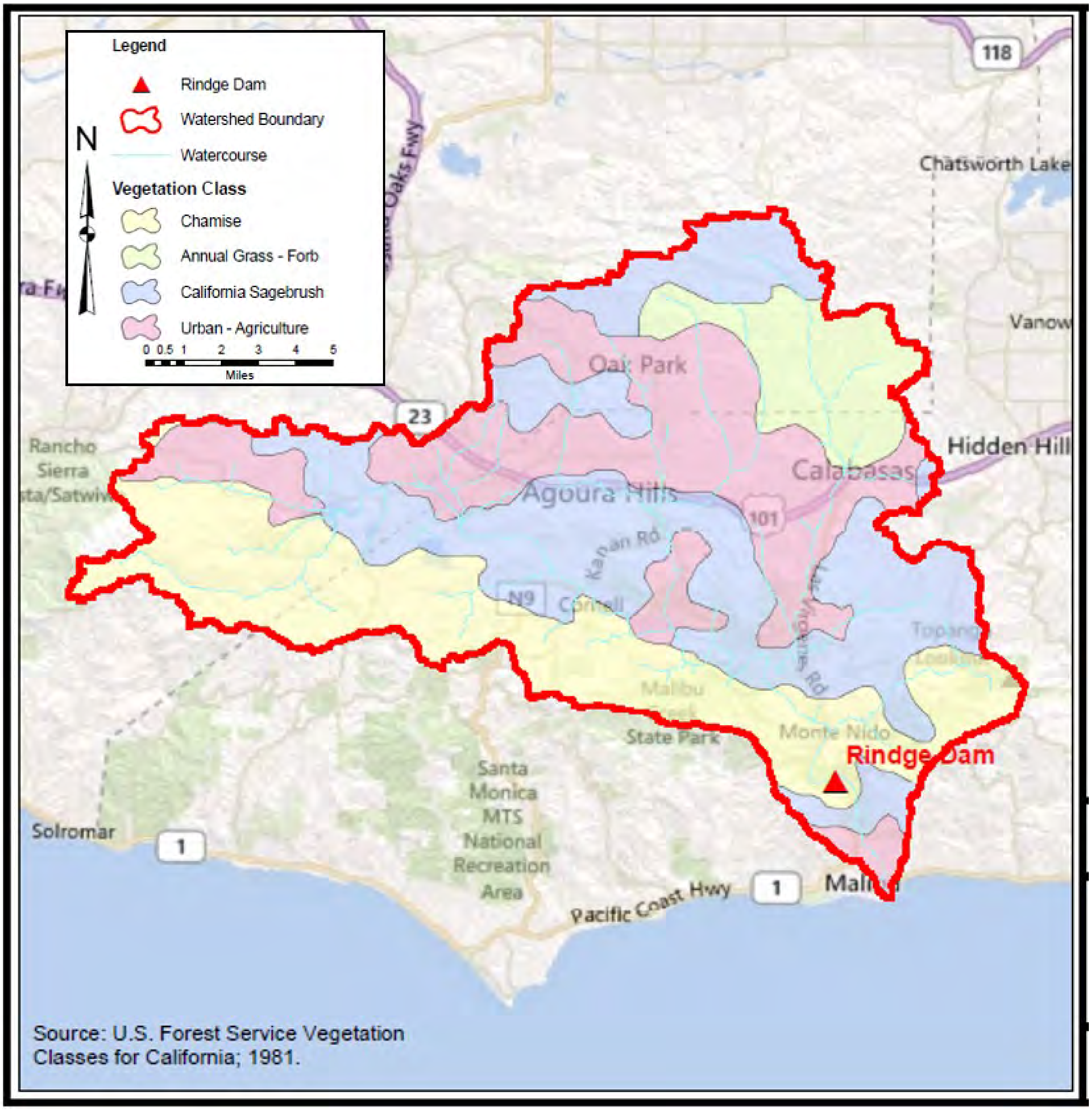


Figure 3.4-2 - Vegetation Classes within the Malibu Creek Watershed

Grasslands in the Malibu Creek area consist of low-growing herbaceous species dominated by annual and perennial grasses and forbs. Grazing and cultivation has left only a few native grasses such as purple needle-grass (*Nassella pulchra*), California brome (*Bromus carinatus*), and blue wildrye (*Elymus glaucus*) that occur in small, isolated patches as remnants of the former large expanses that once characterized the area's foothills and flatlands. Today, the dominant grasses are introduced, nonnative grasses such as various bromes (*Bromus* spp.), wild oats (*Avena* spp.), and ryegrasses (*Lolium* spp.). Forbs found in the grassland community include, but are not limited to, California poppy (*Eschscholzia* spp.), tarplant (*Deinandra* spp. And *Madia* spp.), lupines (*Lupinus* spp.), lilies (variety), clover (*Trifolium* spp.), thistles (variety), asters (variety), and fennel (*Foeniculum vulgare*).

Grassland typically grows in well-developed, deeper, fine textured soils on gentle slopes and flats, coastal terraces, and in disturbed sandy sites. Areas dominated by grasses are often in early successional stages. Over time, grassland tends to revert to shrublands, and eventually even to woodlands, if burning and disturbance frequencies are minimal (Zedler et al. 1997).

Woodlands make up about 10% of the survey area. Woodland vegetation is dominated by woody trees and tall tree-like shrubs, forming an open to closed canopy, growing over a scattered variety of low-growing shrubs and a graminoid (grassy) ground layer. Some woodland communities may not contain a shrub stratum, and may consist only of a tall canopy over annual or perennial grasslands. Woodland understory is directly related to the density of the tree canopy and its total percent canopy cover. Permanent shade, created by dense tree canopies, typically inhibits the growth of stratified layers. The woodland community is typically found on the north and northeast-facing slopes and in the shaded canyon bottoms on moderately to very deep, well-drained soils. Groves are formed across valleys and along streams and intermittent drainages, where permanent water is within reach of the roots.

Malibu Lagoon

Malibu Creek flows into the Pacific Ocean at Malibu Lagoon estuary near the city limits of Malibu, California. The lagoon is part of Malibu Lagoon State Beach. Malibu Lagoon currently receives a combination of natural, seasonal freshwater input, and a substantial non-natural water input from various sources including the Tapia Water Reclamation Facility (TWRF). Most of the information in the following section is taken from Dillingham (1989) and Moffat and Nichol (2005).

Malibu Lagoon tends to close to tidal flow through the formation of sand bars across its ocean front. In some extremely wet years, the lagoon remains open to the ocean and tidal exchange occurs all year. In some dry years, the sand bar remains unbreached in the winter and water flows over the sand bar. Large floods temporarily remove most of the vegetation, greatly alter topography, and completely redefine the habitats and occurrence of vegetation.

The high volumes of freshwater input to the lagoon estuary greatly influences the plant species found in the area, and favor plants tolerant of brackish rather than salt water. The distribution of plants in less disturbed estuaries occurs in zones based on plant salt tolerance and inundation levels. In Malibu Lagoon, this natural zonation of vegetation that occurs in other estuaries was non-existent.

Past inventories identified approximately 133 plant species in the lagoon. Only about 5% of these are native estuary plants. Prior to recent restoration activities, the majority of the area (65%) was vegetated with non-native exotic species. In 2012-2013, Malibu Lagoon underwent extensive restoration by the Malibu Lagoon Habitat Enhancement Project, funded by the CDPR, HTB, and SMBRC and others, via several grants. Restoration activities included habitat restoration within the lagoon, including recontouring of onsite channels to increase circulation. Additional plantings to enhance the species diversity and cover occurred in 2014.

The three most dominant salt tolerant plants in the lagoon prior to the recent restoration activities were salt grass (*Distichlis spicata*), fleshy jaumea (*Jaumea carnos*a), and to a lesser extent, pickleweed (*Salicornia virginica*). The dominance of fleshy jaumea in the estuary is likely the result of the large freshwater influx that creates the dominant brackish conditions that favors fleshy jaumea. Pickleweed normally dominates most southern California estuaries. Along the channel banks, mats of drift algae (*Enteromorpha intestinalis*) are common.

3.4.4 *Wildlife*

The Santa Monica Mountains supports a remarkably abundant wildlife community. The Santa Monica Mountains are reported to support over 450 vertebrate species, including 50 mammals, 384 species of birds, and 36 reptiles and amphibians (CDPR 2005).

The vegetation in the study area provides a variety of habitat types, including sensitive riparian and emergent wetland habitats. Riparian and aquatic wetlands occur throughout Malibu Creek and provide wildlife with shade, protection from predators, and foraging, nesting, and breeding habitat. The upland vegetation communities that occur within and adjacent to the project (e.g., annual grassland, oak savannah, scrub and chaparral) support a wide variety of species, and contribute to the overall wildlife species diversity.

Mammals in the study include a variety of large and small species. Mule deer (*Odocoileus hemionus californicus*) are the largest herbivore. The largest predator is the mountain lion (*Felis concolor*), but its continued ability to survive in the mountains is uncertain due to its need for large expanses of unfragmented habitat. Other mammals typical of the study area are the western gray squirrel (*Sciurus griseus*), raccoon (*Procyon lotor*), gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), and coyote (*Canis latrans*).

NRCS (1995) reports that over 384 species of birds have been observed in the Malibu Creek watershed and vicinity. More than 262 species have been recorded in Malibu Lagoon alone. Approximately 117 species of resident bird species are estimated to breed in the area. Thirteen raptor species breed in the Malibu Creek watershed, including red-shouldered hawks (*Buteo lineatus*), red-tailed hawks (*B. jamaicensis*), sharp-shinned hawks (*Accipeter striatus*), great horned owls (*Bubo virginianus*), and burrowing owls (*Athene cunicularia*).

About 25 species of reptiles inhabit the watershed. They include southern alligator lizard (*Elgaria multicarinata*), coastal whiptail (*Aspidoscelis tigris stejnegeri*), side-blotched lizard (*Uta stansburiana*), two-striped garter snake (*Thamnophis hammondii*), southwestern pond turtle (*Emys marmorata*), and gopher snake (*Pituophis melanoleucus*).

Amphibians reported in the study area include species such as California treefrog (*Pseudacris regilla*), bullfrog (*Rana catesbeiana*), California newt (*Taricha torosa torosa*), and western toad (*Bufo boreas halphilus*).

A variety of other federal and state wildlife species of concern including the Coast Range newt (*Taricha torosa torosa*), two-striped garter snake (*Thamnophis hammondi),* Coast patch-nosed snake (*Salvadora hexalepis virgultea*), and southwestern pond turtle (*Emys marmorata*), among others, are known in Malibu Creek.

3.4.5 *Freshwater and Estuary Fish*

Seventeen fish species, both native and non-native, have been documented in previous surveys within the study area (Swift et al. 1993, Dagit and Abramson 2007, Moyle 2002, Dagit *pers. Comm*. 2013). Native freshwater species occurring in the study area include: federal endangered and California species of concern southern California steelhead-Southern California Distinct Population Segment (DPS) (*Onchorhynchus mykiss*), federally endangered and California species of concern tidewater goby (*Eucyclogobius newberryi*), California species of special concern arroyo chub (*Gila orcutti*), Pacific lamprey (*Lampetra tridentata*), prickly sculpin (*Cottus asper*), topsmelt (*Atherinops affinis*), staghorn sculpin (*Leptocottus armatus*), striped mullet (*Mugil cephalus*) and California killifish (*Fundulus parvipinnis*). Non-native freshwater species occurring in the study area include: green sunfish (*Lepomis cyanellus*), bluegill (*Lepomis macrochirus*), fathead minnow (*Pimephalas promelas*), mosquitofish (*Gambusia affinis*), largemouth bass (*Micropterus salmoides*), common carp (*Cyprinus carpio*), channel catfish (*Ictalurus punctatus*), and black bullhead (*Ameiurus melas*).

The estuary fish found in Malibu Lagoon are typical of small southern California saltmarshes. The Lagoon serves as an important primary and nursery habitat for several fish species, including the tidewater goby. Southern California steelhead use the estuary just prior to migrating to freshwater spawning areas in Malibu Creek. Steelhead smolts pause in the lagoon to grow prior to entering the ocean. The Pacific lamprey, under consideration by the USFWS (69 FR 77158, December 27, 2004) for listing under the Endangered Species Act (but not listed), is known to occur sporadically in the study area and is considered to be rare. Arroyo chub are known both above and below Rindge Dam in Malibu Creek (Swift et al. 1993).

3.4.6 *Shoreline Habitat*

The shoreline area evaluated in this study includes the Los Angeles County Malibu Surfrider beach area east of the Malibu Pier. Much of this area is heavily disturbed by humans and there are homes adjacent to the beach. The beach is sandy and contains little vegetation.

To the east of Malibu Pier, the shoreline diminishes from a sandy beach to a rocky shoreline. Large boulders have been placed at the base of shoreline homes for protection. A cement wall separates Pacific Coast Highway and the Pacific Ocean. Intertidal boulders in front of homes east of the proposed placement area support patchy areas of surf grass (*Phyllospadix torreyi*).

California grunion (*Leuresthes tenuis*) may utilize the sandy beach area, but are considered unlikely due to the narrow nature of the beach, backed by rock rip rap protection for the adjacent parking lot. Delivery of beach compatible material will be limited to temporary storage areas in the parking lot adjacent to Malibu Pier.

The federal and state endangered and California fully protected California least tern (*Sternula antillarum browni)*, and federal threatened and California species of concern western snowy plover (*Charadrius alexandrius nivosus*) all utilize the sandy beach areas associated with the mouth of the

Malibu Lagoon, which is a half mile west of the Malibu Pier. Seven California least tern nests were documented at Surfrider Beach in 2013. Further details are included in section 3.4.7 below.

3.4.7 *Near Shore Habitat*

The nearby intertidal and subtidal habitats are primarily sand influenced with low relief rubble and cobble/gravel between the shoreline and a depth of -20 ft MLLW.

Marine invertebrates common to the sandy near shore inter- and shallow subtidal habitats include mole crabs, clams, and polychaete worms, which bury themselves in the sand between cobbles and feed on particles brought in by the waves. These species in turn are fed on by shorebirds during low tides and by fish during high tides. The mixture of sand and cobble, coupled with the strong wave energy and periods when low tides expose the area to desiccation, creates a harsh environment that limits the numbers of animal, plant, and algal species that occur in this area. Little neck clams (*Protothaca staminea*) could act as indicator species should any non-natural sand movement occur within the beach area.

Several hundred species of finfish occupy California's near shore environment. The fishes found in the warmer waters of southern California are seldom found north of Point Arguello. The most common fish found in the nearshore environment are the rockfishes. Another dominant fish of the soft-bottom habitats in southern California are the left-eyed flatfish (family *Bothidae*) (e.g., California halibut [*Paralichthys californicus*] and sanddab [*Citharichthys* sp.]); right-eyed flatfish (family *Pleuronectidae*) (e.g., turbot [*Hypsopsetta guttulata* and *Pleuronichthys* sp.]); and tonguefish (family *Cynoglossidae*) (e.g., California tonguefish [*Symphurus atricauda*]). Other common near shore sandybottom dwellers include the Pacific angel shark and skates and rays. Fish common in or near the surf zone include California corbina, surfperches, grunion, and croakers.

Marine mammals potentially occurring in the nearshore waters include the common dolphin (*Delphinus delphis*), Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), harbor seals (*Phoca vitulina*), California sea lions (*Zalophus californianus*), and California grey whales (*Eschrichtius robustus*). Although individual seals and sea lions may be sighted along the nearby shoreline, the beach is not expected to be used as a haul-out area for either of these species.

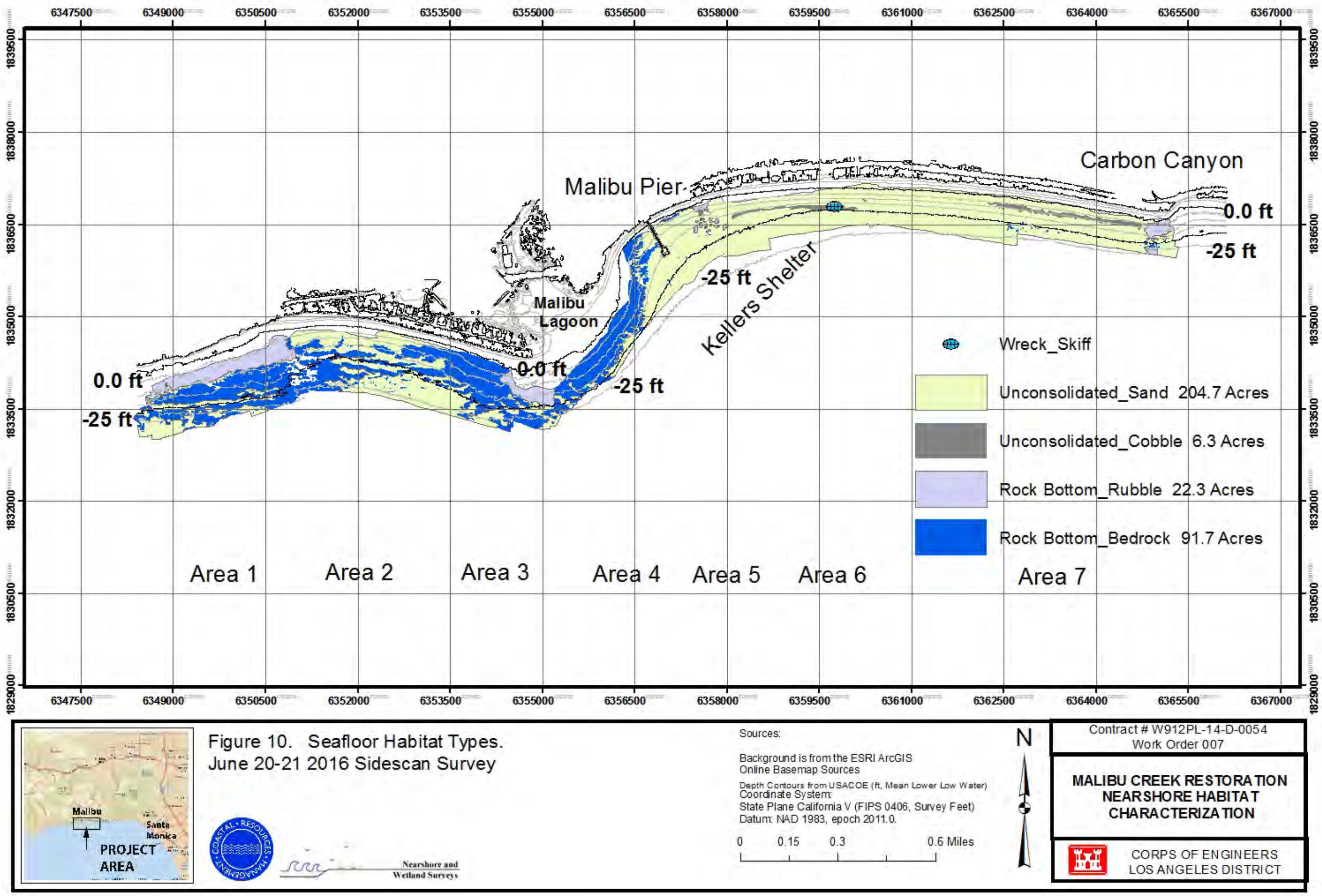


Figure 3.4-3 - Nearshore Seafloor Habitat Types (from USACE 2016)

3.4.8 *Threatened, Endangered, and Sensitive Species*

Plant and animal species are designated as sensitive because of their overall rarity, endangerment, unique habitat requirements, and/or restricted distribution as defined by the USFWS. In general, it is a combination of these factors that leads to a sensitivity designation. Sensitive species include those listed by the USFWS, CDFW, and the California Native Plant Society (CNPS) (Skinner and Pavlik 1994). The CNPS listing is sanctioned by the CDFW and essentially serves as its list of "candidate" species for Threatened or Endangered plant species.

Special-Status Plants

A total of 695 species of vascular plants from 108 families have been documented to date from the Santa Monica Mountains (McAuley 1996, National Park Service (NPS) 2008, CNDDB 2013). Most of the observed plants are common to the region and many in the study area are widely distributed. State or federally listed, candidate, or otherwise sensitive plant species encountered during surveys or previously documented are described below. Potentially, some of the historically documented rare species in the Malibu Canyon watershed could occur within the study area and are therefore included in the descriptions below. The NPS performed a focused rare plant survey as part of the vegetation surveys for the Malibu Creek area in 2003-2004. Rare plant surveys were performed by visiting previously known locations of rare plants obtained through literature and herbarium searches. Locations on public lands in the watershed were visited and assessed for presence or absence of species. Additionally, the entire canyon of the study area was surveyed on foot for any possible new locations of rare species known to exist in the canyon, as well as for any possible new additions to the rare plant list. Any uncommon plant species occurrences also were recorded. The sensitive plants found in the Malibu Canyon area are listed in **Table 3.4-2**. Species that have a medium–high potential to be present are shaded in **Table 3.4-2** and discussed in more detail.

Table 3.4-2 Known and Potentially Occurring State or Federal listed Threatened or Endangered Plant Species within the Study Area

Species	Status	Occurrence
Common Name (Scientific Name)	Federal; State; CNPS	Observed, Potential, No Potential
Braunton's Milk-vetch (Astragalus brauntonii)	FE, 1B	No potential. Known to occur in Santa Monica Mountain National Recreational Area, but not at the project site. Suitable habitat not present.
Coulter's goldfields (Lasthenia glabrata ssp. coulteri)	1B	Low potential. Historically observed in vicinity of Malibu Lagoon
Davidson's saltscale (*Atriplex serenana* var. *davidsonii*)	1B	Low potential. Historically observed in vicinity of Malibu Lagoon
Lyons's Pentachaeta (*Pentachaeta lyonii*)	FE, CE, 1B	Potential at Site F. Known to occur in the lower reaches of Malibu Creek well outside the project site where it will not be directly impacted. Suitable habitat not present.
Malibu Baccharis (Baccharis malibuensis)	1B	Low potential. Observed in upstream near MCSP headquarters.
Marcescent Dudleya (*Dudleya cymosa* ssp. *marcescens*)	FT, CR, 1B	Low potential. Known to occur in Santa Monica Mountain National Recreational Area upstream of site.
Santa Monica Dudleya (Dudleya cymosa ssp. ovatifolia)	FT, 1B	Low potential. Known to occur in Santa Monica Mountain National Recreational Area upstream of site.
Plummer's mariposa lily (*Calchortus plummerae*)	4.2	Moderate potential to occur on site outside active floodplain. Known in Stokes Canyon to north.
Round-leaved filaree (*California macrophylla*)	1B	Potential to occur on or associated with clay soils of cismontane wetlands and valley and foothill grasslands. Blooms March-May.
Sonoran maiden fern (Thelypteris puberula var. sonorensis)	2B	Low potential. A perennial rhizomatous herb associated with meadows, streams, and seeps.

Federal:
FE = Listed as Endangered under the federal Endangered Species Act (ESA).
FT = Listed as Threatened under the federal ESA.
FPE = Proposed for federal listing as Endangered under the federal ESA.
FPT = Proposed for federal listing as Threatened under the federal ESA.
FSC = Species of Concern.
– = No listing.
State:
CE = Listed as Endangered under the California ESA.
CT = Listed as Threatened under the California ESA.
CR = Listed as rare under the California Native Plant Protection Act. This category is no longer used for newly listed plants, but some plants previously listed as rare retain this designation.
CSC = Species of special concern in California.
– = No listing.
California Native Plant Society:
1B = List 1B species: rare, Threatened, or Endangered in California and elsewhere.
2 = List 2 species: rare, Threatened, or Endangered in California but more common elsewhere.
3 = List 3 species: plants about which more information is needed to determine their status.
4 = List 4 species: plants of limited distribution.
– = No listing.

Lyon's pentachaeta (Pentachaeta lyonii)

Lyon's pentachaeta is federally listed as endangered. This species is also listed as endangered by the State of California and is a CNPS List 1B species. This plant is found in open areas amongst chaparral, coastal sage scrub, and valley and foothill grasslands. This species is known from fewer than 30 extant occurrences in the Santa Monica Mountains and Simi Foothills (Service 2008). Lyon's pentachaeta is threatened by development, fire regimes, non-native vegetation, and recreational activities. This species may occur within Site F.

Malibu baccharis (Baccharis malibuensis)

Malibu baccharis is a CNPS List 1B species. This plant is found in chaparral, cismontane woodland, and coastal scrub. This species is known from four occurrences in the Santa Monica Mountains, Los Angeles County. Malibu baccharis are threatened by urbanization. This species has been observed upstream of the dam removal site, near the Malibu Creek State Park headquarters, but is expected to have a low potential to occur on the project site.

Marcescent dudleya (Dudleya cymosa ssp. marcescens)

Marcescent dudleya is a federally listed as threatened and is a CNPS List 1B species. This plant is found in chaparral on volcanic soils and is endemic to the Santa Monica Mountains (Service 2009c). The subspecies is known from eight occurrences. Marcescent dudleya is threatened by development and foot traffic. This species is known to occur in the Santa Monica Mountain National Recreational Area, but is considered to have low potential to occur at the project site.

Santa Monica dudleya (Dudleya cymosa ssp. ovatifolia)

Santa Monica dudleya is federally listed as threatened and is a CNPS List 1B species. On a broad scale, suitable habitat for this subspecies is generally located on sedimentary and conglomerate rock on canyon bottoms and shaded slopes in drainages along the south-facing slope of the Santa Monica Mountains. Adjacent plant communities include coastal scrub and chaparral (Service 2009b). This subspecies is known from fewer than four extant occurrences in Los Angeles, and Orange counties. Santa Monica dudleya are threatened by development and recreation. This species is known to occur in the Santa Monica Mountain National Recreational Area upstream of the site, but is considered to have low potential to occur at the project site.

Round-leaved filaree (California macrophylla)

Round-leaved filaree is a species of flowering plant in the geranium family, Geraniaceae, that is a CNPS List 1B species. It is native to the western United States and northern Mexico, where it grows in open habitat such as grassland and scrub. It is an annual herb that grows only a few centimeters high, forming a patch of slightly lobed, somewhat kidney-shaped to rounded leaves on long, slender petioles. It is native to the western United States and northern Mexico, where it grows in open habitat such as grassland and scrub. This species has the potential to occur on or associated with clay soils of cismontane wetlands and valley and foothill grasslands and may occur at the project site.

Sonoran maiden fern (Thelypteris puberula var. sonorensis)

Sonoran maiden fern is a perennial rhizomatous herb associated with meadows, streams, and seeps, and is a CNPS list 2B species. This species has low potential to occur at the project site.

Special-Status Wildlife

NPS (2002) identified 84 rare, sensitive, Threatened, or Endangered vertebrate animals that occur or potentially could occur in the entire Santa Monica Mountains. For the Malibu watershed, the Malibu Creek Watershed Plan identified about 40 such species in their 1995 report (NRCS 1995).

Species that have been observed or potentially exist within the study area based on a review of the California Natural Data Diversity Base (2013), discussions with CDPR staff, and cross referenced with CDPR (2005), NPS (2002), NRCS (1995) are shown in **Table 3.4-3**. Species that have a medium–high potential to be present are shaded in **Table 3.4-3**.

Table 3.4-3 Known and Potentially Occurring State or Federal Listed Threatened or Endangered Wildlife Species within the Study Area

Species	Status	Occurrence
Common Name (Scientific Name)	Federal; State	Observed, Potential, No Potential
FISH		
Arroyo chub (*Gila orcuttii*)	CSC	Observed in Malibu Creek potential to occur in upstream tributaries
Southern California steelhead (*Oncorhynchus mykiss*)-southern California DPS	FE, CSC	Observed in Malibu Creek downstream of Rindge Dam.
Tidewater goby (Eucyclogobius newberryi)	FE, CE	Observed in Malibu Lagoon
AMPHIBIANS		
Coast range newt (Taricha torosa torosa)	CSC	Observed in Santa Monica Mountains and Malibu Creek. Low potential.
REPTILES		
California horned lizard (*Phrynosoma blainvillii*)	CSC	Observed in Santa Monica Mountains and Malibu Creek. Potential to occur.
Coast patch-nosed snake (Salvadora hexalepis virgultea)	CSC	Observed in Santa Monica Mountains; potential to occur in project area
Coastal whiptail (Aspidoscelis tigris stejnegeri)	CSC	Observed in Santa Monica Mountains and Malibu Lake; potential to occur in project area
San Diego mountain kingsnake (Lampropeltis zonata parvirubra)	CSC	Known from Stunt Ranch and Cold Creek Canyon Preserve. Potential to occur in suitable habitats along Malibu Creek within the project area.
Silvery legless lizard (*Anniella pulchra pulchra*)	CSC	Known to occur within the study area, considered rare.

Species	Status	Occurrence
Common Name (Scientific Name)	Federal; State	Observed, Potential, No Potential
Two-striped garter snake (*Thamnophis hammondii*)	CSC	Observed in Malibu Lagoon, lower creek. Known to occur within the study area.
Western pond turtle (*Emys marmorata*)	CSC	Observed in Malibu Creek; potential to occur.
BIRDS		
American peregrine falcon (*Falco peregrinus anatum*)	CE	Low potential to occur, observed in MCSP.
Black swift (Cypseloides niger)	CSC	Nearest record at Mt. Wilson, no potential to occur in project area
California least tern (*Sterna antillarum browni*)	FE; CE; SFP	Potential to occur at offshore beach disposal site (does not nest in project area).
Cooper's hawk (Accipiter cooperii)	SFP, WL	Observed in Santa Monica Mountains; high potential to occur in project area
Golden eagle (Aquila chrysaetos)	CSC	Potential to occur. Observed in Malibu Canyon.
Least Bell's vireo (*Vireo bellii pusillus*)	FE, CE	Unconfirmed sighting in the reach just above the PCH Bridge and in Malibu State Park. Suitable nesting habitat occurs in the PCH portion of the project area.
Least bittern (Ixobrychus exilis)	CSC	No potential to occur in project site. No suitable habitat within project area.
Loggerhead shrike (*Lanius ludovicianus*)	SC; CSC	Sightings in Malibu State Park, not likely at project area.
Merlin (Falco columbarius)	CSC	Nearest record Cal Poly Pomona, seen fall/winter at Malibu Lagoon, no potential to occur in project area.
Northern harrier (*Circus cyaneus*)	CSC	Scattered records in Los Angeles County including Malibu. No potential to occur in project area.
Osprey (Pandion haliaetus)	CSC	Present at Malibu Lagoon, no potential to occur in project area.
Prairie falcon (*Falco mexicanus*)	CSC	Nearest record Angeles National Forest, no potential to occur in project area.
Rufous-crowned sparrow (Aimophila ruficeps canescens)	CSC	Nearest record Chatsworth, no potential to occur in project area.
Sharp-shinned hawk (*Accipiter striatus*)	CSC	Fall/winter visitor, no potential to occur in project area during construction window.

Species	Status	Occurrence
Common Name (Scientific Name)	Federal; State	Observed, Potential, No Potential
Southwestern willow flycatcher (*Empidonax traillii*)	FE, CE	Suitable habitat present. Sightings as migrant in Malibu Canyon. Low potential to occur at project site.
Summer tanager (*Piranga rubra*)	CSC	No record in Los Angeles County. Nearest record Victorville, no potential to occur in project area.
Tricolored blackbird (*Agelaius tricolor*)	CSC	Nearest record Northridge, no potential to occur in project area.
Vaux's swift (*Chaetura vauxi*)	CSC	No record in CNDDB. No potential to occur in project area.
Western snowy plover (Charadrius nivosus nivosus)	FT	Wintering populations present at beach fronting Malibu Lagoon, no potential to occur in project area, beach too narrow to provide suitable habitat.
Western yellow-billed cuckoo (*Coccyzus americanus occidentalis*)	FC, CE	No potential; not documented in study area, suitable habitat present.
White-tailed kite (*Elanus leucurus*)	SFP	Sightings in Malibu State Park, not likely at project area.
Yellow-breasted chat (*Icteria virens*)	CSC	Nearest record Santa Fe Dam Recreational Area, no potential to occur in project area.
Yellow warbler (Dendroica petechial brewsteri)	CSC	No recent record in project area, no potential to occur in project area.
MAMMALS		
American badger (*Taxidea taxus*)	CSC	Observed in Santa Monica Mountains; no potential to occur in project area.
California leaf-nosed bat (*Macrotus californicus)*	CSC	Potential to occur in suitable crevice sites along Malibu Creek and other areas within the project area. Potential to forage over the project area.
Pallid bat (Antrozous pallidus)	CSC	Nearest record Sherman Oaks, no potential to occur in project area.
Ringtail (Bassariscus astutus)	SFP	No record in CNDDB. Roadkill found along Los Virgenes Road in 2012. Low potential to occur in project area.
Spotted bat (Euderma maculatum)	CSC	Potential; to occur in suitable crevice sites, particularly along Malibu Creek.
Townsend’s western big-eared bat (*Corynorhinus townsendii)*	CSC	Low potential to occur in any isolated caves within the project area.

Species	Status	Occurrence
Common Name (Scientific Name)	Federal; State	Observed, Potential, No Potential
Western mastiff bat (Eumops perotis californicus)	CSC	Observed in Malibu Creek State Park, potential to occur in project area.
San Diego woodrat (Neotoma lepida intermedia)	CSC	Low potential, no suitable habitat present. Documented west of project site on Pepperdine University campus.
Southern California saltmarsh shrew (*Sorex Ornatus salicornicus*)	CSC	Low potential to occur, observed in Malibu Lagoon.
South coast marsh vole (Microtus californicus stephensi)	CSC	No potential to occur at project site, observed in Malibu Lagoon during restoration.
Yuma myotis (Myotis yumanensis)	CSC	Potential to occur in project area. Observed in MCSP.

Federal: same as Table 3.4-3.
State: same as Table 3.4-3 with the following additions:
SFP=California State Fully Protected Species
WL = California Watch List
CSC = California Species of Concern

Fish

Arroyo Chub (Gila orcutti)

The arroyo chub is a California species of special concern. This species was native to the Los Angeles, San Gabriel, San Luis Rey, Santa Ana, and Santa Margarita Rivers and Malibu and San Juan Creeks. It has been successfully introduced far outside its native range, often with trout plants, into the Santa Clara, Ventura, Santa Ynez, Santa Maria, Cuyama and Mojave River drainages and Malibu, Arroyo Grande and Chorro Creeks. Introduced populations of this species are abundant in the above noted rivers. The species is now absent from much of its native range and is abundant only in the west fork of the San Gabriel River. The arroyo chub appears to prefer low gradient streams, concentrating in pools and backwaters. This species is known to occur in Malibu Creek (NPS 2008, CNDDB 2013).

Southern California steelhead – Southern California DPS (Oncorhynchus mykiss)

The southern California steelhead was originally federally listed as an endangered evolutionary significant unit (ESU) on August 18, 1997, and re-listed as an endangered distinct population segment (DPS) on January 5, 2006, for naturally spawned populations of steelhead and their progeny residing below long-term impassible barriers. Critical habitat was designated for the southern California steelhead on September 2, 2005. Steelhead, an ocean-going form of rainbow trout, is native to Pacific Coast streams from Alaska south to northwestern Mexico. Wild steelhead populations in California have decreased significantly from their historical levels. Extensive habitat loss due to water development, land use practices, and urbanization are largely responsible for the current population status.

Malibu Creek has been identified as a "high value" recovery planning area in the Recovery Plan for California Steelhead (NMFS 2012). A critical recovery task identified in the recovery plan is the removal of Rindge and Malibu dams, and physically modify road crossings, to allow steelhead natural routes of migration to upstream spawning and rearing habitats, and passage of smolts and kelts downstream to the estuary and ocean (NMFS 2012).

Prior to the completion of Rindge Dam in 1926, 14-pound steelhead were reportedly caught as they migrated upstream to the lower reaches of Las Virgenes Creek and Cold Creek to spawn. Observations of small numbers of adult steelhead in Malibu Creek below Rindge Dam have continued to the present, including documented steelhead sightings in 1947, 1952, 1968, 1979, 1986, 1987, 1992, and 2006 through 2014. Recent surveys have documented steelhead rearing habitat, as well as use of this habitat by juvenile fish, below Rindge Dam. A population of less than 101 adults is the most recent estimate of the Malibu Creek steelhead population (Dagit and Krug 2011).

Currently, the 3-mile stretch of Malibu Creek below Rindge Dam is listed as critical habitat for steelhead (70 FR 52488, September 2, 2005). Above Rindge Dam it is estimated that 5.5 stream miles of good to excellent steelhead habitat are currently inaccessible as a result of the impassible barrier created by the dam. The National Marine Fisheries Service has identified removal of Rindge Dam as a critical recovery action in its Southern California Steelhead Recovery Plan (NMFS 2012) and that the inaccessible reaches of Malibu Creek above Rindge Dam be identified as critical habitat. Although the area above the dam is not currently designated critical habitat, NMFS concluded that historically this currently inaccessible habitat provided the principal spawning and rearing habitat for steelhead within the Malibu Creek watershed (NMFS 2004). Historical records show that runs within Malibu Creek have been estimated as high as 1,000 steelhead (Nehlsen et al. 1991). The current population is estimated in the dozens (Franklin and Dobush 1989)

Tidewater Goby (Eucyclogobius newberryi)

Tidewater gobies were federally listed as endangered on March 7, 1994. The Service designated revised critical habitat for tidewater gobies on February 6, 2013. Malibu Lagoon was designated as critical habitat, site LA-3. The tidewater goby, a member of the Gobiidae family, is the only species in the genus *Eucyclogobius*. It is a small fish, rarely exceeding 2 inches standard length, and is characterized by large pectoral fins and a ventral sucker-like disk formed by the complete fusion of the pelvic fins. Tidewater goby are known to occur in the Malibu Lagoon and the lagoon is considered a source population.

The tidewater goby historically occurred in at least 134 California coastal lagoons. This species is currently presumed to occur in about 112 locations throughout its range. The tidewater goby was extirpated in the 1960's and reintroduced into Malibu lagoon in 1991 by the Topanga-Las Virgenes Resource Conservation District (NRCS 1995, USFWS 2004). Its decline can be attributed to upstream water diversions, pollution, siltation, climate change, and urban development on surrounding lands. These threats continue to affect the remaining populations of tidewater gobies. In addition, given the lack of a marine life history stage and the high level of fragmentation between existing populations, the probability for exchange between the populations and natural colonization of suitable habitat is low.

Amphibians

Coast Range Newt (Taricha torosa torosa)

The California newt is a California species of special concern. This subspecies is a stocky, medium-sized salamander with rough, grainy skin in the terrestrial phase, and no costal grooves. Terrestrial adults are yellowish-brown to dark brown above, pale yellow to orange below. The eyelids and the area below the eyes are lighter than the rest of the head. Aquatic larvae are light yellow above with two dark regular narrow bands on the back. This subspecies is endemic to California and found along the coast and coast range mountains from Mendocino County south to San Diego County in wet forests, oak forests, chaparral, and rolling grasslands. In southern California, it can be found in drier chaparral, oak woodland, and grasslands. California newts are known to occur in Malibu Creek and Cold Creek (DeLisle et al. 1986). This subspecies is threatened by introduction of non-native species and habitat loss. Low potential to occur in study area.

Reptiles

California Horned Lizard (Phrynosoma blainvilli)

The California horned lizard is a California species of special concern. This native coastal subspecies is found in a variety of arid and mesic habitats such as coastal sand dunes, open scrub, and riparian habitats with friable soils. The species ranges from Shasta County southward along the edges of the Sacramento Valley into much of the South Coast Ranges, San Joaquin Valley, and Sierra Nevada foothills to northern Los Angeles, Santa Barbara and Ventura Counties (Jennings and Hayes 1994). The specialized diet and habitat requirements, site fidelity, and cryptic defense behavior make this species highly vulnerable. Commercial collecting, and habitat loss due to agriculture and urbanization are the main reasons cited for the decline of this taxa. Most surviving populations inhabit upland sites with limited optimal habitat. Many of these sites are on marginally suitable Forest Service land (Jennings and Hayes 1994). However, the most insidious threat to California horned lizard is the continued elimination of its food base by exotic ants. Argentine ants (*Linepithema humile*) colonize around disturbed soils associated with building foundations, roads and landfills, and expand into adjacent areas, eliminating native ant colonies (Ward 1987). Under these conditions California horned lizard populations have become increasingly fragmented, and have undergone the added stress of a number of other factors, including fire, grazing, off-road vehicles, domestic cats, and development (Jennings and Hayes, 1994). This taxon is unable to survive habitats altered by development, agriculture, off-road vehicle use, or flood control structures (Goldberg 1983). This species is known to occur within the study area (DeLisle et al. 1986, CNDDB 2013).

Coast Patch-nosed Snake (Salvadora hexalepis vigultea)

Inhabits semi-arid brushy areas and chaparral in canyons, rocky hillsides, and plains and occurs at elevations from below sea level to around 7,000 ft. occurs in California from the northern Carrizo Plains in San Luis Obispo County, south through the coastal zone, south and west of the deserts, into coastal northern Baja California. Active during daylight, even in times of extreme heat. Terrestrial, but may climb shrubs in pursuit of prey. Burrows into loose soil. Able to move very quickly. Their acute vision allows them to escape quickly when they feel threatened, making this snake sometimes difficult to capture during the heat of the day. When cornered, they will inflate the body and strike. Eats mostly lizards, along with small mammals, and possibly small snakes, nestling birds, and amphibians. There are no records from the study area, however the study area is within the known range of this species. Low potential to occur in study area.

Coastal Whiptail (Aspidoscelis tigris stejnegeri)

The coastal whiptail is a California species of special concern. This subspecies is an active lizard of deserts and semiarid habitats, usually where plants are sparse. It prefers open areas where it can run to escape predators. Whiptails range from deserts to warmer, drier areas within montane pine forests. They are also found in woodland and streamside growth, and avoid dense grassland and thick growth of shrubs. Whiptails are usually found where the ground has firm soil and is rocky. The whiptail's diet consists of invertebrates including insect larvae, termites, grasshoppers, beetles, spiders, and scorpions, as well as other lizards (Stebbins 2003). The coastal whiptail is uncommon over much of its range in California, but it is abundant in the desert regions where suitable habitat is available (Zeiner *et al.* 1988). This subspecies is known to occur within the study area (DeLisle et al. 1986, CNDDB 2013). Low potential to occur in study area.

San Diego Mountain Kingsnake (Lampropeltis zonata parvirubra)

The San Diego Mountain Kingsnake is a colorful species with black, white and red crossbands that completely encircle the body and tail. It has smooth, glistening scales. The snout and eyes are generally black. Southern populations often have red spotting on top of head. Known from Stunt Ranch and Cold Creek Canyon Preserve. Potential to occur in suitable habitats along Malibu Creek within the project area.

Silvery Legless Lizard (Anniella pulchra pulchra)

The silvery legless lizard is a California species of special concern. This highly specialized fossorial lizard occurs in a variety of habitats but is quite specific in its microhabitat requirements. It burrows beneath the leaf litter of shrubs or trees in loose, sandy soils and is generally absent from soils possessing a significant clay or silt component or that contain any degree of saturation, overlay a high water table or are subject to frequent disturbance (such as flooding). This subspecies is known to occur within the study area (DeLisle et al. 1986). The Service considers this subspecies to be rare in the study area. Extensive surveys for this species occurred as part of the Malibu Lagoon restoration project, but none were found. Anecdotal information suggests they have been found at the Adamson House area adjacent to the Malibu Lagoon. Low potential to occur in study area.

Western Pond Turtle (Emys marmorata)

The western pond turtle is considered a California species of special concern and protected species by the California Department of Fish and Wildlife (CDFW). The western pond turtle is found from sea level to approximately 6,600 feet, with the majority of populations below 4,300 feet in both permanent and intermittent aquatic habitats. Its distribution is fragmented by human activities, such as habitat alteration, grazing practices, recreational fishing, and introduction of exotic predators and competitors (Jennings and Hayes 1994). The species is thought to be in a general state of decline in an estimated 75 to 80 percent of its range. Threats to western pond turtles include climate change, introduction of non-native species, and habitat loss due to development. Western pond turtles formerly occurred along all major river systems within their present range. They are usually found near the banks or quiet backwaters of streams where the current is relatively slow and basking sites and refugia are available. However, they appear to be uncommon in heavily shaded areas, being concentrated where openings in the streamside canopy allow sufficient sunlight to facilitate basking. They have also been noted in small ponds and vernal pools in California. Western pond turtles may move distances up to several hundred yards from drying pools to adjacent creeks (Service 1993).

Dagit and Albers (2009) determined that within the Santa Monica Mountains, it appears that western pond turtles are restricted to remnant populations with limited recruitment at most locations. The populations are isolated from one another and the potential for successful migration from one location to another is extremely limited. In 2009, western pond turtles were found in eight sites, but only two locations have more than 35 individuals. Fewer than five individuals were captured in five locations and 16 individuals were found at one site. This pattern of disjunctive populations spread over a wide area, resulting in significant population decline, appears to be the current pattern in southern California (Bury and Germano 2008). Dagit and Albers' (2009) study area covered approximately 279 mi^2 of the Santa Monica Mountains and extended from Topanga Canyon on the east, to Wildwood Regional Park on the west. A variety of sites within the Malibu Creek watershed were also surveyed. Western pond turtles were observed in eight locations, including Malibu below the Rindge Dam, in 2009. DeLisle, et al. (1986) documented 13 locations with western pond turtles in the Santa Monica Mountains. Western pond turtles are also documented to occur with the study area in Las Virgenes Creek (CNDDB 2013).

Two-striped Garter Snake (Thamnophis hammondii)

The two-striped garter snake is a California species of special concern. This aquatic snake occurs in semi-permanent and permanent freshwater streams and ponds with bordering riparian woodland in central and southern California. It also frequents stock ponds and other human-made water sources. It can range well into xeric habitats such as chaparral adjacent to a watercourse. Habitat alteration, flood control activities and the prolonged drought of 1986-1991 have reduced populations throughout its range. Additionally, the introduction of non-native predators such as the largemouth bass and bullfrogs, may have reduced or eliminated populations from many areas. This species is known to occur within the study area (DeLisle et al. 1986). Two were seen in the Malibu Lagoon and one seen in Cold Creek by CDPR staff in 2012-13.

Birds

Peregrine Falcon (Falco peregrinus anatum)

Peregrine falcon is a California endangered species and a formerly federally listed endangered species that was delisted by the US Fish and Wildlife Service effective August 25, 1999.

These falcons are formidable hunters that prey on other birds (and bats) in mid-flight. Peregrines hunt from above and, after sighting their prey, drop into a steep, swift dive that can top 200 mi an hour (320 kilometers an hour). They prefer wide-open spaces, and thrive near coasts where shorebirds are common, but they can be found everywhere from tundra to deserts. Peregrines are even known to live on bridges and skyscrapers in major cities. These birds may travel widely outside the nesting season—their name means "wanderer." Though some individuals are permanent residents, many migrate. Some nesting sites have been in continuous use for hundreds of years, occupied by successive generations of falcons.

California Least Tern (Sterna antillarum browni)

The California least tern is listed as Federally endangered and California endangered. The California least tern is one of three subspecies of least tern, although recent genetic studies found little variation among the subspecies (Whittier et al. 2006). The California least tern (hereafter CLT) nests along the west coast of North America, from Baja California, Mexico, north to the San Francisco Bay area (USFWS 1985). CLT establish nesting colonies on sandy soils with little vegetation on beaches, salt flats, estuarine islands, and man-made areas of dredge material (Keane et al. 2010).

The CLT was listed as endangered by the U.S. Secretary of the Interior in 1970 (USFWS 1973) and the California Fish and Game Commission in 1971 (CDFG 1976) due to a population decline resulting from loss of habitat (Craig 1971, Cogswell 1977). The CLT Recovery Plan, which has not been updated since 1985, included an appendix listing major feeding areas used from 1969 and 1977 and concluded that CLT "foraging, roosting, and wintering habitat must be preserved and properly managed" (USFWS 1985). However, aside from foraging studies at localized areas and summarized in this report, the relative importance of various foraging areas and habitats near CLT nesting sites has not been evaluated (KBC 2003a, KBC 2003b), nor has official protection been designated to any CLT foraging areas (USFWS 1985).

The CLT has been reported to forage in shallow waters of bays, lagoons, estuaries, tidal marshes, river mouths, ponds and lakes (Thomson et al. 1997). However, a significant amount of foraging also occurs offshore in deep-water habitats (KBC 2003a). CLT forage throughout the day by flying over the water and diving/plunging for fish (Thompson et al. 1997).

CLTs feed in both saltwater and freshwater habitats on small (10 cm or less) prey fish, including northern anchovy (*Engraulis mordax*), topsmelt (*Atherinops affinis*), jacksmelt (*A. californiensis*), shiner perch (*Cymatogaster aggregata*), rough silversides (*Membras martinica*), flat croaker (*Leiostomus xanthurus*), deep-body anchovy (*Anchoa compressa*) or slough anchovy (*A. delicatissima*), among other species (Atwood and Kelly 1984). CLT are also known to eat freshwater species including killifish (*Fundulus parvipinnis*) and mosquito fish (*Gambusia affinis*) (Atwood and Kelly 1984). At least 49 species of potential forage fish have been identified from fish dropped at 13 CLT nesting sites (Atwood and Kelly 1984).

Atwood and Minsky (1983) conducted the first systematic CLT foraging studies near three CLT nesting sites. Their study concluded that 75% of CLT foraged within 1.2 km (0.75 mile) of nesting sites, but foraging also occurred up to 3 km (1.86 mi) distant, although anecdotal observations have been documented of CLT several miles from shore during the nesting season.

The California least tern is known to forage within the coastal area of the project vicinity and study area. In 2013, seven nests were established, but ultimately failed, within the Malibu Lagoon State Beach berm. Potentially present in project area, but likely limited to foraging in Malibu Lagoon or open ocean.

Coopers Hawk (Accipiter cooperii)

A medium-sized hawk of the woodlands. Feeding mostly on birds and small mammals, it hunts by stealth, approaching its prey through dense cover and then pouncing with a rapid, powerful flight. Observed in Santa Monica Mountains; high potential to occur in project area.

Golden Eagle (Aquila chrysaetos)

Golden eagles prey on rabbits, marmots, and ground squirrels. They also eat carrion, reptiles, birds, fish, and smaller fare such as large insects. They have even been known to attack full grown deer. Ranchers once killed many of these birds for fear that they would prey on their livestock, but studies showed that the animal's impact was minimal.

Golden eagle pairs maintain territories that may be as large as 60 mi^2 (155 square kilometers). They are monogamous and may remain with their mate for several years or possibly for life. Golden eagles nest in high places including cliffs, trees, or human structures such as telephone poles. They build huge nests to which they may return for several breeding years. Females lay from one to four eggs, and both parents incubate them for 40 to 45 days. Typically, one or two young survive to fledge in about three months.

Golden eagles are protected by the Bald and Golden Eagle Protection Act and are not a listed species under the Endangered Species Act. The Act prohibits the “take” of golden eagles, which includes intentional disturbance. Golden eagles may use portions of the Malibu Creek State Park for nesting and foraging, specifically in the Century Dam area.

Least Bell’s Vireo (Vireo bellii pusillus)

A range wide decline of this species resulted in a federal listing of endangered on May 2, 1986 (51 FR 16474). Critical habitat for the species was designated on February 2, 1998 (59 FR 4845; USFWS 1998). No critical habitat occurs in the study area. The decline was attributed to extensive habitat loss and degradation and brood parasitism by brown-headed cowbirds (*Molothrus ater*).

The least Bell's vireo is a neotropical migrant that breeds in low-elevation riparian habitats below about 2,000 feet in willows and other low, dense valley foothill riparian habitat and lower portions of canyons (Zeiner et al. 1990). Its breeding range is restricted to Southern California and Northern Baja California, Mexico (USFWS 1998). They migrate and arrive from Mexican wintering areas by the end of March and leave by the end of August (Zeiner et al. 1990). They are usually found near water, but also inhabit thickets along dry, intermittent streams (Garrett and Dunn 1981). They are typically associated with willow, cottonwood, baccharis, wild blackberry, or mesquite in desert localities (Zeiner et al 1990). This species typically inhabits structurally diverse woodlands along watercourses (USFWS 1998) where willow cover is 50% or more. Least Bell's vireo are diurnal and active yearlong. They glean insects from foliage and branches and eat some fruits. An open-cup nest is often placed on slender branch of willow, other shrub, mesquite, or other small tree made of pieces of bark, fine grasses, plant down, horsehair (Zeiner et al. 1990). Least Bell's vireo are monogamous. They lay 3-5 eggs in May to early June, incubate 14 days by both sexes, and fledge 11-12 days after hatching (Zeiner et al. 1990). Both sexes care for altricial young. Least Bell's vireo have declined drastically or vanished entirely throughout California's range in recent decades, apparently from cowbird parasitism and habitat destruction and degradation (Garrett and Dunn 1981; Zeiner et al. 1990).

An individual was observed in 2013 near the Malibu Lagoon by a local biologist, but confirmation of presence by USFWS has not occurred to date.

Peregrine Falcon (Falco peregrinus anatum)

Peregrine falcon is a California endangered species and a formerly federally listed endangered species that was delisted by the US Fish and Wildlife Service effective August 25, 1999.

These falcons are formidable hunters that prey on other birds (and bats) in mid-flight. Peregrines hunt from above and, after sighting their prey, drop into a steep, swift dive that can top 200 miles an hour (320 kilometers an hour). They prefer wide-open spaces, and thrive near coasts where shorebirds are common, but they can be found everywhere from tundra to deserts. Peregrines are even known to live on bridges and skyscrapers in major cities. These birds may travel widely outside the nesting season—their name means "wanderer." Though some individuals are permanent residents, many migrate. Some nesting sites have been in continuous use for hundreds of years, occupied by successive generations of falcons.

Mammals

American Badger (Taxidea taxus)

The American Badger is a California species of special concern. Observed in Santa Monica Mountains; no potential to occur in project area.

California Leaf-nosed Bat (Macrotus californicus)

Habitats occupied include desert riparian, desert wash, desert scrub, desert succulent shrub, alkali desert scrub, and palm oasis. Feeds on a variety of flying and flightless insects, including orthopterans, sphingid and noctuid moths, beetles, and cicadas. Elsewhere in its range, it is partly frugivorous. Forages close to the ground (often less than 1 m). Nocturnal; this species emerges late, usually 1-2 hr after sunset in summer, and at sunset in winter. This species may forage over the study area.

Spotted Bat (Euderma maculatum)

Habitats occupied include arid deserts, grasslands and mixed conifer forests. Moths are the principal food. There is some evidence of beetle consumption. Feeds in flight, over water, and near the ground, using echolocation to find prey. Prefers to roost in rock crevices. Occasionally found in caves and buildings. Cliffs provide optimal roosting habitat. This species may forage over the study area and may roost in cliffs adjacent to the project site.

Yuma Myotis (Myotis yumanensis)

The Yuma myotis is a California species of special concern. This bat is common in California and found throughout the state except in the Mojave and Colorado deserts of southeastern California. This species occupies a variety of habitats. It is found in open forests and woodlands, usually feeding over water. The Yuma myotis emerges soon after sunset and feeds on a variety of flying insects low to the ground. This species roosts in buildings, mines, caves, or crevices (Zeiner et al. 1990b). Yuma myotis forms large maternity colonies of several thousand in buildings, caves and bridge structures. This species mates in the fall and bears one young between late May to mid-June. The Yuma myotis has been found roosting with other bats including pallid and Mexican free-tailed bats. Reasons of decline for this species include loss of suitable roosting sites habitat, including destruction and disturbance, and pesticides. Widespread use of insecticides may have also reduced insect abundance and potentially poisoned some bats. This species probably forages over the study area and there may be roosting habitat present.

Western Mastiff Bat (Eumops perotis californicus)

The western mastiff bat is a California species of special concern. This large bat is an uncommon inhabitant of scrub and open woodlands from San Francisco Bay south through Baja California and mainland Mexico (Zeiner et al. 1990b). Incidental information suggests that this species has undergone significant declines in recent years (Williams 1986). Reasons for the species decline are only conjecture. Extensive loss of habitat because of urbanization of coastal basins, marsh drainage, and cultivation of major foraging areas are likely factors. Widespread use of insecticides may have also reduced insect abundance and potentially poisoned some bats (Williams 1986). This subspecies probably forages over the study area and there may be roosting habitat present.

Essential Fish Habitat

The 1996 amendments to the Magnuson-Stevens Fishery Management and Conservation Act set forth a number of new mandates for NMFS, regional fishery management councils, and other federal agencies to identify and protect important marine and anadromous fish habitat. The Councils, with assistance from NMFS, are required to delineate "essential fish habitat" (EFH) for all managed species. The Act defines EFH as " . . . those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with NMFS regarding the potential effects of their actions on EFH, and respond in writing to the NMFS' recommendations. For the Pacific region, EFH has been identified for a total of 89 species covered by three Fishery Management Plans (FMPs) under the auspices of the Pacific Fishery Management Council (NMFS 1998). Several of these "managed" species are known to occur in the study area off shore of the beach placement area (e.g., Northern anchovy, leopard shark, big skate, Dover sole, rockfish, and others). In addition, many other native marine fish in the study area undoubtedly serve as prey for many of the "managed" species. Also, the study area is located within an area designated as EFH for the Coastal Pelagics and Pacific Groundfish Management Plans.

Movement Corridors

Wildlife and aquatic corridors are synonymous, except that fully aquatic species require a continuous body of water (i.e., stream or lake) in which to travel. Wildlife and aquatic corridors link together areas of suitable wildlife habitat that are otherwise separated by rugged terrain, changes in vegetation, or human disturbance. The fragmentation induced by urbanization creates isolated "islands" of wildlife habitat. In the absence of habitat linkages that allow movement to adjoining open space areas, various studies have concluded that some wildlife species, especially the larger and more mobile mammals, will not likely persist over time in fragmented or isolated habitat areas because they prohibit the infusion of new individuals and genetic information (Bennett 1990; Harris and Gallagher 1989; MacArthur and Wilson 1967; Soule 1987). Corridors mitigate the effects of this fragmentation by (1) allowing animals to move between remaining habitats, which allows depleted populations to be replenished and promotes genetic exchange; (2) providing escape routes from fire, predators, and human disturbances, thus reducing the risk that catastrophic events (such as fire or disease) will result in population or local species extinction; and (3) serving as travel routes for individual animals as they move within their home ranges in search of food, water, mates, and other needs (Farhig and Merriam 1985; Harris and Gallagher 1989; Noss 1983; Simberloff and Cox 1987).

Wildlife movement activities usually fall into one of three categories: (1) dispersal (e.g., juvenile animals from natal areas, individuals extending range distributions); (2) seasonal migration; and (3) movements related to home range activities (foraging for food or water, defending territories, searching for mates, breeding areas, or cover). A number of terms have been used in various wildlife movement studies, such as "travel route," "wildlife corridor," "habitat linkage," and "wildlife crossing," to refer to areas in which wildlife move from one area to another.

Corridors function to prevent habitat fragmentation that would result in the loss of area-sensitive species that require large contiguous expanses of unbroken habitat and the loss of large animals that have extensive home ranges and that normally occur in low densities, such as mountain lions. Habitat fragmentation may cause increases in the number of highly adaptable non-native species and favors those that are normally common, and may cause inbreeding to occur in species whose populations are small because they have become confined to smaller areas. This results in lowering the rate of reproductive success. Corridors promote gene flow, allow recolonization after disturbance (such as fire or flooding), prevent the loss of large animals by linking suitable habitat areas and help ensure the survival of native species that cannot compete with more aggressive non-native species in fragmented habitats (Harris and Gallagher 1989). Fragmentation can be equally as damaging as habitat destruction because it reduces functioning ecosystems to scattered pockets of habitat stripped of their essential interactive processes. These pockets tend to decrease substantially in biodiversity over time because small, isolated populations often become locally extinct in the absence of recruits from other areas.

Since Malibu Creek is a major drainage that connects coastal regions of Los Angeles County with interior regions of Los Angeles and Ventura counties, it is an important regional corridor linking riparian ecosystems from the immediate coastal plain with the interior plains and valleys of the region. In Malibu Creek within the study area, wildlife species can move relatively unimpeded downstream or upstream of Rindge Dam, but not over the dam. East west migration is inhibited by a heavily used scenic byway of Malibu Canyon Road and precipitous slopes. In addition, Malibu Canyon Road serves as a partial barrier to wildlife movement because of the amount of noise, motion, light, and startle impacts associated with traffic on this highway.

Habitat Evaluation (HE)

USACE guidance for ecosystem restoration (Engineer Regulation (ER) 1105-2-210, Appendix E, Section V) provides information on the purpose and importance of quantifying environmental outputs of ecosystem restoration projects to assure that civil work investments have the intended beneficial effects. To perform this type of analysis, it is necessary that the environmental outputs be based on some quantifiable unit (e.g., Habitat Units, Functional Capacity Units, etc.) that reflects both the baseline conditions in an area and the projected effects of project alternatives.

The USACE organized a Technical Advisory Committee (TAC), consisting of members from various federal, state, local institutions, and private organizations with expertise in the principles of wildlife biology, fisheries, and restoration of riverine and estuarine systems as well as knowledge of the Malibu Creek ecosystem. The TAC met periodically beginning in 2004 to review evaluation methods, decide upon an appropriate methodology to use for this study, and to lead the development of that methodology. The TAC agreed to develop a Habitat Evaluation (HE) for the baseline conditions and project alternatives to quantitatively assess the quality of existing habitat in several reaches of Malibu Creek, including Malibu Lagoon. The HE includes analysis of Malibu

Creek from Century Dam to the Malibu Lagoon and portions of the Cold Creek, Liberty Canyon Creek and Las Virgenes Creek tributaries.

In general, the TAC reached a consensus on the most important environmental issues related to the feasibility study. The habitat evaluation greatly benefited from this consensus building approach, and the varied expertise of the members of the Malibu Creek TAC was fully utilized in this analysis. The HE analysis is provided as **Appendix J** and is discussed in Section 5.4.

3.5 Cultural Resources

For the purpose of identification of existing cultural resources for this project, the study area includes Malibu Creek and the creek bed from just above the Rindge Dam to the Malibu Lagoon, the areas to be used for staging of construction activities, removal of upstream barriers, and disposal areas for material from behind the Dam.

Local prehistory and history are briefly summarized here in order to provide a context for further discussion of the known archaeological and historical remains within the project area.

3.5.1 *Regulatory Setting*

According to the implementing regulations of Section 106 of the NHPA (36 CFR 800), historic significance of a cultural resource is established by applying the National Register criteria to determine if the resource is eligible for the NRHP as a "historic property." If historic properties are found to exist within the APE, then the criteria of adverse effects are applied to determine the project's potential to alter those characteristics of a historic property which qualify it for inclusion in the NRHP in a manner which would diminish its integrity. Adverse effects may include direct, indirect or cumulative effects. Examples of adverse effects under 36 CFR 800.5 include:

- Physical destruction of or damage to all or part of the property;
- Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standard for the
- Treatment of Historic Properties (36 CFR 68) and applicable guidelines;
- Removal of the property from its historic location;
- Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;
- Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- Transfer, lease, or sale of property out of Federal ownership of control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.

Mitigation under Section 106 of the NHPA is defined as a measure to resolve specific adverse effects to historic properties. Resolution of adverse effects is referenced in the NEPA review and documented in a Memorandum of Agreement (MOA) developed in consultation with the Section 106 consulting parties, which may include the lead agencies, tribes, SHPO and other interested parties.

Cultural resources that are listed in or eligible for the CRHR, and therefore defined as "historical resources," are recognized as part of the environment and must be given consideration under CEQA. A project with an effect that may cause a substantial adverse change in the significance of an historical resource is a project that may have a significant impact on the environment. Effects may be direct or indirect, but must be related to a change in the physical conditions of an affected resource. Substantial adverse change is defined in the CEQA guidelines (14 CCR 15064.5) as "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired." Material impairment of an historical resource is that which:

- Demolishes or materially alters in an adverse manner those physical characteristics of an historical resource that convey its historical significance and that justify its inclusion in, or eligibility for inclusion in, the California Register of Historical Resources, or
- Demolishes or materially alters in an adverse manner those physical characteristics that account for its inclusion in a local register of historical resources pursuant to section 5020.1(k) of the Public Resources Code or its identification in an historical resources survey meeting the requirements of section 5024.1(g) of the Public Resources Code, unless the public agency reviewing the effects of the project establishes by a preponderance of evidence that the resource is not historically or culturally significant; or
- Demolishes or materially alters in an adverse manner those physical characteristics of a historical resource that convey its historical significance and that justify its eligibility for inclusion in the California Register of Historical Resources as determined by a lead agency for purposes of CEQA.

Mitigation of significant impacts must lessen or eliminate the physical impact that the project will have on the historical resource. Similar to NEPA, the CEQA guidelines (14 CCR 15370) define mitigation to include consideration of measures to **avoid** impacts by not proceeding with all or parts of an action; **minimize** impacts by limiting the degree or magnitude of the action and its implementation; **rectify** impacts by repairing, rehabilitating, or restoring the impacted environment; **reduce or eliminate** impacts over time through preservation or maintenance operations during the life of an action; and **compensate** for impacts by replacing or providing substitute resources or environments. Additionally, the CEQA guidelines (14 CCR 15126.4(b)) provide for specific guidance on mitigation for impacts on historical resources as follows:

(1) Where maintenance, repair, stabilization, rehabilitation, restoration, preservation, conservation or reconstruction of the historical resource will be conducted in a manner consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring, and Reconstructing Historic Buildings* (Weeks and Grimmer 1995), the project's impact on the historical resource shall generally be considered mitigated below a level of significance and thus is not significant.

(2) In some circumstances, documentation of an historical resource, by way of historic narrative, photographs or architectural drawings, as mitigation for the effects of demolition of the resource will not mitigate the effects to a point where clearly no significant effect on the environment would occur.

(3) Public agencies should, whenever feasible, seek to avoid damaging effects on any historical resource of an archaeological nature. The following factors shall be considered and discussed in an EIR for a project involving such an archaeological site:

a) Preservation in place is the preferred manner of mitigating impacts to archaeological sites. Preservation in place maintains the relationship between artifacts and the archaeological context. Preservation may also avoid conflict with religious or cultural values of groups associated with the site.

b) Preservation in place may be accomplished by, but is not limited to, the following:

1. Planning construction to avoid archaeological sites;

2. Incorporation of sites within parks, greenspace, or other open space;

3. Covering the archaeological sites with a layer of chemically stable soil before building tennis courts, parking lots, or similar facilities on the site.

4. Deeding the site into a permanent conservation easement.

c) When data recovery through excavation is the only feasible mitigation, a data recovery plan, which makes provision for adequately recovering the scientifically consequential information from and about the historical resource, shall be prepared and adopted prior to any excavation being undertaken. Such studies shall be deposited with the California Historical Resources Regional Information Center. Archaeological sites known to contain human remains shall be treated in accordance with the provisions of Section 7050.5 Health and Safety Code. If an artifact must be removed during project excavation or testing, curation may be an appropriate mitigation.

d) Data recovery shall not be required for an historical resource if the lead agency determines that testing or studies already completed have adequately recovered the scientifically consequential information from and about the archaeological or historical resource, provided that the determination is documented in the EIR and that the studies are deposited with the California Historical Resources Regional Information Center.

In addition to CEQA, Public Resources Code 5024.5 requires that state agencies take into account effects on state-owned historical resources. When a project will affect state-owned historical resources, the lead state agency shall consult with the SHPO and adopt prudent and feasible measures to eliminate or mitigate adverse effects. Consultation should be coordinated in a timely fashion with the preparation of environmental documents.

The proposed project is then analyzed in order to determine if the project will have an effect on an eligible resource, and if that effect is considered “adverse.” An adverse effect is one that may alter the integrity of a resource’s characteristics which make it significant under the historical registers. Project effect determinations are also submitted to the SHPO for review and concurrence. When a proposed project is determined to have an adverse effect on NRHP- or CRHR-eligible or listed resources, then the federal and/or state agency must begin a consultation process with the SHPO to identify methods to resolve those effects, either through project re-design or other mitigation

measures. The agreed-upon plan for the resolution of project effects is often detailed in an agreement document, such as a Memorandum of Agreement.
In addition to the regulatory framework discussed above, the Malibu Creek State Park General Plan contains the following criteria relevant to the historic and cultural resource of Rindge Dam:

- **Goal RD-1:** Consider natural, aesthetic, and historic aspects of the dam and its surroundings in future management of Malibu Creek.
  - Guidelines:
    - **RD-1.1:** Coordinate with USACE to evaluate the feasibility of removing Rindge Dam.
    - **RD-1.2:** Conduct comprehensive research and recordation of the historic structure prior to any modification or removal.
    - **RD-1.3:** Evaluate opportunities to include the history of the Ridge Dam in exhibits focusing on early agriculture in the region.

3.5.2 *Cultural and Ethnographic Background*

The Santa Monica and Malibu coastal areas represent one of the most intensely studied archeological regions in the state of California. A century of formal and informal research has generated considerable information regarding the area's prehistoric cultural development (Baldwin 1996; Morrato 1984). Investigations of the native Chumash and Gabrielino/Tongva of the region have provided insight into the development of complex hunter-gatherer societies in coastal southern California.

Archeological data indicate that prehistoric occupation of the California south-central coast dates to at least 9,500 yrs before present (BP) (Erlandson and Colten 1991), with even earlier evidence from the Channel Islands, including a date from Santa Rosa Island of 13,000 BP (Ritsh 1999). Although cultural chronologies have been defined and refined by several researchers, King (1990, 2009) provides a widely-referenced timeline of dates for the Santa Monica Mountains based on a sequence of changes in bead and other ornament forms, while Glassow et al. (2007) provide a recent regional synthesis for the Northern California Bight by refining King's (1990) chronology through patterns observed from increased numbers of radiocarbon dates. The following discussion on the background of the prehistoric period in the project area is primarily based upon these references.

The Early Period (8,000 BP to 2,800 BP) is the first time period that exhibits permanent settlements and formal cemeteries (King 2009). Glassow et al. (2007) push back this period a bit more to 9,000 radiocarbon years before present (RCYBP) based on additional radiocarbon dates. The period is characterized by maritime and hunting adaptations, as well as plant processing subsistence, as evident from abundant milling stone caches. Ornamentation varied little, but usage increased over time, suggesting generally increasing social complexity. More detailed classification by phases has been difficult due to the lack of well preserved and recovered archaeological contexts that have been definitively dated to the Early Period, but generally the Early Period is divided into three phases. Settlements before 5,500 BP were largely located defensively at high points with a wide range of view, indicating only loose ties with surrounding groups. Between 5,500 BP and 4,500 BP, settlements moved to lower elevations, but consolidated to form larger communities which would better withstand incursions by others. After 4,500 BP, smaller satellite sites moved back up to more defensible positions around the more centralized settlements.

The Middle Period (2,800 BP to 750BP; King 2009) is defined by a broadening of subsistence strategies, including the introduction of the mortar and pestle, an increase in the use of projectile points, as well as the influx of Uto-Aztecan language groups, including the Gabrielino/Tongva, into southern California. Through analysis of cemetery data, the transition from the Early to Middle periods is marked by a change in social structure, from wealth acquired through personal accomplishments and not concentrated within any particular family or segment of the population, to wealth or power handed down through inheritance and limited to certain groups or families, reflecting an increasingly institutionalized and centralized power system. Settlements correspondingly consolidated with an increase in valley bottom and shoreline locations above good boat landing areas. A shift toward high value beads and ornamentation from more common bead types used for exchange signifies the accumulation of wealth objects to cement authority roles, and that wealth was rarely buried with the deceased, but instead passed along as inheritance. This shift may have been the result of influence from Uto-Aztecan speaking groups who brought more institutionalized social complexity (King 2009:269). The increase in large mortar bowls, effigies and stone pipes indicates a greater role of feast and ritual events that were likely sponsored by political leaders.

By the late Middle Period, an increase in ornamentation across the population and a reduction in the size of effigies suggest another shift, where the economic system became more independent from centralized political power such that personal accumulation of wealth was possible and ceremony was performed on more of a personal or family level. Bead manufacturing increased substantially by the end of the Middle Period, and differentiation of bead types may have further defined the separation of economic and politico-religious social systems (King 2009:271).
The Late Period (750 BP to 200 BP; King 2009), ending at the time of European land expeditions of Alta California, encompasses the “classic” Chumash social stratification structure, as evidenced by cemetery data. This period saw increased population, sedentism, specialization and trade, with central villages surrounded by temporary resource gathering or spiritual sites. There was a general decrease in the number of settlements across the area, as populations consolidated and grew, particularly during the protohistoric period. A clear separation of economic and political control was in place during the Late Period, and the extensive trade network established via political alliances and the economic system for the acquisition of resources ensured that local populations would be supported even during periods of low resource productivity. Bow and arrow technology was introduced at this time, as were limited amounts of pottery from the desert regions.

<u>The Historic Period (1542 - present)</u>

The first account of European contact in the region was the 1542 Cabrillo expedition, which visited the “Pueblo de las Canoas,” reportedly the village of *Muwu* near Point Mugu at the western end of the Santa Monica Mountains, although some claim that it may also have been the village of *Humaliwo* at the mouth of Malibu Lagoon. In 1602, the Vizcaíno expedition was greeted by Chumash people in a canoe from *Muwu*, although the Europeans did not come ashore. The first land expedition, under Gaspar de Portolà traveled across southern California, staying at the village at Encino, and then proceeded north to the Santa Clara River, and then west toward Saticoy. Their return route followed roughly the modern route of Highway 101, through the interior of the western Santa Monica Mountains. Several additional expeditions in the late 1700s provided accounts of the region (King 2009:7-9).

The San Buenaventura Mission was established at Ventura in 1782, followed by the San Fernando Mission in 1797. The missions recruited converts and workers from nearby village sites, and much of the native population of the Santa Monica Mountains was brought into one of the two missions as evidenced by the baptismal records which documented village names and kinship ties. The establishment of the missions drastically altered the existing social organization of the California Native Americans. As neophytes brought into the mission system, they were transformed from hunters and gatherers into agricultural laborers and exposed to diseases to which they had no resistance. By the end of the Mission Period in 1834, the Native American population had been decimated by disease and declining birthrates. Population loss as a result of disease and economic deprivation continued into the next century.

In addition to the mission, military presidio and town (pueblo) lands, Spain granted settlement and grazing rights to individuals on large tracts of land known as *ranchos*, including the Las Virgenes, El Conejo and Topanga Malibu Sequit grants in the western Santa Monica Mountains. José Bartolomé Tapia was granted rights to the 13,300 acre Rancho Topanga Malibu Sequit in 1801.

Once Mexico gained independence from Spain in 1821, the missions were secularized and the land was granted to former mission Indians, or more often, to prominent citizens after 1834. The grants included the Guadalasca, San Vicente y Santa Monica, Boca de Santa Monica, Los Encinos and Ex-Mission San Fernando lands in and adjacent to the Santa Monica Mountains. After Tapia's death in 1824, the Rancho Topanga Malibu Sequit remained in the hands of his widow, until she sold her rights in 1848 to her granddaughter's husband, Leon Victor Prudhomme, the year after Mexico lost California to the United States in the Mexican-American War. The California Land Act of 1851 required grantees and subsequent owners of Spanish and Mexican land grants to prove their claims, but Prudhomme did not have the necessary documentation when he filed his claim in 1852. As a result, he sold the Rancho Malibu to Matthew "Don Mateo" Keller in 1857.

Unfortunately, droughts in the 1860s and property taxes took their toll on many land grantees, and families who were rich in land yet poor financially had to sell all or a portion of their lands to cover expenses. Because of the unclear title transferred by Prudhomme, Keller was not able to get the Rancho Malibu surveyed and officially granted until 1872 after substantial legal wrangling in the courts. After Don Matteo's death in 1881, the rancho fell to his son, Henry Keller. In 1892, Henry sold the ranch to wealthy businessman Frederick Hastings Rindge, who purchased additional property to expand the Malibu Rancho to 17,000 ac.

The Rindge family constructed a weekend and summer home in 1895 in today's Serra Retreat neighborhood, which later burned in a 1903 wildfire. The Ranch was largely used for cattle grazing and agricultural fields were planted within the lower Malibu Creek floodplain. When the Southern Pacific Railroad applied for an easement over the Malibu Ranch in 1904 to connect Santa Monica and Santa Barbara, the Rindges took advantage of an obscure law that would not allow two railroads in the same area and began planning their own railroad and shipping pier. When Frederick Rindge died suddenly in 1905, his wife Rhoda May Knight Rindge took over ranch operations, including the 1906 completion of the Hueneme, Malibu and Port Los Angeles Railway. The railroad continued in operation until about 1922, when it was disassembled and the rails used in the construction of Rindge Dam. When government interest in building a public road across the Ranch began in 1907, May Rindge started her long legal battle in maintaining her private land interests, ultimately losing to a county road claim in 1919, and to the state highway which was completed in 1929. Although ownership of the ranches in the Santa Monica Mountains changed over time, the land holdings remained relatively intact until the 1920s-30s, when several parcels began to be sold off for smaller custodian-administered "gentlemen ranches" for livestock, as well as beach houses for weekend retreats by wealthy Los Angeles businessmen and Hollywood stars, thereby paving the way for the wealthy enclaves of Malibu, Calabasas and other incorporated areas of the Santa Monica Mountains today. In order to fund her legal battles, May Rindge began leasing and selling off portions of the Malibu Ranch, including several beachfront parcels in the celebrity-dominated

Malibu Colony. These new property interests in turn required access to water, so May commissioned the construction of the Rindge Dam in 1924 to provide a more reliable water supply.

Despite her legal and financial burdens, Rindge set about building a large mansion on Laudamus Hill in today's Serra Retreat neighborhood in the 1920s to replace the home that had burned in 1903. Along with the weekend home on the coast built for her daughter, Rhoda Rindge Adamson, the constructions extensively used decorative tiles from Rindge's Malibu Potteries, which operated from 1926 until it was destroyed by fire in 1931.

As the Rindge family's Marblehead Land Company continued to sell off portions of the Malibu Ranch for development, local conservation movements of the 1960s and 1970s began to consider the preservation of open space and recreational lands in the region. Several California State Parks and the Santa Monica Mountains National Recreation Area were established in the mid- to late 1970s as a result.

3.5.3 *Records and Literature Search and Field Survey Results*

Records searches at the South Central Coastal and Central Coast information center were completed in February 2013 and December 2016, encompassing a 1/2 mile radius around the APE. The APE consists of several discontiguous project components described as follows: A) removal of the Rindge Dam and upstream sediment deposits, including construction access and staging areas; B) the area downstream of Rindge Dam, including potential flood mitigation structures; C) proposed beach nourishment areas at Surfrider beach; D) eight upstream barriers along the Las Virgenes and Cold Creek tributaries, and E) off-loading of sediments onto barges at Ventura Harbor. The APE considers both direct and indirect effects from any identified stream flow changes along Malibu Creek during barrier removals and covers the maximum construction footprint for all alternatives, including proposed construction staging areas and access roads.

The tribal consultation meeting on April 29, 2016 included discussion of the APE. The California SHPO was consulted regarding the APE pursuant to 36 CFR 800.4(a)(1). The SHPO concurred on November 14, 2016 that the APE appears to have been appropriately determined and documented as defined in 36 CFR 800.16(d) and that it may require amendment as project design refinements occur.

The records search at the South Central Coastal Information Center and other databases identified four previously recorded cultural resources within the project APE components: P-19-186946 (Rindge Dam); P-19-177472 (Adamson House), CA-LAN-264 (Village of *Humaliwo*), and the American Boy fishing vessel shipwreck. No resources were identified in the Ventura Harbor APE by the records search at the Central Coast Information Center.

A previous evaluation report (Thompson et al. 2005) has determined that P-19-186946 is eligible for the NRHP; however, this determination has not yet been submitted to the State Historic Preservation Office (SHPO) for concurrence. The Adamson House (P-19-177472) and CA-LAN-264 are both listed on the NRHP.

Cultural resources field surveys of accessible portions of the APE were conducted in February, March and August 2013. The field surveys confirmed locations of the previously recorded resources described above, and have identified four additional resources, designated as follows: P-19-004428 (Sheriff's Honor Camp site); P-19-004429 (Rindge Dam water pipeline); P-19-190759

(White Oak Dam and Pumphouse); and P-19-190760 (Piuma Culvert). A description of each resource identified within the APE follows.

- P-19-177472 (Adamson House) is a NRHP-listed built-environment resource located within Malibu Lagoon State Beach. The NRHP property includes both the Adamson Home and the surrounding landscaped grounds and features. The home was designed by architect Stiles Clement (1923-1929) in a blend of Moorish and Spanish-Mediterranean architecture, with lavish use of Malibu Potteries tile throughout. The home was built by Rhoda Rindge Adamson, the daughter of Mr. and Mrs. Frederick Rindge. The Adamson House property includes a buried tank at Surfrider Beach that was part of a saltwater intake structure to provide ocean water to the Adamson House.
- P-19-186946 (Rindge Dam) is a concrete constant-radius arch dam constructed in two phases between 1924 and 1926. The dam was commissioned by Rhoda May Rindge to provide a reliable water supply for her Malibu Ranch. The Rindge Dam has been determined eligible under Criterion b for its association with a noted historical figure, Rhoda May Knight Rindge; and, under Criterion c for its association with dam building, water retention and distribution, and dam construction (Thompson et al. 2005).
- Archaeological site CA-LAN-264, believed to be the ethnohistoric village of *Humaliwo*, underlies the Adamson House property at Malibu Lagoon State Beach. The site is separately listed on the NRHP, and was significant as the easternmost "capital" village of the Ventureño Chumash. The site consists of extensive shell midden deposits, as well as a Middle Period (AD 950-1150) cemetery and a native Historic Period (1775-1805) cemetery (Gamble et al. 1996).
- P-19-004428 is a newly-recorded resource that documents the Sheriff's Honor Camp site. This site is located off of Malibu Canyon Road, above the Rindge Dam, and is also locally known as the Sheriff's Overlook. It is partially located within Malibu Creek State Park, and partially within the Los Angeles County road right-of-way. The Sheriff's Honor Camp No. 3 was operated as a prison labor camp c. 1945-1952 for the construction of Malibu Canyon Road. Extensive mortared rock retaining wall features, as well as concrete foundations remain at this historical archaeological site. The site is potentially eligible for the NRHP under Criterion A for its role as a model in an innovative correctional program for first time misdemeanor offenders.
- P-19-004429 is a newly recorded resources that consists of the remains of the Rindge Dam 8-inch water distribution pipeline which extends down Malibu Canyon toward the former Rindge family home, now the Serra Retreat, and continuing on to the Adamson House. Only those portions of the exposed and accessible pipeline within the Malibu Creek bed were recorded. Some portions of the pipeline remain in-situ, while other sections have been washed out and fragmented within the creek channels. P-19-004429 is a contributor to the Rindge Dam (P-19-186946), and thus would be considered eligible for the NRHP.
- P-19-190759 is a newly-recorded resource consisting of the White Oak Dam and Pumphouse. This built-environment resource includes a concrete dam and pump house building and pipeline that are associated with the operation of the White Oak Farm, also known as the Colyear Ranch. An example of a Gentleman's Ranch, P-19-190759 is potentially eligible at the local level for listing on the NRHP for its association with pioneer businessman Curtiss Calhoun Colyear from 1911-1947 and Hollywood celebrity Bob Hope from 1954 to 1975 (Bevil 2013).

- P-19-190760 records the built environment resource of the Piuma Culvert, designated as crossing CC1 in the proposed Project. The resource is described as a steel corrugated culvert supported by mortared rock abutments that allows the flow of Cold Creek underneath Piuma Road. The rustic stone abutments of the structure suggest that this culvert may have originally been constructed c. 1915 with the development of the Crater Camp recreational area by Charles A. Knagenhelm; however, there is no physical or documentary evidence to support the eligibility of P-19-190760 for listing on either the NRHP or the CRHR (Bevil 2013).
- Surfrider Beach at Malibu is a newly-recorded resource that encompasses the three offshore surf breaks (First Point, Second Point, and Third Point) and a 360-foot-long sandy beach extending from the mouth of Malibu Lagoon northeast to Malibu Pier. Their unique combination created some of the most consistent and often challenging waves that attracted a number of notable pioneer surfers who contributed to the development of the southern California surf culture and surfboard design between 1926 and 1969. Surfrider Beach is potentially eligible for the NRHP under Criterion A in the area of ocean-related entertainment/recreation activities, and under Criterion B for its association with locally and nationally significant innovative pioneer surfers and board designers. It is also significant under Criterion Consideration G in the period of 1970-1984 for its role in nationally and internationally competitive surfing events and in the modern environmental movement in the creation of the Surfrider Foundation to address ocean pollution issues.
- A review of the California Shipwrecks WebMap published through ESRI and the California State Lands Commission Shipwreck Database showed one shipwreck within the project APE. This was the American Boy fishing vessel which was destroyed by fire and sunk in 1956. It is unknown if there are any remnants of this wreck still extant, although due to its wood construction it is highly unlikely that any portion of the boat remains.

3.5.4 *Native American Concerns*

Section 106 of the NHPA, the American Indian Religious Freedom Act of 1978 (Public Law 95-341; 42 U.S.C. 1966), and Executive Order 13175 of November 6, 2000 (Consultation and Coordination with Indian Tribal Governments), all require that government agencies consult with Native Americans to determine their interests in federal projects.

On May 6, 2013, the USACE requested via fax, a list of Native American groups and individuals associated with the APE vicinity from the NAHC. The NAHC provided the list via emailed letter on May 7, 2013. The letter provided by the NAHC also included the results of a Sacred Lands File search conducted for the APE and indicated that Native American cultural resources have not been identified within the APE. A revised list was requested and received via email on March 29, 2016. The 2016 letter provided by the NAHC noted that sites on the Malibu Beach quadrangle may be impacted by the project. A California Assembly Bill 52 (AB52) notification was also provided by CDPR for one Tribe.

On April 13, 2016, the USACE mailed a consultation meeting invitation for a meeting on April 29, 2016, to the Native American groups and individuals indicated by the NAHC. CDPR called individuals on the list on April 22, 2016 to provide a reminder about the meeting. The USACE made follow-up calls and sent reminder emails on April 25 and April 27, 2016 regarding the meeting to everyone on the NAHC list.

An initial Tribal Consultation Meeting was held on April 29, 2016; representatives from the Santa Ynez Band of Chumash Indians, Wishtoyo Chumash Foundation, and the Tongva Ancestral Territorial Tribal Nation attended in person or via teleconference.

Summary of Native American Consultation

Native American consultation conducted to date strongly indicates that the Malibu Ecosystem Restoration Project area should be considered sensitive for Native American resources. Consultation under Section 106 of the NHPA, CEQA, and USACE and CDPR Tribal Consultation policies is ongoing.

3.6 Socioeconomics and Environmental Justice

The project area is predominantly in the Malibu Creek watershed. All construction activities are in the general vicinity of Rindge Dam and the upstream barriers, with sediment placement proposed either on the shoreline adjacent to Malibu Pier or offshore of the same location. Under the LPP, material would be hauled to Ventura Harbor and the existing facilities there would be utilized to transport material to the off-shore placement site. However, no construction or development of new facilities would occur in Ventura. Therefore the data below primarily covers those areas in the direct vicinity of the project area, with additional coverage of Ventura provided where appropriate.

3.6.1 *Population Characteristics*

The Malibu Creek watershed covers portions of Los Angeles and Ventura counties. Ventura County is 1,873 mi^2 in area. The population for Ventura County as of the 2010 census was 823,318, with about 9.3% growth since 2000. Los Angeles County is 4,752 mi^2 in area. The population for Los Angeles County was 9,818,605 as of the 2010 census, with about 3.1% growth since 2000. **Table 3.6-2** shows the population for the cities/towns within the Malibu Creek Watershed. The study area is portion of the City of Malibu and Malibu Creek Watershed.

Table 3.6-1 Population Figures for Project Vicinity

County	City/Area	Area (mi^2)	Census Population			Population Increase 2000-2010
			1990	2000	2010	
Ventura	Thousand Oaks	54.9	104,352	117,005	126,683	8.3 %
Ventura	Ventura	32.1	92,575	100,916	106,433	5.5%
Los Angeles	Westlake Village	5.4	7,455	8,368	8,270	- 1.1%
Los Angeles	Agoura Hills	7.9	20,390	20,537	20,330	1.0 %
Los Angeles	Calabasas	12.9	--	20,033	23,058	15.1 %
Los Angeles	Hidden Hills	2	1,729	1,875	1,856	-1.0 %
Los Angeles	Malibu	19.6	--	10,301	12,645	22.8 %
Ventura County	Entire County	1873.0	670,132	753,197	823.318	9.3 %
Los Angeles County	Entire County	4752.3	8,863,164	9,519,338	9,818,605	3.1 %
Los Angeles	Study Area (est)	6.0	--	--	3,000	

Thousand Oaks is the largest city in the Malibu Creek watershed area and is nearly 55 mi^2 in size. However, only the cities of Malibu and Calabasas are located in the study area itself. The other cities/towns are part of the larger Malibu Creek watershed. The total population for the City of Malibu in the 2010 census was 12,645. While this is a 22.8% growth from the 2000 census, data from 2004 indicated the Malibu population was around 13,550, indicating recent slight declines mirroring other small cities in the region. The City of Calabasas had a population of 23,058 people during the 2010 census, an approximate 15.1% growth from the 2010 census.

3.6.2 *Income Characteristics*

Although there is a wide variation between cities, median household income in Ventura County in 2003 was $60,948, increasing to $77,348 by 2015. Income in Los Angeles County varies more widely than most counties in California. The median household income for Los Angeles County in 2003 was $44,674. Increasing to $56,196 by 2015. **Figure 3.6-1** shows median household income over time for Ventura and Los Angeles Counties.

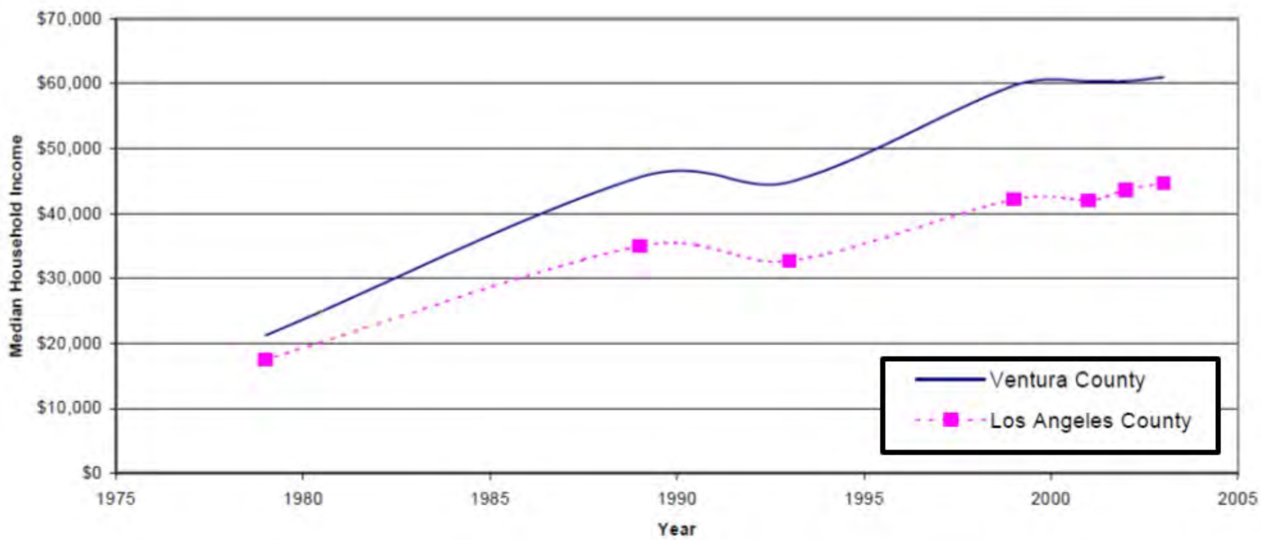


Figure 3.6-1 - Median Household Income in Ventura and Los Angeles Counties

The median household income for the City of Malibu, at $119,659 as of the 2015 American Community Census, is around 2.25 times the median income of Los Angeles County and around 55% higher than the median household income of Ventura County. The median household income for the City of Calabasas is about $106,050 in the 2015 American Community Census.

The percentage of population and of families below poverty status is far lower and the median income is far greater in the cities of Malibu and Calabasas than in Los Angeles County generally. Based on the most recent financial data available from the U.S. Census Bureau (1999-200), around 18% of the Los Angeles County population was below poverty level, while around 14% of all families were below poverty level. The City of Malibu percentage of population below the poverty level was about 8%, and the percentage of families classified below the poverty level was about 3%. For the City of Calabasas, the percentage of the population that was classified below the poverty level was about 3% while the percentage of families underneath the poverty level was about 2% (2000 Census of Population and Housing, Summary File 3A).

3.6.3 *Employment Characteristics*

The largest employer in Ventura County was the U.S. Navy with around 16,000 military and civilian workers. The U.S. Census Bureau reported in its 2001 Supplementary Survey that the most common Ventura County occupations were management, professional, and related occupations at 38%, followed by sales and office occupations, at 27%. Next were service occupations at 13%, then production, transportation, and material moving occupations at 10%. Finally construction, extraction, and maintenance were estimated at 9%. For 2001, the Ventura County total employment was reported at 302,500, with an unemployment rate of 4.5%. The largest employer in Los Angeles County, with over 92,000 employees, is the County of Los Angeles. Another large employer is the Los Angeles Unified School District with over 80,000 employees in 2003. The U.S. Census Bureau reported in its 2001 Supplementary Survey that the most common occupations in Los Angeles County were management, professional, and related occupations at 33%, followed by sales and office occupations at 27%. Next were production, transportation, and material moving occupations at 16%, then service occupations at 15%, and construction, extraction, and maintenance occupations at 8%. Farming, fishing, and forestry occupations were estimated at 1%. **Table 3.6-3** shows employment in 2001 by industry for Ventura and Los Angeles Counties (U.S. Census Bureau). A review of more recent employment data from 2011-2015indicates that general trends in Los Angeles and Ventura Counties do not differ significantly from those of 2001.

Table 3.6-2 Employment by Industry, Ventura and Los Angeles Counties 2001

Industry	Percent Industry by County	
	Ventura	Los Angeles
Agr., Forestry, Fishing, Hunting, & Mining	3	1
Construction	6	6
Manufacturing	13	15
Wholesale Trade	6	4
Retail Trade	10	11
Transportation, Warehousing, Utilities	3	6
Information	3	5
Finance, Ins., Real Estate, Rent & Leasing	9	7
Professional Business Services	11	11
Education, Health, & Social Services	18	18
Leisure and Hospitality	8	9
Other Services	3	5
Public Administration	5	3

3.6.4 *Housing Characteristics*

In August 2004 the median home sale price for Ventura County was $626,500 and for Los Angeles County was $425,000. In general, housing costs in Ventura and Los Angeles Counties have increased over time, and this trend is expected to continue due to limited supply. The U.S Census Bureau reported in 1990 the Ventura County housing stock had 228,478 units; the 2000 stock was

251,712 units, and the 2015 stock was 283,899. This is a growth of 10.2% in 10 yrs from 1999-2000 and 12.8% growth from 2000-2015. This represents an annual growth rate slightly less than 1% per year over the past 25 years. Los Angeles County housing stock was 3,163,343 units in 1990, 3,270,909 in 2000, and 3,476,718 in 2015. This is a growth of 3.4% in 10 yrs from 1990-2000 and 6.3% from 2000-2015. This represents an annual growth rate of about 0.4% per year over the past 25 years.

The distribution of housing types for Ventura County in 2015 was single-family dwellings at 74.5%, multi-family dwellings at 21.3%, and mobile homes at 3.9% of the total. According to the U.S. Census Bureau, 35.8% of the housing occupants in 2015 were renters.

The distribution of housing types for Los Angeles County in 2015 were single family dwellings at 56%, multi-family dwellings at 42.3%, and mobile homes at 1.6%. Boats, recreation vehicles, and vans used as housing comprise approximately 0.1% of the total. According to the U.S. Census Bureau, 54% of the Los Angeles County housing occupants in 2010 were renters.

The City of Malibu was incorporated as a city in March 28, 1991. The U.S. Census Bureau reported Malibu had a housing stock of 6,126 units in 2000, and 6,864 in 2010. The number of occupied housing units for Malibu in 2010 was 5,267, or 76.7% occupancy. According to the U.S. Census Bureau, 29.4% of the housing occupants in 2010 were renters. In 2015, the median selling price of a single-family residence in Malibu was $1,937,000. In 2007, the median selling price of a land-side single-family residence in Malibu was $2,197,500, and $6,407,500 for a beachfront residence themaliburealestateblog.com).

3.6.5 *Public Finance Characteristics*

Table 3.6-3 provides total municipal revenue and expenditures for the City of Calabasas as well as the City of Malibu (California Office of the State Controller, 2000). Also included are average expenditures per citizen.

The City of Malibu and the City of Calabasas have contracted for law enforcement with the Los Angeles County Sheriff's Department. The Los Angeles County Sheriff also serves all unincorporated areas throughout the Study area. Fire protection services are provided by the Los Angeles County Fire Department.

Table 3.6-3 Public Finance Characteristics

	City of Calabasas	City of Malibu	Los Angeles County
Total Revenue	$16,789,580.00	$11,325,278.00	$12,966,749,328.00
Total Expenditures	$14,172,786.00	$10,184,973.00	$12,705,413,362.00
Revenues Over Expenditures	18.50%	11.20%	8.40%
Expenditures Per Resident	$752.00	$835.00	$513.00

3.6.6 *Environmental Justice*

Within Los Angeles County, according to the 2010 Census, about 74% of the population was considered a minority, while minority composition within the City of Calabasas was about 17%, and within the City of Malibu was about 10% (U.S. Census Bureau, 2010b). Within Ventura County according to the 2010 Census, about 51.3% of the population was considered a minority, while within the city of San Buenaventura (Ventura), 40% of the population was considered a minority.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations (1994), directs Federal agencies and state agencies receiving Federal funds to assess the effects of their actions on minority and/or low-income populations within their region of influence. The order requires agencies to develop strategies to identify and address any disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and/ or low-income populations.

The US Environmental Protection Agency (EPA) has published *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses* (USEPA, 1998) which indicates that a minority population exists when either:

- The minority population of the affected area is greater than fifty percent of the affected area's general population.
- The minority population percentage of the affected area is meaningfully greater than the population percentage in the general population or other appropriate unit of geographic analysis.

An environmental justice screening analysis must determine whether any significant impacts of the project would disproportionately and adversely impact local low-income and/or minority populations. If a disproportionate impact is determined, mitigation measures must be implemented to reduce the adversity of the impact to a less than significant level.

3.6.7 *Population and Income Characteristics*

Thousand Oaks is the largest city in the Malibu Creek watershed area and is nearly 55 mi^2 in size. The city of Malibu grew about 22.8% from 2000 to 2010 to about 12,645 people. The City of Calabasas grew by over 15% in the same time period with a projected population of just over 23,000 people.

The median household income for the City of Malibu is significantly higher than the median income for both Los Angeles and Ventura Counties at just over $119,659 based on the 2015 American Community Census. The median household income for the City of Calabasas is about $106,050 in the 2015 census. In 2007, the median selling price of a land-side single-family residence in Malibu was $2,197,500 and was $6,407,500 for a beachfront residence (source: themaliburealestateblog.com).

3.6.8 *Economic Analysis*

The USACE studied baseline economic conditions in the lower portion of Malibu Creek relating to flood damages, environmental conditions, and recreation supply and demand. The base flood damage analysis used the software developed by the USACE Hydrologic Engineering Center (HEC) designed for risk based analysis (HEC-FDA program). Annual equivalent of benefits and costs are computed using a constant Federal discount rate of 5 3/8%.

The primary area of potential flooding is outlined by the 500-yr floodplain. All the land parcels that fall within the 500-yr floodplain or parcels that could be inundated by floodwaters under existing and future no action (baseline) conditions were examined. A site survey of the Malibu Creek floodplain properties was conducted in April 2005 with 137 parcels in the 500-yr floodplain of which 84 have structures and 53 were vacant land. Only 64 of those 84 structures were found to be at elevations subject to flood damages under current conditions. These parcels total 1,117 acres of the floodplain. Floodplain maps are included in **Appendix B**.

Most of the expected damages from flooding are associated with residential housing and commercial buildings. The flood affected residential housing units include three areas: along the right bank (looking downstream) of Reach 1 (the beach area), the left bank area of Reach 2 inland from the beach, and the right bank of Reach 3. The number of residential parcels (sites) is 66 parcels in the study area 500-yr floodplain. Commercial buildings are found on 13 of the parcels in the 500-yr floodplain. The types of commercial buildings range from store buildings to shopping centers.

The number of parcels with structures located within the 100-yr floodplain is 38, for the 50-yr floodplain the number is 29, for the 25-yr floodplain the number is 15, for the 10-yr floodplain, the number is 9, and for the 5-yr floodplain the number is 3. By far the largest group of structures in the Malibu Creek floodplain area is the single-family residences. At the 500-yr floodplain the single-family residences account for 73% of all the structures.

The floodplain includes the affluent Malibu community. Residential structures in this area are generally of excellent constructional quality and many are quite large reflecting the higher value per structures. The HEC-FDA risk-based analysis (RBA) has been used to evaluate without project flood damages in the study area. The guidance specifies that the derivation of expected annual flood damage must take into account the uncertainty in hydrologic, hydraulic and economic factors. Risk and uncertainty are intrinsic in water resource planning and design. They arise from measurement errors and the inherent variability of complex physical, social and economic situations. Best estimates of key variables, factors, parameters and data components are developed, but are often based on short periods of record, small sample sizes, measurements subject to error, and innate residual variability in estimating methods. RBA explicitly incorporates these uncertainties by defining key variables in terms of probability distributions, rather than single-point estimates. The focus of RBA is to concentrate on the uncertainties of variables having the largest impact on study conclusions.

The USACE calculated floodwater heights at incremental river station points. The difference in the elevation of the building to the expected height of the floodwater determines the amount of expected damage. The result of both the Structural & Content damage analysis for the 500-yr flood event or less has an expected annual damage value of $328,200. Future housing growth in the damage area is assumed to be low. Therefore, the expected annual damage value is not expected to increase dramatically due to future housing growth based upon USACE current assessment. However, recent real estate prices and housing demand may change this assessment of an area historically known for low or no growth policy. Cleanup and temporary housing costs are estimated to have an expected annual damage value of $37,700. These costs represent a little over 10% of the Structural & Content expected annual damages.

3.7 Aesthetics

The NEPA and Council on Environmental Quality (CEQ) regulations identify aesthetics as one of the elements that must be considered in determining the effects of a project. NEPA, as amended, establishes that the Federal government use all practicable means to ensure safe, healthful, productive, and aesthetically and culturally pleasing surroundings for all Americans (42 United States Code 4331[b][2]). The USACE has established a number of environmental goals, including preservation of unique and important aesthetic values and restoration and maintenance of the natural and man-made environment for measures of quality important to the American people.

Aesthetics includes viewhsheds, odors, lights, and glare. Aesthetic resources can be defined as a person's sensory perception of the environment. It includes physical features, such as land, water and air, and spiritual features, such as the beauty of place or the knowledge that such a place exists Viewsheds are generally described in terms of visual quality, or quality of views. Views can be categorized into three types: the first one half-mile being the foreground, from one-half mile to five miles being the middle ground, and greater than five miles being the background. Attention to detail at varied distances determines the type of view captured by the viewer (CDPR 2003).

Aesthetics analysis considers the existing and future appearance, or perception of views, of the project site and areas surrounding the site, and viewer sensitivity. Aesthetics analysis for the project includes identifying areas considered containing valuable views, such as designated scenic resource areas and scenic highways, describing existing visual characteristics of the region and Study area, discussing applicable plans, policies, and regulations.

The following aesthetics information was obtained from Malibu Creek State Park General Plan (CDPR 2005) and site visits by USACE personnel in summer and fall 2005.

3.7.1 *Regional Setting*

The Santa Monica Mountains are home to mountains, hills, and creeks as well as historical and cultural sites. Generally southwestern Los Angeles County contains visual resources such as mountains, canyons, native vegetation, beaches, lakes, rivers, and creeks. Man-made structures include visual features such as parks, golf courses, harbors, homes, levees, and other structures that have contributed to the aesthetic quality of this area both positively and negatively (County of Los Angeles 2003).

3.7.2 *Study Area Setting*

Chaparral covered mountains and volcanic rock formations dominate the study area. The variety of plant communities provide a visual setting ranging from riparian habitat along Malibu Creek to chaparral covered hillsides to oak woodlands. Malibu Creek is lined with willows, cottonwoods, sycamores, mulefat and other typical riparian vegetation. Many of the scenic characteristics of the park are determinate by the season. Throughout spring, wildflowers are typical along the hills and shrub-covered hillsides become green. During the fall the trees that inhabit the riparian corridor contain leaves of changing colors. Rainfall and fog are most common during the winter months (CDPR 2003).

The study area contains canyons, ridgelines, and other natural features that provide dramatic views from many locations called viewsheds. Some of these areas are defined as "key observation points" that are located in areas accessible to the public. In addition to the natural scenery, the study area contains cultural and historical sites, such as Rindge Dam and the Adamson House. These sites offer snapshots into human occupation of the region and enhance the overall visual quality of the study area.

There are designated scenic corridors within the study area. Las Virgenes Road, which becomes Malibu Canyon Road to the south, was designated in 2002 as a scenic highway by the State of California. It is also designated a scenic highway by the County of Los Angeles, the first roadway in southern California to be so named. The eight-mile stretch of Malibu Canyon Road/ Las Virgenes Road extends from Lost Hills Road in the north to PCH in the south (NPS 2002). This roadway receives increased protection against emplacement of billboards, utility lines, and other potential structures that could harm the aesthetics of the area.

Mulholland Highway was established as a scenic corridor by the city of Los Angeles in 1973. This road runs east to west from Griffith Park to Leo Carrillo State Park. The route contains pull out areas and scenic overlooks. It traverses Malibu Creek State Park from just north of the Park headquarters at Las Virgenes Road through to north of Century and Malibu Lakes (County of Los Angeles 2003).

All of the trails throughout the study area offer scenic vistas of the surrounding mountains; however, these are not designated scenic routes. The NPS has identified the Backbone Trail System through the Park to be a scenic corridor (NPS 2002).

Reach 5: Rindge Dam to Cold Creek Confluence

Nearly all of Malibu Creek Reach 5 is contained within Malibu Creek State Park. Reach 5 begins at the confluence of Malibu Creek and Cold Creek and runs downstream over the sediment impounded by Rindge Dam to the Dam. The ridgelines are visible in this reach. In the upstream portion of Reach 5 Malibu Creek meanders and begins to flow northeast as the Creek continues upstream. As the Reach continues upstream the ridgelines are visible to the northwest and northeast and begin to converge. The foreground contains a higher number and concentration of riparian species along the corridor. The middle-ground is consistent with other reaches containing seasonally changing shrubs along the hillsides.

Reach 4: Big Bend Pool on Malibu Creek to Rindge Dam

Reach 4 begins at Rindge Dam and ends at a large pool on Malibu Creek as the Creek turns south. The major portion of Reach 4 is contained within Malibu Creek State Park. Areas to the west of Malibu Canyon Road are part of unincorporated Los Angeles County. The background views from Malibu Canyon below are of the Santa Monica Mountains to the west and east. Riparian habitat can be seen in the foreground and shrubs and chaparral occur in the middle-ground.

Rindge Dam is visible from only three places throughout the Study area: from the Creek bed, Piuma Road and a small portion of the Sheriffs Overlook, off Malibu Canyon Road. Rindge Dam is not visible from Malibu Canyon Road or the Sheriff's Overlook main parking area.

Reach 3: Cross Creek Road to Big Bend Pool

Reach 3 begins at a large pool on Malibu Creek as the creek turns south and ends at the intersection of Malibu Creek and Cross Creek Road. Upstream Reach 3 includes part of Malibu Creek State Park and unincorporated areas of Los Angeles County. The canyon is steep and narrow in this area. In the upstream portion of Reach 3, foreground views are of Malibu Creek with riparian vegetation. Middle-ground views are of the surrounding hillside shrubs and vegetation. Background views are of the surrounding Santa Monica Mountains. The upstream portion of Reach 3 is managed by CDPR east of Malibu Canyon Road and, aside from a small area of rural residential development in the northeastern corner of the Reach, is devoid of any development. The lower portion of the Reach, still largely within the limits of the City of Malibu, contains a mixture of residential and commercial land uses.

Reach 2: Pacific Coast Highway to Bridge over Cross Creek Road

Reach 2 extends from Malibu Creek and Cross Creek Road south to the PCH. Malibu Lagoon State Beach becomes Malibu Creek State Park at the northern extent of Reach 2.

This Reach, inside the City of Malibu, is the most-developed Reach within the Study area. The topography of this Reach is relatively flat with views of the Santa Monica Mountains in the background. Foreground views are affected by the buildings within the commercial and residential areas. Depending on the observation point, portions of Malibu Creek, Malibu Lagoon, and the Pacific Ocean are visible from this Reach.

Reach 1: Malibu Lagoon to Pacific Coast Highway

Malibu Lagoon State Beach is adjacent to the Pacific Ocean and continues upstream into Malibu Lagoon until meeting with the PCH. Malibu Lagoon State Beach is composed of 22 ac of wetlands, native habitats, and sandy beach, which have recently been restored. A nature area with bird watching and a saltwater marsh occurs on the west side of Malibu Creek Bridge within Malibu Lagoon. The topography in this reach is flat from Malibu Lagoon to the Pacific Ocean. The Santa Monica Mountains are visible in the background (CDPR 2004).

Malibu Pier: Shoreline and Offshore Placement Sites

Malibu Pier is just east of the Malibu Lagoon and Surfrider Beach. The proposed shoreline and near-shore placement sites are just east of the Malibu Pier. The beach along the east side of Malibu Pier has been primarily eroded away. Views from the east side of Malibu Pier include views of the pier itself and the shoreline heading east. Inland views across PCH include views of the mountains behind Malibu.

Upland Site F: Temporary Staging Site

Upland site F is a temporary storage site for sediment proposed for use under the NER. Upland site F is located within Malibu Creek State Park just north of Mulholland Hwy and just east of Malibu Canyon Road (**Figure 4.4-9**). Upland Site F primarily consists of fallow fields filled with native and non-native grasses, surrounded by the rolling hills of the Santa Monica Mountains, and adjacent to minor tree-lined creeks. The site itself contains no significant aesthetic resources, although panoramic views from the site are available.

Ventura Harbor

Ventura Harbor is located in the city of San Buenaventura (typically referred to as Ventura), within Ventura County, and is accessible from Harbor Blvd. and Spinnaker Drive (**Figure 4.4-12**). This area is entirely developed and topographically flat. Views are highly limited due to extensive infrastructure including housing developments, hotels, and commercial buildings. Generally, views along the landward side of Ventura Harbor are of a built environment on land and a busy commercial and private harbor and associated boat traffic within the harbor itself.

3.7.3 *Applicable Policies and Regulations*

Applicable plans, policies and regulations that apply to aesthetic resources within the study area were obtained from the County of Los Angeles General Plan; the City of Malibu General Plan; the Malibu Creek State Park General Plan; Engineering Manual 1110-2-38, Environmental Quality in Design of Civil Works Projects produced by the USACE, and the Visual Resources Assessment Procedure for the USACE.

<u>County of Los Angeles General Plan</u>

Much of the focus of the County of Los Angeles General Plan (2003), in terms of aesthetic and visual concerns is located in the Circulation Section. This section looks at the protection of scenic routes and highways throughout the County. The General Plan emphasizes the development of a system of scenic corridors along existing roadways. Importance is placed on the protection of scenic resources within the selected corridors. Aesthetic Resources are listed under the Goals and Policies section.

- Goal: Preservation and enhancement of aesthetic resources within scenic corridors
- Policies:
    - Protect and enhance aesthetic resources within corridors of designated scenic highways.
    - Develop and apply standards to regulate the quality of development within corridors of designated scenic highways.
    - Remove visual pollution from designated scenic highway corridors.
    - Require the development and use of aesthetic design considerations for road construction, reconstruction or maintenance for all designated scenic highways.
    - Increase governmental commitment to the designation of scenic highways and protection of scenic corridors.
    - Improve scenic highway coordination and implementation procedures between all levels of government.

City of Malibu General Plan

Aesthetic and visual resources are addressed in the Open Space and Recreation section of the City of Malibu's General Plan. The goals, objectives and applicable policies in terms of aesthetic and visual resources are listed below:

- OS Goal 1- An abundance of open space conservation contributing to a rural, natural environment consistent with this open space management plan.
    - OS Objective 1.1- Ample and diverse public parkland and open space, integrated by circulatory and visual links, to create a rural, open feeling.
    - OS Policy 1.1.3: The City shall preserve, protect, and enhance the character and visual quality of natural open space as a scenic resource of great value and importance to the quality of life of residents and to the enhancement of the scenic experience of visitors.

City of Malibu Local Coastal Program and Land Use Plan

The City of Malibu Local Coastal Program and Land Use Plan (LCP), prepared by the City of Malibu in compliance with the California Coastal Act of 1976, governs certain types of development within the geographic area of the Malibu LCP, which includes the Rindge Dam site, upstream barrier sites, and the proposed sediment placement areas adjacent to Malibu Pier (Malibu, 2002). The LCP provides guidance to minimize impacts as they pertain to new development, structures, and other forms of permanent alterations or hardscapes within the coastal zone, including guidance related to scenic and visual resources. Guidance in the LCP falls into the following general categories:

- New Development
- Land Divisions
- Protection of Native Vegetation
- Signs,
- Pacific Coast Highway

Each of these categories contains a suite of considerations that should be applied, as appropriate, to proposed development projects. In addition, the Malibu LCP also contains guidance on public works projects, including projects that impact traffic and circulation facilities.

CDPR, Malibu Creek State Park General Plan

Aesthetics analysis criteria in the Malibu Creek State Park General Plan rely on guidance from CEQA. Generally, this guidance suggests that activities would be incompatible with the Malibu Creek State Park General Plan (CDPR 2003) if they damaged scenic resources within a state scenic highway, substantially adversely effected a scenic vista, degraded the existing visual character or quality of a site, or created a new source of light or glare which would adversely affect daytime or nighttime views in the area. In addition, the general plan also calls out the following specific goal relating to aesthetics:

- **Goal RD-1:** Consider natural, aesthetic, and historic aspects of the dam and its surroundings in future management of Malibu Creek.
  - Guidelines:
    - **RD-1.1:** Coordinate with USACE to evaluate the feasibility of removing Rindge Dam.
    - **RD-1.2:** Conduct comprehensive research and recordation of the historic structure prior to any modification or removal.
    - **RD-1.3:** Evaluate opportunities to include the history of the Ridge Dam in exhibits focusing on early agriculture in the region.

City of San Buenaventura Comprehensive Plan

The City of San Buenaventura (normally referred to as Ventura) Comprehensive Plan identifies criteria for consideration for projects within the city limits (City of Ventura, 2010). The plan contains specific discussion of the Ventura Harbor area, and also includes considerations related to visual and aesthetic resources (Appendix X).

Engineering Manual 1110-2-38, Environmental Quality in Design of Civil Works Projects

The USACE Engineering Manual directs the avoidance and minimization of impacts on aesthetic resources by the planning and design of projects to make positive contributions to aesthetic values.

Visual Resources Assessment Procedure for the US Army Corps of Engineers

The Visual Resources Assessment Procedure (VRAP) for the USACE (EL-88-1) was published in 1988. The VRAP is a method to: 1) evaluate and classify existing aesthetic or visual quality; 2) assess and measure visual impacts caused by a USACE water resource project; 3) evaluate the beneficial or adverse nature of the visual impacts; and 4) make recommendations for changes in plans, designs, and operations of water resource projects.

3.8 Recreation Resources

The study area includes publicly managed lands and privately owned facilities that provide a variety of recreational opportunities. Rindge Dam and Upland Site F are within Malibu Creek State Park, operated by CDPR. The beach adjacent to Malibu Pier is primarily eroded away with little direct use. However, the adjacent beach to the west is Surfrider Beach, which is a high traffic recreational destination. Ventura Harbor is accessible to recreational boats.

Various recreational areas and facilities within the study area are operated by Federal, state, county, city and private entities. Recreational opportunities include camping, mountain biking, and horseback riding. Aquatic based activities include boating, surfing, fishing, kayaking and swimming. Bird watching and wildlife viewing are also popular.

3.8.1 *Santa Monica Mountains National Recreation Area (SMMNRA)*

The NPS operates the SMMNRA that encompasses over 150,000 ac within both Los Angeles and Ventura counties. Of this amount 69,099 ac are protected parkland. Federal, state, county, city and private entities maintain and operate lands within the SMMNRA. The Santa Monica Mountains connect these lands and open space areas together through a system of trails. The recreation area extends from the Hollywood Bowl on the east, 46 mi west to Point Mugu and averages 7 mi in width. To the north, Simi Valley, the San Fernando Valley, and communities that have developed along Hwy 101 border the SMMNRA.

The SMMNRA was established in 1978 and includes the portion of Malibu Creek State Park and Malibu Lagoon State Park potentially affected by project alternatives included as part of this Integrated Report. The Federal government owns about 15% (22,093 ac) of the SMMNRA land managed directly by the NPS, but the NPS "oversees" the entire area comprised of multiple land owners. The CDPR, holds about 23% (34,909 ac) of the SMMNRA. These two organizations are the largest managing agencies within the SMMNRA. Other land owners are listed in **Table 3.8-1** (NPS, 2008).

Table 3.8-1 Land Owners within the Santa Monica Mountains National Recreation Area

Land Owner	Acres	Percentage of Area
Other Private Land	72,638	0.49
State Dept. of Parks and Recreation	34,909	0.23
National Park Service	22,093	0.15
Other Los Angeles County Land (non-parkland)	3,258	0.02
Mountain Resources Conservation Authority	5,729	0.04
Santa Monica Mountains Conservancy Land	2,922	0.02
University of CA Reserve	328	0.00
Other city of Los Angeles Land (non- parkland)	2,021	0.01
Miscellaneous Public Land	265	0.00
Other Federal Land	936	0.01
Mountain Restoration Trust	1,491	0.01
Los Angeles County Parkland	328	0.00
City of Calabasas Parkland	245	0.00
City of Los Angeles Land	447	0.00
City of Thousand Oaks Parkland	36	0.00
Las Virgenes Municipal Water District	1,198	0.01
Total	148,884	1.00

3.8.2 *Applicable Federal Laws and Executive Orders*

Multiple Federal and Executive Orders govern Federal water projects and recreation as described below.

Federal Water Project Recreation Act of 1965, as amended

The Federal Water Project Recreation Act of 1965, as amended requires that any Federal water project must give full consideration to opportunities afforded by the project for outdoor recreation and fish and wildlife enhancement.

National Trails System Act

The Act recognizes the increasing popularity of outdoor recreation, and the need to promote access to, and enjoyment of, urban and more-remote outdoor areas.

Executive Order 13195, Trails for America in the 21st Century

The executive order directs Federal agencies, to the extent permitted by law and where practicable, to protect, connect, promote, and assist trails of all types.

3.8.3 *Recreation Management Agencies*

California Department of Parks and Recreation

CDPR operates Malibu Creek State Park and the associated Tapia Park Unit, Malibu Lagoon State Beach. Malibu Creek is contained within the Malibu Creek State Park from Malibu Dam to the confluence with Malibu Lagoon and within Malibu Lagoon State Beach. A large portion of the project area falls within the boundaries of Malibu Creek and Malibu Lagoon State Parks, managed by CDPR. Specific sites on CDPR land include Rindge Dam, the majority of Malibu Creek within the project area, two upstream barriers (LV1 and LV2), Upland Site F, and the Malibu Pier parking lot.

Malibu Lagoon State Beach

Malibu Lagoon State Beach encompasses 22 acres of wetlands and beach. Malibu Lagoon State Beach is located approximately 13 mi west of Santa Monica via the PCH, and approximately 12 mi from the Hwy 101 Las Virgenes Road exit. The state beach features guided tours, and exhibits, and programs. Guided tours of the wetlands and culturally significant areas are conducted seasonally. Malibu Pier and the associated parking lot offers access to saltwater fishing, wildlife viewing, dining, and concessions. Other recreational opportunities include swimming, surfing, and nature walks throughout the lagoon area (CDPR 2005).

Malibu Creek State Park

Malibu Creek State Park encompasses 7,553 ac. The park headquarters is located 4 mi south of Hwy 101 on Malibu Canyon Road/ Las Virgenes Road, and several miles upstream from Rindge Dam. The park contains over 40 mi of trails, and includes a total of 27 trails. Hiking and equestrian uses are permitted on all trails. Biking is allowed on 14 of the trails, totaling 26.3 mi available. Camping is allowed only in designated areas south of the main park entrance. Rock climbing and bouldering are permitted within the park, with routes ranging from beginner to advanced, including several difficult sport routes (CDPR 2005).

Currently, there are no established trails in the upstream or downstream vicinity of Rindge Dam. There are several hiking trails that begin in the vicinity of the Serra Retreat residences about one mile upstream from the mouth of Malibu Creek. These trails do not extend beyond the Big Bend area of the Creek, about 1.75 mi downstream from Rindge Dam. CDPR and stakeholder feedback have previously indicated that there was not strong backing for creation of a continuous trail leading from the Malibu Lagoon area, past the Rindge Dam area, to established trails several miles upstream near the park headquarters. A trail could be established within the Dam area, or from the Dam upstream. There were concerns regarding the establishment of a trail downstream of the Dam due to the close proximity of the Creek to private residences. There were also issues related to opening access to the public in areas that contain threatened and endangered species and sensitive habitats.

The Malibu Creek State Park Final General Plan (2005) describes the goals and guidelines for the maintenance of the recreational facilities and areas within the state park.
Goal REC – 1: Accommodate diverse recreational uses while protecting the wilderness experience and protecting cultural and natural resources.
Guideline:

- *Rec-1.1* Accommodate existing recreational opportunities and work to ensure compatibility between existing users. Evaluate new and emerging recreational activities and trends for safety, environmental impacts, and compatibility with existing uses, consistent with park guidelines.
- *Rec-1.2* Create trail linkages to minimize recreationalist's off-trail impacts to natural resources.
- *Rec-1.3* Provide trail maps to recreational enthusiasts, which explain signage, rules, routes and trail etiquette.
- *Rec-1.4* Provide bilingual signage that clearly marks the trails and reinforces rules and policies of trail usage.
- *Rec-1.5* Provide bilingual interpretive signage or other interpretive media that enhance the visitor's understanding and appreciation of the resources along the trails.

<u>Los Angeles County Department of Beaches and Harbors</u>

Los Angeles County Department of Beaches and Harbors maintains 19 beach areas throughout Los Angeles County. Surfrider Beach is a county maintained beach within the study area, and often identified as one of southern California's premier surfing areas. Recreational opportunities on include surfing, swimming, and fishing (LA County Department of Beaches and Harbors 2005).

<u>City of Malibu Parks and Recreation Department</u>

The City of Malibu operates seven facilities for public use excluding various sports fields, but none are within the project area. A list of recreational areas within the City of Malibu as show in **Table 3.8-2** (City of Malibu, 2005).

Table 3.8-2 City of Malibu Recreational Facilities and Areas

Park and Facilities	Location	Uses/ Facilities
Charmlee Wilderness Park	2577 S. Encinal Canyon Road	590 acre Wilderness Park; Picnic Area; 8 miles of hiking trails; Nature Center
Las Flores Creek Park	3805 Las Flores Road	General Use Park
Malibu Bluffs Park	24250 Pacific Coast Highway	6 acre Community Park; 2 Baseball Diamonds; Soccer Field, Picnic Tables; Jogging Path
Malibu Community Pool	30215 Morning View Drive	Swim Hours; Swimming Lessons; Club Programs
Malibu Equestrian Park	6224 Merritt Drive	2 Riding Rings, Picnic Area

<u>City of Calabasas</u>

The City of Calabasas owns and operates 11 recreational facilities including City Hall, a tennis and swim center, a community center, and eight community parks. None are within the project construction footprint, although several are within the project area, along major roadways. A list of recreational areas within the City of Calabasas is shown in **Table 3.8-3** (City of Calabasas, 2005).

Table 3.8-3 City of Calabasas Recreational Facilities and Areas

Park and Facilities	Location	Uses/ Facilities
Calabasas City Hall	26135 Mureau Rd.	Various city uses
Tennis & Swim Center	23400 Park Sorrento	Includes Swimming lap pool, children's pool, 16 tennis courts, weight room and lockers
Agoura Hills/ Calabasas Community Center	27040 Malibu Hills Rd.	Aerobic facility, various outdoor courts, refreshment area
Grape Arbor Park	Corner of Canwood & Parkville	General Use Park
Juan Bautista de Anza Park	3701 Lost Hills Rd.	Building and recreational areas for rent, Large picnic areas
Freedom Park	Corner of Parched & Balcony	General Use Park
Gates Canyon Park	25801 Thousand Oaks Blvd.	General Use Park
Highlands Park	23581 Summit Dr.	.5 acre park, children's play area
Calabasas Creekside Park	3655 Old Topanga Canyon Rd.	General Use Park
Bark Park	4232 Las Virgenes Rd.	Dog Park
Wild Walnut Park	Old Topanga Canyon Rd. & Mulholland Hwy.	General Use Park

<u>Ventura Port District</u>

Ventura Harbor is operated by the Ventura Port District. Ventura Harbor is a mixed used harbor containing commercial and private access. Recreational resources available at the harbor includes dining, recreational fishing and other recreational boating opportunities, and the Channel Islands National Park headquarters and boat launch facility. The majority of public and recreational access facilities are on the southern and seaward sides of the harbor along Spinnaker Drive, which is outside of the project area. Along the northern landward side of Ventura Harbor, public and recreational facilities include several dining establishments, access to sport-fishing boat slips, and the Harbortown Point Marina Resort.

3.9 Transportation

3.9.1 *Existing Road System*

For the purposes of the transportation baseline conditions description, the existing roadway system is defined as the routes that could be used to access the study area. Roadways located within the vicinity of Rindge Dam are shown in **Figure 3.9-1**. Additional roadways that would be utilized for sediment transport to Ventura Harbor S. Victoria Ave, Olivas Park Dr, Harbor Blvd, Schooner Dr, and Anchors Way in Ventura (See **Figure 3.9-1** for route details).

Within the vicinity of Rindge Dam, roadway transportation consists of the two-lane Malibu Canyon Road, which runs north-south through the study area. This is the only road providing local access to Malibu Canyon. Direct roadway access to and from Malibu Canyon near the Rindge Dam area is non-existent. Piuma Road intersects Malibu Canyon Road about 1.3 mi north of Rindge Dam and is a two-lane road serving local residential areas within the Santa Monica Mountains. North of Piuma Road, Malibu Canyon Road continues as Las Virgenes Road.

Malibu Canyon Road, along with Las Virgenes Road, is defined as a Scenic Highway from the PCH in Malibu to Lost Hills Road in the City of Calabasas. Other nearby roadways serving the Study area include Mulholland HWY, PCH and Lost Hills Road. Mulholland HWY runs through the Santa Monica Mountains generally parallel to the coast, and is designated as a scenic highway east of Topanga Canyon Rd. PCH is primarily a four-lane road with a median, running east-west through the City of Malibu along the Pacific Ocean. PCH serves as the southern terminus to Malibu Canyon Road. PCH is also designated as State Route (SR) 1 in the California Freeway and Expressway System. Lost Hills Road is located in the City of Calabasas and provides a key connection to Las Virgenes Road from Hwy 101. It is primarily a four-lane road with a center divider. Major freeway access is limited to Hwy 101, which intersects Las Virgenes Road and Lost Hills Road in Calabasas. Hwy 101 is located about six miles north of the study area. Hwy 101 has four lanes and a discontinuous auxiliary lane in each direction in the vicinity of the project site. Pertinent traffic volumes along all regional routes (highways and freeways) were obtained from traffic counts collected by the Caltrans in 2011 (**Figure 3.9-1**).

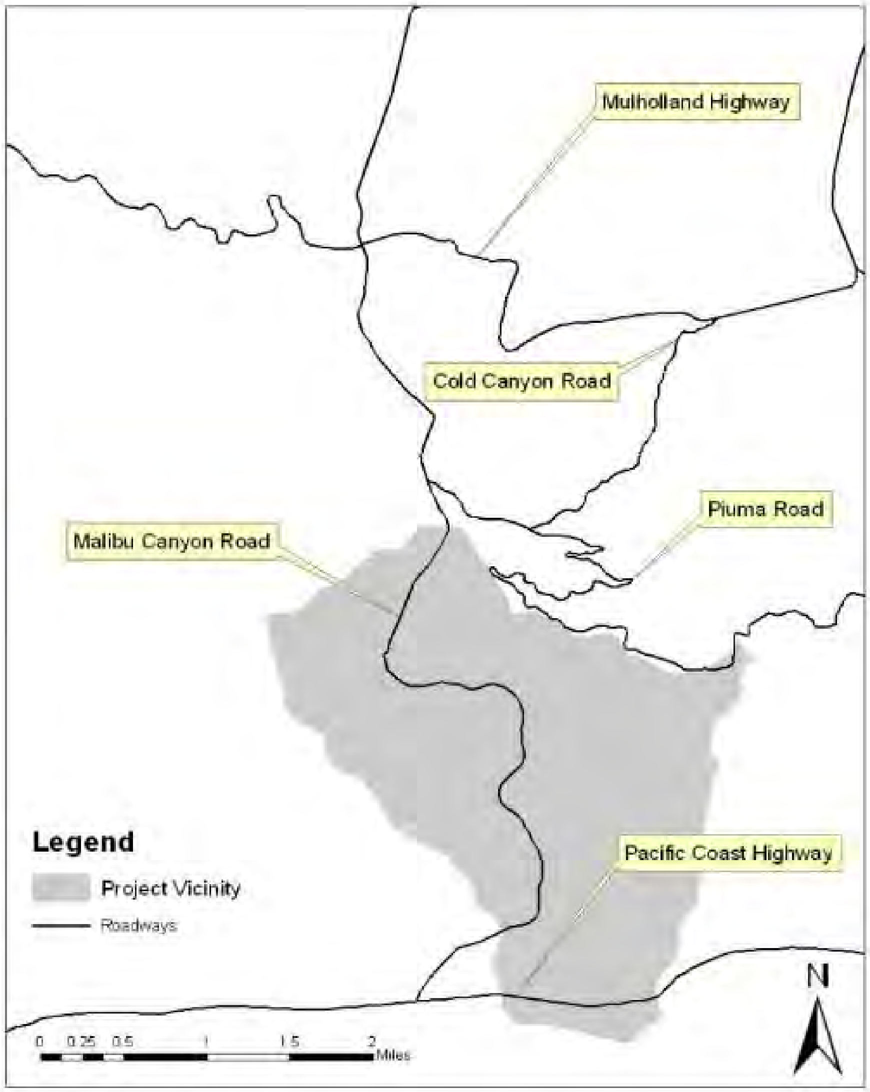


Figure 3.9-1 - Map of the Rindge Dam Vicinity

Table 3.9-1 Traffic Volumes for Regional Routes

Freeway/Highway	Location	AM Peak Hour Volume	PM Peak Hour Volume
State Route 1 (PCH)[1]	East of Malibu Canyon Road	3,751	3,675
State Route 1 (PCH)[1]	West of Malibu Canyon Road	3,081	3,019
Northbound Hwy 101	West of Lost Hills Road	7,204	6,235
Southbound Hwy 101	West of Lost Hills Road	5,816	6,493
Northbound Hwy 101	East of Las Virgenes Road	7,749	6,707
Southbound Hwy 101	East of Las Virgenes Road	6,256	6,983

Available traffic volumes were gathered along nearby local routes from counts collected by the LACDPW in 2012 (**Table 3.9-2**). At locations where year 2012 traffic counts were not available, traffic volumes under year 2012 conditions were developed using the most recent available counts at the time of the analysis and the growth factors calculated from historic LACDPW counts. Traffic count sheets for historic and most recent counts available along local routes are included in **Appendix N**. The route from Malibu Canyon to Ventura Harbor, where barge loading of sediment would occur under some variations of Alternative 2, consists primarily of US 101 (described above) until reaching the general vicinity of Ventura Harbor, where the main routes of Victoria Ave. and Olivas Park Road will be used to access the harbor. Minor roads around the harbor to be utilized Harbor Blvd, Schooner Drive, and Anchors Way. Since traffic counts for the route from Rindge Dam to Ventura Harbor beyond US 101 were not available, Intersection Capacity Utilization (ICU) and Level of Service (LOS) data at applicable intersections was utilized to inform analyses (**Table 3.9-3**; **Appendix N**).

Table 3.9-2 2012 Traffic Volumes along Local Routes

Roadway	Location	AM Peak Hour Volume	PM Peak Hour Volume
Malibu Canyon Road	North of Potter Drive	1,723	1,555
Malibu Canyon Road	South of Piuma Road	1,668	1,574
Las Virgenes Road	South of Mulholland Highway	2,387	2,365
Las Virgenes Road	North of Agoura Road	1,797	2,731
Lost Hills Road[1]	North of Agoura Road	1,722	1,782

[1]Traffic volumes were developed using 2008 counts collected by CDM Smith (previously CDM) and growth factors developed from historic LACDPW counts.

Table 3.9-3 Peak Intersection Utilization (ICU) and Level of Service (LOS) for major routes through Ventura County (City of Ventura, 2005)

Segment / Intersection	ICU & (LOS)
US 101 at Victoria Ave.	0.66 AM (B) / 0.60 PM (A)
Victoria Ave. at Olivas Park	0.77 AM (C) / 0.79 PM (C)
Victoria Ave. at Valentine Rd.	0.43 AM (A) / 0.61 PM (B)
Olivas Park at Telephone Rd.	0.53 AM (A) / 0.66 PM (B)
Olivas Park at Harbor Blvd.	0.39 AM (A) / 0.54 PM (A)

3.9.2 *Other Transportation Resources*

<u>Bus Transit</u>

Several transit agencies provide public transportation access near the Study area. The Los Angeles County Metropolitan Transportation Authority (Metro) serves the City of Malibu and the City of Calabasas. The City of Calabasas and the Los Angeles Department of Transportation (LADOT) also serve Calabasas. Metro Route 534 is an express bus line that serves several stops throughout Malibu and passes through Santa Monica before heading to the Washington/Fairfax Transit Center in West Los Angeles. Commute bus service is provided to the City of Calabasas via LADOT's Commuter Express Route 423 operating toward downtown Los Angeles during the AM peak period and from downtown Los Angeles for the PM peak period. Local bus service is provided to the City of Calabasas by Metro's Local Route 161, with several stops within the city. Other limited transit service is provided by the City of Calabasas within its city limits, consisting of infrequent circulation routes serving high-demand locations of interest. A summary of bus lines and services areas are shown in **Table 3.9-4**.

Table 3.9-4 Bus Service within the Study Area

Transit Agency	Route Number	Frequency (minutes)	Service Type	City Served	Stops Served Near Study area
Metro	534	15-30	Express	Malibu	Malibu Canyon Rd/Civic Center Way, Malibu Canyon Rd/PCH
Metro	161	30-60	Local	Calabasas	Agoura Rd/Lost Hills Rd, Agoura Rd/Las Virgenes Rd
City of Calabasas	1	90-120	Local	Calabasas	Agoura Rd/Lost Hills Rd, Agoura Rd/Las Virgenes Rd, Lost Hills Rd/Las Virgenes Rd
City of Calabasas	Calabasas Trolley[1]	60	Local	Calabasas	Agoura Rd/Lost Hills Rd, Agoura Rd/Las Virgenes Rd, Lost Hills Rd/Las Virgenes Rd
City of Calabasas	2	One AM and PM trip[2]	Local	Calabasas	Lost Hills Rd/Malibu Hills Rd
City of Calabasas	5	One AM and PM trip[2]	Local	Calabasas	Lost Hills Rd/Cold Spring St, Lost Hills Rd/ Malibu Hills Rd, Las Virgenes Rd/Willow Glen St
LADOT	423	15	Commuter	Calabasas	Agoura Rd/Lost Hills Rd, Agoura Rd/Las Virgenes Rd

Source: Los Angeles Metropolitan Transportation Authority, City of Calabasas, Los Angeles Department of Transportation (2013)
Notes: [1]Calabasas Trolley primarily operates on Saturdays and Sundays. Weekday frequencies are for Friday evening only.
[2] Calabasas Routes 2 and 5 only operate once during the AM peak school arrival and PM peak school departure periods.

Existing Rail Facilities

The Union Pacific Railroad (UPRR) provides freight rail operations within Ventura and Los Angeles Counties. Near the Study area, UPRR runs the Coast Line railroad line, running south near the Pacific Ocean coastline through Oxnard and Ventura, then east through Simi Valley and Northridge, before merging with other rail lines in Burbank and heading south into downtown Los Angeles. The Coast Line runs approximately 14 mi north of the study area and about 10 mi north of Calabasas.

Passenger rail service is provided by Metrolink commuter rail service along the Ventura County line, which connects Ventura and Oxnard with Los Angeles through the San Fernando Valley. The nearest Metrolink station to the main study area is located in Simi Valley, approximately ten miles to the north. The Ventura Metrolink station is about 3.5 mi east of the Ventura Harbor barge loading site, although the haul route along US 101 passes directly past the station. In addition, Amtrak provides rail service via the intercity Pacific Surfliner train route, which connects cities in southern California between San Luis Obispo and San Diego. Near the study area, Amtrak and Metrolink utilize the same route using UPRR’s tracks. No rail service exists in Malibu or the Malibu Canyon area.

Airport Facilities

There are five major airports that serve the Los Angeles area, as well as several other general aviation airports. The closest two major airports are Los Angeles International Airport (LAX) and Bob Hope International Airport (BUR), located in Burbank. LAX is approximately 20 mi southeast of the study area and BUR is approximately 25 mi northeast of the study area. The nearest general aviation airports are the Santa Monica Municipal Airport, which is approximately 15 mi east of the study area, and the Van Nuys Airport, around 20 mi northeast of the study area.

Harbors

Both commercial and recreational harbors exist within both Los Angeles County and Ventura County. In Los Angeles County, commercial harbors include the Port of Los Angeles and Port of Long Beach, approximately 43 mi and 48 mi away, respectively. Port Hueneme, in Ventura County, is a deep-water commercial harbor that is approximately 35 mi from the main study area and approximately 8 mi south of Ventura Harbor. Recreational harbors within Los Angeles County are Marina Del Rey and Redondo Beach Harbor.

Ventura Harbor is a mixed use recreational and commercial harbor that supports approximately 1500 craft, 10 sport fishing, and 73 commercial fishing vessels. Ventura Harbor also contains a fish processing facility, offshore oil drilling support facility, the headquarters for the Channel Islands National Park, and two public boat launches. Ventura Harbor is home to a wide range of businesses including full service marinas, dive and fish excursion companies, bait and fuel docks, shopping, dining, entertainment, and the Four Points Sheraton luxury hotel and conference center.

3.9.3 *Applicable Transportation Policies and Regulations*

Construction activities resulting from implementation of any of the alternatives described could potentially affect traffic flow of roadways on local roadways and freeways, which will require coordination, and potentially legal agreements with, appropriate public agencies (i.e., Caltrans, County of Los Angeles, City of Malibu, City of Ventura, County of Ventura, and City of Calabasas).

As described in Section 5.9, a transportation management plans will be developed during detailed design to address any transportation or traffic related issues. This plan would be subject to approval by the responsible jurisdictions and would be required to incorporate the standards and techniques presented in such references as the Caltrans Traffic Manual, Manual of Traffic Controls for Construction and Maintenance Work Zones, the Work Area Traffic Control Handbook, the Standard Specifications for Public Works Construction, and the Manual on Uniform Traffic Control Devices (MUTCD). The transportation plan would include traffic control measures and other procedures that may be necessary during construction.

3.10 Land Use

3.10.1 *Current Land Use Patterns*

The Southern California Association of Governments (SCAG) has identified 28 separate land use types within the 3,248-ac study area. Although the watershed is modified by residential development, reservoirs, and agricultural operations, a large majority of the land is held as part of the SMMNRA, including Malibu Creek State Park and Malibu Lagoon State Beach, operated by the CDPR, or is part of unincorporated Los Angeles County. Of this 3,248-ac area 2,866 ac are classified as “vacant undifferentiated”, which comprises over 88% of the total study area. Approximately 12% of the project area in the vicinity of Rindge Dam is identified for various non-vacant purposes. Residential areas including high density, low density, and rural residential zoning constitutes 6.1% of the total study area. Approximately 1% of the total TSP vicinity is identified as retail center or office space. **Table 3.10-1** describes total acreages in the TSP vicinity by land use type as defined by the SCAG (SCAG; data provided by AIS).

Figure 3.10-1 depicts current land use. The majority of the study area as well as the entire City of Malibu is within the Coastal Zone as defined by the California Coastal Act (City Malibu 2005). Eight barriers to aquatic species on Cold and Las Virgenes Creeks are proposed for removal under the NER and LPP.

Table 3.10-1 City of Malibu Recreational Facilities and Areas

Land Use Type	Acres	Land Use Type	Acres
Residential	149.43	Agriculture	
Low-Density Single Family Residential	39.35	Nurseries	14.25
High-Density Single Family Residential	4.64	Orchards and Vineyards	8.9
Low-Rise Apartments, Condominiums, and Townhouses	12.83	Government / Public Facilities	
Rural Residential, Low-Density	149.43	Government Offices	11.83
Commercial		Police and Sheriff Stations	3
Retail Centers	22.84	Other Public Facilities	4
Low- and Medium-Rise Major Office Use	7.01	Fire Stations	0.48
Modern Strip Development	10.74	Maintenance Yards	1.58
Manufacturing, Assembly, and Industrial Services	3.37	Vacant/ State Park Land	
Open Storage	6.77	Vacant Undifferentiated	2864.44
Recreation		Other	
Horse Ranches	17.44	Research and Development	22.84
Golf Courses	10.75	Religious Facilities	4.89
Beaches (Vacant)	5.76	Communication Facilities	3.31
Beach Parks	5.21		
Developed Local Parks and Recreation	3.72		
Other Open Space and Recreation	2.79		
Developed Regional Parks and Recreation	3.18		

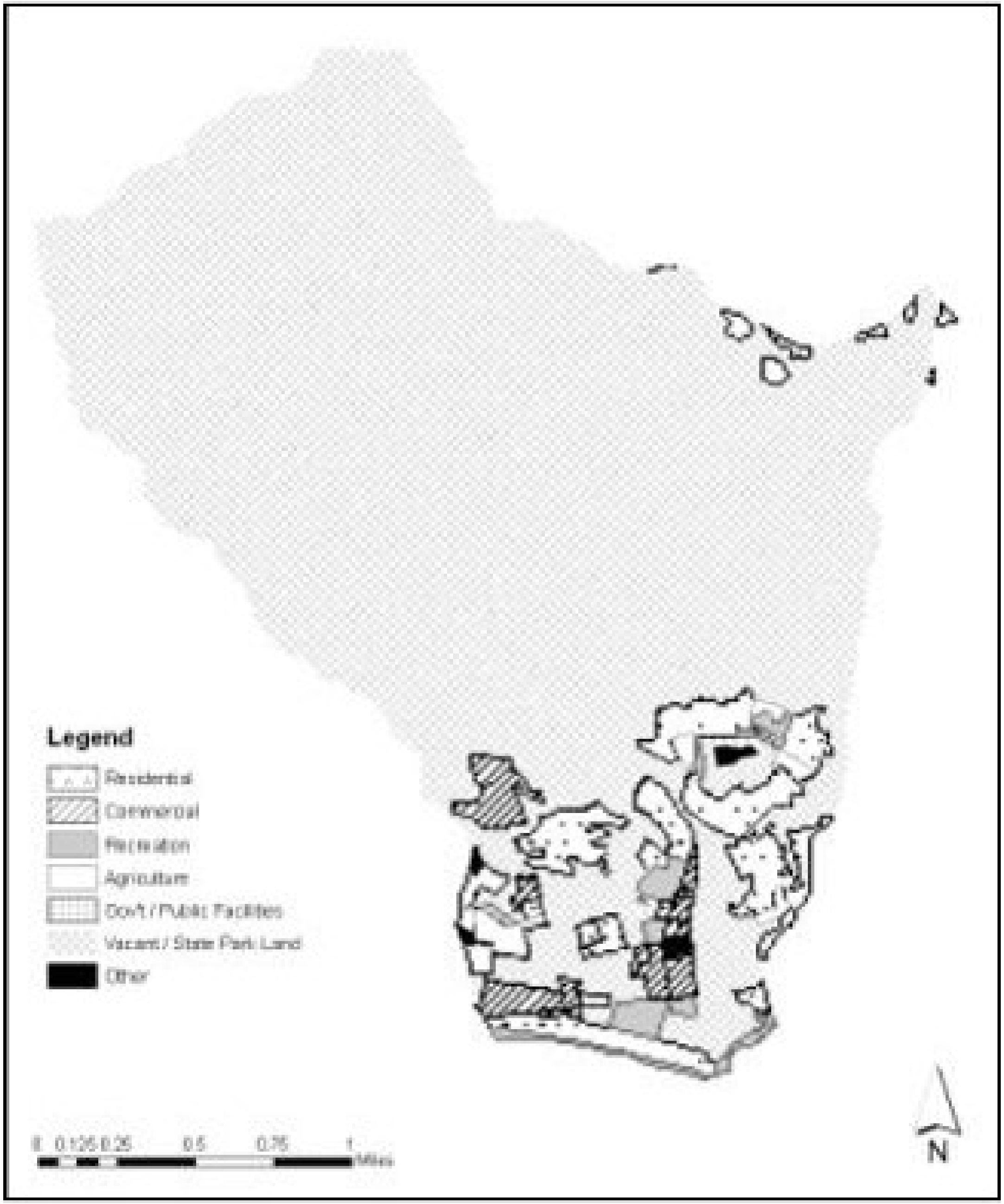


Figure 3.10-1 - Land Use within the Study Area

Upstream Barriers Identified for Removal

LV1 – Crag's Road Culvert

The Crag's Road culvert is a double 6-ft diameter concrete box culvert bridge with concrete abutments and wing walls. The barrier is located within Malibu Creek State Park. It is impassable to fish, but is not a terrestrial barrier. Surrounding vegetation is a primarily native riparian species with some non-native vegetation.

LV2 – White Oak Dam

White Oak Dam is approximately 6 ft high, 86 ft wide and 6 t long. It is surrounded by a narrow riparian corridor with native and non-native species and is located within an undeveloped, area of Malibu Creek State Park. It is passable to fish at high flows and does not present a terrestrial barrier.

LV3 and LV4 – Lost Hills Road Culvert and Meadow Creek Lane Crossing

The Lost Hills Road culvert and Meadow Creek Lane crossing are large concrete channel structures with concrete aprons. The Lost Hills Road culvert is approximately 23 ft high, 61 ft wide, and 241 ft long with four 14-ft by 14-ft openings. It is typically silted in and supports wetland vegetation including cattails, rabbitsfoot grass, and nutsedge. The Meadow Creek Lane crossing is a concrete culvert similar to the Lost Hills Road culvert in size with an approximately 14-ft wide vertical concrete drop structure at the end. The concrete wingwalls adjacent to the drop structure are cracked and failing. Both barriers are impassable to fish, other aquatic species, and small terrestrial animals. Both barriers are surrounded by developed areas.

CC1- Piuma Culvert

The Piuma Road culvert is a metal arch culvert with stone wing walls and a concrete invert. It is approximately 11 ft high, 12 ft wide and 46 ft long and located near Malibu Creek State Park. It is not passable to fish or other aquatic species but does not present a terrestrial barrier. It is surrounded by native and non-native vegetation within a largely undeveloped, rural area.

CC2 – Malibu Meadows Road Crossing

The Malibu Meadows Road crossing is a steel beam bridge with a wood deck, concrete invert, and metal abutments and wing walls. It is approximately 4 ft high, 28 ft wide and 40 ft long. It is passable to fish at high flows and does not present a terrestrial barrier. It is surrounded by primarily native riparian vegetation and located within a private development that supports a fair amount of natural vegetation.

CC3 – Crater Camp Road Crossing

The Crater Camp Road crossing is a steel beam bridge with wood deck and concrete invert, similar to the Malibu Meadows Road Crossing. This barrier is not passable to fish but does not present a terrestrial barrier. It is located very close to the Malibu Meadows Road crossing, and is also surrounded by primarily native riparian vegetation within a private development that supports a fair amount of natural vegetation.

CC5 – Cold Canyon Road Culvert

The Cold Canyon Road Culvert is a 25-ft diameter concrete culvert with a short concrete apron and large boulder/bedrock pool at its outlet. It is not passable to fish and presents a barrier to other aquatic species and large terrestrial species. It is surrounded by mostly native riparian vegetation and located within an undeveloped open space area.

Malibu Creek Project Reaches

Malibu Creek from Malibu Dam to its mouth is also part of the Malibu Creek State Park and Malibu Canyon State Beach and is the focus for restoration opportunities of the TSP. The Malibu Creek Project Reaches are described below and shown in **Figure 1.10-1**.

Reach 5: Rindge Dam to Cold Creek Confluence

The entire portion of this Reach that is north and then east of Malibu Canyon Road is operated by CDPR. The area south of Malibu Canyon Road at Rindge Dam is identified as vacant undifferentiated. Malibu Canyon Road turns northward and the ownership of the land to the west transfers to the CDPR. Upstream of this point all of the land in Reach 5 is owned and operated by the state of California (SCAG data provided by AIS).

Reach 4: Big Bend Pool on Malibu Creek to Rindge Dam

This Reach is partly located in an unincorporated area of Los Angeles County. To the east of Malibu Canyon Road is the area that is operated by CDPR, Malibu Creek State Park. Land classified as vacant undifferentiated, a portion of which is part of unincorporated Los Angeles County, and land designated rural residential occupy the remainder of the Reach.

Reach 3: Cross Creek Rd. Intersection and Big Bend Pool

Continuing northward the City of Malibu's city limits end and the Park widens to Malibu Canyon Road on the west and the eastern extent of reach 3 on the east. Within the city limits in Reach 3 there are 13 separate land uses, including low-density single family residential, low rise apartments, nurseries, government offices, low and medium rise major offices, high density single family residential, research and development, and a religious facility. Horse stables and vacant undifferentiated land uses comprise the remainder of the Reach. Some of this vacant area is part of unincorporated Los Angeles County.

Reach 2: Pacific Coast Highway to Bridge over Cross Creek Road

Immediately to the west of Malibu Lagoon/ Malibu Creek are retail centers, modern strip development, low and medium rise major office uses, communication facilities, a developed local park, two areas of open storage, maintenance yards, manufacturing services, horse stables and an area of low density single family residential housing. To the west of this center are government facilities attached to a police/ sheriff station. To the southwest of these facilities is a developed area that contains retail centers, modern strip development and government offices. A low-density single family residential area occurs on the east side of Malibu Lagoon and Malibu Creek along with an area of orchards and vineyards. The remainder of the land within Reach 2 is classified as vacant undifferentiated.

Reach 1: Malibu Lagoon to Pacific Coast Highway

There are eight separate land uses within Reach 1. Malibu Lagoon is managed by the CDPR as part of Malibu Lagoon State Beach from the southernmost point of the lagoon upstream to PCH. Public and semi-public facilities, high density single-family residential housing, a golf course, and developed regional parks occupy the majority of the area. Low and medium major office uses also occur in the area. The area adjacent to the ocean, Malibu Surfrider Beach is operated as a Los Angeles County Regional Park by DBH and is classified as a Beach Park. The remainder of the land in Reach 1 is classified as vacant undifferentiated.

Malibu Pier: Shoreline and Offshore Placement Sites

Malibu Pier is just east of the Malibu Lagoon and Surfrider Beach. The proposed shoreline and near-shore placement sites are just east of the Malibu Pier. The beach along the east side of Malibu Pier has been primarily eroded away. This beach is an eastern extension of Surfrider Beach, which is a highly popular public beach utilized for surfing, swimming, and fishing. Malibu Pier is a mixed used public pier with dining, fishing, and other recreational activities.

Upland Site F: Temporary Staging Site

Upland site F is a temporary storage site for sediment proposed for use under the NER. Upland site F is located within Malibu Creek State Park just north of Mulholland Hwy and just east of Malibu Canyon Road (**Figure 4.4-9**), and is managed by CDPR. Upland Site F primarily consists of fallow fields filled with native and non-native grasses, surrounded by the rolling hills of the Santa Monica Mountains, and adjacent to minor tree-lined creeks.

Ventura Harbor

Ventura Harbor is a mixed use recreational and commercial harbor that supports approximately 1500 craft, 10 sport fishing, and 73 commercial fishing vessels. Ventura Harbor also contains a fish processing facility, offshore oil drilling support facility, the headquarters for the Channel Islands National Park, and two public boat launches. Ventura Harbor is home to a wide range of businesses including full service marinas, dive and fish excursion companies, bait and fuel docks, shopping, dining, entertainment, and the Four Points Sheraton luxury hotel and conference center.

3.10.2 *Applicable Policies and Regulations*

The majority of the project area in the vicinity of Rindge Dam (excluding the haul route and Ventura Harbor) includes land operated by CDPR and unincorporated areas of Los Angeles County. The Los Angeles County General Plan and Malibu Creek State Park General Plan govern these areas. The portion of the study area that lies within the City of Malibu is governed by the City of Malibu General Plan.

Over the period of analysis, it is conservatively assumed that all lands within existing City boundaries and unincorporated Los Angeles County that are not protected will be developed. Within the 110-square mile Malibu Creek watershed, this means that approximately an additional 39 mi^2 (24,960 ac) within existing city boundaries will be developed.

Within the watershed, lands in unincorporated Los Angeles County accounts for approximately 51 mi^2 (32,640 ac). Approximately 4.5 mi^2 (2,880 ac) is already developed. Of the remaining approximately 47.3 sq mi, the majority of this land is on slopes of greater than 50%. According to the Los Angeles County General Plan (2003), Criteria for Non-Urban Hillside Development, the highest allowable density within the unincorporated areas on this slope is 1 dwelling unit per 20 acres, or 1,632 units. A small remaining portion of unincorporated County land is on slopes between 25 and 50% (approximately 42 ac). The highest allowable density within the unincorporated areas on this more moderate slope is 1 dwelling unit per every 2 ac. It is assumed that both these areas will be developed to the extent allowable over the period of analysis, which, according to the Los Angeles County General Plan would entail an approximate additional 1,640 units in the unincorporated areas of the watershed.

Approximately 7.6 mi^2 (4,864 ac) of land within the watershed is operated by the National Park Service and other are Federal agencies as open space, and an additional approximately 11.8 mi^2 (7,552 ac) of land is operated by the CDPR and other State agencies. This area is currently dedicated open space and is projected to remain largely undeveloped and unimproved. Approximately 2.8 mi^2 of land is currently categorized as vacant, undifferentiated but is owned or operated by various municipal agencies or other. No projections have been made for this area.

The RWQCB and other agencies have stringent policies in place that require new development to have no net increase in discharge to natural watercourses in the watershed. Although over 47 mi^2 of steep slopes (greater than 50%) may be developed in the future, the impact on runoff is minimal due to the consideration of the density of development (1 dwelling per 20 ac) and the other regulatory restrictions on surface water discharges.

Malibu Creek State Park General Plan

While the CDPR works in coordination with surrounding local governments to ensure successful park planning and conservation development in the Park is not subject to the land use plans and policies of these agencies. Development within State Parks is regulated by State land use guidelines and regulations as described in the applicable General Plan, including requirements set forth under the California Coastal Act. The following specific goal from the General Plan pertains to land use:

- **Goal REG-2:** Participate in regional development processes to ensure protection of the integrity of natural, cultural, aesthetic, and recreational resources in and surrounding the Park.
    - Guidelines:
        - **REG-2.1:** Address the effects of adjacent planning and development on the natural, cultural, and aesthetic experience. Monitor the planning and permitting process and comment, where appropriate, as it relates to Park resources and opportunities.

- **REG-2.2:** Outreach to agencies and landowners will be used to encourage their participation and ensure their awareness of recommended planning projects and potential Department actions.
- **REG-2.3:** Actively coordinate with the California Coastal Commission to ensure that all development within the coastal zone is consistent with the adopted LCP.

Los Angeles County

Appendix A of the Land Use Element of the County of Los Angeles General Plan addresses Conditions and Standards for development of unincorporated County Areas. The unincorporated lands within the Study area have a designation of Open Space Areas and are subject to specific criteria for development by the County of Los Angeles. The County has identified compatible uses with these open space areas as those that are permitted in Zones O-S (Open Space) and W (Watershed) of the Los Angeles County Zoning Ordinance. These include uses such as a variety of agricultural, recreational, mineral extraction, and public and semi-public activities and services. If development is proposed that does not meet the classifications stated under compatible uses and is not intended for long term open space use the project will be reviewed and is subject to the following criteria:

- **Land Compatibility/ Suitability**. It shall be demonstrated that the subject property is capable of supporting the proposed development without increasing exposure to significant natural hazards or degrading identified critical natural resources. It shall further be established that access to the site is adequate to serve the intended use and that the provision of necessary services and facilities will not result in undue public costs.
- **Compatibility**. It shall be demonstrated that the proposed development is compatible, in terms of scale and designed character, with surrounding land use patterns. Appropriate use type and intensity standards shall be reflective of those existing or proposed for adjacent non-open space properties. It shall further be demonstrated that the scale, design and overall character of the proposed development will not adversely affect or significantly diminish the open space and recreational potential of adjacent resource areas.
- **Safety**. The Safety Element addresses the following issues within the unincorporated area: seismic hazards, geologic hazards, flood and inundation hazards, wildland and urban fires, and other safety issues such as management of hazardous materials, potentially hazardous buildings, critical facilities, emergency response resources, and safety- oriented research. As mandated by the Seismic Hazards Mapping Act of 1990, Seismic Hazard Zone Maps, published by the California Geological Survey, are incorporated by reference into the Element. These maps identify areas that are prone to earthquakes- related hazards including liquefaction, earthquake- induced landslides and amplified ground shaking (Los Angeles County General Plan 2003, California Department of Conservation, 2005).

City of Malibu

The City of Malibu addresses the goals, objectives and policies governing land use and development, and public health and welfare, in the city’s General Plan. Land Use Objective 1.1 states development should not degrade the environment. The policies that are emplaced to accomplish this are below.

- *Land Use Policy 1.1.1:* The City shall protect the natural environment by regulating design and permitting only land uses compatible with the natural environment.
- *Land Use Policy 1.1.2*: The City shall ensure that land uses avoid or minimize adverse impacts on water quality and other natural resources, such as undisturbed watershed and riparian areas.

Public health and welfare policies relating to public safety, land use, and earth resources include the following:

- *Safety Objective 1.2*: Risks to residents and businesses from development in hazardous areas are minimized.
- *Safety Policy 1.2.1*: The City shall require development to provide for analyses of site safety related to potential hazards of fault rupture, earthquake ground shaking, liquefaction, and rock falls.
- *Safety Policy 1.2.2:* The City shall require development to provide site safety analyses related to landscaping, debris flows, expansive soils, collapsible soils, erosion/sedimentation, and groundwater effects (City of Malibu 2005).

<u>City of Calabasas</u>

The City of Calabasas Municipal Code carries out the policies of the Calabasas General Plan by classifying and regulating the uses of land and structures within the city. The purposes of the City's municipal code include:

- Provide standards for the orderly growth and development of the city that will assist in maintaining a high quality of life without causing unduly high public or private costs for development or unduly restricting private enterprises, initiative or innovation in design.
- Implement the Calabasas general plan by encouraging the uses of land designated by the general plan and avoiding conflicts between land uses.
- Conserve and protect the natural resources of the city.
- Create a comprehensive and stable pattern of land uses upon which to plan transportation, water supply, sewerage and other public facilities and utilities (City of Calabasas 2005).

<u>California Coastal Commission</u>

The entire portion of City of Malibu that is within the Study area is part of the coastal zone overseen by the California Coastal Commission (CCC). The City's Local Coastal Program addresses several criteria dealing with future development within the coastal zone. These topics are described in Malibu's Local Coastal Program in Section 5 of the Land Use Element.

Coastal Act Provisions

The Coastal Act requires the protection of coastal resources, including public access, land and marine habitat, and scenic and visual quality. Focusing new development to areas in close proximity to existing development with available public services serves to minimize the impacts of remote "leap-frog" development that would require the construction of roads, utilities, and other services. Section 30250 of the Coastal Act requires that new residential, commercial, or industrial development is located near existing developed areas, and where it will not have significant adverse impacts, either individually or cumulatively on coastal resources. Additionally, Section 30250 establishes that land divisions outside existing developed areas can only be permitted where fifty% of existing parcels have already been developed and that the new parcels are no smaller than the average size of existing parcels.

Coastal Zone Management Act and California Coastal Act

The Coastal Zone Management Act (16 U.S.C. Section 1451 et seq.) preserves, protects, develops where possible, and restores and enhances the Nation's coastal zone resources. It additionally encourages and assists states in their responsibilities in the coastal zone through development and implementation of management programs. The California Coastal Act of 1976 (California Public Resources Code, Division 20, Section 30000 et seq.), as amended, protects and enhances coastal resources within the California Coastal Zone, including, but not limited to public coastal access, recreation, the marine environment, land resources and development.

3.11 Noise

3.11.1 *Environmental Baseline*

A brief background in acoustics is helpful in understanding how humans perceive various sound levels. Some useful definitions include:

- Acoustics are descriptions of sound wave generation and transmission,
- Sound is the physical oscillation or vibration of a medium, such as air, that can be perceived by an instrument, such as the human ear or a microphone, and
- Noise has commonly been categorized as loud, disruptive sounds that can annoy or cause harm to people.

Background noise is the aggregation of all perceptible, but not necessarily identifiable, sound sources (such as traffic, airplanes, and environmental sounds) that create a static ambient noise baseline.

Although extremely loud noises can cause temporary or permanent damage, the primary environmental impact of noise is annoyance. The objectionable characteristic of noise often refers to its loudness. Loudness represents the intensity of the sound wave or the amplitude of the sound wave height (measured in decibels [dB]). Decibels are calculated on a logarithmic scale; thus, a 10 dB increase represents a tenfold increase in intensity, while a 20 dB represents a hundredfold increase in intensity. Decibels are the preferred measurement of environmental sound because of the direct relationship between sound intensity and the subjective "noisiness" of it. The A-weighted decibel system (dBA) is a convenient sound measurement technique that weights selected frequencies based on how well humans can perceive them.

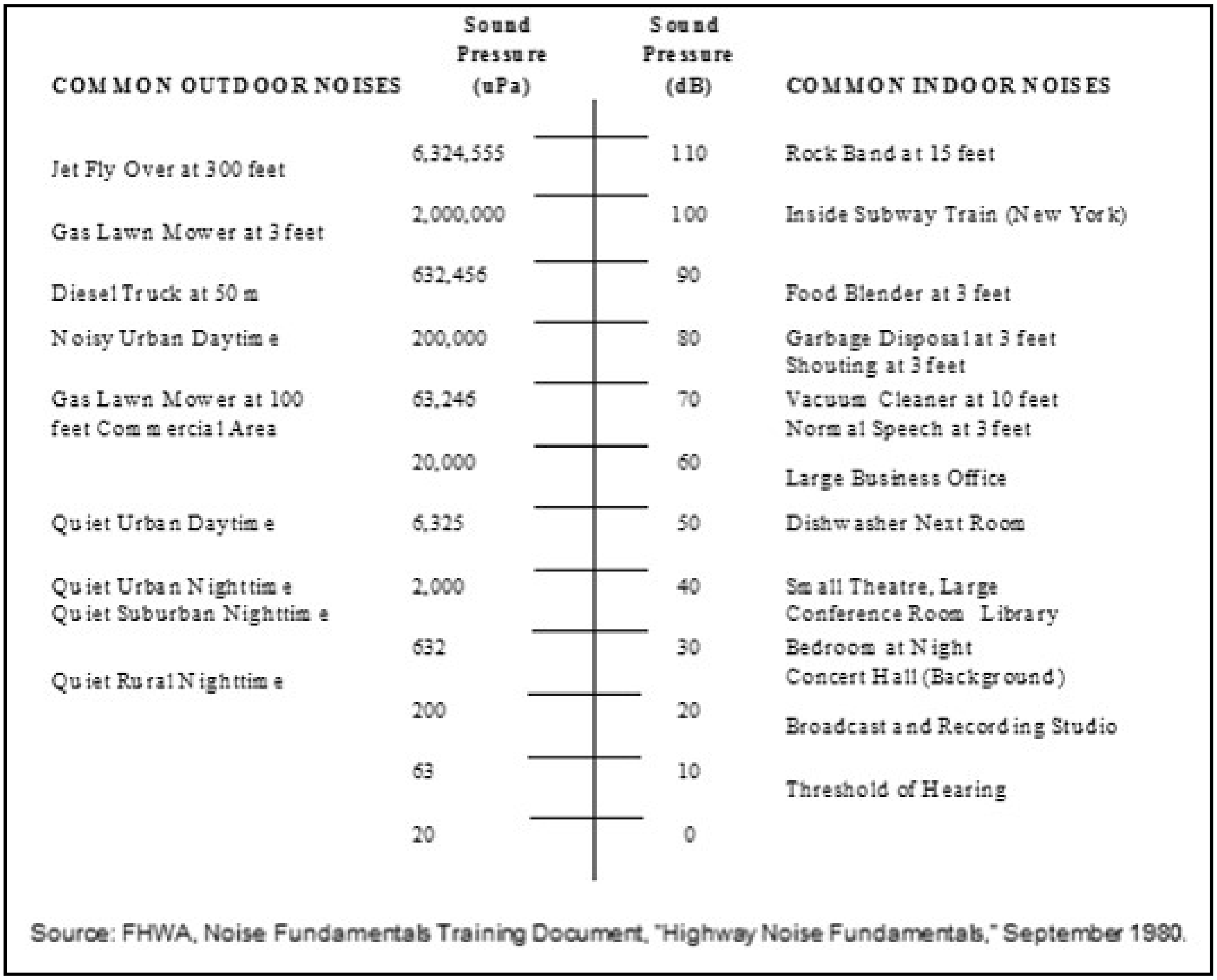
The range of human hearing spans from the threshold of hearing (~3 dBA) to past the threshold of pain (120 dBA). In general, humans will notice a change of sound greater than 3 dBA. Noise levels are generally considered low when they are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. Noise levels greater than 85 dBA can cause temporary or permanent hearing loss if exposure is sustained. Examples of low daytime levels are those observed in isolated natural settings, such as the Grand Canyon 20 dBA, and quiet suburban residential streets (43 dBA). Examples of moderate level noise environments are urban residential or semi-commercial areas (55 dBA) and commercial locations (60 dBA). Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones (63 dBA), as well as industrial areas (65 to 70 dBA), the levels are nevertheless considered adverse (USEPA 1971; Berenek 1971). **Figure 3.11-1** shows the range of sound levels for common indoor and outdoor activities.

Background noise is the accumulation of all perceptible, but not necessarily identifiable, noise sources (such as traffic, airplanes, and environmental sounds) that create a constant ambient noise baseline. Ambient environmental noise is described as the equivalent sound level (Leq), which can be considered the average noise level. Leq places more emphasis on occasional high noise levels that accompany and exceed general background noise levels. Leq measured over a one hour period [Leq(h)] is the Federal Highway Administration (FHWA) standard.

- Lmax- the instantaneous maximum noise level that can occur during any period of time. Usually a single event of short duration
- Lmin- minimum sound level during a period of time
- L10- sound level that is exceeded only 10% of the time

The current FHWA procedures for highway traffic noise analysis and abatement are contained in 23CFR 772, "Procedures for Abatement of Highway Traffic Noise." These procedures indicate that a traffic noise impact occurs when the predicted levels approach or exceed the noise abatement criteria (NAC) or when predicted traffic noise levels substantially exceed the existing noise level, even though the predicted levels may not exceed the NAC (NPS 2002). The impact of increasing or decreasing noise levels is presented in **Figure 3.11-1**. For example, it shows that a change of 3 dBA is barely perceptible and that a 10-dBA increase or decrease will be perceived by someone to be doubling or halving of the noise.

The day-night noise level (DNL) is the energy average sound level for a 24-hour day determined after the addition of a 10-dBA penalty to all noise events occurring at night between 10:00 p.m. and 7:00 a.m. The DNL is a useful metric of community noise impact because people in their homes are much more sensitive to noise at night, when they are relaxing or sleeping, than they are to noise in the daytime.



Source: FHWA, Noise Fundamentals Training Document, "Highway Noise Fundamentals," September 1980.

Figure 3.11-1 - Common Indoor and Outdoor Noises

Community Noise Equivalent Level (CNEL) is a 24-hour cumulative noise descriptor that considers the sensitivity of humans to noise at night. The CNEL adds a 5-dBA penalty for nighttime hours between 7:00 p.m. and 10:00 p.m. For the hours between 10:00 p.m. and 7:00 a.m., a 10-dBA penalty is added for the CNEL. The DNL is similar to the CNEL, except that the DNL does not have the 7:00-10:00 p.m. nighttime penalty for noise sensitivity.

Table 3.11-1 Decibel Changes, Loudness, and Energy Loss

Sound Level Change (dBA)	Relative Loudness	Acoustical Energy Loss (%)
0	Reference	0
-3	Barely Perceptible	50
-5	Readily Perceptible	67
-10	Half as Loud	90
-20	1/4 as Loud	99
-30	1/8 as Loud	99.9

Another noise metric used to describe ambient noise levels is the equivalent sound level (Leq). It is defined as the equivalent steady-state sound level, which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same period. It represents a single number descriptor of environmental noise, and is mostly determined by occasional loud, intrusive noise. In addition to equivalent noise levels, sounds in the environment can also be measured using "exceedance" levels. Exceedance levels are values from the cumulative distribution of all of the sound levels observed during a measurement period. Exceedance levels are designated Ln where n can have any value from 0 to 100 percent. For example:

- The L90 noise level is the sound, in dBA, exceeded 90 percent of the time during the measurement period. The L90 is close to the lowest sound level observed during the measurement period. It is essentially the same as the residual sound level, which is the lowest sound level observed when there are no obvious nearby intermittent sources.
- The L10 noise level is the sound, in dBA, exceeded 10 percent of the time during the measurement period. The L10 is close to the maximum sound level observed during the measurement period. The L10 is sometimes called the intrusive noise level because it is caused by occasional louder noises like passing motor vehicles.

3.11.2 *Noise Setting*

The existing noise environment and noise estimates for the Study area are described below and were estimated using the following documents for guidance and information:

- Malibu Creek Environmental Restoration Feasibility Study, Los Angeles County California, Preliminary Draft, Baseline Conditions Report, April 6, 2006
- Malibu Legacy Park Project, Environmental Impact Report, Section 3J Noise, May 2008
- City of Malibu, California Noise Ordinance, Article IV, Public Peace, Chapter 2, Noise (http://www.nonoise.org/lawlib/cities/malibu.htm)
- City of Malibu General Plan, Section 6.0, Noise Element and Noise Maps, November 1995 (http://www.ci.malibu.ca.us/index.cfm?fuseaction=nav&navid=250)
- City of Ventura Noise Ordinance (Municipal Code § 10.650)
- The Village at Calabasas Draft Environmental Impact Report for D2 Development and Construction, Prepared by Christopher A. Joseph & Associates, April, 2008
- Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, EPA# 550/9-74-004, March 1974.
- FHWA Traffic Noise Model Version 2.5.

These studies along with USEPA documentation and the results of a roadway screening noise modeling analysis were used to describe ambient noise conditions. The use of existing ambient noise monitoring data from previous studies conducted in the more urban setting of the project area where daytime noise levels are influenced primarily by traffic and other urban noise sources and do not significantly change over time is a reasonable approach for estimating background noise levels. In rural locations where no noise monitoring data is available, the use of other USEPA reference documents and review of surrounding land use conditions is also a reasonable approach for estimating ambient noise conditions in the absence of ambient noise measurements. A summary of the ambient noise levels for various land uses is presented below (**Table 3.11-2**).

Table 3.11-2 Average Ambient Noise Levels for Various Land Uses

Land Use Description	Average L_{dn}[1] (dBA)	Daytime L_{eq} (dBA)	Nighttime L_{eq} (dBA)
Wilderness	35	35	25
Rural Residential	40	40	30
Quiet Suburban Residential	50	50	40
Normal Suburban Residential	55	55	45
Urban Residential	60	60	50
Noisy Urban Residential	65	65	55
Very Noisy Urban Residential	70	70	60

Source: [1]U.S. EPA, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, March 1974

Major Noise Sources

Vehicle Traffic

Vehicular traffic is the primary noise source throughout the study area. The routes listed below are the primary contributors to noise caused by vehicular traffic:

- Malibu Canyon Road,
- PCH
- 101 Freeway in the northern portion of the study area, and to Ventura Harbor,
- Las Virgenes Road,
- Mulholland Hwy, and
- Other local traffic routes

Airports

The nearest airports to the project area are Santa Monica Airport, Los Angeles International Airport, and Burbank-Glendale-Pasadena Airport. They are 15 mi, 25 mi, and 35 mi away, respectively. Other sources of noise include flyovers by aircraft and construction activities (NPS 2002).

Noise Measurements

Noise estimates were made using FHWA noise estimating procedures. This procedure estimates traffic volumes and the number of large and medium trucks within the traffic estimates. Noise was estimated at 11 sites within the vicinity of Rindge Dam. **Table 3.11-3** describes the ambient noise levels in the vicinity of Rindge Dam (NPS 2002).

Table 3.11-3 Ambient Noise in the Study Area

Route	From	To	Estimated Noise Level (Leq)
U.S. Highway 101	Las Virgenes	Kanan Road	73.8
Mulholland Hwy	Topanga Canyon Blvd.	Kanan Road	60.8
Mulholland Hwy	Topanga Canyon Blvd.	Old Topanga Canyon Road	58.8
Mulholland Hwy	Kanan Dume	Malibu Canyon Road	56.6
PCH	I-10	SR 23	69.5
PCH	Malibu Canyon Road	Sunset Blvd	34.5
PCH	SR 23	Point Mugu	63.0
Topanga Canyon	PCH	Mulholland	62.1
Malibu Canyon Road	PCH	Mulholland	67.5
Kanan Dume Rd.	PCH	Mulholland	60.5
SR 23	PCH	Mulholland	53.5

The estimated noise level is based on the noise generated by evening peak hour traffic volumes at a location 196 ft (60 m) away from the center of the closest travel lane. The noise estimate locations were chosen where traffic noise from a road corridor within the Study area is dominant. The dominant source of noise within the study area is assumed to be from automobile and truck traffic on the major roads. Within the study area, 6 of the 11 sites monitored are within Activity Level B (**Table 3.11-4**). Two of the 11 sites monitored are Activity Level A. Three of the 11 sites estimated are Activity Level C and are located near commercial areas or along heavily traveled roadways. The site in Ventura Harbor where barge loading would occur falls under Activity Level C, although other properties in the vicinity (motels, etc.) are Activity Level B. Due to the heavy and constant traffic associated noise along the entire route of US 101, the entire route is considered Activity Level C.

Table 3.11-4 FHWA Noise Abatement Criteria (NAC) Hourly A-Weighted

Activity Level	Leq (h)	L 10 (h)	Description of Activity Category
A	57 (Exterior)	60 (Exterior)	Lands on which serenity and quiet are of extraordinary significance.
B	67 (Exterior)	70 (Exterior)	Picnic areas, recreation areas, playgrounds, residences, motels, hotels, schools, churches, libraries, and hospitals
C	72 (Exterior)	75 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above
D	-	-	Undeveloped lands
E	52 (Interior)	55 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Critical Receptors

Noise sensitive or critical receptors are facilities or areas where excessive noise may cause annoyance or disruption to users. Within the project area associated with the NER and LPP, critical noise receptors that meet the criteria for Activity Level B would include residential areas, recreation area lands along the road corridors, trailheads, and trails located at various sites throughout the Study area. Other facilities for use by visitors within recreational areas and residences along road corridors would qualify for this Activity Level. The majority of the Study area would fall under these requirements, due to the orientation of the Study area. Areas that would qualify for Activity Level C would include commercial establishments along PCH and other locations that are in close proximity to this roadway, as well as some commercial port facilities at Ventura Harbor. Facilities along Hwy 101 would also meet Activity Level C requirements, as determined by the NPS (NPS 2002).

A review of existing topographic and aerial photographs was used to select noise sensitive receptors. For this analysis residences were the dominant type of sensitive receptor identified near work areas and were chosen for 10 locations determined to be close to the project areas, truck traffic routes or disposal locations (**Figure 3.11-2**). For the Surfrider Beach area and the proposed flood walls along near Malibu Lagoon an average receptor distance of 500 ft was used for construction equipment noise analysis based upon the area of the lagoon and the assumptions that the location of equipment operations in the creek bed would vary depending on the proposed location along the creek's flood plain. For sheet pile installation, noise levels were assessed for a distance of 100 ft because there are residences within this distance.

For the Ventura Harbor barge sediment placement route, the only sensitive receptors identified in the vicinity of the harbor are residential properties approximately 200 ft from where the barge would be moored. The City of Ventura Noise Ordinance was utilized for analysis of noise impacts at this location.

Noise modeling predicts a maximum noise level of 98 dBA which exceeds the City of Malibu's noise ordinances for construction. In addition, the vibration from the pile driving within 100 ft of a residence could result in an impact. Since traffic noise dominates the project area, whenever possible, traffic volumes supplied by traffic engineers or from the California Department of Transportation were used in the TNM 2.5 noise model to determine the existing Community Noise Equivalent Level at each receptor.

Construction would occur only during daylight hours and therefore the existing one-hour Leq noise levels were determined for each receptor from one of the following sources:

- Previous studies and measurements,
- TNM 2.5 traffic modeling,
- Land use descriptor-based CNELs from The Malibu General Plan, 1995, and The State of California General Plan Guidelines.

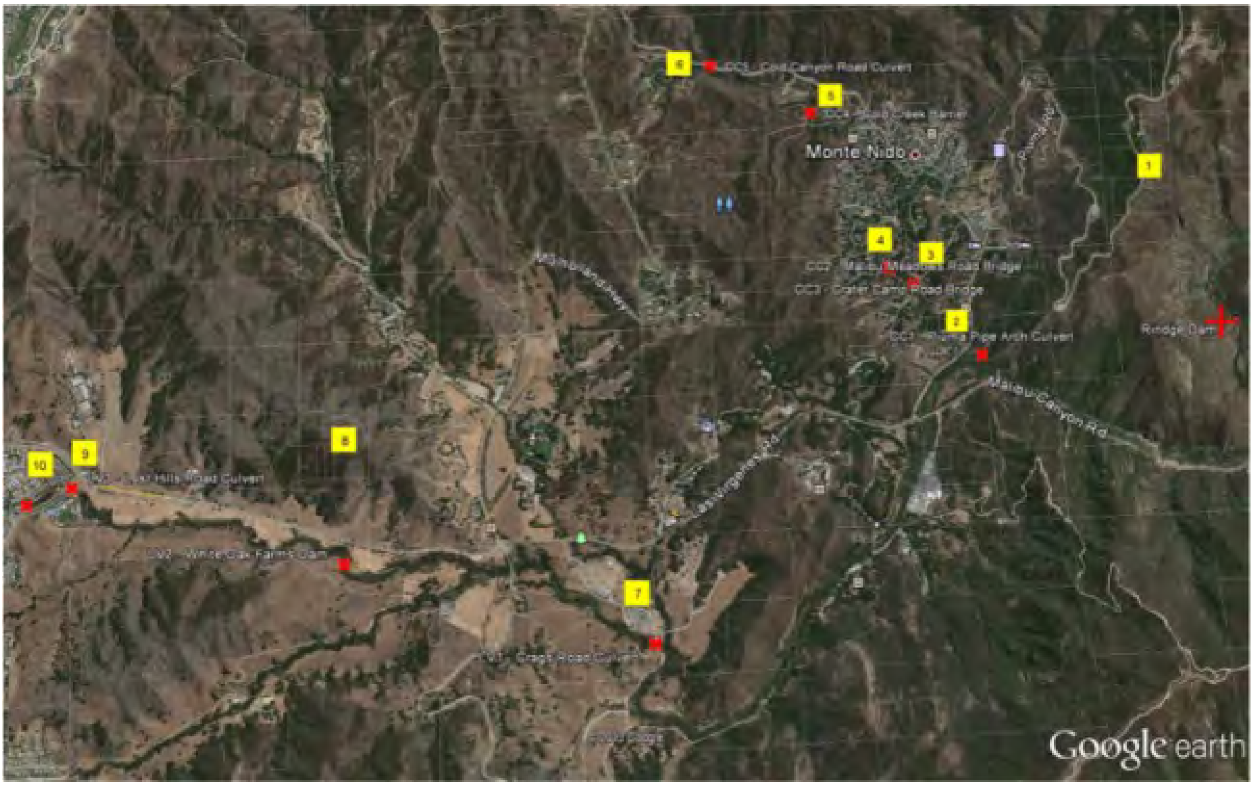


Figure 3.11-2 - Noise Receptor Location Map

Table 3.11-5 summarizes the existing daytime Leq and CNEL noise levels at each receptor. The Leq is used for comparison to construction noise impacts and the CNEL for project related traffic noise impacts. Existing noise levels were estimated for all locations using EPA land use data and associated noise levels described in **Table 3.11-5**. Receptor 7 is subject to Los Angeles County noise criteria by which it is classified as Recreational land use and is therefore assigned a noise level of 70 dBA. Specific Receptors are not used in this assessment for activities at the beach locations. The City of Malibu General plan indicates that the beach area is within the 65 to 75 dBA CNEL contours primarily due to its close proximity to the PCH and therefore the existing daytime noise level at the beach areas is estimated to be in the range or 70 to 75 dBA. Since construction traffic will be a daytime occurrence only, the noise generated by project traffic will be expressed as the 1-hour equivalent noise and will be difference between the noise from existing traffic and the noise from existing traffic plus project traffic as predicted by TNM2.5.

Applicable Policies and Regulations

The state of California requires each local government entity to perform noise studies and implement a noise element as part of their general plan. The California Office of Noise Control administers standards and implementation measures. California Administrative Code, Title 4, has guidelines for evaluating the compatibility of various land uses as a function of community noise exposure (**Table 3.11-3**).

Table 3.11-5 Estimated Existing Noise Levels at Sensitive Receptors (Residences)

Receptor ID	Receptor Type/Location	Land use	Daytime Leq (dBA)	CNEL (dBA)	Barrier Removal Project ID	Project Location
1	Residence/ 24860 Piuma Road	Quiet Suburban Residential	50	50	RD	Rindge Dam
2	Residence/ Piuma Road	Normal Suburban Residential	55	47	CC1	Piuma Pipe Arch Culvert
3	Residence/ Malibu Meadow Drive	Normal Suburban Residential	55	55	CC2	Malibu Meadows Road Bridge
4	Residence/Crater Camp Drive	Normal Suburban Residential	55	55	CC3	Crater Camp Road Bridge
6	Residence/Cold Canyon Road	Quiet Suburban Residential	55	55	CC5	Cold Canyon Road Culvert
7	Malibu Creek SP / Las Virgenes Road	Recreational-Park	70	65	LV1	Crag's Road Culvert
8	Farm/ North of Stokes Canyon Road	Rural Residential	50	50	LV2	White Oak Farms Dam
9	Residence/ El Encanto Drive	Suburban Residential	55	55	LV3	Lost Hills Road Culvert
10	Residence/ Orchid Lane	Suburban Residential	55	55	LV4	Meadow Creek Lane Channel

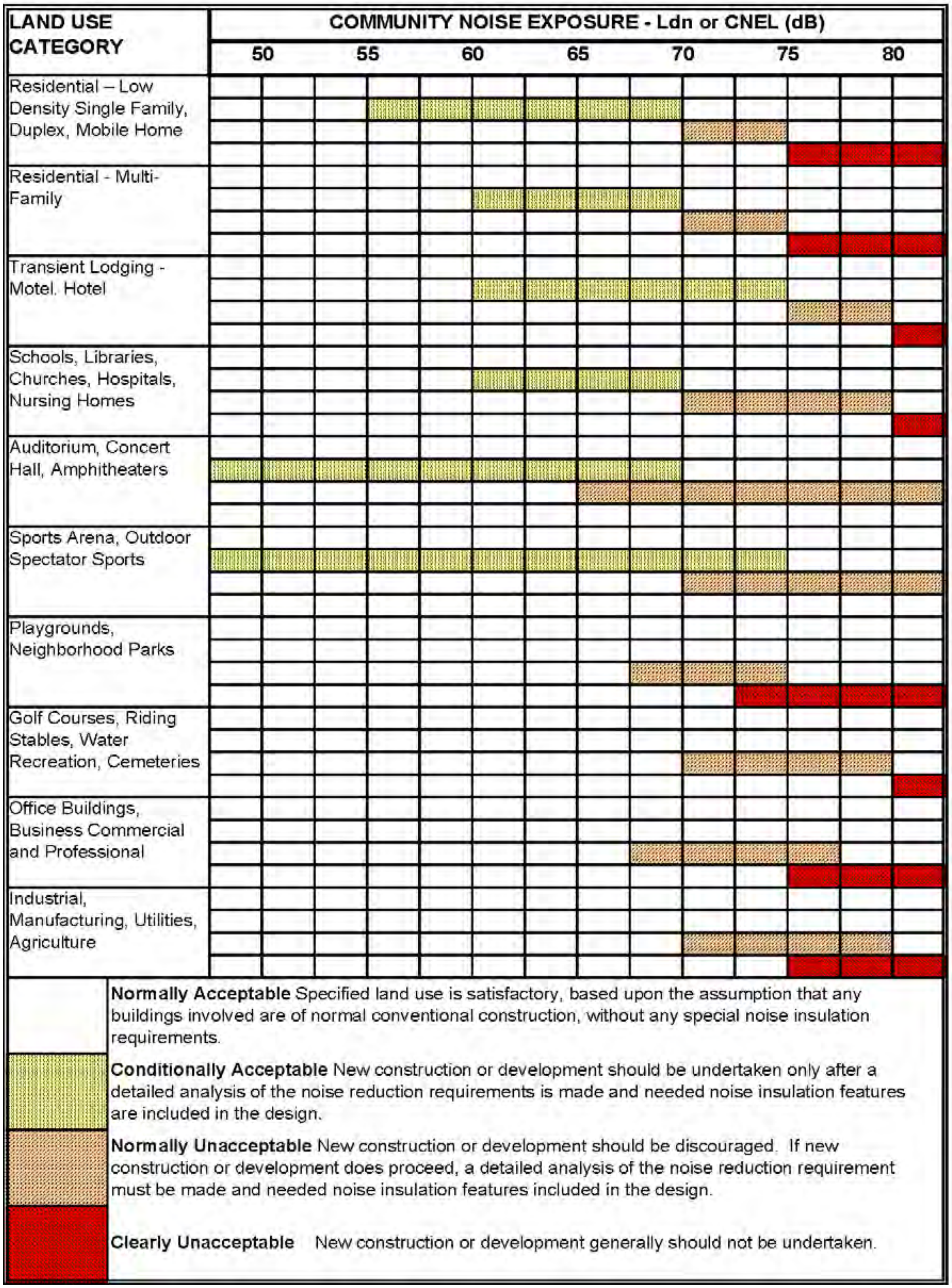


Figure 3.11-3 - Land Use Compatibility for Community Noise Environment (from the State of California General Plan Guidelines, Office of Planning and Research 1990).

Los Angeles County

Section N-1 and N-2 of the Los Angeles County General Plan described the policies restricting noise generation (**Table 3.11-6**).

Table 3.11-6 Los Angeles County General Plan Noise Policies

Policy Number	Description
N-1.1	Maintain quiet residential neighborhoods and consider the impacts of noise-generators when siting residential and other noise -sensitive uses; priority should be given to avoidance of acoustical incompatibility, rather than mitigation of excessive noise
N-1.2	Avoid development of residential and other noise-sensitive uses in areas of the County where outdoor ambient noise levels exceed 55 CNEL unless interior noise levels from exterior sources can be mitigated to less than 45 CNEL
N-1.3	Discourage noise-generating commercial and industrial uses near residential zones and existing residential and other noise -sensitive uses
N-1.4	Require acoustical review and analysis of proposed discretionary developments that may be significantly impacted by railroads/yards, airports, highways, amusement parks, surface mining operations and other major stationary noise sources.
N-1.5	Require incorporation of effective noise abatement measure in residential development to achieve acceptable levels of community noise when avoidance of significant adverse noise impacts is impossible, impracticable or excessively costly in terms of derived acoustical benefits
N-1.6	Encourage construction of aesthetically designed noise barriers- either separately or in conjunction with other acoustical mitigation techniques- in new development projects where the circumstances warrant their inclusion.
N-1.7	Encourage landscaping and vegetation berms along roadways and adjacent to other noise-generating sources as a means of increasing the absorption of noise energy and separation distance.
N-2.1	Encourage the development of industrial and commercial land uses that do not produce excessive amounts of noise, particularly when proposed near noise-sensitive land uses
N-2.2	Locate new noise generating developments so that adverse noise impacts are either eliminated or substantially reduced to be within acceptable levels
N-2.3	Discourage incompatible uses adjacent to noise-generating uses such as airports and manufacturing centers.

The Los Angeles County construction noise ordinances are found in Title 12 of the Los Angeles County Code of Ordinances Chapter 12.08, Section 12.08.440, the relevant portions of which are summarized below (**Table 3.11-7 and Table 3.11-8**).

Table 3.11-7 County of Los Angeles Mobile Equipment Noise Limits

	Single-family Residential	Multi-family Residential	Semi-residential/ Commercial
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	75dBA	80dBA	85dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	60dBA	64dBA	70dBA

Table 3.11-8 County of Los Angeles Stationary Equipment Noise Limits

	Single-family Residential	Multi-family Residential	Semi-residential/ Commercial
Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m.	60dBA	65dBA	70dBA
Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays	50dBA	55dBA	60dBA

In addition to the guidance provided in Table 3.11-7 and Table 3.11-8, the following guidelines from the Los Angeles County code also apply.

A. Operating or causing the operation of any tools or equipment used in construction, drilling, repair, alteration or demolition work between weekday hours of 7:00 p.m. and 7:00 a.m., or at any time on Sundays or holidays, such that the sound creates a noise disturbance across a residential or commercial real-property line, except for emergency work of public service utilities or by variance issued by the health officer is prohibited.

B. Noise Restrictions at Residential Structures. The contractor shall conduct construction activities in such a manner that the maximum noise levels at the affected buildings will not exceed those listed in the following schedule:

   1. Mobile Equipment. Maximum noise levels for nonscheduled, intermittent, short-term operation (less than 10 days) of mobile equipment:

   2. Stationary Equipment. Maximum noise level for repetitively scheduled and relatively long-term operation (periods of 10 days or more) of stationary equipment:

      - N-2.2 - Locate new noise generating developments so that adverse noise impacts are either eliminated or substantially reduced to be within acceptable levels
      - N-2.3 - Discourage incompatible uses adjacent to noise-generating uses such as airports and manufacturing.

Receptors that are within LA County are subject to the noise exposure limits (CNEL) described in the Los Angeles County General Plan and the State of California General Plan Guidelines (**Figure 3.11-3**).

City of Malibu

The City of Malibu Ordinances 4203 and 4204, Chapter 2 of Article 4 of the City of Malibu General Plan defines the City of Malibu's noise regulations. The noise regulations that are pertinent to this study are listed below:

- *Pursuant to Section A of Ordinance 4204*: The unnecessary making of, or knowingly and unnecessarily permitting to be made, any loud, boisterous or unusual noise, disturbance, commotion or vibration in any boarding facility, dwelling, place of business or other structure, or upon any public street, park or other place or building, except the ordinary and usual sounds, noises, commotion, or vibration incidental to the operation of said places when conducted in accordance with the usual and normal standard of practice applicable thereto and in a manner which will not disturb the peace and comfort of adjacent residences or which will not detrimentally affect the operators or customers of adjacent places of business.
- *Pursuant to Section G of Ordinance 4204*: Operating or causing the operation of any tools, equipment, impact devices, derricks or hoists used in construction, drilling, repair, alteration, demolition or earthwork, between weekday hours of 7:00 pm and 7:00 am or at any time on Sundays or holidays, except as provided in Section 4205D herein.
- *Pursuant to Section H of Ordinance 4204*: Sounding or permitting the sounding of any electronically-amplified signal from any bell, chime, siren, whistle or similar device, intended primarily for non-emergency purposes, from any place, for more than ten consecutive seconds in any hourly period.

Based on land use compatibility guidelines for a low density, single family, residential land use, normally acceptable noise levels are between of 50 to 60 dB, conditionally acceptable noise levels are between 55 and 70 dB and normally unacceptable noise levels are between 70 and 75 dB. Community parks and playgrounds are assigned a normally acceptable noise level of 70 dB. Normally unacceptable noise levels from new construction are discouraged, however if construction does occur, the design must provide an analysis of noise reduction levels and necessary environmental commitments.

Table 3.11-9 summarizes the maximum exterior noise limits (Leq) for non-transportation sources and **Table 3.11-10** summarizes the maximum allowable CNEL noise limits for transportation sources within the City of Malibu. Construction activities and construction-related truck traffic are not anticipated to occur between the hours of 7:00 p.m. and 7:00 a.m., so only the 7:00 a.m. to 7:00 p.m. standards in **Table 3.11-9** would be applicable.

Table 3.11-9 City of Malibu Maximum Exterior Noise Limits for Non-Transportation Sources

Receiving Land Use Category	General Plan Land Use Districts	Time Period	Noise Level, dBA	
			Leq	Lmax
Rural	All RR Zones and PRF, CR, AH, OS	7 am – 7 pm 7 pm – 10 pm 10 pm – 7 am	55 50 40	75 65 55
Other Residential	All SFR, MFR and MFBR Zones	7 am – 7 pm 7 pm – 10 pm 10 pm – 7 am	55 50 45	75 65 60
Commercial, Institutional	CN, CC, CV, CG, and I	7 am – 7 pm 7 pm – 7 am	65 60	85 70

Table 3.11-10 City of Malibu Noise Limits for Transportation Noise Sources

Land Use	Outdoor Activity Areas dB
Residential	50
Transient Housing	60
Hospitals, long-term in-patient medical treatment and care facilities	60
Theaters, Auditoria, Music Halls	60
Churches and Meeting Halls	60
Office Buildings	60
Schools, Libraries and Museums, Child Care	60
Playgrounds and Neighborhood Parks	70

City of Calabasas

The City of Calabasas Municipal Code, Title 17, Chapter 17.20.160 Section A specifies standards to manage sources of noise and Section B establishes noise limits for various types of land uses. The standards relevant to this project include the following:

- Limit project-related noise to no greater than a sixty (60) dBA CNEL (Community Noise Equivalent Level) within known wildlife nesting or migration areas, as well as within natural open space areas, as necessary to maintain tranquil open space and viable wildlife habitats and mobility.
- Locate the highest noise sources as far away from adjacent sensitive uses as is feasible.

The City of Calabasas defaults to the County of Los Angeles for construction noise limits because they do not have their own construction noise limits. Noise sources associated with construction, including the idling of construction vehicles are exempt from the City of Calabasas noise standards provided such activities do not take place before 7:00 a.m. or after 6:00 p.m. on any day except Saturday in which no construction is allowed before 8:00 a.m. or after 5:00 p.m. No construction is allowed on Sunday's or federal holidays. These requirements may be modified by a conditional use permit. Construction activities that occur outside of these restricted times are subject to the City of

Calabasas exterior noise standards. Exterior Noise Level Standards for the City of Calabasas are summarized in **Table 3.11-11**.

Table 3.11-11 City of Calabasas Noise Level Standards

Zone	Time Interval	Hourly Equivalent Sound Level (Leq, dBA)
Residential Zones	Monday—Friday	
RS, RM, RMH, RR, RC, HM, OS	10 p.m. to 7 a.m.	50 dBA
RS, RM, RMH	7 a.m. to 10 p.m.	65 dBA
RR, RC, HM, OS	7 a.m. to 10 p.m.	60 dBA

Calabasas Municipal Code (Ord. No. 2010-265, § 3, 1-27-2010)

The City of Calabasas does have limits for transportation noise sources. Delivery of demolition debris by haul trucks to the Calabasas Landfill would be subject to the City of Calabasas mobile source noise ordinance (**Table 3.11-12**).

Table 3.11-12 City of Calabasas Noise Limits for Transportation Noise Sources

Land Use	Maximum Exterior Noise Level CNEL (dBA)
Urban Single Family; Multi-Family Residential	65
Rural Residential	60
Open Space/Active Recreation Areas	70

Source: City of Calabasas General Plan, Community Profile, May 6, 1993

City of Ventura

The City of Ventura Noise Ordinance (Municipal Code § 10.650) controls the production of unnecessary, excessive or annoying noise. However, the ordinance does not apply to traffic noise. In addition, Section 10.650.150 exempts construction activities from the noise ordinance standards if they are conducted within the hours of 7am to 8pm. Construction outside of these hours is required to adhere to the exterior noise levels described in the ordinance (**Table 3.11-13**).

Table 3.11-13 Exterior Noise Levels Described in the City of Ventura Noise Ordinance

Time Period	Zone I	Zone II	Zone III	Zone IV
7 am – 10 pm	50 dBA	50 dBA	60 dBA	70 dBA
10 pm – 7 am	45 dBA	45 dBA	55 dBA	70 dBA

Zone I properties are noise sensitive properties, Zone II properties are residential, Zone III properties are commercial, and Zone IV properties are agricultural and industrial. There are no Zone I properties within the vicinity of the Ventura Harbor barge loading site. There is a residential community (Zone II) adjacent to the harbor barge loading site, approximately 200 ft from where the barge would be loaded. The remainder of the vicinity of the barge loading site in Ventura Harbor is Zone III.

County of Ventura

The Codified Ordinances of the County of Ventura do not set specific decibel limits on noise production. Rather, noise is limited generally as a pollutant by limiting noise production to appropriate levels based on land use and state that noise production shall not be objectionable to surrounding properties.

3.12 Air Quality and Global Climate Change

3.12.1 *Area of Analysis*

Malibu Creek is located approximately 30 mi west of downtown Los Angeles, California. Approximately two-thirds of the watershed is located in northwestern Los Angeles County and the remaining one-third is in southeastern Ventura County. California is divided into 15 different air basins based on common geographic and political boundaries. The South Coast Air Basin (SCAB) covers the portion of Los Angeles County in which the Malibu Creek watershed is located, and all construction activities would occur in the SCAB. The South Coast Air Quality Management District (SCAQMD) has jurisdiction for local air quality impacts in the South Coast portion of Los Angeles County. The route for hauling of material to Ventura Harbor, and the harbor itself, are in the Ventura County Air Pollution Control District (VCAPCD), which is located in the South Central Coast Air Basin (SCCAB).

3.12.2 *Regulatory Framework*

Federal, state, and local governments all share responsibility for air quality management. The Federal Clean Air Act (CAA) and the California Clean Air Act (CCAA) are the primary statutes that establish ambient air quality standards. They establish regulatory authorities to design and enforce air quality regulations.

Federal

The EPA is responsible for implementation of the CAA. The CAA was enacted in 1955 and was amended in 1963, 1965, 1967, 1970, 1977, 1990, and 1997. Under authority of the CAA, the EPA established National Ambient Air Quality Standards (NAAQS) for the following criteria pollutants: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns (PM_{10}), fine particulate matter with an aerodynamic diameter less than or equal to 2.5 microns ($PM_{2.5}$), and sulfur dioxide (SO_2).

Table 3.12-1 presents the current NAAQS for the criteria pollutants (CARB 2012a). O_3 is a secondary pollutant, meaning that it is formed in the atmosphere from reactions of precursor compounds under certain conditions. Primary precursor compounds that lead to formation of O_3 include volatile organic compounds (VOC) and nitrogen oxides (NO_x). $PM_{2.5}$ can be emitted directly from sources (e.g., engines) or can form in the atmosphere from precursor compounds. $PM_{2.5}$ precursor compounds in the area of analysis include sulfur oxides (SO_x), NO_x, VOC, and ammonia.

The CAA requires states to classify air basins (or portions thereof) as either “attainment” or “nonattainment” with respect to criteria air pollutants, based on whether the NAAQS have been achieved, and to prepare State Implementation Plans (SIPs) containing emission reduction strategies to maintain the NAAQS for those areas designated as attainment and to attain the NAAQS for those areas designated as nonattainment.

Table 3.12-1 National Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS Primary	NAAQS Secondary	Violation Criteria
O_3	8 Hour	0.075 ppm (147 µg/m^3)		Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 yrs
PM_{10}	24 Hour	150 µg/m^3		Not to be exceeded more than once per year on average over 3 yrs
$PM_{2.5}$	24 Hour	35 µg/m^3		98th percentile, averaged over 3 yrs
	Annual	12 µg/m$^{3(1)}$	15 µg/m^3	Annual mean, averaged over 3 yrs
CO	1 Hour	35 ppm (40 mg/m^3)	N/A	Not to be exceeded more than once per year
	8 Hour	9 ppm (10 mg/m^3)		
NO_2	1 Hour	100 ppb (188 µg/m^3)	N/A	98th percentile of 1-hour daily maximum concentrations, averaged over 3 yrs
	Annual	53 ppb (100 µg/m^3)		Annual mean
SO_2	1 Hour	75 ppb (196 µg/m^3)	N/A	99th percentile of 1-hour daily maximum concentrations, averaged over 3 yrs
	3 Hour	N/A	0.5 ppm (1,300 µg/m^3)	Not to be exceeded more than once per year
	24 Hour	0.14 ppm (366 µg/m^3)$^{(2)}$	N/A	Not to be exceeded more than once per year
	Annual	0.030 ppm (79 µg/m^3)$^{(2)}$		Annual mean
Pb	Rolling 3-Month Average$^{(3)}$	0.15 µg/m^3		Not to be exceeded

Notes: **(1)** On January 15, 2013, the EPA published a final rule to lower the annual primary PM2.5 NAAQS to 12.0 ug/m3. The final rule was effective on March 15, 2013 (78 FR 3086). **(2)** On June 22, 2010, the 24-hour and annual primary SO_2 NAAQS were revoked (75 FR 35520). The 1971 SO_2 NAAQS (0.14 parts per million [ppm] and 0.030 ppm for 24-hour and annual averaging periods) remain in effect until one year after an area is designated for the 2010 1-hour primary standard. CARB recommended to the EPA that all of California be designated attainment for the 1-hour SO2 NAAQS of 75 ppb (2011a); however, the EPA indicated in its response to the state’s proposed designations that it was deferring action to designate areas in California (2013). **(3)** The Pb NAAQS was revised on November 12, 2008 to a rolling 3-month average (73 FR 66964). The 1978 Pb NAAQS (1.5 µg/m^3 as a quarterly average) remained in effect until one year after an area is designated for the 2008 standard. On December 31, 2010, final area designations for the 2008 Pb standards became effective; therefore, the 1978 Pb NAAQS is no longer in effect in California (75 FR 71033).

Key: µg/m^3 = micrograms per cubic meter; mg/m^3 = milligrams per cubic meter; ppb = parts per billion; ppm = parts per million

General Conformity

Section 176 (c) of the Federal CAA (42 United States Code [U.S.C.] 7506(c)) requires any entity of the federal government that engages in, supports, or in any way provides financial support for, licenses or permits, or approves any activity to demonstrate that the action conforms to the applicable SIP required under Section 110 (a) of the Federal CAA (42 U.S.C. 7410(a)) before the action is otherwise approved. In this context, conformity means that such federal actions must be consistent with a SIP's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of those standards. Each federal agency must determine that any action proposed that is subject to the regulations implementing the conformity requirements will, in fact, conform to the applicable SIP before the action is taken. The USACE developed guidance for applying the general conformity regulations to its projects (USACE 1994). The Malibu Creek Ecosystem Restoration Feasibility Study is subject to the general conformity rule because it is sponsored and supported by a federal agency, the USACE.

On April 5, 2010, the EPA revised the general conformity regulations at 40 Code of Federal Regulations (CFR) 93 Subpart B for all federal activities except those covered under transportation conformity (75 Federal Register [FR] 17254). The revisions were intended to clarify, streamline, and improve conformity determination and review processes, and to provide transition tools for making conformity determinations for new NAAQS. The revisions also allowed federal facilities to negotiate a facility-wide emission budget with the applicable air pollution control agencies, and to allow the emissions of one precursor pollutant to be offset by the emissions of another precursor pollutant. The revised rules became effective on July 6, 2010.

The general conformity regulations apply to a proposed federal action in a non-attainment or maintenance area if the total of direct and indirect emissions of the relevant criteria pollutants and precursor pollutants caused by the TSP equal or exceed certain de minimis amounts, thus requiring the federal agency to make a determination of general conformity. A federal agency can indirectly control emissions by placing conditions on federal approval or federal funding. Direct emissions are those that are caused or initiated by the federal action and occur at the same time and place as the federal action. Indirect emissions are reasonably foreseeable emissions that are further removed from the federal action in time and/or distance and can be practicably controlled by the federal agency on a continuing basis (40 CFR 93.152).

Table 3.12-2 presents the non-attainment or maintenance pollutants in the SCAB along with each pollutant's applicable de minimis thresholds. The final criteria pollutant, SO_2, is currently designated as attainment in the SCAB, therefore genera conformity does not apply.

The general conformity regulations incorporate a stepwise process, beginning with an applicability analysis. According to EPA guidance (1994), before any approval is given for a TSP to go forward, the regulating federal agency must apply the applicability requirements found at 40 CFR 93.153(b) to the TSP. The guidance states that the applicability analysis can be (but is not required to be) completed concurrently with any analysis required under the NEPA. If the regulating federal agency determines that the general conformity regulations do not apply to the TSP (meaning the project emissions do not exceed the de minimis thresholds), no further analysis or documentation is required.

Table 3.12-2 General Conformity De Minimis Thresholds

Pollutant	National Nonattainment or Maintenance Status	Classification of Emissions Type	De Minimis Threshold (tpy)
CO	Maintenance	CO (direct emissions)	100
O_3	Extreme Nonattainment	NOx as O_3 precursor	10
		VOC as O_3 precursor	10
NO_2	Maintenance	NOx as NO_2 precursor	100
PM_{10}	Serious Nonattainment	PM_{10} (direct emissions)	70
$PM_{2.5}$	Nonattainment	$PM_{2.5}$ (direct emissions)	100
		SO_2 as $PM_{2.5}$ precursor	100
		NOx as $PM_{2.5}$ precursor	100
		VOC as $PM_{2.5}$ precursor	100
		Ammonia as $PM_{2.5}$ precursor[1]	100
Pb	Nonattainment	Pb (direct emissions)[1]	25

Source: 40 CFR 93.153.
Notes: [1] Because project sources do not emit ammonia or lead, ammonia and lead are not included in the air quality impact analysis.

If the general conformity regulations apply to the TSP, the regulating federal agency must next conduct a conformity evaluation in accord with the criteria and procedures in the implementing regulations, publish a draft determination of general conformity for public review, and then publish the final determination of general conformity. For a required action to meet the conformity determination emissions criteria, the total of direct and indirect emissions from the action must be in compliance or consistent with all relevant requirements and milestones contained in the applicable SIP (40 CFR 93.158(c)), and in addition must meet other specified requirements, such as:

- For any criteria pollutant or precursor, the total of direct and indirect emissions from the action is specifically identified and accounted for in the applicable SIP's attainment or maintenance demonstration (40 CFR 93.158(a)(1)); or
- For precursors of O_3, NO_2, or particulate matter, the total of direct and indirect emissions from the action is fully offset within the same nonattainment (or maintenance) area through a revision to the applicable SIP or a similarly enforceable measure that effects emission reductions so that there is no net increase in emissions of that pollutant (40 CFR 93.158(a)(2)); or
- For O_3 or NO_2, the total of direct and indirect emissions from the action is determined and documented by the State agency primarily responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would not exceed the emissions inventory specified in the applicable SIP (40 CFR 93.158(a)(5)(i)(A)); or
- For O_3 or NO_2, the total of direct and indirect emissions from the action (or portion thereof) is determined by the State agency responsible for the applicable SIP to result in a level of emissions which, together with all other emissions in the nonattainment (or maintenance) area, would exceed the emissions inventory specified in the applicable SIP and the State Governor or the Governor's designee for SIP actions makes a written commitment to EPA for specific SIP revision measures reducing emissions to not exceed the emissions inventory (40 CFR 93.158(a)(5)(i)(B)).

State

The CCAA substantially added to the authority and responsibilities of the State's air pollution control districts. The CCAA establishes an air quality management process that generally parallels the Federal process. The CCAA, however, focuses on attainment of the California Ambient Air Quality Standards (CAAQS) that, for certain pollutants and averaging periods, are typically more stringent than the comparable NAAQS. The CAAQS are included in **Table 3.12-3**.

The CCAA requires that the CAAQS be met as expeditiously as practicable, but does not set precise attainment deadlines. Instead, the act established increasingly stringent requirements for areas that will require more time to achieve the standards.

The air quality attainment plan requirements established by the CCAA are based on the severity of air pollution problems caused by locally generated emissions. Upwind air pollution control districts are required to establish and implement emission control programs commensurate with the extent of pollutant transport to downwind districts.

The California Air Resources Board (CARB) is responsible for developing emission standards for on-road motor vehicles and some off-road equipment in the state. In addition, CARB develops guidelines for the local districts to use in establishing air quality permit and emission control requirements for stationary sources subject to the local air district regulations.

Table 3.12-3 California Ambient Air Quality Standards

Pollutant	Averaging Time	CAAQS	Violation Criteria
O_3	1 Hour	0.09 ppm (180 µg/m^3)	Not to be exceeded
	8 Hour	0.070 ppm (137 µg/m^3)	
PM_{10}	24 Hour	50 µg/m^3	
	Annual	20 µg/m^3	
$PM_{2.5}$	Annual	12 ug/m^3	
CO	1 Hour	20 ppm (23 mg/m^3)	
	8 Hour	9.0 ppm (10 mg/m^3)	
NO_2	1 Hour	0.18 ppm (339 µg/m^3)	
	Annual	0.030 ppm (57 µg/m^3)	
SO_2	1 Hour	0.25 ppm (655 µg/m^3)	
	24 Hour	0.04 ppm (105 µg/m^3)	
Pb	30-Day Average	1.5 µg/m^3	Not to be equaled or exceeded
Visibility Reducing Particles	8 Hour	See Footnote 1	Not to be exceeded
Sulfates	24 Hour	25 µg/m^3	Not to be equaled or exceeded
Hydrogen sulfide	1 Hour	0.03 ppm (42 µg/m^3)	
Vinyl chloride	24 Hour	0.01 ppm (26 µg/m^3)	

Source: CARB 2012a.

Note: [1] In 1989, CARB converted both the general statewide 10-mile visibility standard and the Lake Tahoe 30-mile visibility standard to instrumental equivalents, which are “extinction of 0.23 per kilometer” and “extinction of 0.07 per kilometer” for the statewide and Lake Tahoe Air Basin standards, respectively.

Key: µg/m^3 = micrograms per cubic meter; mg/m^3 = milligrams per cubic meter; N/A = not applicable; ppm = parts per million

Local

South Coast Air Quality Management District (SCAQMD)

The SCAQMD has jurisdiction over an area of 10,743 mi^2 consisting of Orange County, the non-desert portions of Los Angeles, Riverside and San Bernardino Counties, and the Riverside County portion of the Salton Sea Air Basin and Mojave Desert Air Basin. The SCAB is a sub-region within SCAQMD's jurisdiction covering an area of 6,745 mi^2. The sub-region includes the City of Los Angeles and the surrounding communities. While air quality in this area has improved in recent years, activity in the basin requires more regulation to meet ambient air quality standards.

The SCAQMD has adopted a series of air quality management plans (AQMPs) to meet the CAAQS and NAAQS. These plans require, among other emissions-reducing activities, control technology for existing sources; control programs for area sources and indirect sources; a permitting system designed to ensure no net increase in emissions from any new or modified permitted sources of emissions; transportation control measures; sufficient control strategies to achieve a five percent or more annual reduction in emissions (or 15% or more in a three-year period) for VOC, NO_x, CO, and PM_{10}; and demonstration of compliance with CARB's established reporting periods for compliance with air quality goals.

The current, EPA-approved SIPs for each federal nonattainment or maintenance pollutant in the SCAB are summarized below:

- 1-Hour O_3 – 1997 AQMP and 1999 amendments, approved by EPA on April 10, 2000 (65 FR 18903) ,
- 8-Hour O_3 (1997 Standard, Partial approval) – 2007 AQMP (as amended through 2011), approved by EPA on March 1, 2012 (77 FR 12674), partially withdrawn by EPA on March 28, 2013 (78 FR 18849),
- CO – 2005 maintenance plan and request for re-designation to attainment status, approved by EPA on May 11, 2007 (72 FR 26718),
- PM10 – 1997 AQMP and supplemental information, approved by EPA on April 18, 2003 (68 FR 19316),
- PM2.5 – No EPA-approved SIP, and
- NO_2 – SIP approved by EPA on July 24, 1998 (63 FR 39747), based on the 1997 AQMP. In this SIP approval; EPA also re-designated the SCAB from nonattainment to attainment/maintenance for NO_2.

On June 1, 2007, SCAQMD adopted a comprehensive update: the 2007 AQMP for the SCAB. The 2007 AQMP outlines air pollution control measures needed to meet federal O_3 and $PM_{2.5}$ standards. The 2007 AQMP was approved by CARB and submitted to the EPA for its approval on September 27, 2007. The EPA proposed to approve in part and disapprove in part the 2007 AQMP (76 FR 41562). Subsequently, the SCAQMD and CARB filled revisions to the 2007 AQMP, which led to EPA approval of the 2007 AQMP SIP revision in March 2012 (77 FR 12674). However, several court case decisions have forced EPA to withdraw its approval regarding the vehicle miles traveled (VMT) reduction SIP requirements (78 FR 18849). This withdrawal triggers a requirement for SCAQMD and CARB to provide a revised SIP amendment within a specified time period to avoid federal New Source Review and transportation funding sanctions. Since this project does not involve a stationary source that has, or requires, an air quality permit, and does not generate additional motor vehicles trips after completion, it is not anticipated that the sanctions would affect the project. The SCAQMD released an updated AQMP in December of 2012.

The SCAQMD also adopts rules to implement portions of the AQMP. Rule 403 requires the implementation of best available fugitive dust control measures during active construction activities capable of generating fugitive dust emissions from on-site earth-moving activities, construction/demolition activities, and construction equipment travel on paved and unpaved roads.

Ventura County Air Pollution Control District

Ambient air quality and attainment status in Ventura County are monitored by the VCAPCD, which covers the entirety of the county. Ventura County, along with Santa Barbara and San Luis Obispo Counties, make up the SCCAB. The VCACPD previously adopted the Ventura County Air Quality Management Plan (AQMP), which goes through periodic updates. In December of 2016, the latest draft AQMP was released. The AQMP uses projections of growth and emissions to determine control strategies in order to achieve attainment with ambient air quality standards.

3.12.3 *Environmental Setting*

Climate and Atmospheric Conditions

The climate of the SCAB is determined primarily by terrain and geography. Regional meteorology is dominated by a persistent high pressure area that commonly resides over the eastern Pacific Ocean. Seasonal variations in strength and position of this pressure cell cause changes in area weather patterns. Local climactic conditions are characterized by warm summers, mild winters, infrequent rainfall, moderate daytime on-shore breezes, and moderate humidity. The SCAB's normally mild climate is occasionally interrupted by periods of hot weather, winter storms, and hot easterly Santa Ana winds.6

The SCAB area has high levels of air pollution, particularly from June through September. Factors leading to high levels of pollution include a large amount of pollutant emissions, light winds, and shallow vertical atmospheric mixing. These factors reduce pollutant dispersion, exacerbating elevated air pollution levels. Pollutant concentrations in the SCAB vary by location, season and time of day. Concentrations of O_3, for example, tend to be lower along the coast and in far inland areas of the basin and adjacent desert and higher in and near inland valleys.

Existing Air Quality Conditions

Air quality conditions for a project area in the vicinity of Rindge Dam are typically the result of meteorological conditions and existing emission sources in an area. **Table 3.12-4** summarizes air quality data from monitoring stations nearest the area of analysis. The following list identifies, in order of the nearest to farthest stations from Malibu Creek, the monitoring station names and codes used by CARB:

- Thousand Oaks, Ventura County – Moorpark Road (CARB Code 5600435),
- Simi Valley, Ventura County – Cochran Street (CARB Code 5600434),
- West Los Angeles – VA Hospital (CARB Code 7000091), and
- LAX/Hastings (CARB Code 7000111).

These stations best represent air quality conditions at the project area in the vicinity of Rindge Dam, or in the case of O_3, for the region. Air quality has gradually improved over 2009-2011, which is consistent with general improvement in air quality in the region for past three decades despite substantial increases in population and automobile traffic levels over the same period (**Table 3.12-4**). The reduction in pollutant levels has been primarily driven by the extensive regulation of mobile and stationary source emissions.

Table 3.12-4 Summary of Pollutant Monitoring Data

Pollutant	2009	2010	2011	CAAQS	NAAQS
Maximum 1-Hour Concentration, ppm	2	2	*	20	35
Maximum 8-Hour Concentration, ppm	1.5	1.4	1.3	9.0	9
Maximum 1-Hour Concentration, ppb	47	69	41	180	N/A
98th Percentile Concentration, ppb	42	41	36	N/A	100
Annual Average Concentration, ppb	11	10	9	30	53
Maximum 1-Hour Concentration, ppm	0.109	0.104	0.093	0.09	N/A
Maximum 8-Hour Concentration, ppm	0.086	0.091	0.079	0.070	N/A
Fourth-Highest 8-Hour Concentration,	0.081	0.076	0.072	N/A	0.075
Number of Days Exceeding 1-Hour CAAQS	4	2	0		
Number of Days Exceeding 8-Hour CAAQS	9	9	7		
Number of Days Exceeding 8-Hour NAAQS	5	6	1		
Maximum 24-Hour Concentration,	76.8	35.2	45.8	50	150
Annual Average Concentration, □^{3}	25.5	18.8	19.6	20	N/A
Number of Days (%) Exceeding 24-Hour CAAQS	1	0	0		
Number of Days Exceeding 24-Hour NAAQS	0	0	0		
Maximum 24-Hour Concentration,	28.2	21.7	27.5	N/A	N/A
24-Hour NAAQS Design	22	21	20	N/A	35
Annual CAAQS Design Value, □^{3}	11	11	11	12	12
Number of Days (%) Exceeding 24-Hour NAAQS	0	0	0		
Maximum 1-Hour Concentration, ppb	20	25.9	11.5	250	75
Maximum 24-Hour Concentration, ppb	6	3.5	8.3	40	140

Source: SCAQMD 2013; CARB 2012b. **Key:** * = data not available; µg/m^3 = micrograms per cubic meter; N/A = not applicable; ppb = parts per billion; ppm = parts per million

3.12.4 *Air Quality Attainment Status*

The Federal CAA requires states to classify air basins (or portions thereof) attainment status with respect to criteria air pollutants (**Table 3.12-5 and Table 3.12-6**), based on whether the NAAQS have been achieved, and to prepare air quality plans containing emission reduction strategies for nonattainment areas.

Table 3.12-5 Attainment Status for SCAQMD (Los Angeles County)

Pollutant	National Standards	California Standards
O_3	Nonattainment, extreme	Nonattainment, extreme
CO	Maintenance	Attainment
NO_2	Maintenance	Nonattainment
SO_2	Attainment	Attainment
PM_{10}	Nonattainment, Serious	Nonattainment
$PM_{2.5}$	Nonattainment[3]	Nonattainment
Pb	Nonattainment	Nonattainment
Source: CARB 2011b; EPA 2012; 40 CFR 81.305. **Notes:** Classification is for the 1-hour O_3 standard only. Designated as a nonattainment area for both the 2006 24-hour standard and the 1997 24-hour standard.		

Table 3.12-6 Attainment Status in Ventura County

Pollutant	National Standards [1]	California Standards
O_3	Nonattainment	Nonattainment
CO	Attainment	Attainment
NO_2	Attainment	Attainment
SO_2	Attainment	Attainment
PM_{10}	Attainment	Nonattainment
$PM_{2.5}$	Attainment	Attainment
Pb	Attainment	Attainment
Source: VCAPCD website (http://www.vcapcd.org/air_quality_standards.htm).		

3.12.5 *Climate Change*

Many environmental factors affect the abundance and distribution of marine species, including ocean temperatures, ocean circulation patterns, ocean acidification, and climate. Additionally, for species such as anadromous salmonids that also depend upon freshwater systems, environmental factors such as water quality may also affect species reproduction and survival. Global warming changes have the potential to alter these environmental factors. The following section provides a brief summary of potential global warming effects on salmonid species and adaptive strategies.

The global climate exhibits natural variability that often causes fluctuations in marine fish populations (Rothschild 1996, PFEL 2008, Watson et al. Undated). For example, scientific research has “found that salmon returns in the Northwest show long-term behavior which closely follows climate cycles” (Taylor and Southards 1997). Multiple year droughts or inopportune ocean conditions attributed to the northeastern Pacific climate-ocean system can adversely impact salmon and steelhead populations for multiple years and even decades with recovery occurring as favorable conditions return (Boughton, 2010). However, changes in climate beyond normal oscillations, in particular global warming, have the potential to alter marine fish populations on a more permanent basis.

As previously discussed, global climate change has the potential to disrupt existing ecosystems. In particular, potential increases in fresh and marine water temperatures, ocean acidification, droughts, fires, severe storm events, and sea level may adversely impact salmon and steelhead habitat. The Draft National Ocean Policy Implementation Plan states "ocean temperatures and ocean acidification are expected to have significant impacts on many marine species, food webs, and ocean ecosystem structure and function, and the many benefits, they provide" (NOC, 2012). As ocean temperatures rise marine fish are most likely to shift geographic location to match their preferred temperature range (Sharp 2003, Watson et al. Undated). This may cause regional and local shifts in fish stocks (Rothschild 1996, Sharp 2003, Watson et al. Undated).

Ocean acidification is the decrease in the pH of seawater attributed to an increase in human-induced CO_2 concentrations in the oceans since the industrial revolution (NMFS, 2012). Oceans absorb CO_2 from air emissions. The pH of seawater has decreased from 8.2 to 8.1 and further decreases range from 0.3 to 0.4 by the end of the century dependent upon emission scenarios (NMFS, 2012). Ocean acidification affects various organisms differently. For steelhead and salmon, the impacts of ocean acidification may impact their food sources and the ability of the fish to adapt their diets (NMFS, 2012).

Increased frequency and severity of droughts, fires, and severe storm events related to global warming may potentially exacerbate existing erratic weather conditions in southern California and impact anadromous fish (Capelli, 2012). Alterations in current fire, flood, and sediment patterns may further eliminate tree canopy in riparian corridors, lower groundwater tables, or remove trees by debris flows or floods further impacting steelhead habitat (NMFS, 2012). Steelhead tend to exhibit adaptability towards unstable environments as they experience a myriad of varying conditions while swimming to and from the ocean (Capelli, 2012). The Southern California Steelhead Recovery Plan takes into consideration climate change. One of the many recommendations identified by the Technical Recovery Team in the Plan is to identify and maintain refugia areas against severe multi-year droughts.

Areas with inland steelhead populations are more vulnerable to climate change impacts in comparison to coastal populations as the ocean will continue to moderate coastal climates (Boughton, 2010). Alterations in climate that affect quantities and timing of rain events and subsequent freshwater flows have the potential to shift salmonid spawning patterns and juvenile survival in freshwaters (Watson et al. Undated). More inland areas containing oversummering refugia habitat for juvenile steelhead may be subject to lower water conditions and higher water temperatures creating additional stress on the fish (Capelli, 2012) Inland juvenile populations must be able to survive oversummering for migration to the ocean to occur (Capelli, 2012).

As discussed in **Section 3.3.3**, increases in sea level may cause shorelines, coastal marshes, and wetlands to retreat inland where possible. In areas where there is inadequate space for a retreat to occur or sediment loads are inadequate to raise marshes and wetlands, then these areas will gradually lose their function and cease to exist. Estuaries perform a valuable function for anadromous fish species by providing acclimation areas for adult and juvenile fish transitioning between freshwater and seawater environments (Capelli, 2011). Additionally, studies have shown that juvenile steelhead growth rates are higher for steelhead reared in estuaries than those fish exclusively reared in freshwater (Capelli, 2011). The larger a juvenile steelhead the greater their survivability when they enter the ocean thereby increasing their return rates to freshwater (Capelli, 2011).

For the Malibu Creek Watershed changes in climate have the potential to alter Malibu Lagoon habitats and the species that depend on them, however the extent of all changes is unknown requiring implementation of adaptive strategies. As summarized in the Final Southern California Steelhead Recovery Plan, "while some physical parameters of climate change are likely to be predictable, the response of ecosystems and hence the future conditions of steelhead habitats are much less predictable" (NMFS, 2012). Sea level rises may alter the flow patterns into and out of Malibu Lagoon and cause the lagoon to retreat, therefore altering the salinity and subsequent plant and wildlife species composition. As for the southern California steelhead, which depends upon both salt and freshwater habitats; growth, survival, reproduction, and spatial distribution may be affected (Watson et al. Undated). Warmer ocean temperatures may shift the southern California steelhead's distribution northward and "warmer river water and reduced flows in the late summer may increase mortalities and reduce spawning success" (Watson et al. Undated).

NMFS's "overarching strategy for dealing with climate change will be to enhance the resilience of the steelhead metapopulations to respond to ecosystem changes, through forecasting and managing the envelope of the species according to a few principles" (NMFS, 2012). These core principles include:

- Widen opportunities for fish to be opportunistic;
- Promote the evolvability of populations and metapopulations;
- Maintain the capacity to detect and respond sustainably to ecosystem changes as they occur; and
- Maximize connectivity of habitats (NMFS, 2012).

Global Warming

Global warming or global climate change is a change in average climatic conditions in comparison to long-term historical climatic conditions (AEP, 2007). Climatic conditions include temperature, wind patterns, precipitation, and storms (AEP, 2007). Reconstruction of historical climate data over the past 2,000 yrs indicates temperature has historically varied although the past 100 yrs appears to indicate a significant increase in temperature (National Research Council, 2006). These historic reconstructions are considered by the National Research Council (2006) as a "qualitatively consistent picture of temperature changes over the past 1,100 yrs and especially over the last 400 yrs."

There is a broad consensus in the scientific community that global warming is occurring in response to increased emissions of greenhouse gases (GHGs) and black carbon particles both from natural and anthropogenic sources (USGS, 2009 and CEQ, 2011). Average air and water temperatures have risen and are expected to continue to rise in the future with impacts dependent on future GHG emission levels although the effects of global climate change differ regionally (USGS, 2009 and CEQ, 2011). To reduce impacts associated with climate change heat trapping emissions must be reduced and adaption to climate change impacts must occur (CEQ, 2011).

According to the IPCC, an increase in GHG emissions is the only driver that can scientifically explain global warming at the global and national levels over the past few decades (IPCC, 2007a). Observed changes related to global warming include shrinking glaciers, thawing permafrost, later freezing, earlier break-up of ice on rivers and lakes, a lengthening growing season, shifts in flora and fauna distribution ranges, and earlier flowering of trees (IPCC, 2007b). At the national level observed climate change impacts include an increase in average temperatures, more frequent heat waves, high intensity precipitation events, sea level, more prolonged droughts, and an in increase in acidic ocean water (CEQ, 2011). Over the last fifty years, the average year-round air temperature of the continental US has risen by more than 2°F with further increases projected (CEQ, 2011). Merely implementing strong programs to reduce GHGs will not reduce the effects of climate change in the near future as the impacts of historical emissions will linger in the atmosphere coupled with excess heat already absorbed by the oceans (CEQ, 2011).

At a regional level, climate models applied to California project summer temperatures increasing for the first 30 yrs of the century from a minimum of 0.9 to a maximum of 3.6° F increasing to a minimum of 2.7 to a maximum of 10.5° F by the last 30 yrs century of the century dependent upon the emission scenario applied in model runs (CALEPA, 2009). Over the course of the next century, the California Climate Action Team report predicted the following climate change effects based on modeling results:

- A shift in snow water peak equivalent from 4 to 14 days earlier in the Sierras and a reduction in runoff from snowmelt,
- Extension of extreme summer temperatures from July through August to June through September with an increase in frequency, magnitude, and duration of heat waves,
- Precipitation decreases in Southern California as the century progresses with up to a 15% decrease in some simulations,
- Decrease in annual crop yields and increased challenges including limited water, increasing temperatures, and saltwater intrusion into the Delta,
- Increase in wildfire size, duration, and frequency with fire probability increasing in the extreme North and Northwest regions of the State, Central Coast Ranges, high Sierras, and various regions in southern California,
- By 2050 a sea level rise ranging from 11 to 18 in higher than in 2000 and by 2100 a rise ranging from 23 to 55 in higher than in 2000 resulting in an increase in high sea level events when high tides coincide with storm events,
- Increase in poor air quality related to heat waves and formation of ozone,
- More frequent, longer, and more intense heat waves,
- Increase in heat related deaths by 0.8 to 3.2%,
- Substantial economic impacts on the order of tens of billions of dollars annually under worst case emission scenarios, and
- Increased electricity demand, particularly in the hot summer months (CALEPA 2009).

Determining impacts of climate change in California is an ongoing effort that is continuously progressing and in time is leading to further refinements of impacts.

In turn, effects of climate change can have direct and indirect impacts on resources requiring implementation of adaption measures. If strong reductions in GHG emissions occur in the future, the lingering effects of past GHG emissions will allow climate change effects to continue as result of the persistence of past emissions in the atmosphere and heat absorption by the ocean (CEQ, 2011). To address the lingering effects of climate change the USACE has adopted a climate change policy and State of California has enacted legislation and has developed a climate change strategy to guide policy development.

The USACE policy is to integrate climate change adaption planning and actions into its missions, operations, programs, and projects (USACE, 2011). The USACE continues to develop its climate change adaption planning and implements results of the planning using best available and actionable climate science and climate change information. Simultaneously, the USACE continues to work with other agencies to develop the necessary science and engineering research on climate change into actions to address climate change impacts in the USACE' missions. The USACE shall consider potential climate change impacts when undertaking long-term planning, setting priorities, and making decisions affecting its resources, programs, policies, and operations. The USACE' climate change policy actions are fully compatible with the guiding principles and framework of the US Federal Interagency Climate Change Adaption Task Force and Implementing Instructions for Federal Agency Climate Change Adaption issued on March 4, 2011 jointly by the Executive Office of the President's Council on Environmental Quality/Office of the Federal Environmental Executive (CEQ/OFEE) and the Office of Management and Budget (USACE, 2011).

The USACE is acting to integrate climate change adaption (managing the avoidable impacts) with mitigation (avoiding the unmanageable impacts). It is the policy of the USACE, that mitigation and adaption investments and responses to climate change shall be considered together to avoid situations where near-term mitigation measures might be implemented that would be overcome by longer-term climate impacts requiring adaptation, or where short-term mitigation action would preclude a longer-term adaptation action. Successful implementation of the USACE' adaption policy will assist in enhancing the resilience of the built and natural water resource infrastructure the USACE manages and reduce its potential vulnerabilities to the effects of climate change and variability. This success will allow the USACE to continue fulfilling its missions using Integrated Water Resource Management to safeguard the Nation's tremendous investment in the built and natural water-resource infrastructure by mainstreaming climate change adaption in all USACE activities. Additionally, the USACE is closely collaborating, internationally and nationally, with other agencies to identify and reduce mission vulnerabilities related to climate change. Through its climate change policy, the USACE has established the USACE Climate Change Adaption Steering Committee to oversee and coordinate agency-wide climate change adaption and implementation USACE, 2011).

California has a long history of addressing climate change leading to its current climate change strategy. In 1988, the State legislature enacted a statute requiring a report on climate change with recommendations to address, avoid, and reduce potential impacts (CALEPA, 2010). California was the first State to adopt required economy-wide targets for GHG emissions with passage of Assembly Bill 32 (AB32), also known as the Global Warming Solutions Act of 2006. In 2005, Governor Schwarzenegger signed Executive Order S-3-05 establishing GHG emission targets and requiring biennial reports on progress to date on meeting the targets and updates on potential climate change impacts on the State (CALEPA, 2010). This was followed in 2008 with Executive Order S-13-08 calling on State agencies to develop a strategy for identifying and preparing for expected climate change impacts (CNRA, 2009).

In response to Executive Order S-13-08, the California Natural Resources Agency (CNRA) is leading the development of a statewide strategy addressing climate change through work with the Climate Action Team. Efforts are concentrated on summarizing climate change impacts and developing adaption strategies across seven sectors: public health, biodiversity and habitat, oceans and coastal resources, water, agriculture, forestry, and transportation and energy (CNRA, 2009). Four key actions in the Executive Order are: (1) initiate California's first Statewide climate change adaptation strategy that will assess the State's expected climate change impacts, identify where California is most vulnerable and recommend climate adaptation policies by early 2009; (2) request the National Academy of Science establish an expert panel to report on sea level rise impacts in California to inform State planning and development efforts; (3) issue interim guidance to State agencies for how to plan for sea level rise in designated coastal and floodplain areas for new projects; and (4) initiate a report on critical existing and planned infrastructure projects vulnerable to sea level rise.

In December, 2009 the CNRA released the culmination of its first efforts to develop climate change strategies for each of the sectors in response to the Executive Order, 2009 Climate Change Adaption Strategy. The document is designed to guide and inform decision makers in the State as policies are developed to protect the State, residents, and resources from impacts associated with climate change (CNRA, 2009). Strategies for each of the sectors are presented based on state-specific scientific assessments and will be updated and refined as a greater understanding of climate change is developed (CNRA, 2009). Overall, the strategy recognizes climate change impacts are occurring, impacts will occur within the State, and seeks to serve as a framework for developing policies.

Other actions that have taken place in response to Executive Order S-13-08 include preparation of a Sea Level Rise Report by the California State Lands Commission in December 2009 to address concerns on the issue of sea level rise, a summary of the efforts of California, Federal agencies, and other coastal states related to sea level rise, and included recommendations to reduce the impacts of sea level rise in California. The Coastal and Ocean Climate Working Group of the California Climate Action Team (CO-CAT), which is a forum for State agencies to share information and coordinate on actions to implement the California Climate Adaptation Strategy developed a Sea-Level Rise Interim Guidance Document in October 2010 as a guide to assist State agencies in incorporating sea level rise projections into planning and decision making for new construction projects (CO-CAT, 2010). Sea level rise is detailed in **Section 3.3.3**.

<u>Green House Gases</u>

When sunlight enters the Earth's atmosphere it is reflected off land masses and water into the atmosphere where it is trapped and retained by certain gases maintaining a fairly constant long-term temperature. These gases are known as greenhouse gases (GHGs) and operate similar to a greenhouse trapping heat. GHGs are emitted by both natural and human-induced processes. Examples of human and natural produced GHGs are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Examples of GHGs emitted primarily by human induced activities include fluorinated gases (hydrofluorocarbons and perfluoerocarbons) and sulfur hexafluoride. Natural sources of GHGs include, but are not limited to, volcanic activity, wildfire, decomposition of organic matter, anaerobic decay of organic matter, and microbial processes. Anthropogenic sources include, but are not limited to, fossil fuel use, deforestation, aerosol use, industrial use, and landfills. An additional important GHG is water vapor, in that it traps more heat than any other GHG, but its atmospheric concentrations are not a concern as humans play an insignificant role in atmospheric concentrations in the atmosphere (DWR/EPA, 2011). Approximately 85% of water vapor is derived from evaporation of the oceans (AEP, 2007).

Without natural GHG emission the earth's surface would be approximately 61°F cooler (AEP, 2007). Overtime humans have increased the concentration of GHGs in the atmosphere increasing the ability of the atmosphere to retain heat. GHG concentrations in the atmosphere increase when GHG emissions exceed natural physical and chemical removal processes. Removal processes may vary dependent on the concentration of specific gases and other atmospheric properties (IPCC, 2007b). Long lived GHGs, such as CO_2, CH_4, N_2O, have long lives in the atmosphere and remain chemically stable for long periods of time (decades to over a century), thus have a longer term potential to impact climate (IPCC, 2007b). Other GHGs, such as sulphur dioxide and carbon monoxide, are removed by chemical oxidation in the atmosphere rather quickly and atmospheric concentrations are highly variable (IPCC, 2007b). Between 1970 and 2004 global GHG emissions attributed to human activities have increased 70% with the largest increases attributed to energy supply, transport, and industry (IPCC, 2007a).

Human induced GHGs emissions result in four long lived GHGs: CO_2, CH_4, N_2O, and halocarbons (group of gases containing fluorine, chlorine, or bromine) (IPCC, 2007a). CO_2 has increased from a pre-industrial level of approximately 280 parts per million (ppm) to 379 ppm, CH_4 from approximately 715 part per billion (ppb) to 1774 ppb in 2005, an N_2O from approximately 270ppb to 319 ppb in 2005. Multiple halocarbons have also increased from near zero in the pre-industrial period. According to the IPCC, "Most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase anthropogenic GHG concentrations" (IPCC, 2007a).

Climate change is driven by a complex system of "forcings" and "feedbacks." A feedback is "an internal climate process that amplifies or dampens the climate response to a specific forcing." Radiative forcing is the difference between the incoming energy and outgoing energy in the climate system

Dependent upon a particular gas, GHGs have varying heat trapping abilities, or global warming potential (GWP). GWP is the potential of a gas or aerosol to trap heat in the atmosphere. The carbon dioxide equivalent methodology is used for comparing GHG emissions between various GHGs. This methodology normalizes GHGs to a consistent metric where CO_2 is the reference gas and has a GWP of 1. CH_4 has a GWP of 21 meaning CH_4 has a global warming potency 21 times greater than CO_2 on an equal mass basis. In comparison, N_2O has a GWP of 310 and sulfur. To account for GWPs, GHGs are typically reported as CO_2equivalents (CO_2e) so all GHG emissions from a particular source can be reported as a single number. The CO_2e is calculated by multiplying the emissions of each GHG by its GWP, then summing the results together to produce a single, combined emission rate representing all GHGs.

Baseline GHG emissions for the project area are not applicable. Rindge Dam is an abandoned and non-functional dam. All other existing manmade fish passage barriers do not generate GHG emissions or utilize fossil fuels, although many serve a function in allowing vehicle crossings.

3.12.6 *Applicable Policies and Regulations*

Human induced GHG emissions and their potential impact on climate change has led to the formation of policies and regulations at the Federal, State, and local levels. The following discussion focuses on the rules, regulations, and planning efforts concerning GHG emissions.

<u>Federal Policies and Regulations</u>

The USEPA currently does not regulate GHG emissions; however, Massachusetts v. USEPA (549 U.S. 497 [2007]) was argued before the U.S. Supreme Court on November 29, 2006, in which it was petitioned that USEPA regulate four GHGs, including carbon dioxide, under §202(a)(1) of the Clean Air Act. The Court issued an opinion on April 2, 2007, in which it held that petitioners have standing to challenge the USEPA and that the USEPA has statutory authority to regulate emissions of GHGs from motor vehicles. In response, in December 2009 the Federal government released an 'endangerment finding' that GHGs endanger public health and welfare.

As required by the Supreme Court ruling, on May 7, 2010 the USEPA in conjunction with the Department of Transportation's National Highway Traffic Safety Administration (NHTSA) finalized the Light-Duty Vehicle Rule (LDVR) that establishes a national program consisting of GHG emissions standards and CAFE standards for light-duty vehicles. On May 13, 2010 the EPA finalized the Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule (Tailoring Rule) that requires new facilities that emit over 100,000 tons of GHGs per year or modifications to facilities that increase GHG emissions by over 75,000 tons per year to obtain permits that would demonstrate they are using the best practices and technologies to minimize GHG emissions. The permitting requirements under the Tailoring Rule went into effect on January 2, 2011, the same date the LDVR standards first apply to new cars and trucks starting with model year 2012.

In addition, to evaluate the sources of greenhouse gas emissions in the U.S. economy, the USEPA finalized a Mandatory Greenhouse Gas Reporting Rule (MRR) on December 29, 2009. The MRR covers suppliers of fossil fuels and industrial GHGs, manufacturers of vehicles and engines, and facilities that emit over 25,000 metric tons of GHGs per year to report their annual emissions to the USEPA. The first emissions reports from covered facilities were due in September of 2011. Information collected from this rule is expected to be used to inform future policy decisions.

On August 1st, 2016, the CEQ issued guidance final guidance memorandum, Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews, for public consideration regarding ways in which Federal agencies can evaluate GHG emissions and climate change under NEPA. This memorandum "affirms the requirements of the statute and regulations and their applicability to GHGs and climate change impacts." Furthermore, the Guidance recognizes the scientific limits of analyzing a project's impacts on global climate change and environmental documents should not "devote effort to analyzing wholly speculative effects."

Within the Guidance, it is recommended that if a project will be subject to the aforementioned MRR, emission of 25,000 metric tons or more of CO_2e GHGs annually from a stationary source, then the responsible agency should include this information in the NEPA documentation for consideration. CEQ is not proposing this emission level as a measure of indirect effects, but its use as a potential indicator for an agencies' evaluation of GHG emissions and documentation within NEPA documents. Additionally, CEQ is not proposing this emission level "as an indicator of a level of GHG emissions that may significantly impact the human environment, as that term is used by NEPA, but notes that it serves as a minimum standard for reporting emissions under the Clean Air Act." The Draft Guidance highlights that many proposed federal projects would not be expected to produce significant effects on the human environment or require a detailed discussion in NEPA documentation.

Without an adopted or scientifically based GHG standard for federal agencies, the USACE will not propose a new GHG standard for its actions or put forth a NEPA impact determination for GHG emissions anticipated from the proposed Project Alternatives. In compliance with CEQ's NEPA Guidance on GHG emissions, the USACE will use the 25,000 metric tons of CO_2 equivalent emissions as an appropriate indicator level to determine if additional analysis is warranted unless State or regulations are more stringent.

State Policies and Regulations

Senate Bill 97 required the Office of Planning and Research to develop amendments to the CEQA Guidelines regarding analysis and mitigation of GHG emissions for adoption by the CNRA by January 1, 2010. On December 30, 2009, the CNRA adopted State CEQA Guidelines Amendments, including regulatory guidance for CEQA documents to analyze and recommend mitigation measures for GHG emissions, with an effective date of March 10, 2010.

Section 15064.4 was added to the CEQA Guidelines to assist lead agencies in determining the significance of impacts from GHG emissions and to provide a list of factors that a lead agency should consider, in addition to other factors, when assessing the significance of a project's GHG emissions on the environment. To describe, calculate, or estimate the projected GHG emissions from a project a lead agency is required to make a good-faith effort based on available scientific and factual data. A lead agency also has the discretion to quantify GHG emissions based on using an accepted model/methodology or using a qualitative analysis or performance based standards. When assessing the significance of GHG emission impacts on the environment, a lead agency should consider:

- The extent to which the project may increase or reduce GHG emissions as compared to the existing environmental setting;
- Whether the project emissions exceed a threshold of significance that the lead agency determines applies to the project; or
- The extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions. Such requirements must be adopted by the relevant public agency through a public review process and must reduce or mitigate the project's incremental contribution of greenhouse gas emissions. If there is substantial evidence that the possible effects of a particular project are still cumulatively considerable notwithstanding compliance with the adopted regulations or requirements, an EIR must be prepared for the project.

Mobile source engine and transportation fuel GHG emissions are regulated by the California Air Resources Board (CARB) as promulgated by AB1493 adopted on July 22, 2002. AB1493, also known as the Pavley regulations, is designed to reduce GHG emissions for passenger vehicles. Originally, the bill originally intended to reduce GHG emissions from passenger vehicles beginning in 2004, however a waiver to implement the standards was denied by the USEPA in 2008. Subsequently, on June 30, 2009 the EPA granted the waiver allowing the State to adopt GHG emissions standards for new passenger cars, pick-up trucks, and sport utility vehicles. In response, CARB adopted amendments to the existing Pavley regulations on September 24, 2009 allowing CARB to set new GHG emissions for passenger vehicles starting in 2009 and extending through 2016. The regulations are expected to reduce passenger vehicle emissions by approximately 22% in 2012 and 30% in 2016 (CARB, 2012b).

Executive Order S-01-07 was enacted by the Governor on January 18, 2007 to address the carbon intensity of transportation fuels. It required the establishment of a statewide goal to reduce the carbon intensity transportation fuels by at least ten% by 2020 and development of a low-carbon fuel standard (LCFS) for transportation fuels. CARB adopted a LCFS standard in 2009 with an effective date of January 12, 2010. The regulations call for a reduction of at least a ten% carbon intensity in transportation fuels by 2020. These standards went into effect in 2011.

On October 24, 2008 CARB released a preliminary draft proposal, "Recommend Approaches for Setting Interim Significance Thresholds for Greenhouse Gases under CEQA." This proposal suggests a GHG emission threshold of significance for industrial projects of 7,000 metric tons of CO_2e with mitigation from non-transportation related sources, such as stationary combustion, process losses, purchased electricity, water usage, and wastewater discharge. CARB is developing performance standards for transportation and construction sources.

Local Policies and Regulations

On December 5, 2008, the SCAQMD Governing Board adopted the staff proposal, "Interim CEQA GHG Significance Threshold for Stationary Sources, Rules, and Plans" where SCAQMD is the lead agency. This interim threshold is applicable to stationary/industrial sources only and sets a significance threshold of 10,000 metric tons of CO_2e, inclusive of construction emissions amortized over 30 yrs, for determining significant impacts. Commercial and residential interim thresholds are under development by the SCAQMD. Once a final statewide significance threshold is adopted by CARB, SCAQMD will review the interim threshold to determine if changes are necessary.

According to OPR, as of June 18, 2012 the County of Los Angeles is in the process of drafting climate change policies and programs that will affect general plan policies, general plan implementation measures, and ordinances. In the future the City of Malibu is planning to address climate change (OPR, 2012).

3.13 Safety and Hazards

The purpose of this section is to characterize existing safety issues in the Study area. Existing safety issues include structural integrity of the dam, fire hazards, flooding, and hazardous materials.

3.13.1 *Rindge Dam Safety*

The California Department of Safety of Dams (DSOD) is responsible for the supervision of non–federal dams and reservoirs under the statutes governing dam safety in California (Division 3 of the Water Code). DSOD reviews plans and specifications of new non-federal dams within California or the alteration, repair or removal of existing dams. These changes require written approval before any construction may proceed. Operating dams are inspected periodically to ensure necessary maintenance, or to define any deficiencies. The Division of Design and Construction, Department of Water Resources conducted a safety inspection of Rindge Dam in 1992 and concluded that:

- The dam and reservoir are not in danger of sudden failure at the present time.
- The abutments of the dam should be monitored and photographed periodically, particularly after flood flows and/ or nearby large earthquakes.
- The erosion at the downstream end of the spillway should be monitored and photographed periodically, particularly after flood flows.
- The spillway erosion may have to be repaired at some future date to preserve the safety of the dam (Department of Water Resources 1992).
-

The USACE performed visual inspections of the overall condition of Rindge Dam in May and September 2005. The downstream face of the concrete dam, the crest of the dam and overpour (weir) sections were intact and appeared to be in stable condition. The abutment rock appeared to be in good condition and did not show any signs of deterioration or adverse conditions. Flows from the outlet pipe in the dam face do not appear significantly different from historic photos. The downstream toe of the dam appeared to be in good condition as observed from a distance. Competent rock at toe of dam structure indicates a lack of erosion despite evidence of over-dam spills, which have occurred over the years. The dam is fully filled with impounded sediment and the static load against the structure does not appear to have overstressed the steel reinforced concrete arch dam, reinforced with former railroad rails. The spillway was not inspected closely due to the high water levels on the upstream side.

The inspections included hammer tests of the concrete on the face of the dam to provide a general indication of the soundness of the concrete quality. The test results indicated no immediately obvious deterioration of the concrete comprising the dam. A dynamic stress evaluation of Rindge Dam is not within the scope of the current study.

It is assumed that the Dam will remain in-place for the 50-yr period of analysis. The general conclusions presented above do not supersede any information presented by the DSOD and should in no way be viewed as a guarantee of the overall stability of the Dam. Future coordination with DSOD will occur if a tentatively recommended alternative includes features that may require a more comprehensive evaluation of the Dam's structure.

3.13.2 *Fire Hazards*

The Study area is located in an area where fire is an integral part of the ecosystem. In May 2012, CAL Fire recommended classification of the majority of the Study area as a Very High Fire Severity Zone. Local agencies have the opportunity to comment on these recommendations before they are officially approved. Areas classified as Very High Fire Severity Zones are subject to ignition-resistant building standards for new construction, defensible space maintenance, and disclosure when a property is sold.

3.13.3 *Flooding*

There is a potential for flood hazards on Malibu Creek downstream of Rindge Dam. Flooding is described in **Appendix** B, and also in the introduction under Flood Risks – Downstream Reaches.

3.13.4 *Hazardous, Toxic and Radioactive Waste*

This section describes the affected environment for hazardous, toxic, and radioactive waste in impounded sediments and the Malibu Creek watershed. A detailed discussion regarding the safety of the impounded sediments captured behind Rindge Dam is provided in the **Appendix D**. In 2002 impounded sediments at the Dam were tested to determine if contaminants were present. Leachate test results indicated the sediments are suitable for beach nourishment. Additionally, testing indicated the sediment had no observable characteristics, nor any test results indicative of, ignitability, corrosiveness, reactivity, toxicity, nor any history of specific industrial processing that would indicate such characteristics. Overall, the sediment was found to not be classified as hazardous waste and is suitable for upland disposal. Upland disposal includes all non-ocean placement of the sediment, including on-beach placement, landfill cover, and wasting in a landfill.

Impounded Sediments

The environmental sampling regime on the sediment impounded behind Rindge Dam was designed with consideration of the possible uses and/or means of disposal of the various types of sediment. The USACE conducted chemical testing of soil samples taken from the study of the impounded sediment. These samples were tested for 89 analytes, which, if are not present or are below acceptable levels can be used for certain disposal options. Of the post reservoir sediment that was tested, none of the units contained levels of contaminants that exceed SQG (sediment quality guidelines). Both Units 2 and 3 are chemically suitable for upland disposal. No hazardous wastes were identified. The overall test results for the ocean disposal suite of analytes was favorable, suggesting that portions of the impounded sediment could be used for beach nourishment, offshore disposal, or other marine disposal options. Although test results indicate that the impounded sediment is acceptable for either upland disposal or ocean disposal, additional monitoring for oil and grease, organic content, and grain size was suggested by the USACE. Complete information on the sampling protocols and results is detailed in **Appendix D**. Soil sampling has not been conducted for any of the upstream barriers at this time.

Known Contaminants in the Watershed

Malibu Creek watershed encompasses the entire communities of Westlake Village and Agoura Hills, much of Calabasas and Thousand Oaks, and small parts of Hidden Hills and Simi Valley. About two-thirds of the contributory watershed is in Los Angeles County, and the rest is in Ventura County. Nearly 10 mi of Hwy 101 and over 12 mi of Mulholland Drive traverse Malibu Creek Watershed from east to west.

A survey was conducted for information about potential environmental concerns in the contributory watershed, and each potential concern encountered was evaluated to determine whether it carried the potential to impact the impounded sediments behind Rindge Dam. Results of this evaluation are summarized below and detailed in **Appendix D**. None of the potential sediment contaminants from the contributory watershed were determined to be of concern to the sediments impounded behind Rindge Dam.

Calabasas Landfill

Calabasas Landfill located in Agoura Hills, California, is within the contributory watershed in a tributary canyon to Las Virgenes Creek, approximately 7 creek miles upstream of the impounded sediments at Rindge Dam. The landfill is operated, but not owned, by the Sanitation Districts of Los Angeles County, Solid Waste Management Department (hereafter, "LACSD"), and is one of the three Sanitary Landfills that comprise the core of the LACSD waste management system (LACSD 2005).

The 416-ac site, active since 1961, has accumulated approximately 21 million tons of materials and receives approximately 1,700 tons of refuse per day. The landfill operates as a Class III facility, meaning that it accepts only municipal solid waste and inert waste, and active areas of the landfill are lined with plastic liners and have leachate and methane gas collection systems. However, this landfill was a Class I facility prior to mid-1980, accepting liquid and hazardous wastes, and the older parts are unlined with wastes placed directly on alluvial soils (Natural Hazards Disclosure 2002).

A 2002 California State Water Quality Control Board order to CalEPA to sample groundwater at some 50 landfills in the State (RWQCB 2005) discovered levels of radiation in fluids that formerly were allowed to be dumped at Calabasas landfill. Those levels exceeded State Drinking Water standards, but otherwise would not be considered hazardous. Groundwater down-gradient from the landfill is not used for drinking and is not considered potable by LVMWD due to high TDS (total dissolved solids), having 1000 mg/L TDS. LVMWD uses 500 mg/L as the limit for TDS in drinking water that it supplies. There are no downstream domestic groundwater users of this water (Natural Hazards Disclosure 2002).

<u>Perchlorate</u>

Perchlorate, a component of rocket fuel that has come under increased regulation in recent years, was reported in the contributory watershed in one groundwater sample at the Ahmanson Ranch well M1 at a depth of -550 ft, in Aug. 2002. The well is near the west bank of Las Virgenes Creek, about 11.5 creek miles upstream from the impounded sediments at Rindge Dam. Previous and follow-up groundwater sampling were unable to produce perchlorate readings. The conclusion of the RWQCB, after reviewing these test results, was that no further sampling and testing was needed. "The Regional Board has reviewed all groundwater and surface water monitoring results for the Ahmanson Land Company property, and other relevant information available regarding the supplemental sampling and analyses of groundwater from Well No. 1, conducted during June and July 2003, and have concluded that there is no conclusive evidence which would require additional hydrogeologic assessment or monitoring at Well No. 1, at this time. The Regional Board has no further requirements for sampling from Well No. 1 or other wells, seeps, or watercourses on the former Ahmanson Land Company property" (Dickerson 2004).

The regional user of perchlorate, Rocketdyne (the Santa Susana Field Laboratory, or SSFL), is in the northern part of the Simi Hills, not in the Malibu Creek Watershed. A study in 2000 by Kleinfelder, Inc., suggested that "trace levels of radiological and chemical compounds from the Rocketdyne laboratory may have filtered into the soil and groundwater near Ahmanson Ranch, but no contamination could be found that could be considered a threat to public safety" (as reported in Loesing 2002).

<u>Radionuclides</u>

In June 2003 the State Department of Health Services, now known as the California Department of Public Health, participated in a resampling of the Ahmanson Ranch well M1 to test for migration of radionuclides from the Rocketdyne facility onto Ahmanson Ranch. They determined through the results of the groundwater sample analysis that "no evidence was found that the Ahmanson Ranch property groundwater has been impacted by man-made radioactive contamination, or that radioactivity has migrated from the SSFL [Rocketdyne] site to the Ahmanson Ranch groundwater." Tritium was the only specific radionuclide that had been identified in groundwater at the Rocketdyne site. None was detected in the State Department of Health Services samples above the minimum detection limit, although the State Department of Health Services report on the matter noted that the lower detection limit in their tests was higher than the local tritium background levels (Bailey 2004).

Water Quality Issues

Widespread and continuing water quality monitoring is conducted in the watershed by a number of different entities. Twenty-seven different substances and conditions have been or are being tracked. They include the 303d listed criteria eutrophic conditions; nutrients (algae); organic enrichment/low dissolved oxygen; odors; foam/scum (unnatural); coliform bacteria; sedimentation/siltation; trash; chloride; specific conductivity; and ammonia. Monitoring is also conducted for: mercury, selenium, lead, copper, chlordane, PCBs, aluminum; arsenic; cadmium; chromium; nickel; silver; zinc; nitrate; nitrite; oxadiazon. The testing under the water quality monitoring programs are performed on water samples in most instances, organism tissue samples in some instances, and rarely, sediment sampling, allowing little one-to-one comparison between the USACE impounded sediment sampling program and the water quality monitoring program. Nevertheless, the water quality monitoring program is indicative of potential contaminants in the contributory watershed. Each monitored substance or condition was evaluated by the USACE, from the perspective of its potential to impact the impounded sediments behind Rindge Dam. Results of this evaluation can be found in **Appendix D**. This evaluation identifies no potential impacts from the contributory watershed on the impounded sediments behind Rindge Dam that would alter the previously established applicability of that impounded sediment for use as beach nourishment or upland disposal.

3.14 Utilities

The purpose of this section is to characterize utilities in the Study area.

3.14.1 *Electrical and Gas Lines*

Overhead utilities are present at the Sheriff's Overlook site and extend north and south along Malibu Canyon Road and over the canyon across Malibu Creek. At barrier site CC2 a 3-in gas line is present on the side of the existing bridge barrier, as well as a water line and overhead powerlines. At barrier site LV1 there is also a water line present that is owned by the Las Virgenes Municipal Water District. No additional utilities have been located in the Study area based on preliminary analysis.

3.13.1 Water and Wastewater Conveyance Systems

Based on preliminary analysis operational water pipelines are not known to be located in the footprint of the construction activity areas within the Study area. Wastewater conveyance systems are not located within the construction activity areas within the Study area. The Study area is not served by a wastewater agency. Individual lots have onsite septic systems.

3.14.2 *Calabasas Landfill*

Calabasas Landfill has been identified as the only feasible receiver site available to dispose of any of the larger sized material (gravel, cobble, boulders) and fines (silts and clays) impounded at Rindge Dam. Currently, the landfill can accept 3,400 tpd, but is receiving approximately 1,700 tpd, therefore capacity is available. The landfill is expected to remain open until 2046 given the current daily disposal volume (Los Angeles County Sanitation District, Pers. Email Communication on 24 January 2013).

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4.0 ALTERNATIVE PLANS/PLAN SELECTION

4.1 Plan Formulation Rationale / Management Measures

The following summary of management measures have been considered in different combinations to address the study authority and planning objectives, and to formulate and evaluate an array of alternative plans for this study. Measures and plans focus on modifications to Rindge Dam to address the restoration of a more natural sediment transport regime and reconnection of the aquatic and riparian corridor. In most cases, measures addressing the dam structure were not considered independent of other measures that addressed the impounded sediment. All other measures are in some way dependent on proposed actions to be taken at the dam site. The table following the next sections display how measures addressed objectives and other considerations used in screening measures and preliminary alternatives.

For the Rindge Dam structure, measures considered include partial or entire removal of the dam arch, entire removal of the spillway or a combination of the two, a v-notch from the top to the base of arch, consideration of a variety of fishways, a sediment bypass through the arch, a sediment bypass around the dam, and restoration of the dam to once again function as a water storage facility (per request of some public interests).

4.1.1 *Structural Alteration of Rindge Dam - Removal of Concrete Arch (in lifts, combined with natural transport of impounded sediment)*

Dam Arch Removal – Natural Sediment Transport

Hydraulic and sediment transport models were used to estimate on-site and downstream effects to the Malibu Creek ecosystem and floodplain for various increments of dam removal combined with natural sediment transport, including a series of 5-, 10-, and 20-ft notches at the dam arch, and a two-phase removal that allow for mobilization of up to half the volume of impounded sediment (approximate 40-ft notch). These incremental notching measures allow for a controlled volume of sediment erosion to occur over time via natural sediment transport during winter storms. Once sediments erode to the crest of the remaining notched dam arch, additional notching of the structure would continue until the arch structure was fully removed and the impounded sediment behind the dam was naturally redistributed along downstream reaches of Malibu Creek, the lagoon and the Pacific Ocean.

Natural sediment transport measures for the impounded sediment include the need for an access ramp from Malibu Canyon Road to provide equipment access for earthwork and for dam structural modification, diversion and control of water during construction using a temporary (coffer) dam and surface water diversion measures around the work site, clearing and grubbing of existing vegetation (including mature trees), and sediment sorting and stockpiling.

> There are significant tradeoffs and uncertainties associated with utilizing storm flows to convey Rindge Dam impounded sediment to downstream reaches of Malibu Creek and the Pacific Ocean and/or removal of the material utilizing trucks, conveyors, or a slurry pipeline. The combination of measures and alternatives array analyzed for this study focus on these tradeoffs, and PDT risk-based decisions made during the planning process to address the impacts associated with proposed removal and placement of Rindge Dam impounded sediment.

4.1.2 *Structural Alteration of Rindge Dam - Removal of Concrete Arch (impounded sediment transport to upland, shoreline or nearshore sites)*

Dam Arch Removal – Mechanical Sediment Transport

For measures combined with mechanical removal and transport of the impounded sediment, the annual extent of arch notching was defined by the annual volume of sediment removed (trucking, slurry, conveyor considered), with a variety of other factors considered related to traffic, air quality, noise, and water resources impacts, locations for temporary and long-term placement of material, and daily and seasonal operational restrictions. Annual dam arch notching heights considered for these measures, combined with mechanical transport of impounded sediment, ranged from about 10-to-30 ft.

Consideration of upland disposal sites included areas adjacent to Malibu Canyon Road both above and below the dam, areas near State Parks offices (by Las Virgenes Road and Mulholland Highway), within or near the City of Malibu and several landfills, or along the shoreline or nearshore area. Sediment transport methods included consideration of a slurry pipeline, a conveyor system, trucking, use of a barge and/or combinations of these methods.

4.1.3 *Rindge Dam Spillway Removal*

Spillway Removal

Measures to address spillway removal were considered to address safety and aesthetic problems, and associated human disturbances to critical habitat. The spillway and arch are attractive nuisances, resulting in significant habitat degradation and public safety concerns due to illegal trespass. These measures would be combined with removal of the arch dam since the spillway is located on a bedrock outcrop adjacent to the arch. No aquatic habitat connectivity is achieved through removal of the spillway alone. The spillway removal measure would include removal with the dam arch, beginning from the top of the spillway. Concrete would be transported via trucks to the Calabasas Landfill.

Spillway and Bedrock Removal

A measure was also considered for the removal of the spillway portion of Rindge Dam, combined with bedrock removal. This would open aquatic and terrestrial species access while retaining the dam arch portion of the dam, and possibly allow for some of the impounded sediment to remain in-situ while excavating a channel to reconnect habitat.

4.1.4 *Other Rindge Dam Structural Modifications*

V-Notch and Sediment Bypass through Dam

The v-notch measure considered removal of only the central portion of the dam arch, tapering the cut from a larger to smaller cross-section from the top to bottom of the dam. A sediment bypass through the dam was another measure to reestablish natural sediment transport at the dam site, and potentially reestablish aquatic habitat connectivity. A 40-foot diameter hole was selected based on the need for sufficient capacity for larger storm events, in alignment with a similar concept prepared by the Bureau of Reclamation (BOR) in a 1995 appraisal study. A sediment bypass around the dam using a tunnel was also considered, but was not included after it was determined that the dam had filled to capacity with sediment, and was no longer trapping additional sediment for any significant period of time.

Restoration of Water Supply Function

At the request of the Rindge family descendants and several other public interests, the PDT and TAC discussed measures to restore the water supply function of the dam for water supply (municipal & firefighting), and for limited flood risk management to the Serra Retreat community and the City of Malibu. Measures associated with this action include the restoration of the spillway by, at minimum, adding new sluice gates at the top of the structure to control releases and storage capabilities. The impounded sediment would be removed mechanically from the site to one or several upland storage sites, with the possibility of some of the material being used for beach nourishment. The California Department of Safety of Dams (DSOD) requires that the dam meet current design standards if it is to be recommissioned for water supply use. The PDT assumed that removal and replacement of the existing arch and spillway would be required to meet design standards, and some allowance for fish passage would have to be incorporated into the design. This combination of measures to restore water supply does not meet any of the study objectives and was dismissed from further consideration.

4.1.5 *Fishways*

Fisheries experts within and outside of the PDT and the TAC were consulted on the possibility of construction of fishways, allowing a portion or all of Rindge Dam and impounded sediments to remain in place while partially attaining the objective to reconnect aquatic habitat. The California Salmonid Stream Habitat Restoration Manual (CDFW, 1998) and Fish Passage Design Dimensions and Monitoring (UN 2002) were used to investigate different fishway designs for this study. Several fish ladder designs were investigated (Alaskan Steep Pass, Denil, and the Step and Pool fishway) to either pass over the entire 100-ft height of the existing dam or to be combined with an alternative that notches the dam by half the height (50 ft) to increase chances of fish passage. The Alaskan Steep Pass fishway has been used effectively to pass steelhead salmon but the entrance to the fishway needs to be close to the obstruction with as few changes in direction as possible. Because of the difficulty in achieving this scenario, this fishway was not looked at further. The Denil fishway is easily blocked by debris and requires daily maintenance during the fish migration season so it too was not looked at further. The Step and Pool fishway has shown to be successful for this environment and as such, is the fish ladder design investigated for this study.

The BOR had investigated several fish passage measures including a Borland fish lift and benched flume (BOR, 1995). These measures were reconsidered in addition to several other fish ladder designs, bypasses, and dam and sediment modifications to restore aquatic habitat connectivity.

Step and Pool Fishway

The Step and Pool fishway design considered for this study consisted of a simple series of concrete pools and weirs, located along the southern bank of Malibu Creek (road side), initially proposed with a one-foot drop every 10 feet. Using the guidance mentioned above, it was determined that approximately 150 pools would be required with an 8 inch (0.2 m) drop to remain within the maximum water velocity between each pool, about 6.6 ft/s (2 m/s) for the migratory fish to pass over Rindge Dam. Pool dimensions recommended for "sea trout", analogous to steelhead, range from a length of 8-10 feet (2.5-3 m), width of 5-6.6 feet (1.6-2 m), and water depth of 2-2.6 feet (0.6-0.8 m). To reach over the existing 100 ft (30 m) height of the dam, the fishway structure would require a 1,230-1,475-foot length (375-400 m), depending on the short and long pool lengths. The fishway would require many support pilings set in bedrock and would require some sort of maintenance access from Malibu Canyon Road to the base of the structure. An alternate design included the use of fill instead of support piers, but it would fill over half of the width of the narrow gorge below the dam and was therefore dismissed from further consideration.

Another alternate fishway alignment was considered using zigzag pattern for the steps and pools just downstream of the face of the dam. This design would require massive piers to hold the fishway in place and would be exposed to more potential damage during large storm events due to uncontrolled stormwater releases over the dam and spillway. This option was dismissed from further consideration due to the additional difficulty in accessing the proposed fishway and the exposure to damage.

<u>Step and Pool Fishway with Dam Notching</u>

The same fishway design combined with notching the dam arch presents further complications. The fishway structure would have to extend across the spillway to the arch portion of Rindge Dam since the spillway is constructed over a bedrock outcrop and removing half of the height of the spillway could destabilize the rest of the arch structure. Instead, the fishway would extend from the notched arch to the south bank of Malibu Creek, crossing in front of the spillway. Locating the fish ladder on the south bank is necessary for operations and maintenance access in this narrow and steep gorge. If the ladder was located on the north bank, no access would be possible during or immediately after high flows for operation and maintenance purposes when access is most critical. The ladder would be about 50 feet high with a maximum water velocity of 6.6 ft/s. Other pool dimensions and water depths are as shown above, with a total of 75 pools and approximate 615-740 foot length for the fishway.

<u>Canyon Wide Stabilization for Fish Passage</u>

This measure includes partial removal of Rindge Dam and partial excavation of the impounded sediment to form a series of steps across the width of the canyon. The existing slope of the canyon would be modified to provide a series of gradual steps by using some of the impounded sediment as backfill for a series of stabilization structures that span the width of the canyon, with pools and weirs located near the center of each step, essentially forming a broad fish ladder. The arch portion of the dam would be notched to act as one of the stabilizing structures, and fill would be placed downstream of the dam. Stabilization structures would have to be constructed at regular intervals to restore a slope and creek gradient that supports fish passage, with resting pools and weirs. Impounded sediment would also be moved above the dam to continue the slope up the canyon until reaching a pre-dam channel elevation. The overall result is that the majority of reservoir sediment would remain. Only fine sediments would be removed from the site or stabilized in-place.

Borland Lift

A Borland fish ladder was considered for transporting fish upstream for spawning. Franklin and Dobush (1989) originally developed the Borland fish ladder option for California Trout. The BOR dismissed this measure based on the difficulty to access such a facility for construction, operations and maintenance, and the possibility of debris slides and falling rock causing damage due to the ladder since the only viable site for the lift is located along the southern canyon slope (right bank looking downstream).

The conceptual design for the lift consisted primarily of three interconnected structures, a lower chamber through which fish entered the lift; a connecting tube running up the face of the dam; and an upper chamber through which fish exited the system. A 30-inch steel pipe was used to connect the upper and lower chambers. In this design, fish are attracted into the lower chamber by a flow which was collected from water falling down the face of the dam. A short fishway connecting the chamber with the pool below the dam lead fish past an electronic sensor, which when tipped, activated a switch which closed two doors: one on the entrance to the lower chamber; the other on the attraction flow intake on the tube. Simultaneously, a small pump at the top of the dam fills the lift at a rate of approximately 1 cfs. As the tube fills from the top, fish are attracted to the inflow, instinctively remaining at the surface of the water, and eventually reach the upper chamber. Upon reaching the upper chamber, fish are attracted through a shot trough to a false weir, through which water is pumped into the system. At this point, fish will swim over the weir and slide on an inclined ramp and into the pool above the dam. As fish slide down the ramp, they trip a treadle device. This activates a camera which photographs the fish and a counter that tallies fish, and at the same time switches off the filling pump and reopens the lower chamber allowing the tube to drain. When the water in the system has dropped to an appropriate level, the valve controlling water flow from the face of the dam will open, and attraction flow through the entrance chamber resumes. The entire system can be automated.

Based on a review of the *Fish Passage Design, Dimensions and Monitoring* (UN 2002) and *California Salmonid Stream Habitat Restoration Manual* (CDFW 1998), mechanical fish lifts are typically limited to height differences of about 20-35 feet and require a maximum 10% slope. Therefore, a lift design for Rindge Dam could be nearly 1,000 feet long.

Fish Conduit

This measure would involve the construction of a tunnel, a pipeline conduit for fish passage, from the base of the dam upstream to daylight leaving Rindge Dam and impounded sediments in-place. The principle is that of a flow path that bypasses the dam by going around it at a slope that does not inhibit fish swimming until the conduit reaches daylight somewhere behind the dam. Structures would have to be constructed to attract fish on both sides of the tunnel while minimizing sediment accumulation that could result in blockage of the conduit and pressure at the head of the conduit. The performance of such a tunnel as an attractor to fish may be questionable.

4.1.6 *Other Measures Adjacent to Rindge Dam*

Trap and Haul Fish

A measure was considered to provide diversion structures and traps above and below Rindge Dam for both upstream and downstream aquatic migratory species. Fish would be temporarily held and transported by truck to a location a safe distance away from the dam. This measure was formulated to partially address the objective for reconnection of the aquatic, but not the riparian corridor.

Stabilizing Impounded Sediment

Stabilizing some of the impounded sediment in-place while also restoring an access connectivity to upstream aquatic habitat was also considered in the array of measures. A single channel would be excavated through the stabilized sediments requiring remaining storage sites to be armored against uncontrolled scour during flood events. If no slope protection was included, downstream flood risk management measures would be included to address the increase risk to the Serra Retreat community and the City of Malibu. The channel would be designed to convey large flood flows, and have a similar slope to the original pre-dam streambed, though it would likely be slightly straighter and steeper.

Sediment Bypass around Dam

A bypass design was initially proposed by the PDT during early formulation, before it was confirmed that the dam is no longer trapping sediment. There were significant difficulties in conceptualizing a design within the narrow gorge that could effectively divert sediment during the short timeframe after peak storm flows.

4.1.7 *Dependent Downstream Flood Risk Management Measures (only when combined with natural transport of Rindge Dam impounded sediment)*

Flood risk management measures were formulated in combination with natural transport measures for the Rindge Dam impounded sediment to address the flood risk to downstream residences and commercial areas. No measures were formulated to address existing floodplain issues. For measures that include an increased flood risk due to release and natural transport of Rindge Dam impounded sediment, measures considered include: levees and/or floodwalls; property acquisition and relocation; structural protection in-place (floodproofing); evacuation and flood warning. These measures are formulated to consider the planning constraint to maintain downstream existing and future no action condition levels of flood protection. The areas of concern include residential property adjacent to Malibu Creek at the Serra Retreat community and portions of the Cross Creek commercial center in the City of Malibu, located several miles below Rindge Dam.

Non-structural measures vary from removing an entire structure from the floodplain to insuring a structure which is permanently located within the floodplain. The costs associated with implementing a measure are variable, where reduction of flood damages is proportional to the cost of the measure (i.e. removal of a structure from the floodplain will eliminate all future damages associated with flooding, while purchasing flood insurance for a structure will assist in making the structure whole after a flood event, it does not eliminate future flood damages to that structure).

Flood warning relies upon stream gage, rain gages, and hydrologic computer modeling to determine the impacts of flooding for areas of potential flood risk. A flood warning system, when properly installed and calibrated, is able to identify the amount of time available for residents to implement emergency measures to protect valuables or to evacuate the area during serious flood events. Since Rindge Dam is located only about 2 mi from Serra Retreat, and within 2.5 mi of the City of Malibu, flood warning is not an effective measure in this flashy system where storm flows quickly escalate.

Floodproofing is applicable as either a stand-alone measure or as a measure combined with other measures such as raising the elevation of structures in the floodplain. Floodproofing is quite applicable to commercial and industrial structures when combined with a flood warning and flood preparedness plan. This measure is generally not applicable to high velocity flows that occur in Malibu Creek.

4.1.8 *Restore Connectivity to Upstream Aquatic Habitat (partial barriers above Rindge Dam)*

Measures to restore aquatic habitat connectivity above Rindge Dam and allow access to good to excellent quality upstream habitat focused on the upstream partial barriers along tributaries to Malibu Creek, including road crossings, culverts and small dams. Existing data, new field surveys and the knowledge of experts within the TAC were used to assess the quality of habitat in upstream reaches and formulate habitat connectivity restoration measures. Measures included partial or total removal of concrete aprons along creek beds at culverts and bridge crossings, removal of small dams, and associated replacement of necessary bridge crossings and utilities lines that still provide services for the watershed. The selected barriers and quality of habitat in reaches between the barriers were ranked in order of importance (report on file at USACE, Los Angeles District). Cold Creek and Las Virgenes Creek tributaries ranked high for overall habitat quality and opportunities for refuge for steelhead and other species. Malibu Creek habitat quality above Century Dam is good to excellent, but is a large financial investment to address for a limited increase in connectivity before the next barrier (Malibou Dam).

4.1.9 *Other Measures*

Control Exotic/Invasive Species

Measures considered include control of Giant Reed (*Arundo donax)*, particularly in and around Rindge Dam and the reservoir footprint, and other exotic/invasive plant species in the watershed. A combination of actions are considered for this measure including mechanical and hand removal, and use of a non-toxic herbicide.

Plant/Revegetate Native Vegetation

These measures are considered in combination with sediment stabilization measures, mechanical sediment transport measures, and around upstream barriers where existing vegetation will be stripped away for construction purposes. Native vegetation will be re-established within the footprint of disturbance. Graded areas will be revegetated with local native stock to control erosion. Any temporary sediment disposal sites will also be restored with native vegetation.

Shoreline/Nearshore Nourishment

Measures were considered for placement and use of some or all of the Rindge Dam impounded sediment along the shoreline and nearshore areas combined with trucking of material, or a combination of truck-to-barge. Areas for placement extended along the shoreline from the Pt. Mugu area to Topanga Beach.

Trails

Early in the study, passive recreation trails were considered combined with Rindge Dam and impounded sediment removal. Trail measures considered linking existing trails at the lower end of Malibu Canyon along the reaches near Rindge Dam to existing trails near the State Parks Headquarters or solely in the vicinity of the dam with no upstream or downstream links. Concerns were raised about the potential for disturbance to sensitive habitat and species in the area, particularly considering issues with people accessing the dam spillway for swimming and diving.

Education

The current area known as Sheriff's Overlook, above the dam off Malibu Canyon Road, is also considered for use as a staging area, and for improvements that provide temporary parking and educational kiosks or signs, describing Rindge Dam and the importance of the dam and the Rindge family in the development of Malibu.

4.2 Screening of Measures and Preliminary Alternatives

For the screening of measures, the PDT considered the effectiveness in addressing the study objectives from a resources perspective, and the efficiency of doing so from a time and cost standpoint. The PDT worked with TAC members and other specialists to compare combinations of management measures to formulate, evaluate and screen the preliminary alternative plans prepared for this study. The PDT and TAC concluded early on in the planning process that study objectives could not be met without addressing the removal of the Rindge Dam concrete arch in combination with addressing the impounded sediment behind the dam. The dam's location in a steep narrow (gorge) section of Malibu Creek does not allow for opportunities to restore a more natural sediment transport regime, aquatic habitat connectivity, or restore fish passage for upstream and downstream migrants without, at minimum, the removal of the concrete arch portion of the dam.

Table 4.2-1 summarizes the screening process considering combinations of measures to form a preliminary array of alternatives. The considerations (footnotes) below provide a description of the equally-weighted metrics for adverse impacts to resources, efficiency and constructability used for screening, as described below. Measures and preliminary alternatives were considered for further analysis if they addressed at least one objective while reasonably addressing one or several of the other metrics.

1. Study objectives are listed in Chapter 2. In brief, they are to establish a more natural sediment transport regime, reestablish habitat connectivity, and restore aquatic habitat of sufficient quality.
2. Adverse Impacts to Natural Resources is determined by TAC environmental subcommittee and habitat evaluation. (High: significant impacts to habitat and/or species (including migratory delays) for more than 5-10 years; Medium: moderate impacts for several years;

Low: short-term impacts that may be difficult to measure when compared to background/other impacts from the watershed)

3. Efficiency is determined by the potential timeliness of benefits and costs of the measure when combined with other measures. (High: significant benefits at low cost within a decade of initial construction; Medium: some benefits at moderate costs within the first several decades; Low: extensive time (more than two decades, with limited benefits and/or high costs)
4. Performance assesses beneficial and detrimental consequences of measures from several perspectives, including accessibility challenges for safe operations and maintenance and constructability challenges within the Rindge Dam canyon area and other reaches of Malibu Creek and tributaries. (High: minimal risk of detrimental consequence; Medium: some risks that can be mitigated for with other reasonable measures; Low: significant short- or long-term safety risks to life and/or habitat)

Table 4.2-1 Summary Screening of Measures / Preliminary Alternative Plans

Measures	Objectives Addressed[1]			Adverse Impacts to Natural Resources[2]	Efficiency [3]	Performance[4]	Drop	Retain	Notes
	1	**2**	**3**						
Structural Alteration of Rindge Dam									
Removal of Rindge Dam Concrete Arch (in lifts, combined with natural transport of impounded sediment)									
At Once	✓	✓		High	High	Low	✓		Rindge Dam arch removed over several years with natural transport eroding sediment in an uncontrolled fashion. Drastic dam area and downstream bed changes expected in the first 5 years, including 77 feet of erosion of impounded sediment, 20 feet of deposition in downstream reach, 11-12 feet of deposition to Cross Creek Bridge (by Serra Retreat and the City of Malibu), 10 feet of deposition above PCH and 4 feet at Malibu Lagoon. Sediment redistribution would stabilize within about 20 years. Eliminated based on significant adverse impacts and low performance.
40-ft Increment (Two-Phases)	✓	✓		High	Medium	Low	✓		Similar impacts as above with about 40 feet of erosion and transport of impounded sediment (approx 390k CY) within the first 5-10 years, followed by a similar volume eroding after the second half of the dam is removed. Although downstream deposition is lessened, there is still about 10 feet of deposition in the immediate downstream reach, and similar trends to the lagoon. The duration of impact for sediment redistribution may last longer than above, depending on the frequency and intensity of storms (more than 20 years). Eliminated based on significant adverse impacts and low performance.
20-ft Increments	✓	✓		Medium	Medium	Low	✓		Similar as above, with significant downstream adverse impacts to critical habitat due to excessive sediment deposition and increased risk to flooding. Eliminated based on significant adverse impacts and low performance.

Measures	**Objectives Addressed**[1]			**Adverse Impacts to Natural Resources**[2]	**Efficiency**[3]	**Performance**[4]	**Drop**	**Retain**	**Notes**
	1	**2**	**3**						
10-ft Increments	✓	✓		Medium	Low	Medium	✓		More short-term, but potentially significant impacts to critical habitat due to sediment deposition. Flood risk management measures would be necessary. Eliminated based on significant adverse impacts and low performance.
5-ft Increments	✓	✓		Low	Low	Medium		✓	Metered release of impounded sediment reduces overall adverse impacts to habitat and lowers potential flood risk. Analysis of impacts did not eliminate need for flood risk management measures. This measure was retained for further
Removal of Rindge Dam Arch and Impounded Sediment Transport to Upland, Shoreline or Nearshore Sites									
Slurry	✓	✓		High	Medium	Medium	✓		Remove dam arch concurrently with impounded sediment removal. Slurry only considered for downstream transport and shoreline placement. Only viable for a portion of the total volume of impounded sediment. Various alignments considered to align slurry pipeline and access/ maintenance in creek or along Malibu Canyon Road. Significant adverse critical habitat impacts along creek, lack of space and high costs for road alignment are several reasons for dismissal compared to other transport measures.
Conveyor	✓	✓		High	Medium	Medium	✓		Investigated both upstream/downstream uses of conveyors with consecutive removal of dam arch. Similar impacts to critical habitat for downstream use as slurry, and lack of space/high costs along road. Limited use in the vicinity of the impounded sediment site also more costly than use of trucks. Water supply needs also problematic, leading to elimination of this measure

Measures	Objectives Addressed[1]			Adverse Impacts to Natural Resources[2]	Efficiency[3]	Performance[4]	Drop	Retain	Notes
	1	2	3						
Trucking	✓	✓		Low	Medium	Medium		✓	Remove dam arch concurrently with impounded sediment removal. Allows more flexibility for transport to various upland and shoreline sites, but adds a significant number of trucks to Malibu Canyon/Las Virgenes Road during construction years. Least costly and most practical of transport options.
Rindge Dam Spillway Removal									
Remove Spillway Concrete Apron			✓	Low	High	High		✓	Included to address the possibility that the structure will continue to attract people to the site, disturbing critical habitat and raising safety concerns. Some TAC members consider the structure to be aesthetically undesirable for ecosystem restoration if the spillway is left in-place. This measure is retained for further analysis.
Remove Spillway & Bedrock		✓		High	Low	Low	✓		Screened out early in formulation process due to safety concerns regarding the remaining arch structure; specifically, the loss of structural integrity. The bedrock behind the spillway is the right abutment of the dam arch, and removal or tunneling through the bedrock would destabilize the rest of the structure.
Other Rindge Dam Structural Modifications									
V-Notch	✓	✓		High	Medium	Low	✓		High costs to stabilize remaining portions of dam arch, need for stabilizing some impounded sediment, increased risk of downstream flooding and property damages due to uncontrolled releases of remaining impounded sediments in larger storms, habitat loss due to deposition below the dam. Not supported by the PDT, Sponsor, and TAC, and eliminated based on significant impacts, excessive costs.

Measures	Objectives Addressed[1]			Adverse Impacts to Natural Resources[2]	Efficiency[3]	Performance[4]	Drop	Retain	Notes
	1	2	3						
Sediment Bypass Through Dam	✓			High	Low	Low	✓		Structural instability of the remaining portions of the dam arch, the potential for clogging and backing up of water and debris, and possible catastrophic failure at the dam site during high flow periods. Measure also increases the risk of detrimental downstream sediment impacts to habitat and residences through uncontrolled releases of impounded sediment unless costly and difficult to design armoring of the remaining impounded sediment occurs. Therefore, this measure waseliminated.
Repair/Restore Water Supply Function				High	Low	Low	✓		Included initially to conceptually address comments from public members that included descendants of the Rindge family. The combination of measures for this plan do not meet study objectives and would require more costly investments than any of the other proposed alternatives. These alternative measures were eliminated early in the planning process.
Fishways									
Step & Pool Fishway		✓		High	Low	Low	✓		There is not enough space within the canyon gorge, both in regards to width and length, to accommodate such a structure. This measure was dismissed from consideration in the array of alternatives due to technical/logistical limitations.
Step & Pool Fishway (with dam notching)		✓		High	Low	Low	✓		The difficulty in designing around the physical constraints in the canyon, access concerns related to operations and maintenance, and added construction costs for the removal of half of the concrete arch of Rindge Dam and over half the volume of impounded sediments resulted in the measure being screened from the viable array of alternatives.

Measures	Objectives Addressed[1]			Adverse Impacts to Natural Resources[2]	Efficiency[3]	Performance[4]	Drop	Retain	Notes
	1	2	3						
Canyon-Wide Stabilization		✓		High	Low	Low	✓		Provides stabilization of virtually all of the impounded sediment. The stream would be expected to eventually erode the remainder of the reservoir sediment over time during high flow events. The construction of each step would require substantial and excessively costly stabilization measures and would eliminate existing high quality aquatic habitat and was therefore dropped.
Borland Lift		✓		High	Low	Low	✓		Consensus among the TAC and PDT was that the Borland lift was essentially a single-species (i.e., steelhead) measure that would not easily address downstream migration of adults, would not effectively reconnect the aquatic corridor, and was unlikely to be successful for passage of juveniles. This design has a greater potential for clogs than the flume or ladder options, and optimal performance would be required during high flows; that is, at the time of least access. Given these concerns, the measure was not considered for further analysis.
Fish Conduit Pipeline		✓		High	Low	Low	✓		While such a structure could be designed to meet maximum flow velocities of 6.6 ft/s, the conduit would be very long (most likely in excess of 1,000 ft) and could not include any resting pools for migrating species. Sustained swimming for fish over such a length is doubtful. In addition, it is thought that fish would likely bypass the tunnel in high flow conditions. Therefore, this measure was not considered for further
Other Measures Adjacent to Rindge Dam									

Measures	Objectives Addressed[1]			Adverse Impacts to Natural Resources[2]	Efficiency [3]	Performance[4]	Drop	Retain	Notes
	1	2	3						
Trap & Haul (fish above & below dam)		✓		High	Low	Low	✓		This is a two-way operation where juveniles would have to be captured above the dam and transported around it, as well as adults captured below the dam and released above it. Given the inaccessible nature of the dam area and need for access below and above the dam, this would be a difficult, time-consuming, and expensive operation benefiting a single species with high mortality risk for downstream migrants due to difficulty trapping during moderate to high flows. This measure was eliminated from further consideration due to logistics and impacts.
Stabilize Impounded Sediment with Access Channel	✓	✓		Medium	Medium	Low	✓		Designs to allow for a channel through the impounded sediment with needed dimensions for flow conveyance, combined with the space needed for armoring and storing the impounded sediments in this topographically confined area was not deemed technically or logistically feasible. Therefore, this measure was not considered in the array of alternatives.
Sediment Bypass Around Dam				N/A	N/A	Low	✓		Sediment bypass around Rindge Dam is not needed since Rindge Dam has already reached its storage capacity.
Dependent Downstream Flood Risk Management Measures (dependent on natural transport of Rindge Dam impounded sediment)									
Non-Structural									
Flood Insurance				N/A	Low	Low	✓		Requires purchase for existing and with project flood risk. Not acceptable to TAC members or the City of Malibu as a viable FRM measure for this area.
Property Acquisition				Low	Low	Low	✓		Excessive in cost: more costly than other FRM structural measures due to high value properties.

Measures	**Objectives Addressed**[1]			**Adverse Impacts to Natural Resources**[2]	**Efficiency**[3]	**Performance**[4]	**Drop**	**Retain**	**Notes**
	1	**2**	**3**						
Floodproofing				Low	Low	Low	✓		Not well-suited for high velocity flow conditions. More costly option than other structural measures, particularly in the City of Malibu.
Evacuation				Low	Low	Low	✓		Not effective in this area based on flashy flow conditions during storms and short warning times due to limited distance from dam.
Flood Warning				Low	Low	Low	✓		Not effective in this area based on flashy flow conditions during storms and short warning times due to limited distance from
Structural									
Floodwalls				High	Medium	Medium		✓	Tie into high ground area(s). Costly foundation work required for structural stability.
Levees				High	Low	Low	✓		Excessive in cost: requires acquisition of commercial and private properties that far exceed costs for floodwall
Restore Connectivity to Upstream Aquatic Habitat (upstream partial aquatic barriers above Rindge Dam)									
Malibu, Las Virgenes, Dark Canyon, Stokes Canyon and Cold Creeks		✓	✓	Low	High	High	✓		Measures modify man-made partial aquatic barriers at road crossings, culverts and small dams upstream of Rindge Dam. Dark Canyon and Stokes Creek were dismissed due to relatively low quality habitat between barriers. The PDT and TAC made an early decision to eliminate Century Dam from further consideration due to the need to also address nearby Malibou Dam; a costly investment for little habitat gain. Measures were formulated for barriers along both Las
Other Measures									
Control Exotic/Invasive Species			✓	Medium	High	High		✓	Per feedback from TAC environmental group, measures only considered in areas already subject to disturbance or where access to habitat is readily available to minimize adverse impacts to more pristine reaches.

Measures	Objectives Addressed[1]			Adverse Impacts to Natural Resources[2]	Efficiency[3]	Performance[4]	Drop	Retain	Notes
	1	**2**	**3**						
Replant native vegetation			✓	Low	High	High		✓	Combined with measures that disturb or remove existing aquatic and riparian/upland habitat during construction.
Shoreline / Nearshore Nourishment	✓			Medium	High	Medium		✓	Directly addresses the study authority. Requires implementing measures to mobilize Rindge Dam impounded sediment.
Trails				Medium	N/A	Low	✓		Sponsor and agency concerns were raised about providing potential access to downstream critical habitat reaches of Malibu Creek and areas above Rindge Dam. These measures were dismissed from further consideration.
Sheriff's Overlook Interpretive/ Education				Low	High	High		✓	Measures to remove Rindge Dam would likely include use of this site for the Contractor's oversight of the project area. This provides an opportunity to use the modified overlook for other interpretive purposes.

4.3 Focused Array of Alternative Plans

The PDT engaged with the TAC and others to assume some risk and accept uncertainties in making decisions about alternatives with readily available information, and addition of some targeted investigations during the iterative planning process. As a result, the PDT revisited uncertainties associated with certain decisions made in earlier planning process iterations when it became evident that new information did not affirm those decisions. In particular, strategies to transport and store Rindge Dam impounded sediment significantly affected past, present and future planning decisions and recommendations during various iterations of the planning process.

After screening the combinations of measures and preliminary alternatives, the PDT continued to review and use prior reports and data, conducted field studies, consulted experts, and prepared technical analyses with numerous meetings held to develop and assess the plans. Each alternative carried forward went through several iterative phases of analyses based on information available at different times during the planning process. Necessary adjustments were made to the scope as the study progressed and alternatives were refined based on newly developed information.

Multiple combinations of measures, methods and transport scenarios were considered for each of the focused array of Rindge Dam and impounded sediment removal alternatives. Variations included consideration of Rindge Dam arch removal and trucking of impounded sediment, dam arch removal and natural transport of impounded sediment, spillway removal with the dam arch removal, upstream barrier modifications, short- and long-term use of a range of upland sediment storage sites, and shoreline or nearshore placement of compatible impounded sediment. As a result, the PDT generated a list of alternatives that considered location and use of upland and shoreline or nearshore sites, methods of delivery, and sequencing of actions. Detailed analyses were prepared for the following alternatives:

Alternative 1: No Action – Includes consideration of existing and future without project conditions

Alternative 2: Rindge Dam removal with trucking (or truck and barge) impounded sediment to shore and upland sites

- Alt 2a1: Rindge Dam arch & spillway removal – shoreline / upland sediment placement
- Alt 2a2: Rindge Dam arch & spillway removal – nearshore / upland sediment placement
- Alt 2b1: Rindge Dam arch & spillway removal – shoreline/ upland sediment placement - upstream barrier modifications
- Alt 2b2: Rindge Dam arch & spillway removal – nearshore / upland sediment placement - upstream barrier modifications
- Alt 2c1: Rindge Dam arch removal – shoreline / upland sediment placement
- Alt 2c2: Rindge Dam arch removal – nearshore / upland sediment placement

> Alternatives 2,3 and 4 include four options (a, b, c, and d): The ‘a’ and ‘b’ options propose removal of the Rindge Dam arch and spillway, ‘c’ and ‘d’ options are arch removal only. The ‘b’ and ‘d’ options also add upstream barriers

- Alt 2d1: Rindge Dam arch removal – shoreline / upland sediment placement – upstream barrier modifications
- Alt 2d2: Rindge Dam arch removal – nearshore / upland sediment placement – upstream barrier modifications

Alternative 3: Rindge Dam removal with natural sediment transport

- Alt 3a: Rindge Dam arch & spillway removal – natural sediment transport – downstream flood risk mgmt
- Alt 3b: Rindge Dam arch & spillway removal – natural sediment transport – downstream flood risk mgmt - upstream barrier modifications
- Alt 3c: Rindge Dam arch removal – natural sediment transport – downstream flood risk mgmt
- Alt 3d: Rindge Dam arch removal – natural sediment transport – downstream flood risk mgmt – upstream barrier modifications

Modeling uncertainties for Alternative 3 limit abilities to differentiate between changes to sediment deposition patterns as a result of metered releases of Rindge Dam impounded sediment versus much greater overall impacts from the higher volumes of sediment generated from the greater watershed during storms. Deposition and erosion patterns in downstream reaches of Malibu Creek could vary up to several feet during the short duration peak events in this flashy system. For Alt 3 options, the risk of changes to downstream creek bed elevations is considered significant enough to warrant inclusion of flood risk management measures (floodwalls).

Alternative 4: Rindge Dam removal with combined natural sediment transport and trucking (or truck/barge) sediment

- Alt 4a1: Rindge Dam arch and spillway removal - natural sediment transport & shoreline / upland placement – downstream flood risk management
- Alt 4a2: Rindge Dam arch and spillway removal - natural sediment transport & nearshore / upland placement – downstream flood risk management
- Alt 4b1: Rindge Dam arch and spillway removal - natural sediment transport & shoreline / upland placement – downstream flood risk mgmt – upstream barrier modifications
- Alt 4b2: Rindge Dam arch and spillway removal - natural sediment transport & nearshore / upland placement – downstream flood risk mgmt – upstream barrier modifications
- Alt 4c1: Rindge Dam arch removal - natural sediment transport & shoreline / upland placement – downstream flood risk mgmt
- Alt 4c2: Rindge Dam arch removal - natural sediment transport & nearshore / upland placement – downstream flood risk mgmt
- Alt 4d1: Rindge Dam arch removal - natural sediment transport & shoreline / upland placement – downstream flood risk mgmt – upstream barrier modifications

- Alt 4d2: Rindge Dam arch removal - natural sediment transport & nearshore / upland placement – downstream flood risk mgmt – upstream barrier modifications

Alts 2 and 4 also include two options for placing the 'mostly sands' layer of Rindge Dam impounded sediment along the shore (Option 1) or in the nearshore area (Option 2) with the remaining sediment going to upland storage sites.

4.4 Alternative Descriptions

4.4.1 *Alternative 1 – No Action Alternative*

The no action alternative characterizes the conditions likely to prevail in the study area within the next 50 years if neither the USACE nor the Sponsor initiates any action to restore the Malibu Creek riverine ecosystem beyond those currently existing or already planned, including any removal or modification of Rindge Dam for these purposes. The No Action Alternative is included in compliance with the NEPA and CEQA regulations, and is presented for comparison to action alternatives.

Under the No Action alternative, Rindge Dam and other upstream aquatic barriers remains in-place. Rindge Dam would continue to act as a barrier for wildlife movement, for both terrestrial and aquatic species. In the absence of unforeseen events, the dam is projected to remain intact and in-place as it ages over the next 50 years since the structure is no longer subject to a dynamic load from water stored behind it. That does not preclude the possibility of damage due to earthquakes and some sort of structural stabilization being required in future decades.

Rindge Dam will not trap any additional sediment aside from small amounts that deposit and erode between storms, nor will it retain storm water since sediment has already filled in to the top of the dam. More coarse-grained sediment will be transported beyond Rindge Dam than prior decades and will deposit in downstream reaches raising the elevation of the channel invert, increasing the risk of flooding to downstream residences and commercial structures as the system recovers from the impact of dam construction 90 years ago. It is estimated that it will take about 100 years before there is a pre-dam equivalent of sediment equilibrium in the downstream reaches. Stream flow conditions and sediment transport and deposition patterns will remain similar over the period of analysis.

Future development will occur, however more so in isolated portions of the upper watershed. This assumption is based on the large amount of state and federally-protected land in the SMMNRA, the strict zoning restrictions of one residence per 20 ac for much of the remaining developable land, and the requirement for new construction to meet strict runoff standards, allowing no net increase in surface water discharge. There is little expected change in the hydrology or hydraulic runoff of the study area due to future land use changes, including peak flow rates or volumes. However, changing land use conditions have the potential to increase erosion adjacent to development and add additional sediment and other contaminants into Malibu Creek and tributaries. These possible effects are considered to be confined to site-specific localized areas primarily within the upper watershed, and not result in changed conditions from the study area perspective.

The No Action alternative effects on water resources would be minimal. Currently Malibu Creek runs at the elevation of the crest of Rindge Dam along gravel bars of the impounded sediment. It is assumed that the Tapia Water Treatment discharges would continue above Rindge Dam into Malibu Creek without change. The water quality of Malibu Creek is not expected to decline significantly during the period of analysis. The RWQCB and other regulatory agencies will continue to regulate and monitor the quality of water in the study area and enforce water quality regulations. In addition, advancements in controlling runoff from development as well as technological advancements in water reclamation techniques are likely to improve water quality over the foreseeable period of analysis.

4.4.2 *Alternative 2 – Alternative Options 2a1, 2a2, 2b1, 2b2, 2c1, 2c2, 2d1, 2d2*

The array of Alternative 2 options the PDT evaluated include consistency in certain combinations of measures, such as access to the Rindge Dam and impounded sediment areas, site preparation for construction activities, mining of the impounded sediment while lowering the dam arch during the low flow "dry" seasons over consecutive construction years, and trucking of the mined sediment from the work area. The differences between alternative options that the PDT evaluated include retention or removal of the spillway remains, shoreline or nearshore placement of about 1/3 of the volume of Rindge Dam beach compatible "mostly sands", placement of the additional 2/3 of the volume of impounded sediment in several upland sites, and the potential addition of upstream barrier modifications on Cold Creek and Las Virgenes Creek.

Construction Staging Area

The former Sheriff's Honor Camp site (Sheriff's Overlook), located adjacent to Malibu Canyon Road about 200 vertical feet above Rindge Dam, will be used throughout construction as a temporary construction staging area during the entire duration of the project construction, used for oversight and management of the dam and impounded sediment removal activities. This staging area is expected to include trailers, vehicular parking and equipment storage. After construction is completed, the site would be restored and used as one of the turnout areas available to vehicles travelling northbound along Malibu Canyon Road for short-term parking and a scenic overlook for viewing of the creek and canyon area. At the conclusion of the staging use, several signs about the site history (Rindge Dam) and the ecosystem restoration project are proposed to be installed at the site. Any construction work taking place at this site shall avoid all historic features related to the honor camp.

Alternative 2, 3, and 4 options all include use of this site for construction staging and permanent signage. Other temporary staging areas will be used during construction for storage and temporary disposal areas and at the upstream barriers.

Rindge Dam and Impounded Sediment Removal

Actions in the Rindge Dam Initial work would clear the mature vegetation from the site, install wells for dewatering of the impounded sediment, and establish controls for diverting creek water away from active excavation areas. Dozers and loaders would be used with trucks to load and haul the sediment away from the site. Construction would be temporarily suspended during the wet season, seasonal restrictions for environmental windows would be followed, and daily operational restrictions would limit hours of operation at the dam and for trucks. With the assumed limits on daily and annual operations at the dam site, the estimated timeframe for removal of Rindge Dam and transport and placement of the impounded sediment is about 7-8 years for these alternatives.

> Sediment mining, dewatering, diversion and control of water, concrete arch removal and minor processing and hauling are all being conducted in a shrinking work area as construction continues from the top to the base of the dam. The associated risk of a likely drop in productivity and efficiency is accounted for in the cost estimates.

Trucks would enter and exit the Rindge Dam impounded sediment area using two ramps that would provide access to both directions, northbound and southbound, on Malibu Canyon Road. Synchronized temporary traffic lights and/or traffic controls with flagmen would be located at the top of the ramps to allow for trucks to cross Malibu Canyon Road while entering or exiting the work site. Loaders would be used on the site to mine sediment and place material into the trucks, hauling an estimated 20 cubic yards with each load. It is assumed that loaders and other equipment on-site would operate during the dry season, from April 1st to October 15th each construction year, when creek flows recede and the work site is safe to access. Daily hauling is assumed to be limited to 6 hours for non-school days and Saturdays to comply with LA County highway restrictions, operating from 9am-3pm. No hauling would occur at night or on Sundays. On school days, trucking is limited to 5 hours per day, from 9-2. There are considerations built into the estimates to provide down times for equipment maintenance, weather related traffic impacts (and road closures), holidays, and for other reasons. Overall, it is assumed that annual sediment mining from the Rindge Dam impounded sediment area amounts to slightly over 150 days per year (about 6.5 months per year).

Access to turnaround areas and general limited space between the canyon slopes and the road preclude use of other measures for access to the site. The general risk of potential damage to the ramps as a result of flood events during construction is accounted for by assuming annual repairs to small portions of the ramps and a one-time need to rebuild a more significant portion of the ramps during construction.

Hourly productivity for sediment mining and hauling varies, but it is generally assumed that trucks can be fully loaded within 15 minutes and approximately 16 trucks per hour will leave the site in the initial year of sediment removal (construction year 2), amounting to 80-100 trucks per day. As construction progresses and the overall surface area available for mining diminishes due to the narrowing of the gorge as more impounded sediment is removed, hourly productivity is assumed to drop. Less equipment can work in this area and it is still necessary to divert and control creek water, along with other activities that require some of the work area. From construction year 3 to completion (year 7), daily truck amounts drop to about 40-50 trucks per day.

The PDT extensively researched and coordinated with local municipalities (cities of Calabasas and Malibu), Los Angeles County (Transportation Dept. Supervisor, Beaches and Harbors), and the State (Caltrans) on assumptions associated with the transport of impounded sediment to both upland and shoreline sites. The PDT assumed that the hauling hours and days per week of operation would not change and that seasonal operations were also restricted by assumed timeframes of operation within Malibu Creek at the dam site.

> Local and regional restrictions on daily truck operating hours limit productive transport time to no more than 5-6 hours daily. Hauling operations from Rindge Dam are assumed to end by mid-late October and do not begin again until late April-early May of each next construction season until complete. This is a significant schedule driver for the sequencing of construction activities over several years, and results in an assumed 7-8 year timeframe for the array of alternative scenarios developed for Alternatives 2 and 4. There could be time and cost savings realized if the construction season extended into earlier/later times each year or if daily hours of hauling increased.

Rindge Dam was constructed decades before the Malibu Canyon Road. At the time of road construction, infilling of the reservoir has already occurred and a static load of sediment had developed behind the dam and along the base of the road, about 100-200 feet down the slope from the road to the deposits. There is uncertainty how the removal of the sediment will affect the stability of the potentially saturated slopes below and adjacent to the canyon road after being left in-place for many decades. The risks are discussed in the Geotechnical Appendix. Measures to monitor and address this risk will be further developed in the Preconstruction, Engineering, and Design (PED) phase.

Considerations for demolition of the dam arch include a combination of diamond wire saw cutting methods and use of high impact breakers. Diamond-wire saw cutting would provide smooth surfaces, facilitate excavation of notch portions of the dam arch, improve control of the excavation grade, provide smooth working surfaces for excavation of each layer, and permit removal of the concrete in large blocks rather than attempting to confine rubble to the working surface and removing the rubble by loaders. Large mobile cranes would be placed on pads and used to remove dam and upper portion spillway concrete. There is little risk of a catastrophic failure of the remaining section of the dam arch during construction due to the nature of the arch design, resulting in retention of the structural integrity throughout the incremental removal. Further investigations will be conducted during PED to ensure the integrity of the bedrock is not compromised during construction.

Potential for increases to flood risks for Malibu Creek habitat and communities downstream of Rindge Dam are accounted for by removing the impounded sediment at the same rate as removal of the concrete arch, offering stabilization for the remaining impounded sediment during the interim wet seasons during construction. Fine sediments from the impounded sediment area may be mobilized in the water column during and soon after storms, but levels should be aligned with background contributions of fines from the watershed.

<u>Alternatives 2a1, 2a2, 2b1, 2b2 - Spillway Removal</u>

For these alternative options, the Rindge Dam spillway 2,000 cy concrete apron would be removed from the underlying bedrock outcrop. The concrete spillway would be demolished by first pre-splitting the concrete from the rock substratum than drilling, micro-blasting the surface to fracture the concrete, and then manually breaking the concrete. While access is available to the top of the spillway in the early phases of construction, prior to sediment removal and lowering of the dam arch, the upper portion of the spillway will be removed. Once the dam arch and sediment removal is nearing completion, the former arch area will be used to access to the lower portion of the spillway for the remainder of removal from the bedrock outcrop. Measures will be implemented to ensure aquatic species cannot access the pool at the base of the dam during construction.

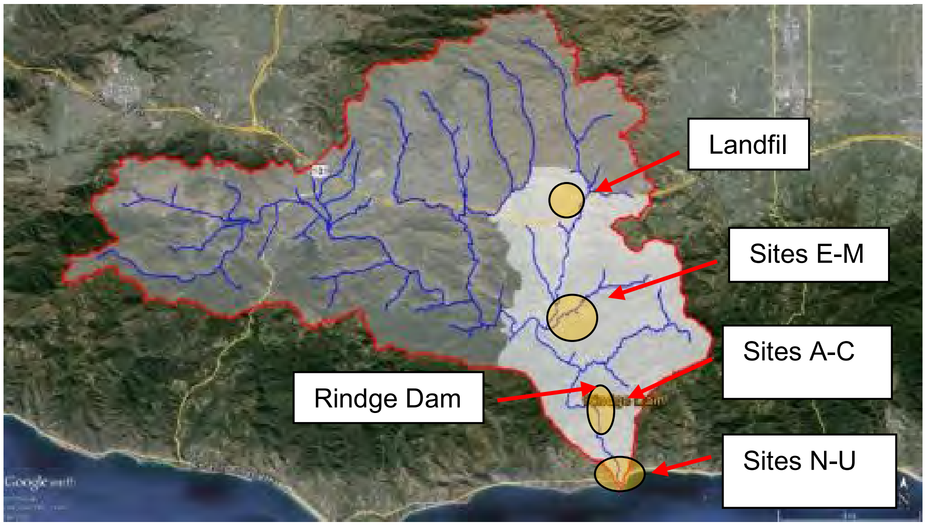
Upland Sites – Rindge Dam Impounded Sediment Placement Options

Numerous upland storage and shoreline placement sites were investigated in support of Alternatives 2 options to investigate use of various combinations of sites, identify risks, and evaluate tradeoffs for temporary or permanent disposal of the Rindge Dam impounded sediment. Initial studies for identification of upland sites focused on a 'worst-case' need for potential storage of the entire volume of impounded sediment at one or several sites near the dam and adjacent to Malibu Canyon Road. During early formulation iterations, the PDT also included a fundamental assumption that at least a portion of the impounded sediment could be transported naturally or mechanically down to the Malibu shoreline or nearshore areas. The Calabasas Landfill at the upper end of the project area was assumed to be the disposal area for the vegetation removed from the surface of the impounded sediment area, the dam concrete, and some or all of the impounded sediment. Other upland sites were added to the study during ongoing iterations of formulation, and reasons for screening of potential placement sites were based on potential stability issues, high acquisition/use costs, adverse impacts to cultural and biological resources, and the inclusion of new upland, shoreline, and nearshore sites later in the study. Sediment placement sites were not considered independent measures since doing so would have exponentially increased the number of alternatives evaluated for this study.

The initial upland sediment storage sites identified by the PDT (sites A-C) were eliminated after concerns were raised that the proposed location of those sites were in active landslide zones and could trigger a new slide if loaded with some of the impounded sediment. Site D, located in Malibu Creek at the 'big-bend' area just over a mile downstream of Rindge Dam was also eliminated from further consideration since it was located in the active floodplain, would require extensive armoring/slope protection, would adversely impact critical habitat, and would significantly increase the risk of flooding to downstream communities if the armoring failed during a storm event.

CDPR worked with other PDT members and the TAC to identify additional upland sites for use, and the PDT assessed maximum (and other) storage capacities and site use, stockpile heights, impacts to resources (biological, cultural), cultural resources, aesthetics, and preliminary traffic, noise and air quality impacts. Sites E-M are located by the CDPR Headquarters, near the intersection of Las Virgenes Canyon Road (named Malibu Canyon Road in the lower watershed) and the Mulholland Highway. Some sites (E-F) are located in the CDPR boundary, while others (G-M) are located along Mulholland Highway and either owned by the Federal Government (managed by National Park Service) or the Mountains and Rivers Conservation Authority (MRCA).

Figure 4.4-1 - Upland Sites



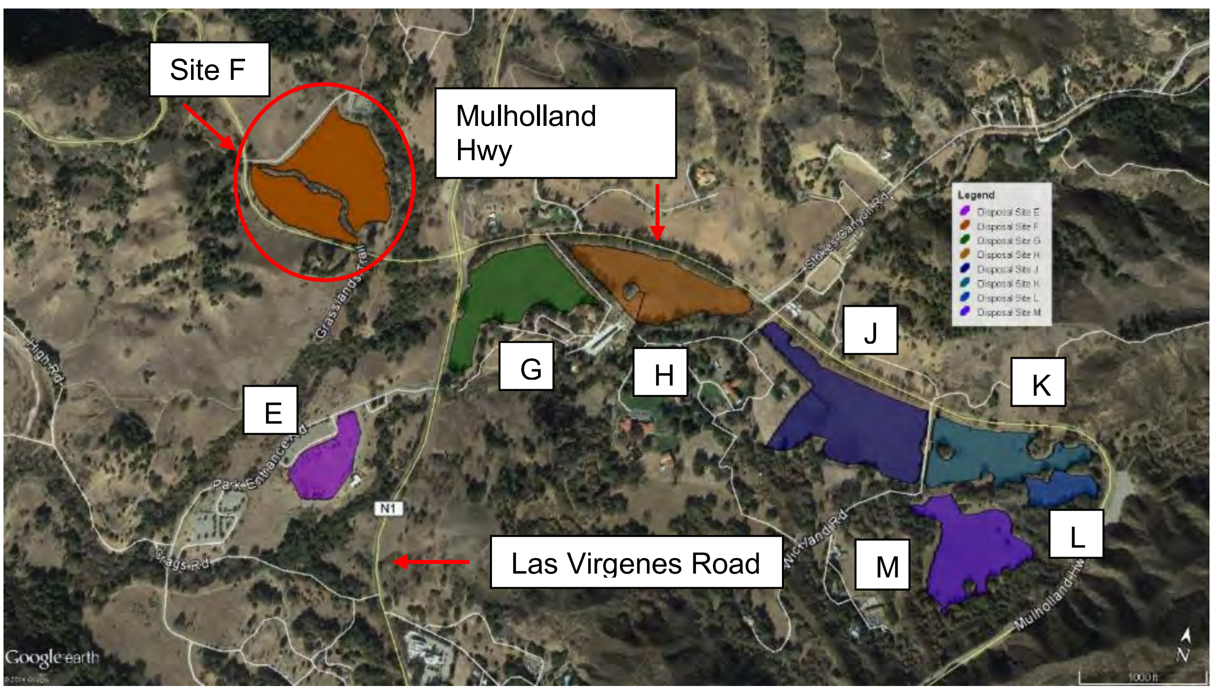


Figure 4.4-2 - Upland Sites E-M

Additional upland sites (sites N-U) were considered in the City of Malibu for temporary placement of the estimated 276,000 cubic yards of the shoreline compatible material (mostly sands), prior to permanent placement along the shoreline. These sites would be used from prior to Memorial Day to after Labor Day to ensure shoreline placement sites would not be disturbed during the peak recreation use summer season and nesting and breeding seasons, thus allowing sediment removal to continue at the Rindge Dam impounded sediment site throughout the dry season.

In addition to these sites, the Sponsor reached out to other interests within and outside of the TAC to identify additional upland sites including NASA and Boeing (Santa Susana site), the City of Los Angeles (Potrero Canyon site), the cities of Calabasas and Malibu, and the Las Virgenes Municipal Water District.

Based on data collected for these sites, iterations of considerations were assessed on impacts to existing land use and resources (biological, cultural, aesthetic) and other considerations. Many of these sites were screened from further consideration. Screening factors included: design considerations regarding access to, from and within the site; duration of impacts; proximity and disturbances to sensitive cultural and biological resources; proximity to existing development and associated noise, traffic, air quality impacts; costs; and existing and future without project condition land use. As a result, Site F in the vicinity of CDPR Headquarters was selected for further evaluation as a temporary use site for Alternative 2 options that included trucking mostly sands to the shoreline (Alternatives 2a1, 2b1, 2c1, 2d1). Long-term use of the site was considered, but not supported by the Sponsor due to potential adverse impacts.

Figure 4.4-3 - Upland Sites N-U

The Calabasas Landfill was also included as a viable upland location for permanent disposal of impounded sediment that did not have another identified beneficial use. Although the Sponsor and TAC identified a few commercial, municipal, and environmental interests that may potentially want small volumes of the Rindge Dam impounded sediment, no other specific uses of the material were identified during the study aside from the roughly 1/3 of the volume used for shoreline or nearshore nourishment. Therefore, it is assumed that the total remaining volume of Rindge Dam impounded

> The use of Calabasas landfill and consideration of the volume of impounded sediment permanently disposed of at the location as waste material resulted in a significant additional tipping fee costs. Many millions of dollars could be saved if the cost per ton for tipping fees were reduced, other uses for the more marketable and beneficial use portion of the sediment delivered were identified. The Sponsor led coordination with the Los Angeles County Sanitation District and county Supervisor's office in discussions regarding the impacts of assumptions made on the tipping fees and other options that may be available, but no assumptions have changed as a result of discussions. Tipping fees are reflected in cost estimates for the Alternative 2 options.

sediment, about 504,000 cubic yards, would be transported and disposed of at the Calabasas Landfill for all of the Alternative 2 options.

Photo 4.4-1- Calabasas Landfill

<u>Shoreline and Nearshore Sites – Rindge Dam Impounded Sediment Placement Options</u>

For the Alternative 2 options, a variety of shoreline placement options were formulated by the PDT and TAC for placement of the Rindge Dam mostly sands portion of impounded sediment. The PDT and TAC, with feedback from resource agencies and other interests, concluded early on that the shoreline placement locations were not suitable for the full complement of impounded sediment due to the variety of grain sizes of the material compared to receiver sites, from silts and clays to rocks and boulders (Alternatives 2a1, 2b1, 2c1, and 2d 1). Nearshore placement options for the mostly sands were considered in later iterations of the six-step planning process (Alternatives 2a2, 2b2, 2c2, 2d2).

Prior studies were referenced to identify nearby shoreline areas that were a priority for sand nourishment, and additional specific investigations were conducted on beach placement in several areas. These sites included Thornhill Broome Beach, Zuma Beach, Dan Blocker Beach, Surfrider Beach, Las Tunas/Topanga Beach and nearby shoreline areas in the vicinity of these sites. The Los Angeles County Department of Beaches and Harbors (LACDBH) and City of Malibu (within city limits) actively participated in the formulation and evaluation of these sites, in addition to feedback from other TAC members. Thornhill Broome and Dan Blocker beaches were dismissed early in the formulation and planning iterations based on access and processing site concerns, resources impacts and costs. The PDT evaluated placement at Zuma, Surfrider and Las Tunas/Topanga Beaches in more detail. There were limitations on the total volume of sands that could be placed at either Topanga or Surfrider Beach based on input from LACDBH. Zuma Beach had ample capacity above the mean high tide line for placement, but less need for nourishment. Overall, Surfrider Beach at the mouth of Malibu Creek had the greatest need for a limited volume of nourishment of these three sites, if placed directly on the beach.

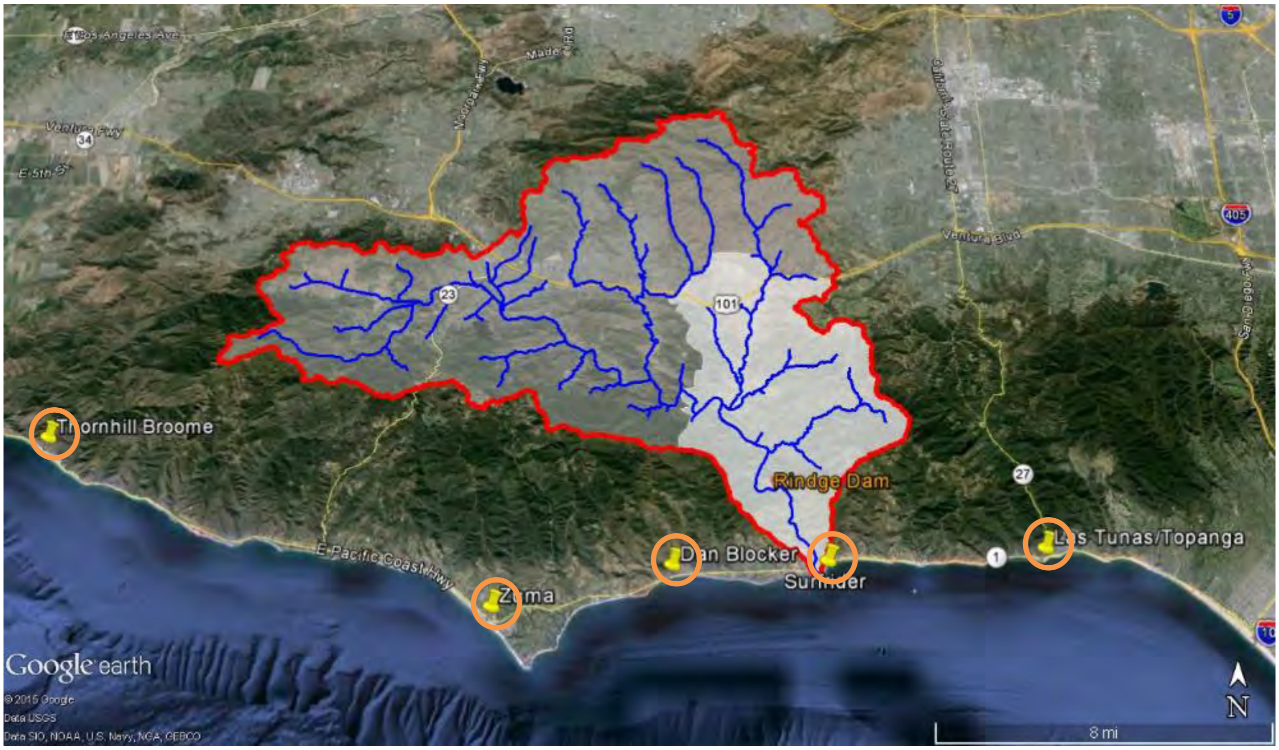


Figure 4.4-4 - Figure 4.4 - Shoreline Sites from the Pt. Mugu Area to Topanga Beach

Further consideration of these sites by the PDT and others, and delivery and placement strategies either on the beach, the active surf zone area (swash zone) or in the nearshore environment (less than -20 feet Mean Lower Low Water (MLLW) led to additional concerns about the viability and need in certain areas. Truck access was more problematic than originally considered for placement

Figure 4.4-5 - Malibu Shoreline & Nearshore Sites

at Zuma, Surfrider and Las Tunas/Topanga Beaches. Additional handling via slurry and separation of some percent of both fines and more coarse grained material (when compared to sand) also presented significant additional logistical challenges with space limitations and challenges assuming use of best available technology currently available. Additional feedback from LACDBH and other interests led to the dismissal of these options from further consideration.

Instead, with support from entities listed above, the PDT pursued new evaluations of placement along shoreline and nearshore areas near the mouth of Malibu Creek to better address the natural sediment transport objective, where the Rindge Dam impounded sediment would naturally have been transported to if the dam was not present. The TAC provided stronger overall support for these concepts. The distance to transport material from the dam or temporary storage areas is less than other shoreline options, although barging to the nearshore area requires long distance truck trips outside of the watershed.

Figure 4.4-6 - Figure 4.6 – Malibu Colony Shoreline & Nearshore Sites

Two general areas were selected for further evaluation: an upcoast site from the mouth of Malibu Creek at the Malibu Colony (residences) that afforded opportunities for both shoreline placement or nearshore placement (with barging); and a downcoast from Malibu Creek site adjacent to a parking lot by Malibu Pier. These sites were evaluated in combination with use/non-use of temporary upland storage areas, different methods of delivery (trucking, truck-to-slurry, truck-to-barge), and different placement scenarios (shoreline, nearshore). Both the shoreline and nearshore sites demarcate conceptual placement areas.

Delivery of mostly sands for nourishment would take place over a period of three years of the total seven-to-eight year construction window, during the late fall to early spring months. Based on construction scheduling for removal of impounded sediment at Rindge Dam, up to 120,000 cubic yards would be transported to these sites for the second of three years, and much less for the other years (60,000 to 80,000 cy each).

Figure 4.4-7 - Figure 4.6 – Malibu Colony Shoreline & Nearshore Sites

Wave action, currents and tides will quickly disperse sediment, predominantly in a downcoast direction. The transport of the sand has been modeled at each of the shoreline sites in order to characterize the timing and extent of distribution. The dispersion of sediment at the nearshore sites were not modeled, but similar trends associated with the timing and extent of distribution are expected. The model results show a relatively rapid redistribution of sands stretching downcoast, with an approximate 50-100 foot increase in beach width for the first four years after initial placement, tapering off to background levels within 10 years. The downcoast influence would extend approximately a mile from the placement sites. The shoreline placement site conditions are expected to return to approximate pre-project conditions at the beginning of each construction season over the estimated three year fall-to-spring placement timeframe.

The June 2016 field survey results were used to determine impacts to marine aquatic resources for the potential shoreline and nearshore placement sites. Various concerns were raised by the PDT (and Sponsor), TAC members, the City of Malibu and resource agencies about use of the proposed Malibu Colony sites with clearly more potential for adverse impacts to abundant rocky bottom habitat and sensitive submerged aquatic vegetation west of Malibu pier. A staircase is to be added for public access to the shoreline at the Malibu Colony shoreline site, resulting in the work area being much smaller in length along the shorefront for trucks to use while unloading sand for placement when compared to the Pier site. For these reasons, the Malibu Pier shoreline and nearshore sites were the focus of additional consideration for shoreline or nearshore placement of the mostly sands from Rindge Dam.

<u>Alternative 2 – Summary of Rindge Dam Placement Options</u>

After numerous considerations of combinations of measures for the hauling and placement of the Rindge Dam impounded sediment, two primary methods of transport and four locations for Rindge

Dam impounded sediment were carried forward by the PDT for the more detailed investigations of Alternative 2 options. Transport options include use of trucks alone, or use of a combination of trucks and barges. Placement options include temporary use of Upland Site F, permanent placement at the Calabasas Landfill, shoreline placement adjacent to the Malibu pier, and nearshore placement offshore and to the east of Malibu pier.

Alternatives 2a1, 2b1, 2c1, 2d1 – Strategy for Delivery and Placement of Rindge Dam Impounded Sediment

These Alternative 2 options include trucking mostly sands to the shoreline, using Malibu Creek Road, also named Las Virgenes Road north of Piuma Canyon Road, as the primary transport route to and from the Rindge Dam impounded sediment area. Sediment transported directly to the Calabasas Landfill would also use Lost Hills Road for the final miles to the Calabasas landfill. For the mostly sands portion of the impounded sediment, about a mile of PCH is used from Malibu Canyon Road to the Malibu pier parking lot. Routes from Rindge Dam to three placement locations are shown below.

Nearly two-thirds of the estimated 780,000 cy of impounded sediment will end up in the Calabasas landfill, located about 7.4 mi away from the Rindge Dam impounded sediment area. About 100,000 cy of that amount will be used to construct the temporary access ramps used to access the site during construction. An additional 10,000 cy of the total volume is estimated to remain in the impounded sediment area after construction around the pre-dam bedrock outcrops and boulders exposed by mining to the former (pre-dam) creek bed elevation. This material is expected to be naturally flushed to downstream reaches and the ocean with much greater volumes of sediment generated from the watershed during early post-construction storm runoff events.

Hauling the estimated 276,000 cubic yards of shoreline compatible material is largely accomplished during the early November to late April timeframe when shoreline recreational use is reduced from the peak summer season. This assumption necessitates the temporary use of upland storage for up to three years so material can be removed from the creek during the dry season, but placed on the shore in the wet season. Sufficient capacity (130k cy at 10-ft high) has been accounted for at upland Site F to allow for several years of sediment to accumulate if for some reason, assumed delivery and placement rates along the shoreline are impacted. The risk of this occurring is low since there is ample time each season for delivery of the sediment to the shoreline given the number of days available to do so from mid-October to early May.

Figure 4.4-8 - Trucking Routes for Rindge Dam Impounded Sediment (Alts 2a1, 2b1, 2c1, 2d1)

Upland Site F is proposed to be used for temporary storage of a portion of the mostly sands layer of the impounded sediment when direct delivery to the Malibu pier parking lot is not possible due to high recreational use along the Malibu shoreline during the summer season. From before Memorial Day to after Labor Day for three years of the construction period (years 2-5), the mostly sands mined from the impounded sediment area will be temporarily placed at Site F, located approximately 4.2 mi up Malibu Canyon from the impounded sediment site at the northwest corner of Las Virgenes Road and Mullholland Highway. This site is located within the Sponsor's property. The temporarily stored mostly sands will be trucked down to the Malibu Pier parking lot for shoreline placement. Site F is not considered for long-term storage due to potential adverse impacts to habitat, nearby cultural resources and general viewscape impacts.

Figure 4.4-9- Upland Site F Footprint – Access, Staging & Stockpile Areas

Based on limited access options along the Malibu shoreline, the PDT selected the Malibu pier parking lot as the site to transfer the mostly sands portion of Rindge Dam sediment to place along the shoreline. The parking lot is owned by the CDPR and operated by a private concessionaire. The current lease agreement allows for use of the site for the purposes considered, however, the CDPR and others are concerned about public access to the pier and beaches and temporary adverse implications to the concessionaire and businesses along the pier associated with proposed use for portions of time over three years.

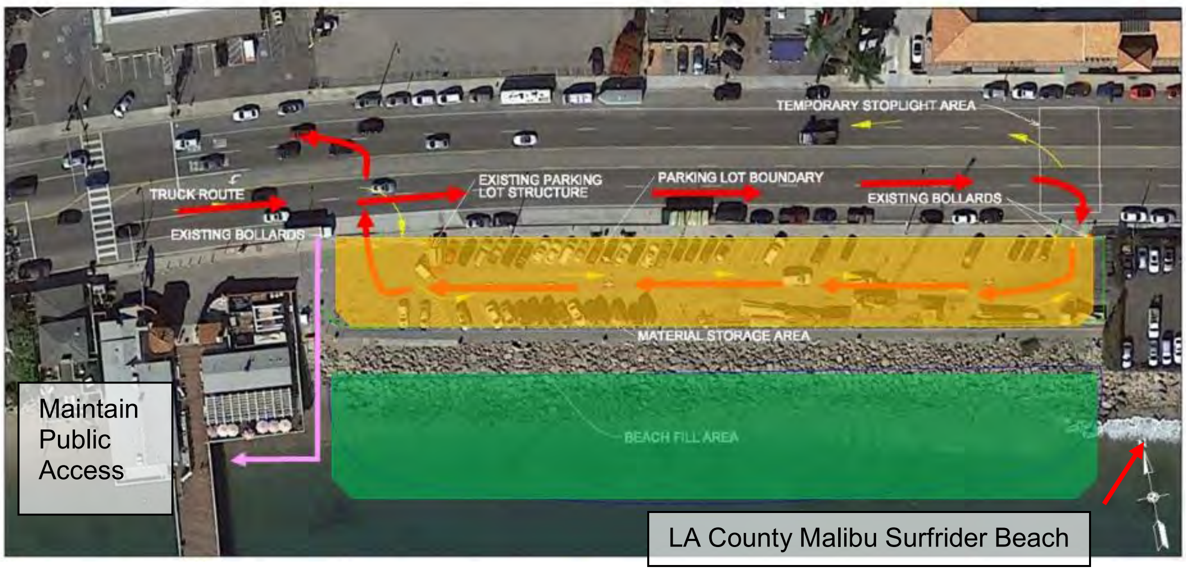


Figure 4.4-10 - Malibu Pier Parking Lot

Trucks would travel five miles from the Rindge Dam impounded sediment area to the pier parking lot to offload sediment from trucks for loader and dozers to place on the 300-foot length of beach immediately in front of the parking lot. The transfer and placement activities require temporary closure and use of the entire parking lot for approximately twelve months over a three-year period (3-4 months per year) of the total estimated seven-year construction window for these alternatives. Fully-loaded trucks would enter the downcoast driveway entrance travelling east along PCH avoiding the need for an additional traffic control light on PCH. Flagmen would be used for safety purposes as trucks travel from PCH in-and-out of the parking lot. The existing traffic light at PCH and the Malibu pier would be used with flagmen for empty trucks exiting the parking lot, crossing PCH and heading upcoast back to the dam site (or upland Site F).

Deliveries of mostly sands would occur after Labor Day (mid-September) to before Memorial Day for construction years 2-4, when the mostly sands unit 2 layer of impounded sediment is being mined at Rindge Dam. Trucks would travel either directly from the Rindge Dam impounded sediment area or from upland Site F, depending on the time of year. Annual delivery of the mostly sands would be limited to 100,000 cy per year. On average, about 40-50 trucks would travel to the pier parking lot daily during shoreline placement operations.

Shoreline material placed in front of the parking lot will disperse mostly downcoast during the winter season, leaving ample capacity for additional material to be placed at the pier for the second and third year of placement, completing delivery of mostly sands to the shoreline. Using the GenCade shoreline model, and running various model simulations for a 3.4 mile length of shoreline from the pier downcoast for a 9-year simulation using wave data from 2002-2011, it is assumed that beach widths downcoast increase significantly for the first four years after placement on the eastern side of the pier, with beach widths increasing by 70-100 feet during that time. Without sediment placement in front of the pier (No Action alternative), the model shows the same areas receding by 50-100 feet of beach width during the same 9-year timeframe. By the end of the 9-year simulation, the model shows that beach widths return to pre-project conditions.

Alternatives 2a2, 2b2, 2c2, 2d2 – Strategy for Delivery and Placement of Rindge Dam Impounded Sediment

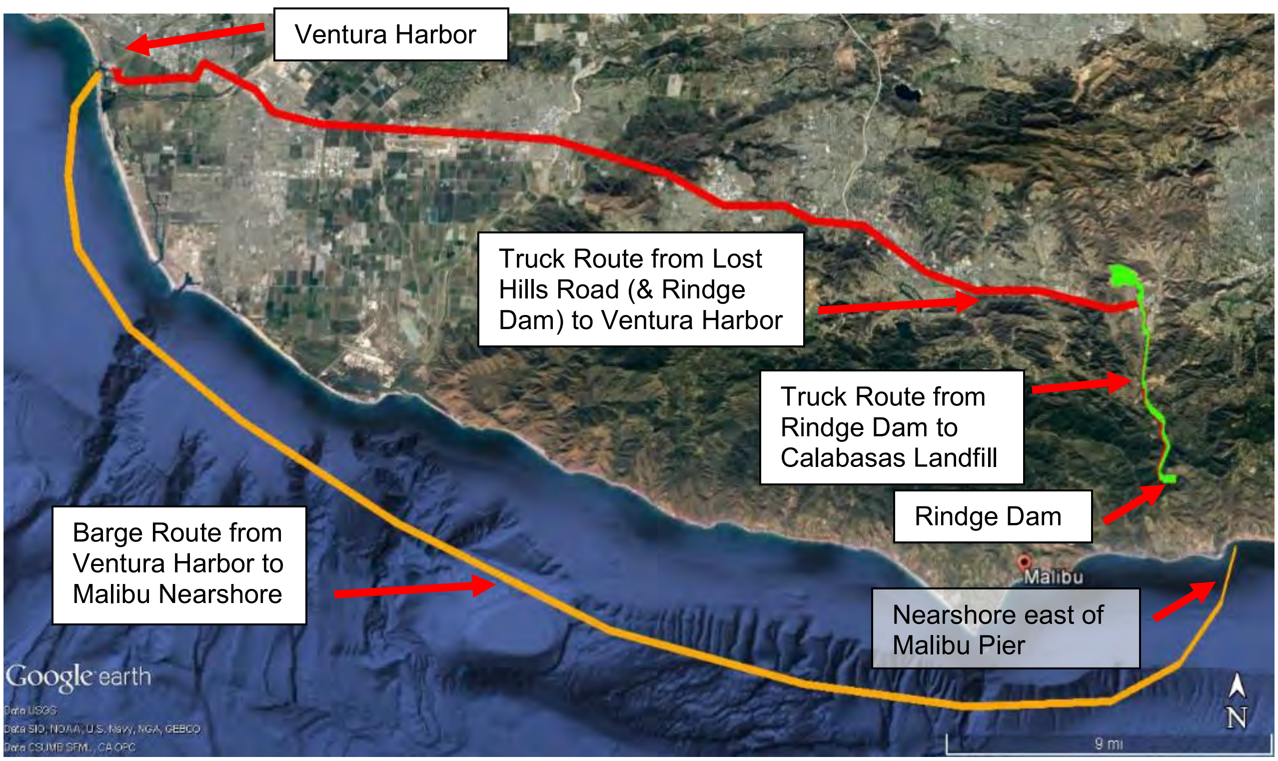


Figure 4.4-11 - Hauling Routes for Alts 2a2, 2b2, 2c2, 2d2

These Alternative 2 options include trucking the mostly sands layer directly from the Rindge Dam impounded sediment site along Malibu Canyon Road / Las Virgenes Road and U.S. Highway 101 to barges located at the Ventura Harbor, about 41 mi away. The 1,500 cy capacity barges (dump scows) would transport the material via tugboat downcoast and place the mostly sands in the nearshore area east of Malibu Pier in a location that does not adversely affect submerged aquatic vegetation offshore from the pier parking lot. Use of a barge also allows flexibility in continuing to consider placement in other areas along the Malibu Creek shoreline. Both trucks and barges would be making nearly 80-mile round-trips for each load: trucks from the Rindge Dam impounded sediment site to Ventura Harbor and back; and the dump scows from the harbor to the Malibu shoreline area and back. As previously assumed for the other sub-alternatives, nearly two-thirds of the estimated impounded sediment would still be trucked about 7.4 mi each way from the impounded sediment site to the Calabasas landfill. Use of barges may allow for a greater volume of the impounded sediment to be placed in the nearshore environment beyond the "mostly sands" portion (not evaluated).

Tradeoffs for these alternative options do not require use of temporary upland storage Site F or use of the Malibu pier parking lot. Truck traffic through the City of Malibu is minimized (none assumed) for these Alternative 2 options. Since the PDT assumed productivity for Rindge Dam sediment mining remains relatively the same for these alternative options and the hauling and barging distance increases significantly, each dump cycle takes longer. Consequently, it is estimated that an additional year of construction is required (8 years). Other assumptions regarding hourly, daily and yearly schedules remain the same as the other Alternative 2 options described earlier.

Figure 4.4-12 - Ventura Harbor Barge Loading Area – Parking Lot Adjacent to Boat Launch Ramp

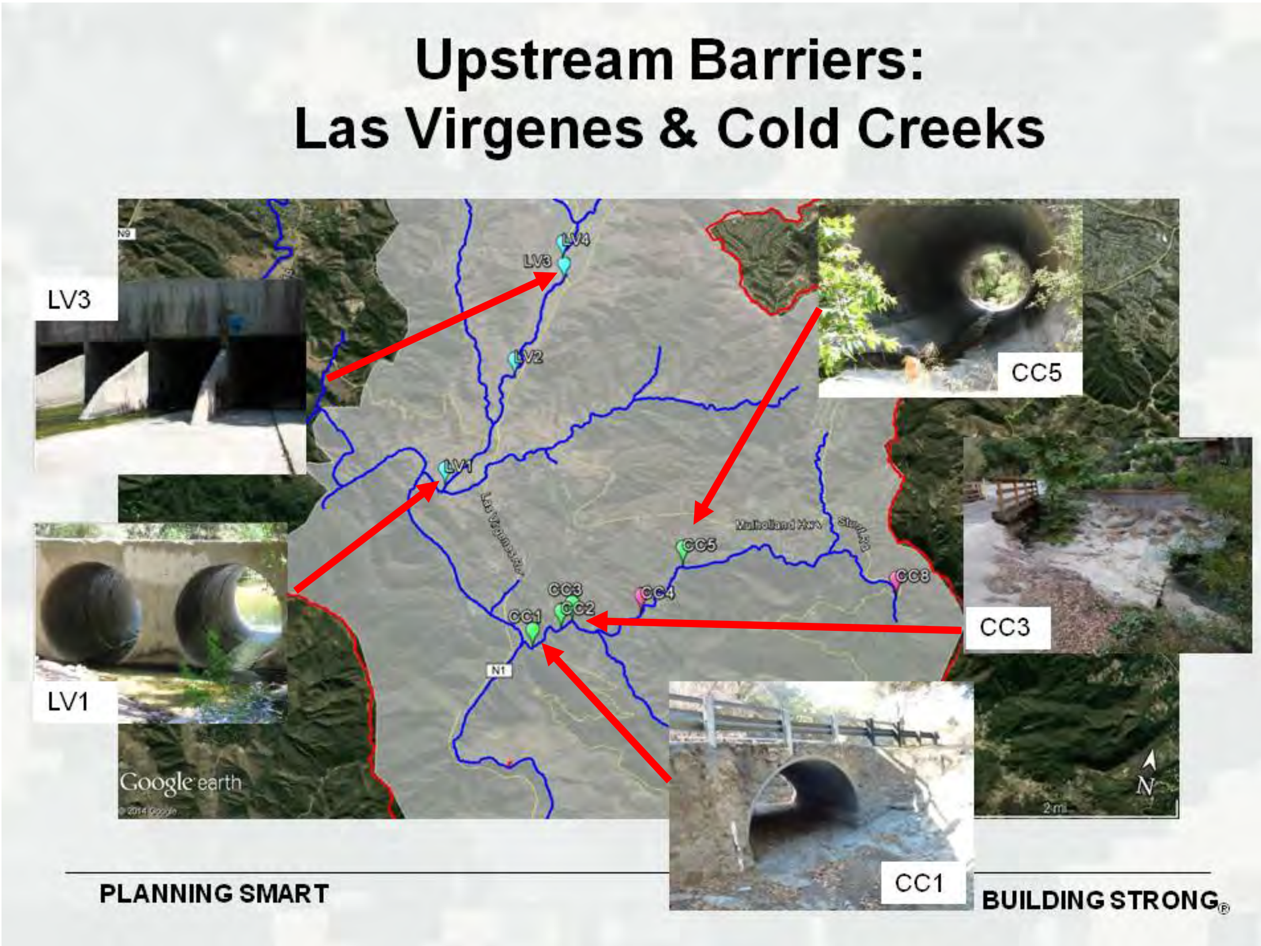
Summary of Transport and Placement Options for Rindge Dam Impounded Sediment

Overall, each of the alternative transport and placement options include tradeoffs associated with temporary traffic impacts during construction, recreational impacts along the shoreline, use of a temporary upland storage site and related impacts, and placement of material along the Malibu coast with one method of transport potentially allowing for more material than the mostly sands layer (cobbles) to be transported to the coast. Overall outputs in the habitat evaluation score the same for either transport option, although the habitat evaluation does not quantify use of the shoreline or nearshore areas. Either option allows for restoration of the natural sediment transport regime and aquatic habitat connectivity in the watershed. Other resources considerations regarding the impacts of these transport and placement methods for the Rindge Dam impounded sediment are considered in the comparison of alternatives and plan selection.

Alternatives 2b1, 2b2, 2d1, and 2d 2 – Modification of Upstream Aquatic Barriers

These Alternative 2 options include measures to address restoration of aquatic habitat connectivity along reaches of Cold Creek and Las Virgenes Creek tributaries to Malibu Creek upstream of Rindge Dam. These partial or total aquatic barriers impede or block connectivity to an additional 13 mi of good to excellent quality habitat. Providing a contiguous link to upstream habitats affords steelhead and other migratory species refuge in former spawning and rearing habitat that have been completely blocked since the mid-1920s construction of Rindge Dam. Benefits for habitat connectivity in areas above Rindge Dam are dependent and contingent on restoration of habitat connectivity at Rindge Dam to allow for restored access from the ocean to these upstream Malibu Creek tributaries.

Various measures were formulated for the barriers to allow for restoration of partial or complete aquatic habitat connectivity ensuring the intended purpose of certain barriers, such as bridge road crossings, was modified to allow for both retention of function and restoration of aquatic habitat connectivity. Investigations focused on four road crossings along Cold Creek, and three road crossings and a small check dam on Las Virgenes Creek. Several other partial aquatic habitat barriers have been removed by other interests since the beginning of the feasibility study (one on Malibu Creek below Rindge Dam at Cross Creek, one upstream on Malibu Creek above the Las Virgenes Creek confluence, and two on Cold Creek).



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2 **Figure 4.4-13 - Upstream Barriers**

3

For Cold Creek, the first aquatic barrier is the concrete culvert under the Piuma Canyon Road Bridge (CC1). Various consideration of measures to address restoration of habitat connectivity at the barrier led to proposed modifications to the bottom of the concrete culvert through construction of an incised roughened channel that allowed for necessary channel depths and velocities for fish passage under a range of flow conditions. The PDT was not able to design for habitat connectivity and fish passage at the barrier by a small channel alone without compromising the structural integrity of the bridge foundations. Therefore, the proposed action includes measures to provide a new channel invert designed for fish passage, and new foundations and a new span to maintain vehicular access along Piuma Canyon Road.

Photo 4.4-2 - Piuma Road

Photo 4.4 - CC3 Bridge & Concrete Apron

Photo 4.4-3 - Photo 4.3 - CC2 Bridge & Concrete Apron

Cold Creek barriers CC2 and CC3 are located a short distance upstream from the CC1 barrier. These bridge crossings have concrete aprons covering the channel invert under the bridges. For CC3, the bridge crossing is the only access to private residences in the surrounding community.

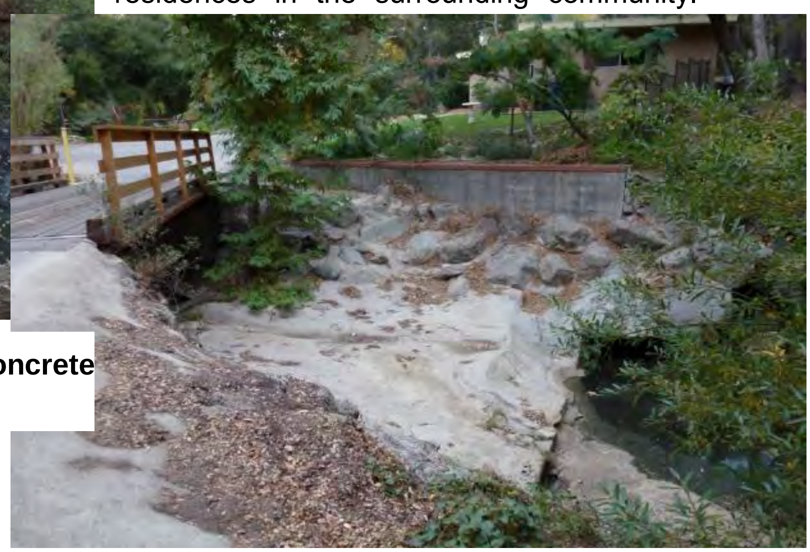


Photo 4.4-4 - CC3 Bridge & Concrete Apron

Similar to CC1, the PDT investigated construction of a small incised channel to concentrate flows within a design velocity range and depths as a proposed plan to restore aquatic habitat connectivity. Since the shallow footings for the bridge foundations could be at risk of failure with the proposed plan, measures were included to remove the concrete apron, construct new foundations and new bridge spans at these barriers.

The next upstream barrier is a large culvert under Cold Canyon Road (CC5). A roughened channel would be constructed along the base (invert) of the culvert to allow for fish passage during most flow conditions (except short duration peak events).

Photo 4.4-5 - CC5 Culvert

Las Virgenes Creek is another tributary to Malibu Creek, located over a mile upstream from the Cold Creek confluence. The first barrier (LV1) is a road crossing with two large concrete culverts within Malibu Creek State Park. The road crossing is used for emergency access for park rangers, firefighters and ambulances. The road is also a heavily used trail crossing for hikers, bikers, and equestrians and is the primary access to popular trails to other portions of the park, including the former MASH television show site. The PDT proposed measures to construct a roughened channel at the base of the culverts, but structural integrity concerns led to the proposed plan to remove the concrete culverts and access road, while reconstructing bridge foundations with a replacement span above the creek.

Photo 4.4-6 - LV1 Culverts

LV2 is a small check dam also located in the park about a mile above LV1. The approximately 6-foot high dam has filled with sediment. Measures were limited in scope to removal of the dam. To reduce localized impacts to release of the small amount of sediment impounded behind the dam, a two-phase removal approach has been proposed over several years. The initial notch would remove half the height of the dam and natural flows would erode the sediment behind it to the downstream reach. The second phase would complete removal of the dam, allowing for the remaining sediment to erode away and the pre-dam channel invert to be exposed again.

Photo 4.4-7 - LV2 Check Dam

Photo 4.4-8 - LV3 Concrete Apron

Photo 4.4-9 -LV4 Concrete Apron

LV3 and LV4 are large bridge crossings for the Lost Hills Road, connecting from Las Virgenes Road to Highway 101 through the City of Calabasas. Both bridges have a concrete apron that extends both upstream and downstream of the bridges. Base flow conditions form a shallow sheet flow that spread out along a thin layer on the surface of these aprons on the channel invert. Measures to address these barriers to restore aquatic habitat connectivity focused on designs for a pilot channel through each concrete apron on the inverts under the bridge crossings. Fish passage criteria was used to allow for an appropriate range of flow depths, velocities and resting areas for these long reaches that currently impede passage and habitat connectivity.

Several habitat assessments conducted for - and independently of - the feasibility study, were used to assess both the quality of habitat that exists upstream and downstream of each barrier, and the severity of the barriers (either partial or total). This information was used by the TAC environmental working group throughout the development of the Habitat Evaluation. Outputs were used in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) developed for this study. Benefits are not realized unless aquatic habitat connectivity is addressed at Rindge Dam first, then the next most downstream barrier is addressed on either Cold Creek or Las Virgenes Creek tributaries.

Table 4.4-1 provides a summary of the Lands, Easements, Relocations, Rights-of-Way, and Disposal Sites (LERRDS) requirements for these upstream barriers. Non-standard estate language is to be developed by the USACE and the CDPR to provide sufficient real estate rights for the proposed project. Demolition costs associated with removing existing structures for CC1, CC2, CC3, LV1 and LV2 are LERRDs costs which will be credited to the CDPR. The CDPR will be responsible for maintaining all project features. Relocations will be maintained by the individual structures' owners.

Table 4.4-1- Upstream Aquatic Habitat Barriers – LERRDS Considerations

Barrier Symbol	Barrier Name	Barrier Owner	Type of Interest	Barrier Description	LERRD Requirements	Proposed Restoration Summary	Non-Standard Estate*	Relocation by Sponsor or Project Feature**
CC1	Piuma Culvert	Los Angeles County	Perpetual Easement	CC1, Piuma Culvert, is a wide corrugated metal pipe (CMP) arch culvert with a concrete invert. Piuma Rd. passes over the structure and provides access to homes throughout the hills.	Provide fee and relocate culvert/bridge-- Replace with a 12 ft long, 46 ft wide pre-cast arch culvert with a soft bottom. Demo of existing culvert/invert.	Restore natural channel -- regrade creek bed to address the drop/restore habitat in place of concrete invert.	No	Relocation
CC2	Malibu Meadows Road Crossing	Malibu Meadows Homeowner's Association	Perpetual Easement	CC2, Malibu Meadows Road Crossing, is a steel beam bridge with a wood deck. The bridge is part of Malibu Meadows Road which is a narrow two lane road that serves homes throughout the hills.	Acquisition of fee, and to address impairment of access, provide bridge replacement	Remove concrete slab impeding aquatic connectivity, regrade channel to address drop, and restore habitat.	No	Relocation (private road)
CC3	Crater Camp Road Crossing	Malibu Meadows Homeowner's Association	Perpetual Easement	CC3, Crater Camp Road Crossing, is steel beam bridge with a wood deck. The bridge is part of Crater Camp Road which is a narrow road that serves homes throughout the hills.	Acquisition of fee, and to address impairment of access, provide bridge replacement	Remove concrete invert impeding aquatic connectivity, regrade channel to address drop, and restore habitat.	No	Relocation (private road)
CC5	Cold Canyon Road Culvert	Los Angeles County	Fee	CC5, Cold Canyon Road Culvert is a concrete culvert along Cold Creek underneath Cold Canyon Road. Cold Canyon Road is a two lane rural road that serves homes in the mountains.	Provide permanent easement to allow modification of culvert to construct low flow channel and right for sponsor to maintain in accordance with project.	Construct a low flow channel through the existing culvert	Perm. Easement	Project Feature
LV1	Crags Road Culvert Crossing	State of California	Fee	LV1, Crags Road Culvert is a concrete, double barrel culvert located along Las Virgenes Creek. It currently serves as a road crossing for maintenance vehicles and emergency access for Malibu	Sponsor provides land in fee and performs relocation: replace crossing with a pre-manufactured 75 ft long, 20 ft wide clear span bridge.	Restore natural channel -- regrade creek bed/restore habitat in place by removing two corrugated metal	No	Relocation

Barrier Symbol	Barrier Name	Barrier Owner	Type of Interest	Barrier Description	LERRD Requirements	Proposed Restoration Summary	Non-Standard Estate*	Relocation by Sponsor or Project Feature**
				State Park and fire trucks as well as for recreational users.	Relocation includes demo cost.	pipes and bridge structure.		
LV2	White Oak Dam	State of California	Fee	LV2, White Oak Dam is small diversion dam that is 6 ft high and spans 87 ft across Las Virgenes Creek. It was originally built to collect water for agricultural use. Dam is no longer in use.	Provide land in fee to project.	Remove the dam in stages and restore cleared areas once removal complete.	No	Project Feature
LV3	Lost Hills Road Culvert	Los Angeles County	Perpetual Easement	LV3, Los Hills Road Culvert is a concrete box culvert with four openings. Los Hills Road is a four lane road that passes over the culvert and through a densely developed residential area.	Provide permanent easement to allow modification of culvert to construct low flow channel and right for sponsor to maintain in accordance with project.	Construct a low flow channel through the existing culvert.	Perm. Easement	Project Feature
LV4	Meadow Creek Lane Crossing	Los Angeles County	Perpetual Easement	LV 4, Meadow Creek Lane Crossing, located 930 ft upstream of LV3, is a concrete culvert with four openings. Meadow Creek Lane is a two lane road that passes over the culvert and it serves as one of two points of entry into a densely developed residential neighborhood.	Provide permanent easement to allow modification of culvert to construct low flow channel and right for sponsor to maintain in accordance with project.	Construct a low flow channel through the existing culvert.	Perm. Easement	Project Feature

4.4.3 *Alternative 3 - Natural Transport of Impounded Sediment*

Alternatives 3a-3d include decades-long incremental removal of Rindge Dam's concrete arch in 5-ft lifts, allowing for storms to erode and transport a metered portion of the impounded sediment over the remaining arch before the next 5-ft cut is made. This cycle would be repeated until the impounded sediment has been mobilized by storm runoff and redistributed to downstream Malibu Creek reaches or out to the shoreline and ocean.

Photo 4.4-10 - Rindge Dam 2005 Storm

When storms occur that are sufficient to mobilize the impounded sediment (1-5+ year intervals), the next incremental notching of the arch will occur until the arch is removed. Since these alternatives are dependent on the frequency and duration of storm runoff, it is difficult to predict what timeframe may be necessary to complete the project. Each interval could be from one to many years, depending on the severity and duration of storms. If there were storms of sufficient magnitude to transport all the impounded sediment made available by the cuts in the arch each winter season, it would take a minimum of two decades to restore connectivity of the aquatic habitat. Based on more than 75 yrs of stream gage records, the actual timeframe to complete could range from 20 to 100 yrs. It is unlikely that storms of sufficient magnitude will occur each year; therefore the assumption is that aquatic habitat connectivity will take 40 years of construction, and potentially decades more.

> The timeframe to complete incremental removal of the Rindge Dam arch may vary by decades beyond what is estimated, particularly when considering the possibility of climate change resulting in more extensive periods of drought. The duration of time needed for restoration of habitat connectivity may be underestimated, since it will take at least twenty storms of sufficient magnitude (one each year) to allow for incremental lowering of the dam arch in each consecutive dry season.

As in the other action alternatives, the mature vegetation and top layer of coarse material would be removed from the impounded sediment area to allow storm flow access to the more erodible deposits of mostly sands, silts and clays below. Trucks and other equipment would be required to remove 5-ft high blocks of concrete from the dam's arch via diamond-wire cutting, hauling those blocks to the Calabasas Landfill. The volume of impounded sediment available for erosion and transport is greatest during initial notches, tapering off to lesser amounts as the lower portions of the impounded sediment are exposed along the narrowing canyon widths, until the pre-dam channel is exposed.

The Alternative 3 options use far fewer trucks for construction when compared to other action alternatives, even though the construction timeframe lasts much longer. No trucks would be necessary to remove Rindge Dam impounded sediment from the site since storms will erode the impounded sediment over time. A ramp from Malibu Canyon Road to the impounded sediment area will be needed for equipment access to the dam and sediment area for the interim years of construction-related activities. This ramp will be needed for decades, therefore repairs are certain, and rebuilding of the entire ramp is likely during that timeframe due to anticipated storm erosion damages. Diversion and control of creek water would be necessary during each phase of construction to move impounded sediment so the back of the concrete arch can be exposed for the next removal of concrete blocks. Long-term open or renewable permits would be required from multiple agencies to work within the canyon and Malibu Creek for decades to remove the entire dam.

The spillway will no longer function as the primary pathway for downstream flows once the first cut is made in the arch because the height of the top of the spillway will be at a higher elevation than the remaining concrete arch. After the first year of construction, all storm runoff would flow directly over the top of the dam arch. Alternatives 3a and 3b include the removal of the spillway, with likely removal strategies being completed decades in the future when access to the reach immediately below Rindge Dam is restored.

Alternatives 3b and 3d include modification of upstream barriers on Cold Creek and Las Virgenes Creek, as described in Alternative 2. Modifications or removal of those barriers would likely occur several decades later due to the longer construction timeframe associated with these alternative options. No benefits to modification or removal of these barriers are realized until the Rindge Dam concrete arch is removed.

No effective measures were formulated to allow for control of the fine sediment that will be conveyed downstream of the dam from the impounded sediment area during non-storm, base flow conditions over multiple dry seasons. Vegetative growth on the site will also need to be removed to ensure that impounded sediment is able to erode during storms. The turbidity from the fine sediment carried over the dam will likely have an adverse effect to the immediate downstream reach during the dry season. Release of impounded sediment fines will blend into background turbidity levels from watershed runoff during winter storms.

Allowing for mobilization of the impounded sediment during storms will cause downstream water quality issues during the non-storm seasons when base flows may carry high levels of silts and clays into sensitive reaches and pools for some distance downstream of the dam. Measures were included to address potential for turbidity increases during construction windows; however, long-term natural sediment transport still poses problems for turbidity control below Rindge Dam between construction cycles.

Hydrologic, hydraulic, and sediment transport model runs were used to identify potential beneficial and detrimental impacts to downstream biological resources along Malibu Creek for the Alternative 3 options, and used to assess changes to the flood risk to the Serra Retreat and City of Malibu communities. The metered release of the more coarse-grained impounded sediment is similar to natural erosional and depositional patterns within the watershed. Coarse sediment will redistribute to downstream reaches over successive years of storms, raising the elevation of the creek bed over time, including reaches in the Serra Retreat and City of Malibu areas. Release of fine sediment (silts and clays) from the Rindge Dam impounded sediment may result in temporary drops in dissolved oxygen levels in downstream reaches.

Modeling results from Cross Creek Road to PCH Bridge show an average increase of about 4 ft of sediment deposition over the No Action condition for the period of analysis, with varying depositional changes at specific cross sections throughout the reach of the creek. Some variation in results are attributed to model limitations and uncertainties. Various measures were considered to address the increased risk to flooding in this populated reach of Malibu Creek. Both structural and non-structural flood risk management (FRM) measures were considered, with PDT decisions leading to the addition of floodwalls on both sides of the creek.

Photo 4.4-11 - Cross Creek Road during storm

Photo 4.4-12 - Cross Creek Rd. Bridge after Storm

The average floodwall height is estimated to be approximately 10 ft above ground, 3,100 ft long on the west bank and 2,700 ft long on the east bank, to address uncertainties in potential changes to the bed and water surface elevations in this reach during peak flow conditions. Considerable work would be required to construct the foundations for the floodwalls, with depths extending approximately 25 ft below the existing surface of the channel banks. Consideration was given to the alignment of the floodwalls to reduce impacts to the surrounding community, consider habitat disruptions, sensitive cultural resources, and to take advantage of existing high ground to lessen the overall length of the flood walls.

Model limitations and uncertainties in model inputs make it difficult to differentiate between changes to sediment deposition patterns as a result of metered releases of Rindge Dam impounded sediment versus much greater overall impacts from the higher volumes of sediment generated from the greater watershed during storms. Deposition and erosion patterns in downstream reaches of Malibu Creek could vary up to several feet during the short duration peak events in this flashy system. For the Alternative 3 options, the risk of changes to the downstream bed elevation is considered significant enough to warrant inclusion of floodwalls as appropriate risk management measures.

Photo 4.4-13 - Conceptual Floodwall Alignment

In the reach between Cross Creek Bridge and PCH, there would be considerable impacts to the surrounding riparian habitat as a result floodwall construction. This action would require a 45-ft wide area to be disturbed along the floodwall lengths for a total estimated loss of 6 acres of vegetative cover, an overall 5% reduction in cover for this reach. Maintenance roads for the floodwall would result in the permanent loss of 0.6 acres of vegetative cover (15-ft access road along 3,100 ft and 2,700 feet of floodwalls requiring construction of a permanent access road). Floodwalls in this reach would increase the velocity of storm flows in relatively frequent events (> 20% chance of recurrence in any year), but would not affect the reach under low-flow (base) conditions. There is also potential for disturbances to cultural resources based on the extent and alignment of the floodwalls proposed for the Alternative 3 options.

The potential liability for increased flood risk in these communities for Alternative 3 and 4 is a significant concern for the City of Malibu, Serra Retreat Community residents, and the Sponsor. Since the floodwalls are formulated to address the increased risk of flooding caused by proposed actions at Rindge Dam only, they do not address the aggradational trend and rise in bed elevation that result from watershed sediment contributions over time, as described in the Alternative 1 (No Action) condition.

4.4.4 *Alternative 4 – Alternative Options 4a1, 4a2, 4b1, 4b2, 4c1, 4c2, 4d1, 4d2*

Alternative 4 options are similar to the Alternative 2 options, but include allowances for controlled natural transport of some of the Rindge Dam impounded sediment during construction. At the close of each construction year, when the dam site is prepared for the wet season and construction shuts down, an additional 5-foot high portion of the dam arch would be cut across to expose some of the impounded sediment. This would allow for a controlled volume of impounded sediment to potentially erode and wash downstream during the winter storms before the next year of construction activities begin. This cycle would be repeated for the estimated 7-8 years it will take to complete construction, leaving the remaining dam concrete arch elevation five feet lower than the remaining impounded sediment each year before the wet season construction pause at the dam site. The maximum total volume of the increments of impounded sediment that could potentially be scoured and transported downstream over the entire construction window amounts to 120,000-130,000 cy. However, the total volume of impounded sediment is entirely dependent on the amount of storm runoff generated each wet season cycle during construction. Actual volumes of impounded sediment mobilized could be minimal during consecutive years of drought or the full volume could be mobilized during wet years.

Alternative 4 options have the potential to decrease the estimated volume of impounded sediment that needs to be transported via trucks to the Calabasas landfill, Site F and the Malibu Pier parking lot shoreline (for Alternative options 4a1, 4b1, 4c1, and 4d1), or by trucks and barge to the nearshore and the landfill (for Alternative options 4a2, 4b2, 4c2, and 4d2). Therefore, total hauling costs are lower than the Alternative 2 options. Downstream biological impacts associated with the total potential volume of sediment potentially eroded from the impounded sediment area may result in some adverse impacts to critical habitat or species in the reach immediately downstream of Rindge Dam.

For the Alternative 4 options, modeling of the relatively low total volume of sediment potentially mobilized from the impounded sediment area is more difficult to differentiate with sediment generated from other sources in the watershed for these alternatives. Outputs of the sediment transport model runs indicate a slight increase in flood risk to downstream communities due to a rise in Malibu Creek bed elevations in the Serra Retreat and City of Malibu reaches. Similar to Alternative 3 options, structural and non-structural FRM measures were considered along City of Malibu and Serra Retreat reaches. Floodwalls were also selected for these alternatives. The footprint and alignment of the floodwalls are the same as described for the Alternative 3 options, but the average height of the floodwall is half the size of Alternative 3 options at approximately 5-feet above ground.

The PDT made a conservative assumption to include floodwalls as appropriate risk management measures. While model results show a potential increase in the flood risk to downstream communities, it is more difficult to differentiate between impacts from mobilization a portion of the impounded sediment for these alternatives and the much greater volume of sediment generated from the entire watershed during storm runoff.

Other features associated with Alternative 4 options are the same as Alternative 2 options. Access and site preparation at Rindge Dam and the impounded sediment area remains the same. Options associated with the transport and placement of impounded sediment are similar, with the potential for less of the impounded sediment placed at the upland, shoreline or nearshore sites if storms erode and transport sediment to downstream reaches of the creek during construction. Upstream barriers are considered for 4b1, 4b2, 4d1 and 4d2, as described for the similar Alternative 2 options.

4.4.5 *Summary of the Focused Array of Alternatives*

Table 4.4-2 provides a general summary of the measures and actions included in the focused array of alternatives, and the potential for restoration of miles of aquatic habitat connectivity from the ocean to portions of the watershed. The PDT evaluated and compared the alternatives in the focused array to identify the National Ecosystem Restoration (NER) plan.

Table 4.4-2 - Summary Description of the Focused Array of Alternatives

	Alternative 1	Alternative 2a Alternative 2c	Alternative 2b Alternative 2d	Alternative 3a Alternative 3c	Alternative 3b Alternative 3d	Alternative 4a Alternative 4c	Alternative 4b Alternative 4d
Description	No Action	Rindge Dam Arch Removal Mechanical Transport	Rindge Dam Arch Removal Mechanical Transport Upstream Barriers	Rindge Dam Arch Removal Natural Sediment Transport	Rindge Dam Arch Removal Natural Sediment Transport Upstream Barriers	Rindge Dam Arch Removal Mechanical Transport and Natural Sediment Transport	Rindge Dam Removal Mechanical Natural Sediment Transport Upstream Barriers
Alt. Summary	Rindge Dam 100-foot high arch (and spillway) would remain in-place without modification. Age of structure may be an integrity issue. Impounded sediment behind Rindge Dam to remain with some temporary deposition between storms. Risk of downstream flooding increases over time due to aggrading channel. Reach below Rindge Dam will degrade 5 to 10 feet reaching equilibrium in about 100 yrs. Approx 2 ft of deposition likely to occur in lower reaches below the Dam. Costs may be incurred to maintain dam safety and provide flood risk mgmt measures in downstream areas.	Remove Rindge Dam arch over 7-8 years while removing impounded sediment to minimize downstream adverse impacts to habitat and flood risk. Truck all 780k CY of impounded sediment to Calabasas Landfill or to shoreline/ nearshore site(s). Screen boulders and cobbles from sand delivered to the shoreline. Opens up about 5 mi of good to excellent aquatic habitat along Malibu Creek. **<u>Alt 2c</u>:** Adds spillway removal to Alt 2a features while removing arch to lessen habitat disturbance, improve safety, and aesthetic purposes. 2a1, 2c1: shoreline placement 2a2, 2c2: nearshore placement	Same as 2a with the addition of modification or removal of upstream aquatic habitat barriers along Las Virgenes Creek (4) and Cold Creek (4), tripling the amount of good to excellent quality aquatic habitat reconnected to lower reaches of Malibu Creek. Opens up a total of about 18 mi of aquatic habitat along Malibu, Las Virgenes and Cold Creeks. **<u>Alt 2d</u>**: Adds spillway removal to Alt 2b features. 2b1, 2d1: shoreline placement 2b2, 2d2: nearshore placement	Incrementally remove Rindge Dam arch over decades (20-100 yrs) in 5 foot lifts, waiting for impounded sediment to be naturally transported downstream with winter storm flows, repeating until structure is completely removed. Assumed timeframe for removal: 40-100 yrs. No need for trucks to transport sediment to Calabasas Landfill or beaches. Trucks needed to transport dam/ spillway concrete to landfill. Floodwalls required for increased flood risk to Serra Retreat & City of Malibu: 10 ft high and 3,100 feet long on west side & 2,700 feet long on east side, from Cross Creek Rd to PCH. After decades, reconnects about 5 mi of good to excellent aquatic habitat along Malibu Creek. **<u>Alt 3c:</u>** Adds spillway removal to Alt 3a features	Same as 3a with the addition of modification or removal of upstream aquatic habitat barriers along Las Virgenes Creek (4) and Cold Creek (4), tripling the amount of good to excellent quality aquatic habitat reconnected to lower reaches of Malibu Creek. Opens up about 18 mi of aquatic habitat along Malibu, Las Virgenes and Cold Creeks. **<u>Alt 3d:</u>** Adds spillway removal to Alt 3b features.	Similar to 2a, with allowance for controlled volume of natural sediment transport during winter storm seasons over 7-8 construction timeframe. Remove Rindge Dam arch while removing impounded sediment and notch height of arch by additional 5 ft each year to allow for storms to mobilize sediment. May allow for up to 130K CY to naturally transport downstream. Truck at least 520K CY of 780k CY of impounded sediment to Calabasas Landfill and remainder to shoreline / nearshore site(s) Floodwalls required for increased flood risk to Serra Retreat & City of Malibu: 5 ft high and 3,100 feet long on the west side & 2,700 feet long on east side, from Cross Creek Rd to PCH. Opens up about 5 mi of good to excellent aquatic habitat along Malibu Creek. **<u>Alt 4c:</u>** Adds spillway removal to Alt 4a features. 4a1, 4c1: shoreline placement 4a2, 4c2: nearshore placement	Same as 4a with the addition of modification or removal of upstream aquatic habitat barriers along Las Virgenes Creek (4) and Cold Creek (4), tripling the amount of good to excellent quality aquatic habitat reconnected to lower reaches of Malibu Creek. Opens up about 18 mi of aquatic habitat along Malibu, Las Virgenes and Cold Creeks. **<u>Alt 4d:</u>** Adds spillway removal to Alt 4b features. 4b1, 4d1: shoreline placement 4b2, 4d2: nearshore placement

4.5 Evaluation of Alternatives

Alternatives 2, 3 and 4 options in the focused array all address the planning objectives by proposing measures to address the removal of the Rindge Dam concrete arch and the impounded sediment that has deposited behind the dam. Establishing a more natural sediment transport regime, reestablishing aquatic habitat connectivity and restoring habitat of sufficient quality, while also benefiting the Malibu coastal area requires addressing actions to remove the dam arch and impounded sediment. The No Action plan (Alternative 1) leaves a large aging structure in-place and means greater risk of recovery for steelhead and other species in the lower 3 mi of Malibu Creek, below Rindge Dam, due to limitations in the extent of habitat, predation, and potential for more severe climate change impacts.

Taking action to remove Rindge Dam and the impounded sediment allows for a greater extent of high quality spawning and rearing habitat for steelhead, and ability to increase a sustainable population of this species within the watershed that may be a source for repopulation in other regions along the west coast that will be subject to greater extremes of climate change. The trade-offs that are key to the evaluation of the array of alternatives include:

- Differences in the timeframe for reestablishment of Malibu Creek aquatic habitat connectivity;
- Various habitat evaluation benefits;
- The costs associated with plan implementation, monitoring and adaptive management requirements, and monitoring and adaptive management;
- The potential for additional habitat connectivity above the dam;
- Impacts to downstream reaches of Malibu Creek when allowing storms to convey some or all of the Rindge Dam impounded sediment through the lower creek to the ocean;
- Effects of truck traffic to local communities and the region;
- Impacts of placement of the impounded sediment in upland sites;
- Impacts of placement of the impounded sediment on the shoreline or nearshore areas.

4.5.1 *Alternative Costs*

Cost estimates for alternatives 2, 3 and 4 currently range from $118-$210 million (includes Construction, LERRDS, PED, Construction Mgmt and Interest during Construction). Detailed estimates have been developed for each alternative based on PDT input into the type, sequencing and duration of specific construction activities, the need for monitoring and adaptive management, and operations, maintenance, repair, replacement and rehabilitation (OMRR&R) cost estimates.

Addressing the impounded sediment behind Rindge Dam to address the study objectives in the lower reaches of the watershed is the most significant cost driver for the action alternatives. While transport costs can be quite high in the sub-alternative options to 2 and 4, the tipping fees associated with disposal of nearly half of the impounded sediment at the Calabasas Landfill are a significant driver of the costs developed for these alternatives. For Alternatives 2a1, 2b1,2c1,2d1, 4a1, 4b1, 4c1, and 4d1 (shoreline placement of mostly sands), the overall average cost for impounded sediment removal, transport and placement amount to about $63/cy. Costs vary considerably depending on the composition of the impounded sediment being mined (mostly gravels, sands or silts and clays), and whether the landfill is assumed to be the primary destination for impounded sediment placement during any given construction year. For the mid-years of construction when most of the mined sediment is delivered to the shoreline, the costs are about $33/cy. Other times during construction, when the landfill is being used, average costs can increase to about $92/cy for the construction year.

The use of Calabasas landfill and consideration of the volume of impounded sediment permanently disposed of at the location as waste material requires a substantial estimated cost per ton for tipping fees. Many millions of dollars could be saved if other uses for the more marketable and beneficial use portion of the sediment delivered were identified, or if some of the material could be temporarily placed in a portion of the landfill for future uses to be identified by other interests. These options were not identified to be viable at this time and therefore the use of the landfill is presumed for the relevant alternatives.

Landfill tipping fees alone account for 50-77% of the costs associated with transporting and disposing of the impounded sediment through the 7-8 year construction cycle.

For Alternatives 2a2, 2b2, 2c2, 2d2, 4a2, 4b2, 4c2, and 4d2 (nearshore placement of mostly sands), the average costs for the removal, transport and placement increases to about $70/cy. Average annual fluctuations in mining and disposal costs are a slightly higher range, from about $52/cy to $87/cy.

Average costs for the Alternative 3 sediment transport options are very low in comparison to Alternatives 2 and 4 since the costs account for site access ramp construction, removal of existing mature vegetation, excavation of sediment adjacent to the back-face of the dam arch to incrementally lower the dam, and repairs to provide access for repeating that work in the 40 years assumed for ultimate removal of the dam arch and erosion and transport of the impounded sediment downstream.

For Alternatives 2, 3 and 4, Rindge Dam arch and spillway removal costs account for a relatively small amount of the total costs associated with each alternative. There is an estimated 4k cy of reinforced concrete in the dam arch and foundation. The cost estimate for removal of the arch, before contingencies, is about $4M. There is an estimated 2k cy of reinforced concrete in the spillway. Costs to remove the spillway, before contingencies, is about $1.54M (about $2.1M, with contingencies).

Costs associated with modification to the road crossings, culverts and small check dams (upstream barriers) on Las Virgenes and Cold Creeks were developed for site preparation, construction and LERRDs-related costs. Overall costs amount to about $9.4M.

Costs associated with Alternative 3 and 4 for downstream measures to address the potential increase in flood risk to the Serra Retreat and City of Malibu communities include foundation work and construction of floodwalls. Cost estimates for the floodwalls are about $18 million for Alternative 3 options and $9 million for Alternative 4 options.

Monitoring and Adaptive Management Plan (MAMP) costs vary by alternative, but include detailed considerations of requirements for monitoring, reporting and adaptively managing the success criteria established for % revegetation targets at the Rindge Dam and impounded sediment area, around the upstream barriers, at the shoreline and nearshore areas, upland site F (where applicable) and other areas where habitat may be disturbed during construction. Costs generally range from about $1.65 million to nearly $2.1 million for the array of alternatives.

Biological resources monitoring costs range from about $5 million to $7.1 million for Alternatives 2 and 4, and about $17.2 million for the Alternative 3 options. Cultural resources consideration for monitoring during construction amount to about $1.4 million to $2.6 million for the alternatives. Higher costs are associated with alternatives 3 and 4. A summary of the total cost by alternative is shown below.

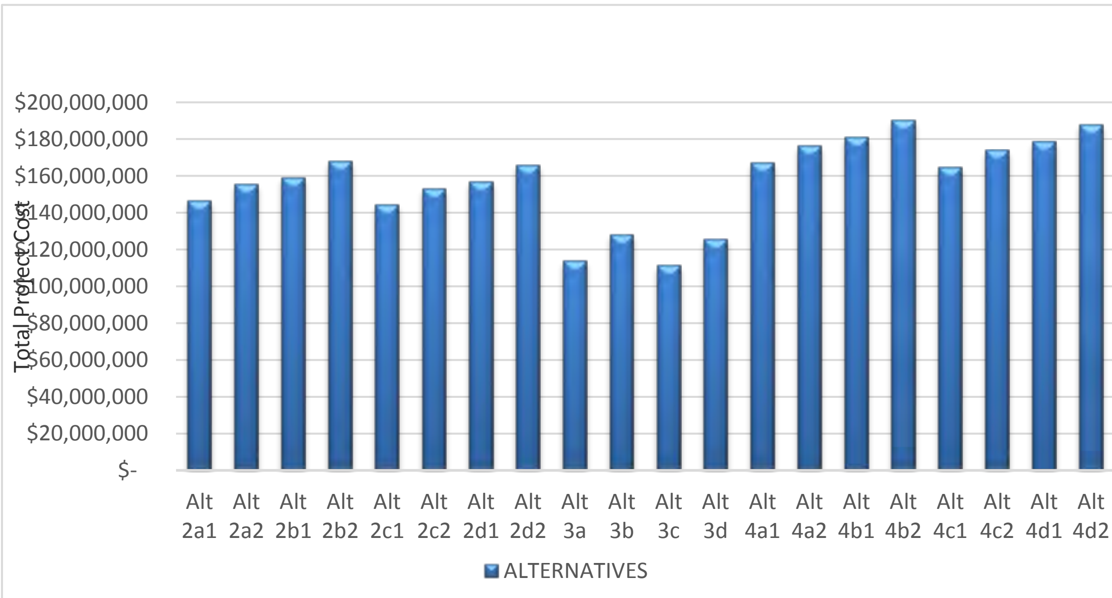


Figure 4.5-1 - Malibu Creek Watershed Alternative Costs

4.5.2 *Operation, Maintenance, Repair, Rehabilitation, & Replacement (OMRR&R)*

The PDT also considered post-construction OMRR&R needs for Alternatives 2, 3, and 4 options. The location for OMRR&R included the Rindge Dam area, including the impounded sediment area and reach immediately downstream of the dam, downstream Malibu Creek reaches for Alternatives 3 and 4, and upstream barriers and adjacent areas disturbed by construction activities (the “b” and “d” alternative options). Alternatives 3 and 4 include OMRR&R costs for floodwall repairs, but not for dredging. Additional evaluation of sediment deposition and scour potential near floodwalls would be needed if Alternative 3 or 4 options were selected. No OMRR&R is anticipated for the Malibu lagoon, but if Alternative 3 or 4 options were selected, additional evaluation of potential for sediment deposition at the mouth of the creek and within the lagoon would be conducted during PED, and OMRR&R would be refined, as needed. No OMRR&R is assumed for the Malibu pier area, surrounding shoreline, or the upland Site F area. OMRR&R actions include floodwall inspections and repairs, inspections for aquatic habitat obstructions and removal of any barriers related to project construction and site restoration areas around the former dam area and upstream barriers. Alternative options that retain the Rindge Dam spillway have higher OMRR&R costs due to need for continued access for inspections and repairs, and assumed minor and major repairs to the spillway for safety purposes during an assumed 50-year project life. OMRR&R costs range from about $20k-$50k/yr for the life of the project.

4.5.3 *Habitat Evaluation Methodology and Results*

The certified habitat evaluation (HE) model used for this study provides the quantitative analysis of gains and losses in habitat values within Malibu Creek and its tributaries, and the Malibu lagoon, for the array of alternatives. The model does not assess shoreline and nearshore habitats. The model designates five reaches downstream of Rindge Dam and thirteen reaches upstream of the dam, including reaches of the Las Virgenes and Cold Creek tributaries that included 10 upstream barriers. Inputs included prior studies, surveys and field data, hydrologic/hydraulic/sediment transport modeling along Malibu Creek. TAC members with ecosystem knowledge, skills and abilities participated in the HE. Target Years 0, 1, 10 and 50 were used to evaluate and compare alternative habitat value calculations in the HE.

Four variables were chosen to represent aspects of aquatic habitat important to the ecosystem restoration. These variables included consideration of the complexity of the physical structure and variety of substrates and topographic features in the reaches, the value of aquatic habitat present, invasive species, water quality, the benthic community, habitat connectivity, and habitat types to support various life stages of steelhead. Riparian habitat values were developed considering the percent of native and non-native vegetation utilizing National Park Service (NPS) vegetation mapping, field surveys, and other documentation and mapping resources. Loss of native vegetation was considered to negatively affect wildlife habitat and movement potential. Natural processes accounted for the amount of hydrologic disturbances within and adjacent to reaches and any alterations in the creek corridor or adjacent watershed which affect the amount of sediment entering the riparian ecosystem.

A total average habitat value score was developed for each reach by adding the three values for aquatic habitat, riparian habitat and natural processes, treating each value equally (no weighting factor), and dividing the sum total by three. Habitat Units were calculated by taking the total habitat value score multiplied by the acreage for each reach. The acreage was determined using NPS vegetation polygons, Google Earth, USFWS national wetlands inventory boundaries and hydraulic modeling outputs.

Table 4.5-1 - Habitat Evaluation – Alternative Comparison of Average Annual Habitat Units (AAHUs)

	Alt 1 (No Action)	Alts 2a, 2c	Alts 2b, 2d	Alts 3a, 3c	Alts 3b, 3d	Alts 4a, 4c	Alts 4b, 4d
Rindge Dam Removal Only (Alternative Options A and C)							
Mainstem Reaches	82	99	99	60	60	89	89
Cold Creek confluence to Century Dam	145	171	171	145	145	171	171
Cold Creek confluence to CC1	7	8	8	7	7	8	8
Las Virgenes Creek confluence to LV1	15	17	17	15	15	17	17
Subtotal with Dam Removal	249	295	295	227	227	285	285
Net Benefit (compared to No Action		46	46	-22	-22	36	36
Upper Barrier Modification/Removal (Alternative Options B and D)							
LV1 Removal	93		122		105		122
LV2 Removal	50		63		54		63
LV3 Removal	5		7		6		7
LV4 Removal	39		59		48		59
CC1 Removal	15		19		17		19
CC2 Removal	5		6		5		6
CC3 Removal	54		70		61		70
CC5 Removal	100		120		104		120
CC8 Removal [(1)]	10		13		11		13
Subtotal Barrier Modification-Removal	361		466		400		466
Net Benefit (compared to No Action			105		39		105
Total Increase in AAHUs above Alt 1 [(2)]		46	151	<0	17	36	141

[(1)] CC8 removal AAHUs were not included in Subtotal Barrier Modification-Removal. Reasons are provided in the CE/ICA summary.
[(2)] Total AAHUs vary slightly from other tables below due to rounding #'s (CE/ICA & NER Tables).

4.5.4 *Cost Effectiveness / Incremental Cost Analysis*

Cost effectiveness and incremental cost analyses (CE/ICA) were performed using IWR-PLAN. The CE/ICA is an evaluation tool which considers and identifies the relationship between changes in cost and changes in quantified, but not monetized, habitat benefits. The evaluation is used to identify the most cost-effective alternative plans to reach various levels of ecosystem restoration outputs and to provide information about whether increasing levels of restoration are worth the successively added costs, explicitly comparing additional costs and outputs of the alternatives. The CE/ICA is a planning tool to combine individual features into alternatives and help identify cost-effective plans which provide a certain level out habitat output at the least cost.

CE analysis seeks to identify the least-costly way of attaining the planning objectives. A plan is considered cost effective if it provides a given level of output for the least cost. The ICA consists of examining increments of plans or project features to determine their incremental costs and incremental benefits. Increments of plans continue to be added and evaluated as long as the incremental benefits exceed the incremental costs. When the incremental costs exceed the incremental benefits, no further increments are added.

Prior to completing the CE/ICA analysis it was apparent that Alternative 3 options have low benefits based on the average annual habitat units (AAHUs) developed for the habitat evaluation, some scoring lower than the No Action plan (Alternative 1). Accordingly, these alternatives were not evaluated in the CE/ICA analysis: only the No Action and Alternative 2 and 4 options were included. Even though the Alternative 3 options were not included in the analysis, these alternatives partially meet planning objectives and are still considered in the final array to display tradeoffs with the other alternatives.

For the CE/ICA, no modification to barriers were considered if downstream barriers were not addressed first because implementation of the first barrier removal plans on the upstream tributaries (LV1 and CC1) rely on implementation of one of the dam removal plans, and all upstream barrier removal plans require implementation of downstream barrier removal plans.

Based upon CE/ICA model inputs, there are 192 possible plan combinations (not including the No Action Plan). Of these plans, there are 10 cost effective action plans, including the best buy plan that includes modification of upstream barrier CC8 (shown in line #11 in **Table 4.5-2**). The remaining cost effective action plans include incremental additions of barrier removals. The output for the cost effective plans range from 46.2 average annual habitat units (AAHUs) for the plan that only includes Rindge Dam arch and impounded sediment removal (Alternative 2C1), to 155.2 AAHUs for the plan that also includes all of the barrier removals.

Initial CE/ICA results showed that the best buy plan included Rindge Dam arch and impounded sediment removal alternatives, and modification and/or removal of all the upstream barriers considered (including CC8). However, the initial results did not allow for clear identification of the upstream barrier best buy options since the results were heavily skewed by the large cost and outputs associated with the prerequisite Rindge Dam arch and impounded sediment removal. Therefore, plans that included all of the upstream barriers had the lowest average annual costs (AAC)/AAHU because the AAC/AAHU is lower for all of the barrier removal alternatives than the most efficient standalone dam removal alternative.

In order to isolate the CE and efficiency of the barrier modification and removal options, a separate CE/ICA analysis was conducted on the upstream barriers. The results of this analysis resulted in four best buy combinations of efficient upstream barrier modifications and removals.

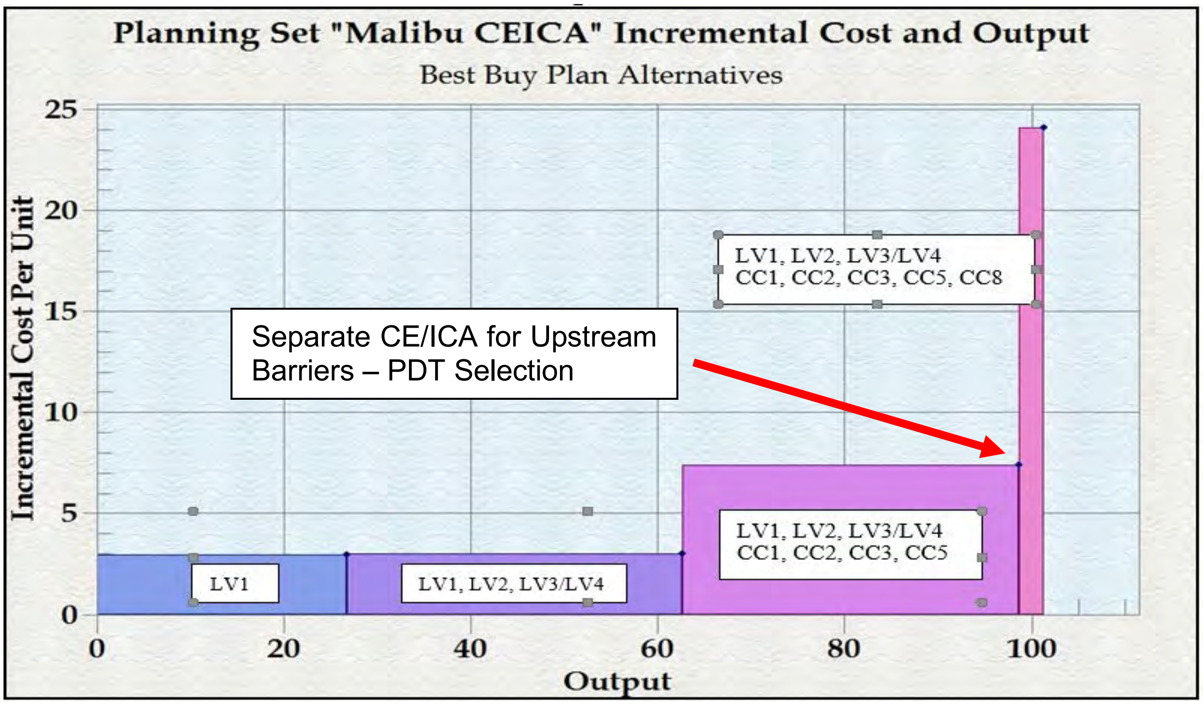


Figure 4.5-2 - Planning Set "Malibu CEICA" Incremental Cost and Output

These best buy options for combinations of other upstream barriers were added to the removal of the Rindge Dam arch and impounded sediment (Alternative 2c1), and further evaluated by the PDT to identify the NER Plan. The PDT selected a cost effective plan that provided high outputs but did not include modification to upstream barrier CC8, as shown in the **Figure 4.5-2**. The CC8 upstream barrier modification provides only a small increase in AAHU outputs for a relatively large additional financial investment when compared to other best buy combinations of upstream barrier modifications. CC8 also serves as a barrier to the spread of the New Zealand mudsnail. Given this, the PDT determined that the modification of the CC8 barrier was not an efficient additional investment and eliminated CC8 from consideration. The PDT selected the smaller scale best buy plan that excludes modification of CC8 (Alternative 2d1) as the NER plan. **Table 4.5-2** presents the outputs of the CE/ICA and cost effective plans, and **Figure 4.5-3** visually display the same outputs. The NER plan is highlighted in green (line #10), and includes Rindge Dam arch removal, shoreline placement of impounded sediment, and modification or removal of upstream barriers Las Virgenes (LV)1-4 and Cold Creek (CC)1-5. A more detailed discussion of the CE/ICA analysis is included in the **Appendix E**.

Table 4.5-2 - CE/ICA - Cost Effective Plan Alternatives

	Name*	Output (AAHUs)	First Cost ($1,000)	AA Cost ($1,000)	AAC/HU
1	No Action Plan	0.0	$0	$0	
2	DR 2C1	46.2	$144,327	$6,425	$139.1
3	DR 2C1, BM LV1	75.0	$146,302	$6,504	$86.7
4	DR 2C1, BM LV1, LV2	88.3	$147,432	$6,549	$74.2
5	DR 2C1, BM LV1, LV2, LV3, LV4	110.9	$148,738	$6,661	$59.6

6	DR 2C1, BM LV1, LV2, LV3, LV4, CC1	115.4	$151,227	$6,710	$58.1
7	DR 2C1, BM LV1, LV2, LV3, LV4, CC1,CC2	116.6	$153,230	$6,790	$58.2
8	DR 2C1, BM LV1, LV2, CC1,CC2, CC3, CC5	129.9	$153,862	$6,815	$52.5
9	DR 2C1, BM LV1, LV2, LV3, LV4, CC1,CC2, CC3	132.2	$154,815	$6,853	$51.8
10	DR 2C1, BM LV1, LV2, LV3, LV4, CC1,CC2, CC3, CC5	152.5	$155,169	$6,877	$45.1
11	DR 2C1, BM LV1, LV2, LV3, LV4, CC1,CC2, CC3, CC5, CC8	155.2	$156,797	$6,942	$44.7

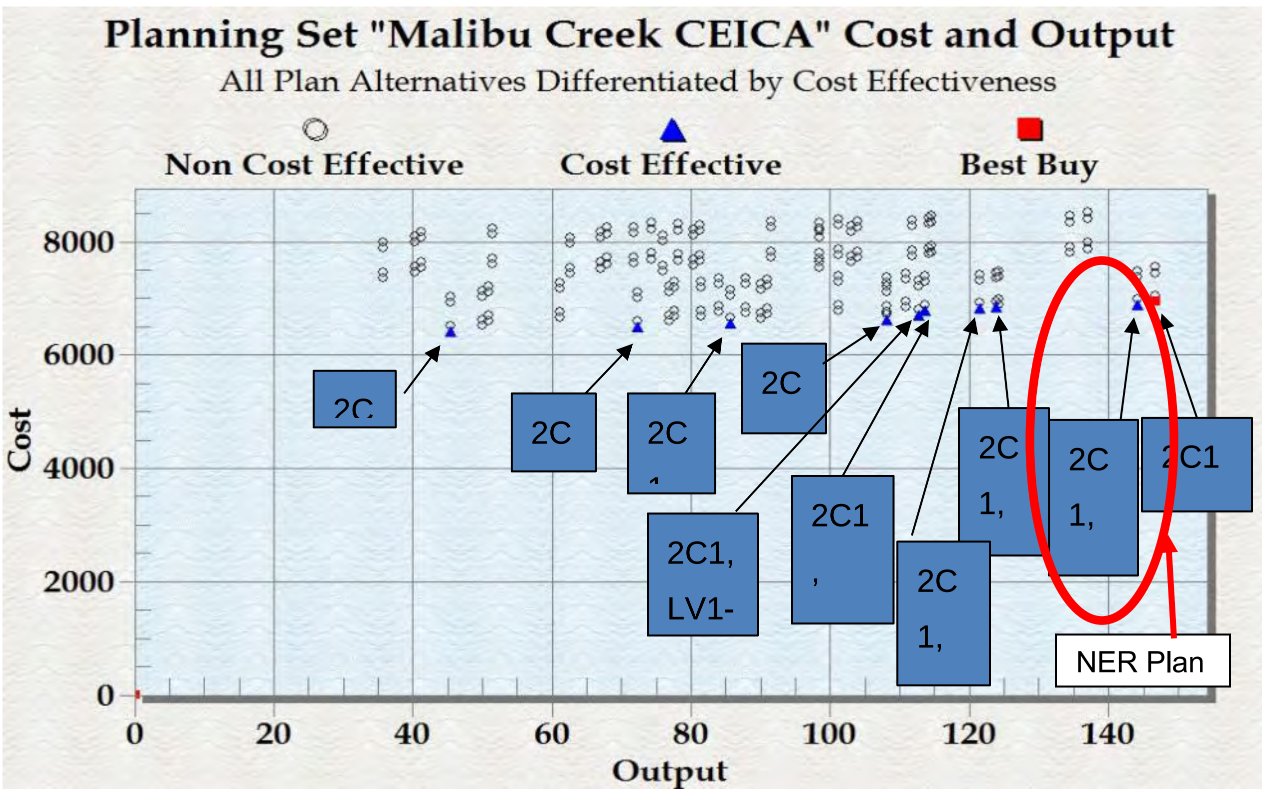


Figure 4.5-3 - Planning Set "Malibu Creek CEICA" Cost and Output - All Plan Alternatives

4.6 <u>System of Accounts</u>

The U.S. Water Resources Council 1983 *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, commonly referred to as the Principles and Guidelines (P&G), established four accounts to organize the effects of alternative plans: national economic development (NED), environmental quality (EQ), regional economic development (RED) and other social effects (OSE). The PDT prepared **Table 4.6-1 and Table 4.6-2** to summarize alternative effects in these accounts. In lieu of the NED account, the **Table**

4.6-1 displays increases in ecosystem restoration values of national outputs, expressed in non-monetary units (habitat units) for consideration in identification of the NER plan.

The selection of the NER Plan and likely Locally Preferred Plan (LPP) is presented later in this chapter. For easier reference, the NER plan and likely LPP are highlighted in the following system of accounts in **Table 4.6-1 and Table 4.6-2**. Green is used to highlight the NER plan, and orange for the likely LPP. Blue cells in the Environmental Quality and Other Social Effects account **Table 4.6-2** indicate where the NER plan and likely LPP share outputs.

1 **Table 4.6-1 - National Ecosystem Restoration**

Alt #	Alternative	Cost Summary		HE Outputs	
		Total Investment Cost* ($million)	Total Annual Costs ($million)	50-Yr Avg (AAHUs)	Change in AAHU over 'No Action'
1	No Action	$0	$0	620	N/A
2a1	Dam arch & spillway removal – shoreline / upland sediment placement	$163.24	$6.53	666.2	46.2
2a2	Dam arch & spillway removal – nearshore / upland sediment placement	$175.99	$7.03	666.2	46.2
2b1	Dam arch & spillway removal – shoreline/ upland sediment placement - upstream barrier modifications	$174.11	$6.61	772.5	152.5
2b2	Dam arch & spillway removal – nearshore / upland sediment placement - upstream barrier modifications	$186.86	$7.48	772.5	152.5
2c1	Dam arch removal – shoreline / upland sediment placement	$160.84	$6.42	666.2	46.2
2c2	Dam arch removal – nearshore / upland sediment placement	$173.55	$6.93	666.2	46.2
2d1	Dam arch removal – shoreline / upland sediment placement – upstream barrier modifications	$171.71	$6.87	772.5	152.5
2d2	Dam arch removal – nearshore / upland sediment placement – upstream barrier modifications	$184.42	$7.38	772.5	152.5
3a	Dam arch & spillway removal – natural sediment transport – downstream flood risk mgmt	$120.93	$4.87	597.7	Less than 0
3b	Dam arch & spillway removal – natural sediment transport – downstream flood risk mgmt – upstream barrier modifications	$131.80	$5.32	637	17
3c	Dam arch removal – natural sediment transport – downstream flood risk mgmt	$118.31	$4.75	597.7	Less than 0
3d	Dam arch removal – natural sediment transport – downstream flood risk mgmt – upstream barrier modifications	$129.18	$5.20	637	17
4a1	Dam arch and spillway removal - natural sediment transport & shoreline / upland placement – downstream flood risk	$186.25	$7.46	655.5	35.5

Alt #	Alternative	Cost Summary		HE Outputs	
		Total Investment Cost* ($million)	Total Annual Costs ($million)	50-Yr Avg (AAHUs)	Change in AAHU over 'No Action'
4a2	Dam arch & spillway removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management	$199.68	$7.99	655.5	35.5
4b1	Dam arch & spillway removal – natural sediment transport & shoreline/ upland sediment placement – downstream flood risk management -upstream barrier mods	$197.12	$7.91	761.8	141.8
4b2	Dam arch & spillway removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management -upstream barrier modifications	$210.55	$8.44	761.8	141.8
4c1	Dam arch removal – natural sediment transport & shoreline / upland sediment placement – downstream flood risk	$183.57	$7.35	655.5	35.5
4c2	Dam arch removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management	$196.95	$7.88	655.5	35.5
4d1	Dam arch removal – natural transport & shoreline / upland sediment placement – downstream flood risk management - upstream barrier modifications	$194.44	$7.80	761.8	141.8
4d2	Dam arch removal – natural sediment transport & nearshore / upland sediment placement – downstream flood risk management - upstream barrier modifications	$207.42	$8.25	761.8	141.8

*Total Investment Costs include Total First Costs (including construction, LERRDS, PED & Construction Management) and Interest during Construction

The EQ account displays changes to the ecological, aesthetic, and cultural attributes of natural and cultural resources. Water quality impacts are significant for Alternative 3 options in reaches below Rindge Dam due to the higher risk of turbidity, with impounded sediment (fine silts and clays) being transported during storms and dry season base flow conditions over decades of construction. Noise impacts are considered significant for the "b" options of alternatives due to the close proximity of residences to some of the upstream barriers, particularly along the lower reaches of Cold Creek. Traffic and air quality impacts are significant for Alternatives 2 and 4 due to the total number of average annual truck trips needed to remove the impounded sediment. Cultural and historic resources are significant for Alternatives 2-4 due to the removal of Rindge Dam. For Alternatives 3 and 4, the addition of floodwalls also potentially impacts significant cultural resources.

Table 4.6-2 - Environmental Quality

Alt.	Water Quality	Noise	Traffic			Air Quality	Biological			Cultural & Historic Resources
			Avg. Daily Truck Trips (~152 days/yr)	Avg. Annual Truck Trips (per yr)			Aquatic Habitat Connectivity Restored (yrs)	Malibu Creek Connectivity to Ocean (mi)		
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A
2a1	Mitigable Class II (Malibu Creek riverine reaches downstream of Rindge Dam) Less than significant Impacts Class III (lagoon)	Mitigable Impacts Class II	25-115	3k-16k	Potentially Significant Impacts Class I Traffic Study Required During PED	Significant Impact (CEQA) NO_x Emissions Class I Less than Significant (NEPA) Class III	7	8.5	Mitigable Impacts Class II	Significant Effect Class I Removal of Rindge Dam
2a2			30-80	2k-11k			8	8.5		
2b1		Significant Impacts Class I	25-115	3k-16k			7	14.8		
2b2			30-80	2k-11k			8	14.8		
2c1		Mitigable Impacts Class II	25-115	3k-16k			7	8.5		
2c2			30-80	2k-11k			8	8.5		
2d1		Significant Impacts Class I	25-115	3k-11k			7	14.8		
2d2			30-80	2k-11k			8	14.8		
3a	Significant Turbidity and Water Quality Impacts Class I (creek below the dam and lagoon)	Mitigable Impacts	N/A	1st yr 300-500 total for clearing & hauling veg & building ramp	Potentially Significant Impacts Class I Traffic Study Required	Mitigable Class II (CEQA) Less than Significant (NEPA) Class III	Assume 40 yrs (range from 20-100 yrs)	8.5	Potentially Significant Impacts Class I turbidity and sediment transport	Significant Effect Class I Removal of Rindge Dam & Impacts to Serra Floodwall
3b		Significant Impacts						14.8		
3c		Mitigable Impacts						8.5		

Alt.	Water Quality	Noise	Traffic			Air Quality	Biological			Cultural & Historic Resources
			Avg. Daily Truck Trips (~152 days/yr)	Avg. Annual Truck Trips (per yr)			Aquatic Habitat Connectivity Restored (yrs)	Malibu Creek Connectivity to Ocean (mi)		
3d		Significant Impacts		Future yrs, <50 for	During PED			14.8		
4a1	Significant Turbidity and Water Quality Impacts Class I (creek and lagoon)	Mitigable Impacts Class II	25-115	1k-16k	Potentially Significant Impacts Class I Traffic Study Required During PED	Significant Impact (CEQA) NO_x Emissions Class I Less than Significant (NEPA) Class III	7	8.5	Potentially Significant Impacts Class I turbidity and sediment transport	Significant Effect Class I Removal of Rindge Dam & Impacts to Serra Floodwall
4a2			30-80	1k-11k			8	8.5		
4b1		Significant Impacts Class I	25-115	1k-16k			7	14.8		
4b2			30-80	1k-11k			8	14.8		
4c1		Mitigable Impacts Class II	25-115	1k-16k			7	8.5		
4c2			30-80	1k-11k			8	8.5		
4d1		Significant Impacts Class I	25-115	1k-16k			7	14.8		
4d2			30-80	1k-11k			8	14.8		

Class I: Significant Unavoidable Impact - An impact that would cause a substantial adverse effect on the environment could not be reduced to a less than significant level through any feasible mitigation measure(s).
Class II: Significant impact - A significant (but mitigable or avoidable) impact is identified when alternatives would create a substantial or potentially substantial adverse change in any of the physical conditions within the affected resource area. Such an impact would exceed the applicable significance threshold established by NEPA and CEQA, but would be reduced to a less than significant level by application of one or more mitigation measures.
Class III: Less than significant impact - When alternatives would cause no substantial adverse change in the environment (i.e., the impact would not reach the threshold of significance).

4.6.1 *Regional Economic Development (RED)*

The RED account considers the different perspectives between the Federal government, contributing to the nation as a whole, and local communities directly impacted by water resource planning. Local communities and regions directly impacted by water resource planning may consider impacts at the state, regional, or local level a more relevant measure. From the Federal perspective, transferring employment opportunities and resources from one region of the nation to another to construct a water resource project does not in itself constitute national economic development and therefore regional economic impacts may not be fully captured in the national economic development (NED) account. However, from a regional or local perspective the transfer of employment opportunities and resources to construct a project in the region, as opposed to other regions, can be a significant benefit to the local economy in terms of more local employment, spending, and production.

Based on the estimated impacts to RED, there is an expectation that about 1,331 full-time equivalent (FTE) jobs would be created to address the NER plan. The NER plan is projected to create an additional 773 FTE jobs by indirect and induced effects that support or compliment that construction effort. Overall, the NER plan should lead to about $125 million in gross regional product (GRP) and about 2,105 additional job opportunities within the region. Approximately $192 million in GRP and about 2,866 jobs would be created state-wide. The impact to the state would be of greater magnitude although less relative importance due to the large size of the California economy.

For the likely LPP, roughly 1,430 FTE jobs will be created to address the project construction, and an additional 830 FTE jobs by indirect and induced effects. The likely LPP should lead to $134 million in GRP and about 2,260 additional job opportunities within the region. About $206 million in GRP and about 3,100 jobs would be created statewide.

4.6.2 *Other Social Effects (OSE)*

The OSE account is a means of displaying and integrating effects that are not included in the other three accounts, such as urban and community impacts, life, health and safety factors, displacement, long-term productivity, and energy requirements and energy conservation (P&G Section II). **Table 4.6-3** highlights differences between the methods of delivery of the Rindge Dam impounded sediment via natural transport (Alternative 3 options), trucking of the impounded sediment and shoreline placement of the mostly sands (Alternatives 2a1, 2b1, 2c1, 2d1, 4a1, 4b1, 4c1, 4d1), and combination of trucking and barging the impounded sediment with shoreline placement of the mostly sands (Alternatives 2a2, 2b2, 2c2, 2d2, 4a2, 4b2, 4c2, 4d2). None of the alternatives assume that potential actions cause a threat to human health, life, or safety beyond those related to typical construction and transport activities.

1 **Table 4.6-3 - Other Social Effects**

Alt #	Flood Risk Downstream of Rindge Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
1	Increases with time	N/A	N/A	N/A	- Safety: May require repairs with time - Undesirable recreational attraction causing habitat disturbances	N/A	N/A
2a1	Same as Alt 1	- Recreation: Requires use of Malibu Pier parking lot for non-peak season (12 mos. over 3 yrs.) - Concessionaire and business revenue impacts - Beach access redirected to upcoast / downcoast on either side of parking lot - Increased truck traffic in community	N/A	- Aesthetics: Temp stockpile of mostly sands for up to 3 years. Max height approx. 10 feet. - Adds truck trips to temp store the material, then haul to pier parking lot	Removed	N/A	Traffic: ~ 1,900-8,500 annual truck trips to Calabasas Landfill during construction

Alt #	Flood Risk Downstream of Ringe Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
2a2	Same as Alt 1	N/A	- Barges working through summer in nearshore area east of the pier - Ven. Harbor truck-to-barge loading adjacent to boat launch	N/A	Removed	N/A	Traffic: ~ 2,200-11,000 annual truck trips to Calabasas Landfill & Ventura Harbor during construction
2b1	Same as Alt 1	Same as Alt 2a1	N/A	Same as Alt 2a1	Removed	- Recreation: Temp access needed at LV1 for park access. - Traffic: Piuma Canyon Road CC1 requires traffic controls during const. - Temp limited access to residents at CC2	Same as Alt 2a1
2b2	Same as Alt 1	N/A	Same as Alt2a2	N/A	Removed	Same as Alt 2b1	Same as Alt 2a2
2c1	Same as Alt 1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	N/A	Same as Alt 2a1
2c2	Same as Alt 1	N/A	Same as Alt2a2	N/A	Same as Alt 1	N/A	Same as Alt 2a2
2d1	Same as Alt 1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	Same as Alt 2b1	Same as Alt 2a1
2d2	Same as Alt 1	N/A	Same as Alt2a2	N/A	Same as Alt 1	Same as Alt 2b1	Same as Alt 2a2

Alt #	Flood Risk Downstream of Rindge Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
3a	- Increase flood risk above Alt 1. - Adds 10-ft high floodwalls b/w Cross Creek Br. & PCH	N/A	N/A	N/A	Removed	N/A	Up to 500 trucks first year, and less than 50 for remaining years
3b	Same as Alt 3a	N/A	N/A	N/A	Removed	Same as Alt 2b1	Same as Alt 3a
3c	Same as Alt 3a	N/A	N/A	N/A	Same as Alt 1	N/A	Same as Alt 3a
3d	Same as Alt 3a	N/A	N/A	N/A	Same as Alt 1	Same as Alt 2b1	Same as Alt 3a
4a1	- Less increase in flood risk than Alt 3. - Adds 5-ft high floodwalls b/w Cross Creek Br. & PCH	Same as Alt 2a1	N/A	Same as Alt 2a1	Removed	N/A	Traffic: ~ 1,100-8,500 annual truck trips to Calabasas Landfill during construction
4a2	Same as Alt 4a1	N/A	Same as Alt2a2	N/A	Removed	N/A	Traffic: ~ 2,100-11,000 annual truck trips to Calabasas Landfill & Ventura Harbor during construction

Alt #	Flood Risk Downstream of Rindge Dam	Shoreline Placement Mostly Sands Impacts	Nearshore Placement Mostly Sands Impacts	Temporary Sediment Storage at Upland Site F	Rindge Dam Spillway	Upstream Barriers	Local Traffic Impacts
4b1	Same as Alt 4a1	Same as Alt 2a1	N/A	Same as Alt 2a1	Removed	Same as Alt 2b1	Same as Alt 4a1
4b2	Same as Alt 4a1	N/A	Same as Alt2a2	N/A	Removed	Same as Alt 2b1	Same as Alt 4a2
4c1	Same as Alt 4a1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	N/A	Same as Alt 4a1
4c2	Same as Alt 4a1	N/A	Same as Alt2a2	N/A	Same as Alt 1	N/A	Same as Alt 4a2
4d1	Same as Alt 4a1	Same as Alt 2a1	N/A	Same as Alt 2a1	Same as Alt 1	Same as Alt 2b1	Same as Alt 4a1
4d2	Same as Alt 4a1	N/A	Same as Alt2a2	N/A	Same as Alt 1	Same as Alt 2b1	Same as Alt 4a2

4.7 Alternatives Evaluation Criteria – Completeness, Effectiveness, Efficiency and Acceptability

The P&G (Paragraph 1.6.2(c)) suggest the use of four evaluation criteria – completeness, effectiveness, efficiency and acceptability -- in the screening of alternative plans. Plans that require substantial activity by others, whereby actions are not likely to be forthcoming to address the study objectives are not complete. Plans that do not readily address planning objectives are not effective. Plans that achieve contributions to objectives at higher costs, whether objectively or subjectively measured, are not efficient. Plans with effects that result in infeasibility are not acceptable. Minimum standards for these four criteria must be established in order to determine whether a plan is worthy of additional consideration.

For completeness considerations, none of the alternatives 2-4 require substantial additional activities by others. A general assumption for those alternatives is that the Calabasas landfill remains open with capacity remaining to accept some of the impounded sediment in future projected construction timeframes. Each of the action alternatives 2-4 effectively address the planning objectives. The significant tradeoff regarding effectiveness is the time it takes to reestablish habitat connectivity along Malibu Creek and tributaries (Objective 2). Alternatives 2 and 4 (and sub-alternative options) allow for aquatic habitat connectivity within 7-8 years. For Alternative 3 options, the minimum timeframe, assuming storms occur every year to transport a controlled volume of Rindge Dam impounded sediment downstream, is 20 years. The assumed timeframe is 40 years, however it can take up to 100 years to effectively erode all of the impounded sediment downstream. Overall, the PDT has estimated that Alternative 2 and 4 options provide specific targeted timeframes to transport mostly sands to the shoreline and reestablish habitat connectivity, but at a higher cost than the Alternative 3 options. In addition, the "b" and "d" options for Alternatives 2-4 include modification to upstream barriers, effectively tripling the extent of the overall aquatic habitat connectivity within the Malibu watershed.

While Alternatives 2 and 4 "a" and "c" sub-alternative options efficiently address the planning objectives, they only provide about a quarter of the outputs (in AAHUs) that are offered by the "b" and "d" sub-alternative options, and for only about 5% less cost than those sub-options. Including modifications to upstream barriers significantly increase outputs (AAHUs, sub-alternatives "b and "d"). Alternatives 3a and 3c are not as efficient in addressing the planning objectives based on the HE and resultant AAHU calculations, scoring less than the No Action plan. Alternatives 3b and 3d effectively address the planning objectives for less cost than other alternatives, but attaining the full benefits of natural transport and aquatic habitat connectivity takes decades longer than the Alternatives 2 and 4 "b" and "d" sub-alternative options. All alternatives are acceptable.

4.8 Comparison of Alternatives

The contributions of the PDT, Sponsor, TAC and USACE vertical team at various times throughout the iterative planning process resulted in refinements to the planning objectives, addition of new measures, formulation and reformulation of alternatives, and combinations of evaluation, comparison and screening exercises. The primary goal of this iterative process was to identify alternative actions that could feasibly attain the planning objectives and seek first to avoid, then minimize and/or mitigate for potential significant effects on the environment. There were many environmental, social and economic tradeoffs to consider in the array of alternatives, with the common assumption that the removal of Rindge Dam and impounded sediment was the key factor to effectively address the planning objectives.

Although all the action Alternatives 2-4 address the planning objectives, they provide for restoration of a more natural sediment transport regime and habitat connectivity within Malibu Creek in 7-8 years as opposed to many decades for Alternative 3 options. However, the estimated total investment for the Alternative 3 options is tens of millions of dollars less than either Alternative 2 or 4 options, and with far less traffic impacts. Potential adverse effects to Malibu Creek critical habitat and aquatic species and sensitive cultural resources downstream of Rindge Dam is much higher for Alternative 3 options, followed by Alternative 4 options, with Alternative 2 options having the least impacts to biological or cultural resources. Traffic impacts along Malibu and Las Virgenes Canyon Roads and the cities of Malibu and Calabasas is much higher Alternative 2 and Alternative 4 than for Alternative 3.

Alternative 2 and 4 option “1” sub-alternatives include shoreline placement of mostly sands in front of the Malibu pier, temporarily requiring some of that sediment to be placed at an upland storage site (Site F), with additional handling required to truck material from that site to the parking lot. Use of the lot displaces the operations of the concessionaire for several months during three years of the construction timeframe, and potentially adversely impacts the income of other surrounding businesses and public access to the beach. There is an increased risk of indirectly impacting isolated patches of surfgrass as mostly sands drift downcoast of the parking lot when compared to the Alternative 2 and 4 option “2” sub-alternatives that include nearshore placement. The PDT considers monitoring and adaptive management sufficient to address any increased risk to surfgrass during and after shoreline placement of mostly sands for these sub-alternatives.

The nearshore placement option “2” sub-alternatives shift all trucking to the upper portion of the Malibu Creek watershed and use Highway 101 to transport impounded sediment to barges for shoreline placement, avoiding use of upland Site F, the Malibu pier parking lot and other potential traffic impacts along PCH and the City of Malibu. These options also allow the potential for a higher volume of impounded sediment to be placed in the nearshore environment, not only mostly sands but gravels and cobbles, lessening the need for use of the Calabasas landfill.

The inclusion of modification to upstream barriers in Alternatives 2-4 “b” and “d” options triple the amount of aquatic habitat that would be available to steelhead and other migratory species once connectivity is reestablished at Rindge Dam, significantly increasing the habitat evaluation (HE) habitat units for these alternatives at a relatively low additional cost. Therefore, the “b” and “d” options are recommended over the “a” and “c” options that do not include upstream barrier modifications or removals.

Although the Alternative 3 options are less costly, the low HE scores for these options, timeframe to completion, and biological, cultural and flood risks to downstream reaches of Malibu Creek do not support the recommendation of these alternatives

For the remaining Alternative 2b1, 2b2, 2d1, 2d2, 4b1, 4b2, 4d1, 4d2, the Alternative 4 options still increase the downstream flood risk, adversely impact cultural resources, and have the potential to adversely impact biological resources. Therefore, these Alternative 4 options are not considered for recommendation.

Alternatives 2b1 and 2b2 include the removal of the Rindge Dam spillway. Although there are aesthetic and safety and critical habitat benefits associated with the removal of the spillway, this action does not directly address the objectives, nor does it provide a benefit to the scoring of the HE for this reach of Malibu Creek. However, the CDPR considers removal of the spillway to be a critical component to the overall restoration plan. In addition, the CDPR prefers use of barges and placement of mostly sands in the nearshore area versus use of the pier parking lot. Since outputs for Alternative 2b1 are the same as Alternative 2d1, but Alternative 2d1 is less costly, Alternative 2b1 is not considered for recommendation. For Alternatives 2d1 and 2d2, Alternative 2d1 provides the same HE outputs for a lesser cost. Other impacts are mitigable, including potential surf grass impacts due to placement of mostly sands on shoreline. Therefore, Alternative 2d1 is identified at the NER plan and the Tentatively Selected Plan.

The CDPR prefers Alternative 2b2 as it proposes use of barges and placement of mostly sands in the nearshore area versus use of the pier parking lot. The Sponsor prefers this alternative as they believe it will may offer cost reductions via the potential for a greater range of material disposal in the nearshore area (thereby reducing landfill tipping fees), and allows more flexibility for nearshore material placement to better avoid resource impacts (surfgrass, etc.). Therefore, Alternative 2b2 is identified at the likely Locally Preferred Plan.

Both Alternatives 2d1 and 2b2 are considered the Least Environmentally Damaging Practicable Alternative. Alternatives 2d1 and 2b2 are considered the Environmentally Preferable Alternatives under NEPA.

Table 4.8-1 includes a summary of the comparison of alternatives and tradeoffs, with more details provided in the tables in the evaluation section. Yellow cells represent the more beneficial selections for each category and the red cells indicate the least beneficial selections. The NER (green) and likely LPP plans (orange) are highlighted in the first column of **Table 4.8-1**. Four alternatives (2b1, 2b2, 2d1, and 2d 2) have four categories each that rank higher in beneficial outputs. When comparing these alternatives, tradeoffs include the total cost invested (lowest for Alternative 2d1) and need for trucking (highest for Alternatives 2b1 and 2d1).

1 **Table 4.8-1 - Comparison of Alternatives**

Alt #	AAHUs Change based on $ Invest. (Max to Min)	Total Investment Cost (Min to Max)	Construction Duration (Short to Long)	Least Bio Risks - Impounded Sediment Use (Best - Worst)	Need for Trucking (Least to Most)	Downstream Flood Risk (least to greatest)	Address Objectives / Avoid Constraints (Best-Worst)
1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2a1	10	6	1	2	5	1	2
2a2	12	10	2	1	3	1	2
2b1	2	9	1	2	5	1	1
2b2	4	14	2	1	3	1	1
2c1	9	5	1	2	5	1	2
2c2	11	8	2	1	3	1	2
2d1	1	7	1	2	5	1	1
2d2	3	12	2	1	3	1	1
3a	20	2	3	5	1	3	5
3b	18	4	3	5	1	3	5
3c	19	1	3	5	1	3	5
3d	17	3	3	5	1	3	5
4a1	14	13	1	4	4	2	4
4a2	16	18	2	3	2	2	4
4b1	6	17	1	4	4	2	3
4b2	8	20	2	3	2	2	3
4c1	13	11	1	4	4	2	4
4c2	15	16	2	3	2	2	4
4d1	5	15	1	4	4	2	3
4d2	7	19	2	3	2	2	3

2

4.9 Key Assumptions

- Rindge Dam and impounded sediment must be removed to address the planning objectives.
- Downstream aquatic barriers much be addressed before any upstream barriers are addressed.
- The field surveys of the Rindge Dam impounded sediment and chemical and bioassay testing allows for appropriate characterization of the sediment grain size and distribution for consideration in placement of sediment and overall construction productivity.
- Based on sediment transport modeling, Rindge Dam downstream risks to habitat and species, cultural resources and flooding increase when larger volumes of impounded sediment are potentially released during storms (larger incremental lift (cuts) in the dam arch)
- Climate change may result in more intense but less frequent storms and associated runoff, increasing the importance of providing habitat connectivity as soon as possible, aiding in the potential recovery of critical species populations by providing access to the upper reaches of Malibu Creek and tributaries.
- Malibu nearshore habitat and biological surveys indicate that potential adverse impacts associated with placement of mostly sands from Rindge Dam impounded sediment can be avoided.

4.10 National Ecosystem Restoration Plan

The PDT selected Alternative 2d1 as the NER Plan for the reasons described above. The NER Plan is the TSP in the absence of an approved LPP waiver. This plan includes the removal of the Rindge Dam arch concurrent with the removal of the estimated 780k cy of impounded sediment, placement of the impounded sediment along the Malibu shoreline, temporarily utilizing upland Site F for some of the mostly sands (Unit 2) layer before delivery to the shore, use of the Calabasas Landfill for disposal of the nearly two-thirds of the remaining amount of impounded sediment, and modification to eight partial aquatic habitat upstream barriers on Cold Creek and Las Virgenes Creek tributaries to Malibu Creek.

The first year of construction is assumed to begin after a late spring construction contract notice to proceed. About 40k cy will be used to construct two access ramps at the upper end of the Rindge Dam impounded sediment area to provide equipment access from Malibu Canyon Road to the work site, allowing for the removal of existing mature vegetation on the surface and temporary diversion and control of Malibu Creek to allow for needed work space for mining and other actions. A temporary cofferdam about 5 feet in height will be constructed upstream of the southbound ramp and direct water into a series of culverts. Controls and best management practices (BMPs) will be in-place to reduce turbidity level of discharges to background levels immediately downstream of the dam. Dewatering wells will be installed in the impounded sediment. Well water will be conveyed immediately downstream of the dam and released into Malibu Creek after BMPs ensure that turbidity and other constituents are maintained at appropriate levels. Wells will be designed with casings that can withstand winter storm flows. Each well casing will be protected in-place prior to each storm season during construction. Any remnants of the wells will be removed at the end of construction.

Sediment mining will begin to remove the top layer of mostly gravels and boulders (approximately 10 foot depth), with some of the material used for completion of the ramps, hauling the remaining Unit 1 layer to the Calabasas Landfill along with the surface vegetation. The first lift, the horizontal cut in the dam arch, will be removed in order to leave the concrete arch at the level of the remaining impounded sediment by October of the first year, repeating this action each year of construction. The site will be cleared of crews and equipment for the winter season, with the second year of construction beginning the next spring after the winter storm season.

The second to fourth year of construction will primarily be associated with removal of the Unit 2 mostly sands with direct delivery to the Malibu pier parking lot during the beginning and end of each construction season. During the summer, the mostly sands Unit 2 material will be temporarily placed at upland Site F. During the non-peak season for beach and general recreation use in Malibu (after Labor Day and before Memorial Day), the mostly sands from the prior season of construction will be transported from upland Site F to the Malibu pier parking lot, offloaded in the parking lot, and placed along the shore in front of the parking lot. This cycle of activities will be repeated for these three years.

Hauling the estimated 276k cy of mostly sands is accomplished during the mid-Oct-early May timeframe when shoreline recreational use lessens. This necessitates temporary Site F for up to 3 years so material can be removed from the creek during the dry season and placed on the shore in the wet season. Sufficient capacity (130k cy at 10-ft high) has been accounted for at upland Site F to allow for several years of sediment to accumulate if for some reason, assumed delivery and placement rates along the shoreline are delayed.

The fourth through sixth years of construction include the removal of the Unit 3 mostly silts and clays with delivery to the Calabasas Landfill. The final year will complete site clean-up, the revegetation of creek slopes exposed during the mining, and removal of one ramp and partial removal of the remaining ramp to limit future access to the site to monitoring and adaptive management activities. The TSP does not include removal of the Rindge Dam spillway.

Table 4.10-1 - Rindge Dam Impounded Sediment (listed from top-to-bottom)

Unit	Material Layer	Description
Unit 1	Fluvial deposition (not deposited in a reservoir pool)	Sand, gravel, cobbles, and larger rock
Unit 2	Shallow to intermediate depths reservoir pool deposits	Mainly silty sands with organic content; does contain silt layers, some gravel
Unit 3	Deeper reservoir pool deposits	Sandy silts, lean clays, and silts (with organics); contains some silty sand layers
Unit 4	Pre-reservoir alluvium	Coarse materials, gravel, cobbles, boulders
Unit 5	Sandstone	Bedrock

About 10,000 cy of impounded sediment is estimated to remain in the impounded sediment area after construction around the pre-dam bedrock outcrops and boulders exposed by mining to the former (pre-dam) creek bed elevation. This material is expected to be naturally flushed to downstream reaches and the ocean with much greater volumes of sediment generated from the watershed during early post-construction storm runoff events.

The impounded sediment area extends from Rindge Dam to approximately 2,400 feet upstream of the dam. The top-width of deposition varies, but is about 250 feet at the dam to about 1,400 feet upstream, at which point it narrows to about 100 feet for an additional 1,000 feet upstream. The elevation of the top of the impounded sediment is about 300-370 feet above Mean Sea Level. The

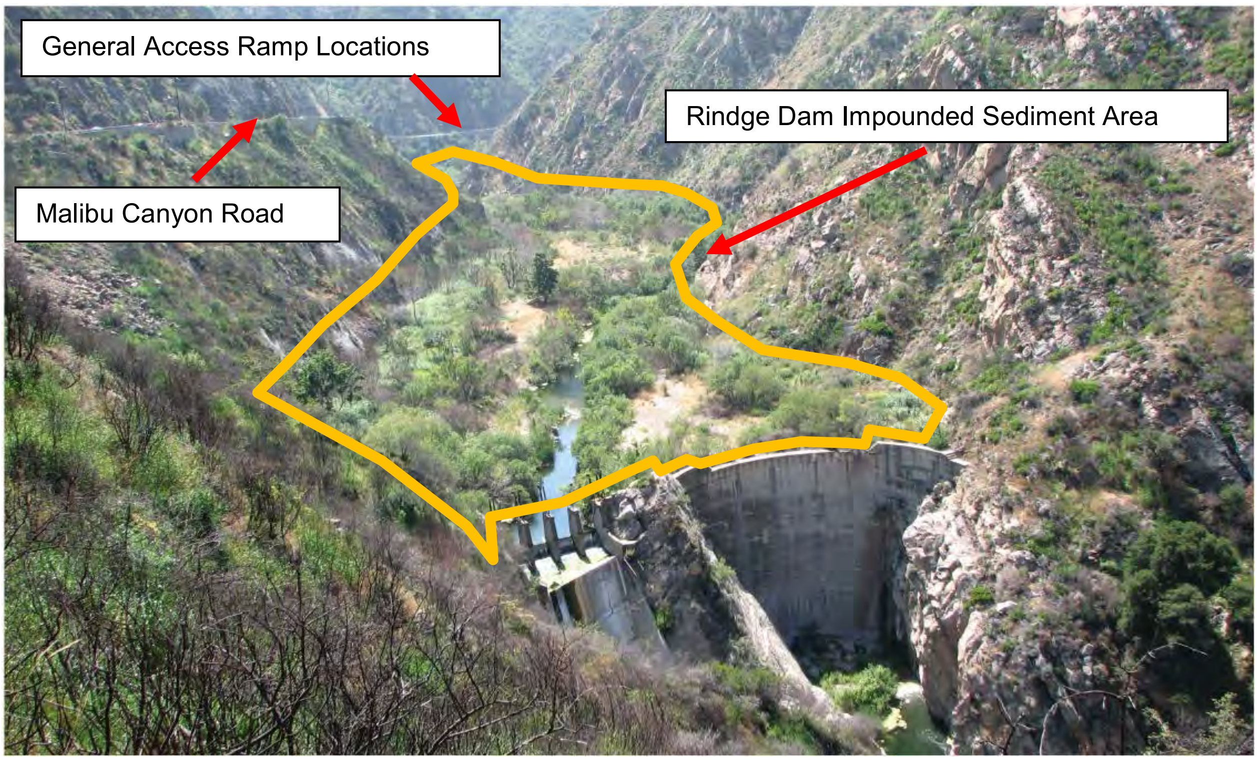


Figure 4.10-2 - Rindge Dam Removal

existing creek canyon is extremely steep, sloping up to the Malibu Canyon Road at about a 1-ft rise (vertical) for every 1-ft traveled (horizontal) (1V:1H). Sediment removal will include excavation of virtually all of the deposited sediment, restoring the approximate gradient of the original channel invert. Some of the larger boulders and other grain-sized sediment at the

Figure 4.10-1 - Former Rindge Dam Site - Post Construction

bottom of the deposition may remain, and will be utilized to stabilize the final channel slope. The depth of excavation ranges from approximately 100 feet at the dam tapering to 0 feet at the upstream end. Excavated side-slopes are expected to look similar to the upper and lower canyon side-slopes. The gradients of excavations made during sediment removal will be determined based upon comprehensive geologic and geotechnical investigation and analyses during PED. The post-construction channel bottom-width will closely match the pre-dam conditions of approximately 40 to 60 ft.

The TSP includes trucking to the Calabasas Landfill, upland site F and the shoreline by the Malibu pier parking lot using Malibu Creek/Las Virgenes Road as the primary transport route to and from the Rindge Dam impounded sediment area. Sediment transported directly to the Calabasas Landfill also uses Lost Hills Road for the final miles to the landfill. For the mostly sands portion of the impounded sediment, about a mile of PCH is used from Malibu Canyon Road to the pier parking lot. Routes from Rindge Dam to three placement locations are shown below.

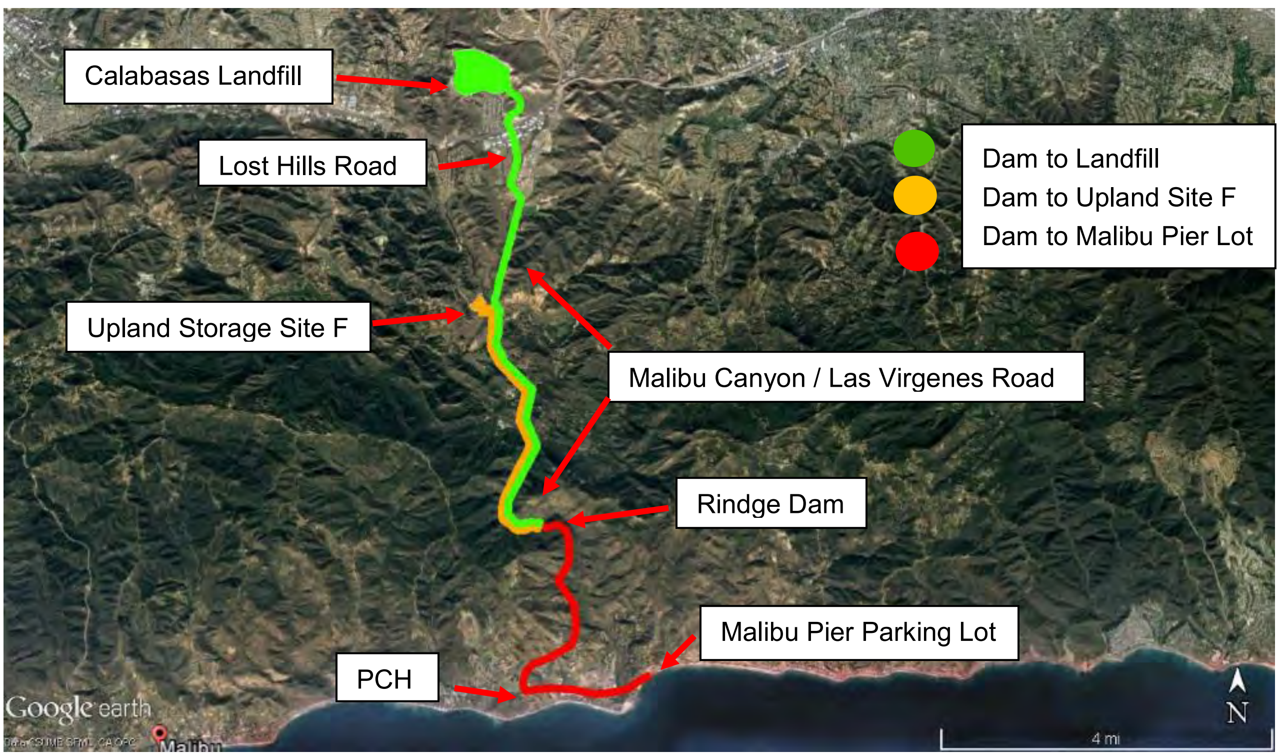


Figure 4.10-3- Trucking Routes for Rindge Dam Impounded Sediment

The Malibu pier parking lot, located on the eastern side of the pier would be used for placement of the mostly sands with material taken from temporary stockpiles left by trucks in the parking lot to the beach fill area in front of the parking lot. No more than 100,000 cy per year is to be placed on the beach in front of the parking lot during transfer and placement activities, requiring temporary closure and use of the entire parking lot for approximately twelve months over a three-year period of the total estimated seven-year construction window. Trucks would travel five miles from the

Rindge Dam impounded sediment area to the pier parking lot to offload sediment from trucks for loader and dozers to place on the 300-foot length of beach immediately in front of the parking lot. The fully-loaded trucks would enter the downcoast driveway entrance travelling east along PCH avoiding the need for an additional traffic control light on PCH. Flagmen would be used for safety purposes as trucks travel from PCH in-and-out of the parking lot. The existing traffic light at PCH and the Malibu pier would be used with flagmen for empty trucks exiting the parking lot, crossing PCH and heading upcoast back to the dam site (or upland Site F).

Deliveries of mostly sands would occur after Labor Day (mid-September) to before Memorial Day for construction years 2-4, when the mostly sands Unit 2 layer of impounded sediment is being mined at Rindge Dam. Trucks would travel either directly from the Rindge Dam impounded sediment area or from upland Site F, depending on the time of year. On average, about 40-50 trucks would travel to the pier parking lot daily during shoreline placement operations.

The parking lot is owned by the Sponsor and operated by a private concessionaire. The current lease agreement allows for use of the site for the purposes considered, however, the Sponsor and others are concerned about reduced public access to the pier and beaches and temporary adverse implications to the concessionaire and businesses along the pier associated with proposed use for an estimated 12 months over three years of construction.

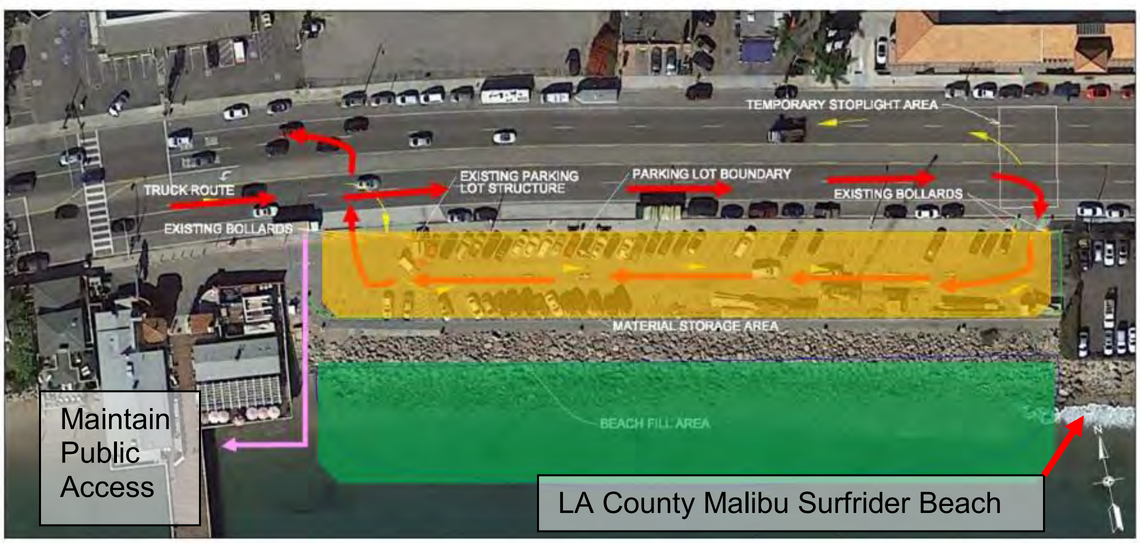


Figure 4.10-4 - Malibu Pier Parking Lot and Shoreline Placement Site

Public pedestrian access would be maintained at the western and eastern side of the parking lot to retain access to beach areas outside the beach fill area. Wave action, currents and tides will quickly disperse sediment, predominantly in a downcoast direction. The transport of the sand has been modeled at the shoreline site in order to characterize the timing and extent of distribution. The dispersion of sediment at the nearshore sites were not modeled, but similar trends associated with the timing and extent of distribution are expected. The model results show a relatively rapid redistribution of sands stretching downcoast, with an approximate 70-100 foot increase in beach width for the first four years after initial placement, tapering off to background levels within 9 years. The downcoast influence would extend approximately a mile from the placement sites. The shoreline placement site conditions are expected to return to approximate pre-project conditions at the beginning of each construction season over the estimated three year fall-to-spring placement timeframe.

The NER Plan also includes removal or modification of eight barriers upstream of Rindge Dam: four along Las Virgenes Creek (LV1-LV4) and four along Cold Creek (CC1-3, CC5). Construction activities will begin after the first several years of construction at Rindge Dam, and will conclude within the estimated construction timeframe for completion of work at Rindge Dam. Barriers CC1 and CC5 are owned by Los Angeles County, and CC2 and CC3 are privately owned. LV1-2 are owned by CDPR and LV3-4 are owned by Los Angeles County. Waste material from these work sites will be transported by truck to the Calabasas Landfill.

The NER Plan Lands, Easements, Relocations, Rights-of-Way, and Disposal Sites (LERRDS) requirements for the upstream barriers are described earlier in the Upstream Aquatic Habitat Barriers – LERRDS Considerations Table. Non-standard estate language is to be developed by the USACE and the Sponsor to provide sufficient real estate rights for where fee acquisition is impracticable, and such language will be submitted to Headquarters for approval. Demolition costs associated with removing existing structures for CC1, CC2, CC3, LV1 and LV2 are LERRDs costs which will be credited to the Sponsor. The Sponsor will be responsible for maintaining all project features. Relocations will be maintained by the individual structural owners

Construction of the NER Plan requires the Sponsor to obtain all necessary lands, easements, relocations, rights-of-way, and disposal sites (LERRDs). The TSP cost estimate includes both credit to the Sponsor for lands and easements already owned by them, and estimates of costs to obtain the additional LERRDs needed for the project. Approximately 62 acres of LERRD will be required for the TSP. The CDPR owns about 39 acres in fee needed for the removal of the Rindge Dam, the excavation of impounded sediment behind the dam, and proposed construction at LV1, LV2, and CC1. A total of 1.1 acres will be acquired in fee for upstream barriers and 16.1 acres will be acquired in the form of temporary easements for staging and access during construction, site preparation activities at the upstream barriers, and for the sediment delivery to the beach nourishment temporary storage sites. The amount of space (temporary construction easement) needed to place the mostly sands is estimated to be 1.7 acre.

4.11 Likely Locally Preferred Plan

The Sponsor has indicated their intent to pursue Alternative 2b2 as a LPP. The likely LPP is similar to the NER Plan in regards to actions described for the Rindge Dam and impounded sediment area. The strategy for modification and removal of the upstream barriers is also the same as the NER plan. The differences in these plans include the method of transport and placement of the mostly sands, using trucks and barges for nearshore placement, and adding the removal of the Rindge Dam spillway. Although the Habitat Evaluation outputs remain the same as those calculated for the NER Plan, the likely LPP has the benefit of avoiding an area of sensitive surfgrass. The likely LPP also reduces future impacts to steelhead

> Use of barges may allow for a greater volume of the impounded sediment to be placed in the nearshore environment beyond the "mostly sands" portion (not evaluated).

critical habitat and public safety via removal of the spillway. The overall costs of the likely LPP increase by about $12 million over the NER Plan.

The LPP allows for direct transport of sediment mined from the Rindge Dam impounded sediment area up Malibu Canyon and Las Virgenes Road, to Lost Hills Road, U.S. Highway 101 and the Ventura Harbor about 41 mi away from the dam. Material would be offloaded from the trucks and placed on barges to be transported to the Malibu shoreline, to the east of the pier. The use of barge allows for more flexibility in the location for placement of mostly sands, reducing risks of habitat and species disturbances during placement activities. Although is assumed that nearly two-thirds of the estimated impounded sediment would still be trucked about 7.4 mi each way from the impounded sediment site to the Calabasas landfill, the LPP has the

Figure 4.11-2 - Ventura Harbor Barge Loading Area – Parking Lot Adjacent to Boat Launch Ramp

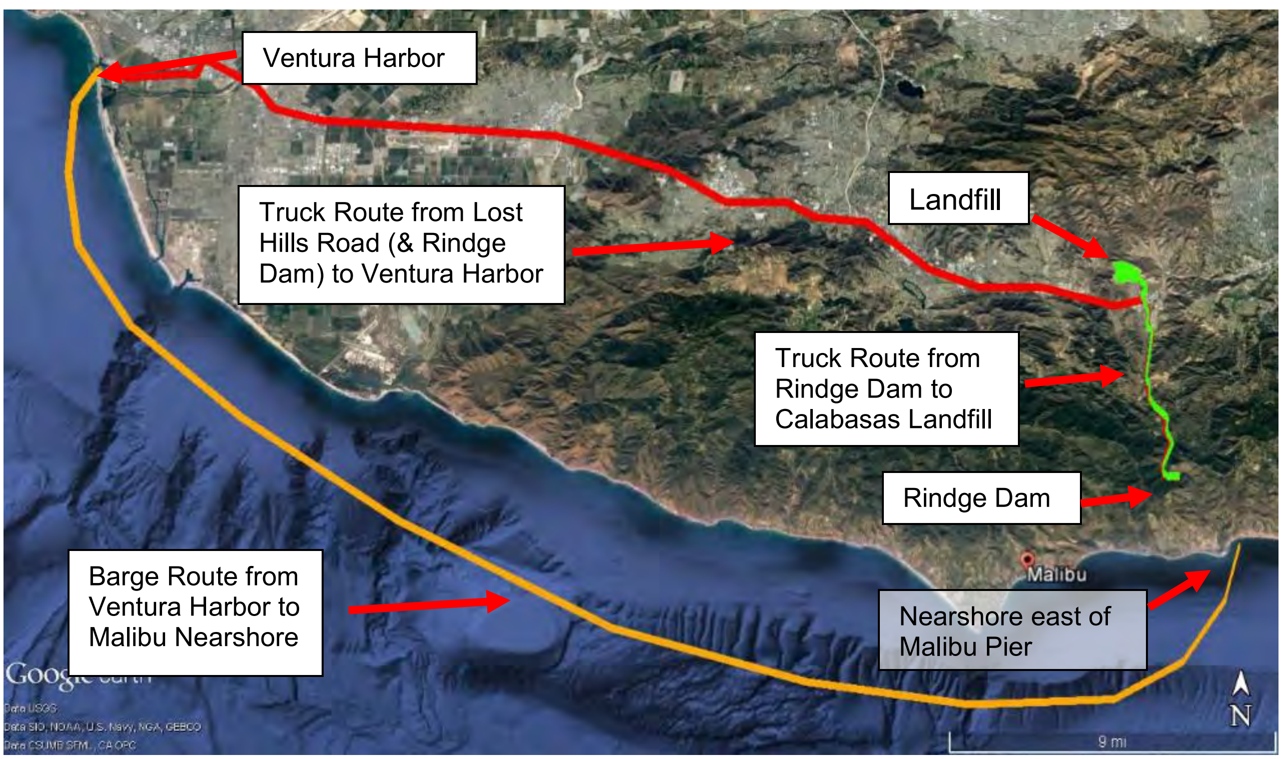
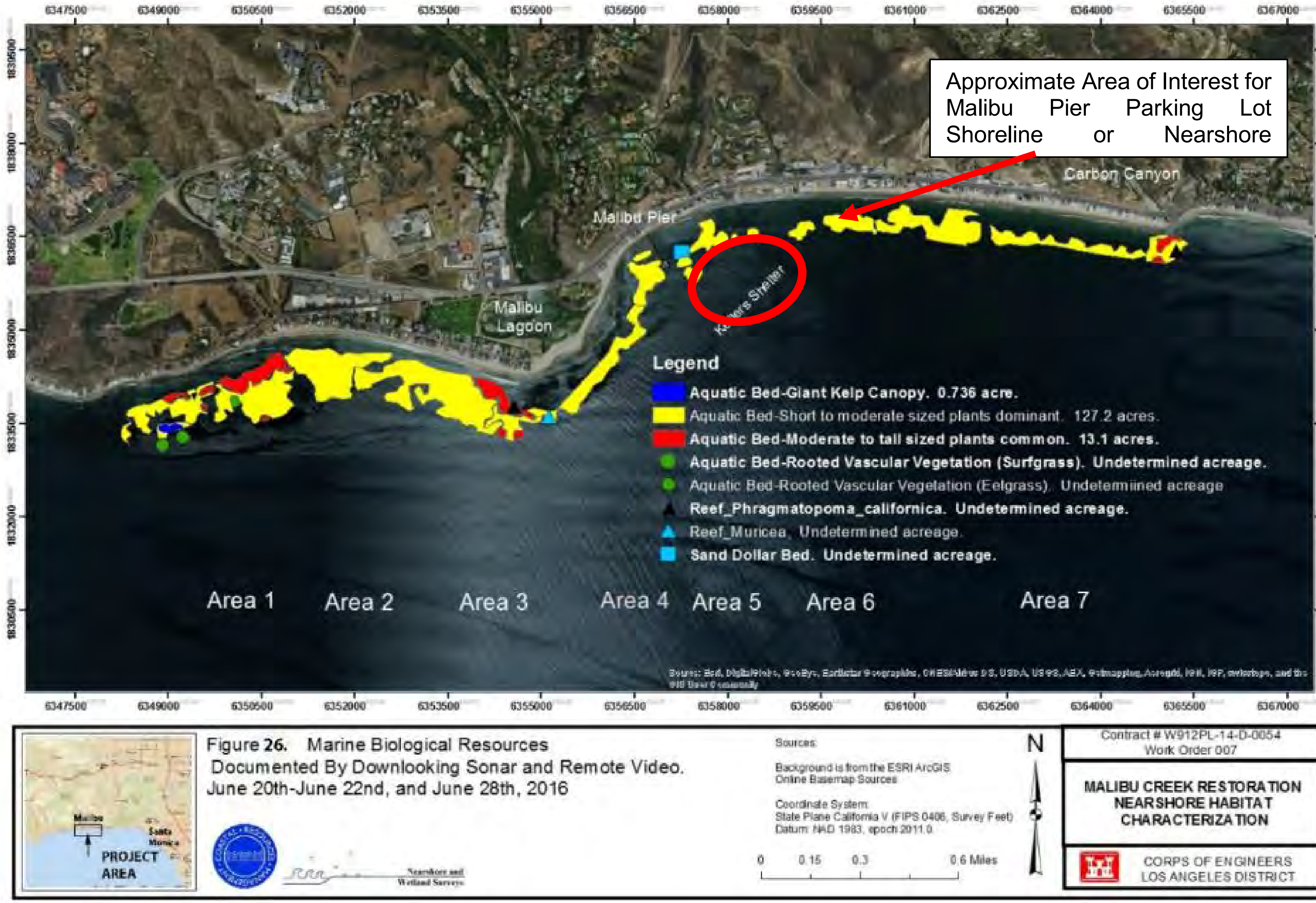


Figure 4.11-1 - LPP Truck to Barge Routes

potential to increase the size range of materials placed via barge, thereby reducing costs associated with landfill disposal.

The 1,500 cy capacity barges (dump scows) would transport the material via tugboat downcoast and place the mostly sands in the nearshore area near, but to the east of Malibu Pier in a location that does not adversely affect submerged aquatic vegetation. Use of a barge also allows flexibility in continuing to consider placement in other areas along the Malibu Creek shoreline to minimize impacts to biological resources. Both trucks and barges would be making approximate 82-mile round-trips for each load: trucks from the Rindge Dam impounded sediment site to Ventura Harbor and back; and the dump scows from the harbor to the Malibu shoreline area and back.

The truck to barge approach does not require temporary use of upland storage Site F or the Malibu pier parking lot. Truck traffic through the City of Malibu is minimal for the LPP. The hauling and barging distance increases significantly for each dump cycle so the overall timeframe to complete construction takes an additional year (8 years total).



1 **Figure 4.11-3 - Nearshore Placement Area**

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5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Introduction

This section evaluates impacts of each of the action alternatives along with the no action alternative. Each of the sub-sections corresponds with a specific resource. Due to the large number of alternatives that result from the combination of existing measures, describing each separate alternative is not an effective method for comparison of impacts. Therefore, the impact analyses contained in most chapters have been broken down by the various measures, combinations of which make up the array of alternatives. A summary of the components contained within each alternative variation is contained in **Table 5.1-1**, and a summary of the overall results of all impact analyses is contained in **Table 5.1-2**. The alternative components include:

- Dam and/or Spillway Removal
- Upstream Barrier Removal
- Sediment Hauling and Placement Options
    - o Mechanical Sediment Transport – Beach vs Nearshore Placement
    - o Natural Sediment Transport
- Floodwall Construction

Table 5.1-1 Matrix of Alternative Components

Alternative	Dam and Spill	Dam Only	Upstream Barriers	Beach	Nearshore	Floodwall
2a1	X			X		
2a2	X				X	
2b1	X		X	X		
2b2	X		X		X	
2c1		X		X		
2c2		X			X	
2d1		X	X	X		
2d2		X	X			
3a	X					X
3b	X		X			X
3c		X				X
3d		X	X			X
4a1	X			X		X
4a2	X				X	X
4b1	X		X	X		X
4b2	X		X		X	X
4c1		X		X		X
4c2		X			X	X
4d1		X	X	X		X
4d2		X	X		X	X

Each row represents a project alternative. An "X" in a cell indicates a measure is part of the alternative. Darkened cells indicate measures that are not included in the alternative.

The column headings in **Table 5.1-2** refer to the effects discussed in each of the sections in Chapter 5. No refers to no significant effects (either no effect or less than significant effects). No (II) refers to no significant effects after implementation of mitigation measures (Class II effects under CEQA). I & II refers to Class I (significant and unavoidable) and Class II (significant, but mitigable or avoidable) effects under CEQA. The detailed analyses resulting in these determinations can be found in the appropriate sections of Chapter 5.

Table 5.1-2 Summary of Significant Effects

Alt	Earth	Water	Bio	Cultural	Socio	Aesthetics	Recreation	Transport	Noise	Air	Safety	Utilities
2a1	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	No (II)	I & II	No (II)	No
2a2	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	No (II)	I & II	No (II)	No
2b1	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	I & II	I & II	No (II)	No
2b2	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	I & II	I & II	No (II)	No
2c1	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	No (II)	I & II	No (II)	No
2c2	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	No (II)	I & II	No (II)	No
2d1	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	I & II	I & II	No (II)	No
2d2	No (II)	No (II)	No (II)	I & II	No	No (II)	No	I & II	I & II	I & II	No (II)	No
3a	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	No (II)	No (II)	No (II)
3b	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	No (II)	No (II)	No (II)
3c	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	No (II)	No (II)	No (II)
3d	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	No (II)	No (II)	No (II)
4a1	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	I & II	No (II)	No (II)
4a2	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	I & II	No (II)	No (II)
4b1	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	I & II	No (II)	No (II)
4b2	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	I & II	No (II)	No (II)
4c1	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	I & II	No (II)	No (II)
4c2	I & II	I & II	I & II	I & II	No	I & II	No	I & II	I & II	I & II	No (II)	No (II)

Within each chapter, to further assist the reader in comparing information about the various environmental issues, each chapter also contains:

- Impact methodology and assumptions
- Thresholds of significance
- Impacts and mitigation measures
- Level of significance

5.1.1 *Methodology Used in This Analysis*

The evaluation of impacts is based upon a comparison of conditions with and without the implementation of an alternative plan. The with-project condition describes the condition that is expected to prevail in the planning area in the future if a particular alternative is implemented. The without-project condition describes the condition that is expected to prevail in the planning area in the future if the No Action Alternative is selected, and is described in each resource chapter. The No Action Alternative characterizes the conditions likely to prevail in the study area within the next 50 yrs if neither the USACE nor the CDPR implements an action alternative to restore the Malibu Creek riverine ecosystem. The "No Action Alternative" is mandated by NEPA and other laws and regulations. For purposes of this analysis, the No Action Alternative for NEPA and the No Project Alternative for CEQA are the same.

The project alternatives are compared to the No Action Alternative and then evaluated relative to each other based on anticipated impacts for each resource area. Environmental impacts are evaluated for each alternative based on the significance criteria provided in each subsection followed by any applicable mitigation measure. In evaluating the potential impacts of the project alternatives, the level of significance is determined by applying the thresholds of significance presented in each resource area. Impacts will be described as either no impact, less than significant, significant but mitigable or avoidable, or significant unavoidable impacts.

5.1.2 *Terminology Used in This Analysis*

The following terms are used to describe each impact:

- No impact (Class IV). A designation of no impact is given when no adverse changes in the environment are expected.
- Less than significant impact (Class III). A less than significant impact is identified when the recommended plan or alternatives would cause no substantial adverse change in the environment (i.e., the impact would not reach the threshold of significance).
- Significant impact (Class II). A significant (but mitigable or avoidable) impact is identified when the recommended plan or alternatives would create a substantial or potentially substantial adverse change in any of the physical conditions within the affected resource area. Such an impact would exceed the applicable significance threshold established for CEQA and NEPA purposes, but would be reduced to a less than significant level by application of one or more mitigation measures.
- Significant unavoidable impact (Class I). A significant unavoidable impact is identified when an impact that would cause a substantial adverse effect on the environment could not be reduced to a less than significant level through any feasible mitigation measure(s).

- Mitigation. Mitigation refers to measures that would be implemented to avoid or lessen potentially significant impacts. Mitigation includes:
    - o Avoiding the impact altogether by not taking a certain action or parts of an action
    - o Minimizing the impact by limiting the degree or magnitude of the action and its implementation
    - o Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
    - o Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
    - o Compensating for the impact by replacing or providing substitute resources or environments
    - o The mitigation measures would be proposed as a condition of plan approval and would be monitored to ensure compliance and implementation.
- Residual impacts. Residual impacts are the level of impact after the implementation of mitigation measures.

5.2 Earth Resources

5.2.1 *Impact Significance Criteria*

The impact criteria below were taken from Appendix G of the CEQA guidelines, and are also being adopted for NEPA. The impacts on earth resources associated with the proposed alternatives would be considered significant if one or more of the conditions described below were to occur as a result of implementation of the project.

1. Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
    a. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault.
    b. Strong seismic ground shaking.
    c. Seismic-related ground failure, including liquefaction.
    d. Landslides.
2. Result in substantial soil erosion or the loss of topsoil,
3. Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse,
4. Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property, and
5. Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

5.2.2 *Analysis of Alternative Components*

Dam and Spillway Removal

Construction Impacts

Construction-related impacts to earth resources, through movement of earth by heavy equipment, would result in potential destabilization and erosion of soils in the vicinity of construction activities at and adjacent to Rindge Dam, in the area of accumulated sediment upstream of the Dam, and in constructed access roads and staging areas, and at the disposal sites (Criteria 1 and 2). This could potentially result in soil erosion, loss of topsoil, or induced soil instability and landslide which would be significant without mitigation. While removing only the dam arch, and leaving the spillway intact, would reduce some impacts to earth resources during construction, the differences in impacts between these two options is negligible. The majority of potential impacts to earth resources, including potential for slope stability issues as described in the long term impacts section below, results from the excavation of the accumulated sediments behind the dam. None of the other impact significance criteria described in **Section 5.2.1** apply.

Long Term Impacts

The longer term impacts associated with removing only the dam arch, versus removing both the dam and the spillway, are the same. Therefore the following discussion applies to both. The main potential long-term impact involves slope stability, including potential sliding and rebound (upward movement or expansion of soil resulting from removal of pressure) that may occur if the mass of the impounded sediment and the Dam are removed after having been in place since the 1920s (Criteria 1). A slope stability exploration or study of this potential condition has not yet been undertaken but would be performed during the Pre-Construction Engineering Design (PED) phase, which would inform the detailed design for removal of Rindge Dam and impounded sediment, and address any slope stability issues.

Although slope stability effects would generally be limited to the area adjacent to the Dam site and the impounded sediments upstream where there are no structures that would be affected, Malibu Canyon Road, located approximately 350 ft south and 225 ft above the Dam, could be affected by slope destabilization. Destabilization effects to Malibu Canyon Road could expose people and structures to potential substantial adverse effects due to landslides and slope instability if not mitigated.

After construction the Dam site would be returned to a more-natural condition. No new structures would be built, and the project would not be designed for human habitation. The project site is not on an active fault.

There would be a potential for soil erosion within Malibu Creek following the Dam removal (Criteria 2). However, the project site will be returned to a more natural condition after construction is completed, allowing natural riverine processes to occur. In time, it is likely that natural slopes that descend to the creek will reach equilibrium, and that erosion of the slopes will reach relative equilibrium. By contrast, cut slopes made during project construction can be expected to weather through time. As they do, erosion within these slopes is likely to accelerate. The sediment transport analysis completed for the project indicates a small potential for induced sediment deposition, for Alternative 2 in comparison to Alternative 1, downstream of the Dam. After 10 yrs, in Malibu Lagoon

(Reaches 1 and 2a), stream deposition would average 2.5 to 4.8 ft, in comparison to 2.4 to 4.4 ft in the without-project condition. Sediment will continue to be deposited at the mouth of the creek and within the lagoon, as it would under the No Action scenario. No additional sediment removal, beyond what is required in the no action scenario, is anticipated. However, maintenance requirements will be further evaluated during PED.

In Reach 2b, just upstream of Malibu Lagoon, 10-yr deposition would average 5.1 ft, in comparison to 4.1 ft for the without-project condition. Most reaches of Malibu Creek show a similar trend over the 50-yr period of simulation, with less than a foot difference in bed elevation between Alternative 2a and Alternative 1 in all reaches except Reach 5, which is immediately downstream of the Dam, at 50 yrs (**Appendix B** has more detailed description of stream deposition). Sediment deposition can result in shifting and destabilized stream channel morphology that could adversely affect adjacent areas and property through erosion and widening the stream channel. Sediment transport simulation shows the ultimate bank-full width/depth ratio of Malibu Creek for Alternative 2 for to be within 10% of the without-project description.

Sediment testing performed in 2002 revealed the impounded sediment is sufficiently free of contaminants and therefore there are no limitations or restrictions on upland disposal or beach placement of excavated sediments. The gradation of the sand layer for on-beach placement is just within acceptable levels of sand versus fines percentages. PDT coordinated with the SC-DMMT, which includes the EPA, California Coastal Commission (CCC), and the RWQCB, in February 2013 for material suitability determination for beach placement of the proposed excavated sand layer. Based on coordination with the SC-DMMT, the 73% sand layer was determined to be within acceptable levels for direct beach placement. However, the USACE proposes to perform additional sediment grain size analysis prior to excavation of the sand layer to confirm the material grain size.

Impacts to earth resources from long term operation and maintenance would be limited to repair of the south access road every other year and maintenance of the replanted areas. Regular sediment maintenance or removal within the Malibu Creek would not be required, although occasional maintenance may be necessary. However, this is not anticipated to be different than what would be expected under the No Action scenario. Repair to the south access road would likely involve limited use of heavy equipment to move soil and re-grade the road. Maintenance of the replanted areas would be limited to watering, weeding, and plant replacement as determined necessary. Minimal to no soil erosion or loss of topsoil is expected. Landslides or induced soil instability resulting from long term operation and maintenance activities are not expected. Activities would not result in exposure of people or structures to adverse effects, as outlined under the impact significance criteria. Significance Criteria 3-5 do not apply to long term operation and maintenance, and there are no impacts under Criteria 3-5.

Upstream Barrier Removal

Construction Impacts

Barrier removal upstream of the dam results in the potential for soil destabilization by heavy equipment and associated erosion of soils at the barrier sites (Criteria 1 and 2). This has the potential to result in loss of topsoil and induced soil instability and landslides, which would constitute a significant impacts if not mitigated. No additional impact significance criteria from Section 5.2.1 apply.

Long Term Impacts

Long term impacts from operation and maintenance activities associated with removing the upstream barriers would be similar to those discussed for dam removal. The nature of these impacts at the upstream barriers would be similar to those at the dam site but reduced in scale. Impacts would be less than significant. As with the construction, there would be no impacts under Criteria 3-5.

Sediment Hauling and Placement

Construction Impacts

Construction-related impacts to earth resources associated with sediment hauling and placement are expected to be minimal. Beach and off-shore sediment placement will not expose people or structures to additional risks (Criteria 1). Beach placement will assist in beach sand replenishment and will not result in erosion (Criteria 2), will not occur on a geologically unstable unit (Criteria 3), and is not subject to adverse impacts associated with unstable or expansive soils (Criteria 4). Criteria 5 does not apply. Nearshore placement will have only minor effects on earth resources as sediments will be deposited off-shore and mobilized by natural ocean processes. The Calabasas Landfill is not located on a geologic unit that is unstable or expansive.

Long-Term Impacts

Sediment hauling and placement will take place over an approximately 5-6 year window, and is not anticipated to result in any long term impacts to earth resources under any of the significance criteria.

Floodwalls

Construction Impacts

Construction of the floodwalls, being in an area that is currently developed, could have the potential for destabilization of existing structures (Criteria 1). However, with implementation of proposed mitigation measures ER-1 and ER-2 described below, these impacts are considered less than significant. Floodwall construction will not result in additional impacts under Criteria 2-5.

Long-term Impacts

Long term impacts from operation and maintenance activities include periodic repairs of the floodwalls and access roads, and vegetation clearing which may involve the use of heavy equipment and could result in some soil erosion or loss of topsoil (Criteria 2). Implementation of mitigation measure ER-2 would reduce impacts to less than significant. Flood wall construction is not anticipated to result in any other long term impacts to earth resources under the remaining significance criteria. However, there remains some uncertainty on the potential effects of floodwalls on sediment deposition in the lower reaches of Malibu Creek. Construction of floodwalls would require additional modeling to determine the extent of possible changes to sedimentation, and whether dredging would be required for operations and maintenance.

5.2.3 *Analysis of Alternatives*

Alternative 1: No Action

The No Action Alternative involves leaving Rindge Dam and the sediment behind it in place. No construction would be implemented as a result of this alternative, and therefore there would be no construction related impacts to earth resources. However, substantial changes in stream morphology are expected long-term. Most sediment transported by Malibu Creek would pass over the Dam, although some additional sediment deposition is expected upstream of the Dam due to locally-flattened stream bed slope caused by the Dam, as described in the **Appendix B**. Upon reaching equilibrium in 100 yrs, all sediment transported by Malibu Creek would pass over the Dam and into downstream reaches. Sediment transport analysis shows that sediment passing over the Dam will deposit in the reaches downstream. After 50 yrs, an average of 2.4 to 5.6 ft of deposition is expected in Malibu Lagoon. Malibu Creek Reaches 2b and 3, representing the developed area adjacent to Malibu Creek upstream of Malibu Lagoon, would experience an average 50-yr deposition of 7.1 to 6.1 ft, respectively.

No mitigation measures would be implemented as a result of this alternative, and there are no impacts with Alternative 1 (Class IV).

Alternative 2: Mechanical Transport

The significance of the impacts of each variation of Alternative 2 is based on the combination of significance of each of the subcomponents as described above in the Analysis of Alternative Components above and summarized in **Table 5.2-1** below. Generally, all variations of Alternative 2 have similar impacts to earth resources. Removal of the spillway would result in less than significant increases in impacts to earth resources relative to the options to leave the spillway intact. Removal of upstream barriers would result in additional impacts over removal of only the dam and/or spillway, but these would be less than significant impacts with the implementation of mitigation measures. Impacts associated with the two sediment placement options are also generally similar. All variations of Alternative 2 result in less than significant impacts with the implementation of mitigation measures described below.

Mitigation Measures

The following mitigation measures would be adopted to avoid impacts or reduce impacts to a level that is not significant.

- **ER-1 Stabilization of Slopes.** Slope stability and geotechnical evaluations will be performed during the pre-construction engineering and design phase, informing the development of slope stabilizing measures. If slope stability issues are found, mitigation measures developed in the evaluation will be implemented in order to reduce impacts to a less than significant level. Stabilization measures will be implemented to protect Malibu Canyon Road and other areas from landslide and soil destabilization effects that may be produced by the project.
- **ER-2 Implement Best Management Practices (BMPs).** An erosion-control and spill response plan will be prepared and implemented to include erosion-control best-management practices during construction and implementation of geotechnical recommendations described in the **Appendix D**, including revegetation of disturbed areas, sloping the final impound surface at the end of each construction year, cutting the Dam simultaneously with reducing impound elevations, construction of a cofferdam for control of flows, removal of the cofferdam during the winter season, dewatering sediments, diverting water around construction through pumping and/or piping, development of slope stability measures for groundwater saturation, construction ramp stability measures, and erosion-control measures at disposal sites.
- **ER-3 Sediment Analysis.** Additional sediment grain size analysis would be performed prior to excavation of the sand layer to confirm the material grain size for beach nourishment. Additionally, quality control and quality assurance measures would be identified during the PED phase and implemented during construction to ensure the material that is identified as beach quality sand is the material that is taken to the beach sites.

Level of Significance

Construction impacts and potential long-term slope destabilization impacts will be less than significant (Class II) after implementation of mitigation measures. All other earth resources impacts after implementation of mitigation measures are considered less than significant (Class III).

Table 5.2-1 Significance of Impacts to Earth Resources from Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	Mitigable Slope Destabilization Class II			LTS			No
2a2					LTS		No
2b1			Mitigable Slope Destabilization Class II	LTS			No
2b2					LTS		No
2c1		Mitigable Slope Destabilization Class II		LTS			No
2c2					LTS		No
2d1			Mitigable Slope Destabilization Class II	LTS			No
2d2					LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

<u>Alternative 3: Natural Transport</u>

Alternative 3 consists of allowing natural stream processes to transport sediment from behind Rindge Dam over time. Rindge Dam would be notched and lowered in 5-ft increments over an estimated 20-50 years. Incremental notches are expected to occur every 2-3 years. Since all sediment deposition will occur via natural processes, no nearshore or beach placement will occur under any of the Alternative 3 variations. However, 5,800 linear feet of floodwalls would be constructed adjacent to Malibu Creek in the populated area downstream of Rindge Dam to prevent the increased risk of flooding due to increased sediment deposition. The significance of each variation of Alternative 3 is based on the combination of significance of each of the subcomponents (**Table 5.2-2**).

As discussed in Alternative 2, all variations of Alternative 3 have similar impacts to earth resources. Removal of the spillway would result in less than significant increases in impacts to earth resources relative to the options to leave the spillway intact. Removal of upstream barriers would result in additional impacts over removal of only the dam and/or spillway, but these would be less than significant impacts with the implementation of mitigation measures.

While the construction-related impacts associated with variations of Alternative 3 are similar to those described in the Analysis of Alternative Components, these impacts will occur approximately annually for a period of 40-100 years, instead of occurring during a shorter window of time as with Alternative 2. Because construction will likely take 40 yrs or more, there will be a potential for increased sediment deposition in the stream bed downstream of the Dam during the construction period. After 20 yrs, in Malibu Lagoon (Reaches 1 and 2a), stream deposition would average 2.7 to 6.4 ft, in comparison to 2.3 to 4.5 ft in the without-project condition. In reach 2b, just upstream of Malibu Lagoon, 20-yr deposition would average 9.4 ft, in comparison to 5.1 ft for the without-project condition. The consequences of this impact involve increased flood risk and shifting and destabilized stream channel morphology.

The long-term impacts associated with variations of Alternative 3, including potential sliding and rebound that may occur after dam and sediment removal, are expected to be greater than Alternative 2 due to the longer period of removal. As noted for Alternative 2, a slope stability exploration and study would be performed during the PED phase, which would inform the detailed design for removal of Rindge Dam and impounded sediment, and address any slope stability issues.

The sediment transport analysis (**Appendix B**) indicates a substantial potential for increased sediment deposition in the stream bed downstream of the dam with Alternative 3 in comparison to future without project conditions and Alternative 2. After 10 yrs, in Malibu Lagoon (Reaches 1 and 2a), stream deposition would average 2.7 to 6.0 ft, in comparison to 2.4 to 4.4 ft in the without-project condition. In reach 2b, just upstream of Malibu Lagoon, 10-yr deposition would average 8.5 ft, in comparison to 4.1 ft for the without-project condition. Most reaches of Malibu Creek show a similar trend over the 50-yr period of simulation, with 50 year deposition as high as 6.7 ft above the without-project condition in Reach 4a (See the **Appendix B** for a more detailed description of stream deposition).

The primary consequence of increased sedimentation is the potential for increasing the flood risk in terms of flood depth and flood frequency in residential and commercial areas adjacent to the creek downstream of the Dam. Sediment deposition can also result in shifting and destabilized stream channel morphology that could adversely affect adjacent property through erosion and widening the stream channel. Sediment transport simulation shows the ultimate bank-full width/depth ratio of Malibu Creek to be up to 34% greater (average 18%) in Reach 2a (Malibu Lagoon) and up to 117% greater (average 52%) in Reach 4a than in the without-project condition.

The increased flooding risk would be mitigated by the placement of approximately 5,800 ft of flood wall along the west side and 2,700 ft of floodwall on the east side of the creek from approximately Cross Creek Road to the PCH. The potential impact of increased sediment deposition leading to modified stream morphology and destabilization of stream channel banks would remain even with mitigation and are significant.

Mitigation Measures

Mitigation Measures ER-1 and ER-2 would apply.

Level of Significance

Construction impacts and potential long-term slope destabilization impacts are less than significant (Class II) with implementation of mitigation measures. Stream morphology and erosion impacts related to sediment deposition are significant (Class I). All other earth resources impacts with implementation of mitigation measures are considered less than significant (Class III).

Table 5.2-2 Significance of Impacts to Earth Resources from Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Dam and Spill	Beach	Dam and Spill	Floodwall	
3a	Potentially Significant Erosion (Class I) Slope stability (Class II)					Mitigable Slope Destabilization Class II	YES
3b			Class II				YES
3c		Potentially Significant Erosion (Class I) Slope stability (Class II)					YES
3d			Class II				YES

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

<u>Alternative 4: Hybrid Mechanical & Natural Transport</u>

Alternative 4 is a hybrid of Alternatives 2 and 3. It consists of mechanically transporting some sediment from behind Rindge Dam, and also allowing some sediment to transport naturally downstream. Similar to Alternative 3, 5,800 linear feet of floodwalls would be constructed adjacent to Malibu Creek in the populated area downstream of Rindge Dam to prevent the increased risk of flooding due to increased sediment deposition. The significance of each variation of Alternative 4 is based on the combination of significance of each of the subcomponents (**Table 5.2-3**).

As discussed in Alternative 2 and 3, all variations of Alternative 4 have similar impacts to earth resources. Removal of the spillway would result in less than significant increases in impacts to earth resources relative to the options to leave the spillway intact. Removal of upstream barriers would result in additional impacts over removal of only the dam and/or spillway, but these would be less than significant impacts with the implementation of mitigation measures.

There will be a potential for increased sediment deposition in the stream bed downstream of the Dam during the construction period. After 5 yrs, in Malibu Lagoon (Reaches 1 and 2a), stream deposition would average 1.8 to 3.2 ft, in comparison to 1.2 to 1.5 ft in the without-project condition. In reach 2b, just upstream of Malibu Lagoon, 20-yr deposition would average 6.9 ft, in comparison to 5.1 ft for the without-project condition. The consequences of this impact involve increased flood risk and shifting and destabilized stream channel morphology, and are further described under long-term impacts below.

There is also the potential for increased sediment deposition in the stream bed downstream of the Dam with Alternative 4. After 10 yrs, in Malibu Lagoon (Reaches 1 and 2a), stream deposition would average 2.5 to 5.1 ft, in comparison to 2.4 to 4.4 ft in the without-project condition. In Reach 2b, just upstream of Malibu Lagoon, 10-yr deposition would average 6.2 ft, in comparison to 4.1 ft for the without-project condition. Deposition at 50 yrs would be as high as 2.5 ft above the without-project condition in Reach 4a. Streambed deposition would be nearly 3 ft higher than the without project condition for Reach 2b, just upstream of Malibu Lagoon, after 5 yrs, decreasing over time to approximately 1.2 ft above the without-project condition at 50 yrs. The consequences of sediment deposition are the same as for Alternative 3 and involve increasing the flood risk and shifting and destabilized stream channel morphology potentially affecting adjacent property through erosion and widening the stream channel.

Mitigation Measures

Mitigation Measures ER-1, ER-2, and ER-3 would apply.

Level of Significance

Construction impacts and potential long-term slope destabilization impacts are less than significant (Class II) with implementation of mitigation measures. Stream morphology impacts related to sediment deposition are significant (Class I). All other earth resources impacts with implementation of mitigation measures are considered less than significant (Class III).

Table 5.2-3 Significance of Impacts to Earth Resources from Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	Potentially Significant Erosion Class I Slope stability Class II			LTS		Mitigable Slope Destabilization Class II	Yes
4a2					LTS		Yes
4b1			Mitigable Slope Destabilization Class II	LTS			Yes
4b2					LTS		Yes
4c1		Potentially Significant Erosion Class I Slope stability Class II		LTS			Yes
4c2					LTS		Yes
4d1			Mitigable Slope Destabilization Class II	LTS			Yes
4d2					LTS		Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

<u>Comparison of Alternatives</u>

Options to retain or remove upstream barriers, as well as the option to retain or remove the spillway, do not alter the significance determination of the alternatives they are associated with. Construction of floodwalls associated with Alternatives 3 and 4 would result in potential, but mitigable impacts, and therefore does not alter the overall significance of Alternatives 3 and 4 relative to Alternative 2. The primary differences between the significance of impacts to earth resources associated with the array of alternatives relates to options to mechanically or naturally remove the impounded sediment behind Rindge Dam. All variations of Alternatives 3 and 4 have the potential to result in significant impacts to stream morphology associated with sediment deposition during the natural transport of impounded sediment. All other components of the array of alternatives have generally minor and non-significant differences in impacts to earth resources. Therefore, all variations Alternative 2 have similar and non-significant impacts to earth resources. Variations of Alternative 3 and 4 have similar, and potentially significant impacts to earth resources as a result of sediment transport and deposition downstream of Rindge Dam.

5.3 Water Resources and Water Quality

5.3.1 *Impact Significance Criteria*

The following water resources and water quality thresholds of significance criteria are based on the CEQA Checklist as provided in Appendix G to the CEQA Guidelines. These criteria are also being adopted for NEPA. Water quality and/or water resources impacts would be considered significant if the Proposed Alternative would:

1. Violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality,
2. Cause lateral erosion, streambed scour, or long-term channel aggradation/degradation resulting in damage to private property, utility lines, or structures,
3. Increase flood hazards through floodplain encroachment, diversion or obstruction of flows, changes in the rate and amount of surface runoff, or placement of people or structures in areas subject to flooding or mudflow, and
4. Deplete groundwater or surface water supplies or interfere with groundwater flow or recharge such that there would be a substantial net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted).
5. Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map.
6. Cause inundation by seiche, tsunami, or mudflow.

5.3.2 *Analysis of Alternative Components*

To ensure compliance with the Clean Water Act, a draft 404b1 analysis has been prepared (Appendix H). Prior to construction, a Clean Water Act (CWA) Section 401 Water Quality Certification (WQC) will be received from the Regional Water Quality Control Board, and Storm Water Pollution Prevention Plan (SWPPP) will be prepared pursuant to Section 402 of the CWA.

Dam and Spillway Removal

The removal of the spillway will not have additional water resource related impacts beyond those associated with removal of the dam structure. Therefore the discussion below applies to both removal of the dam alone, and removal of both the dam and spillway. Removal of the dam structure will have little additional impact to water quality and water resources as the primary driver of potential impacts to water quality is the removal of the impounded sediment behind Rindge Dam.

The majority of potential impacts under Criteria 1-6 are therefore discussed in detail under sediment removal and placement, and within each alternative as appropriate.

The removal of the Dam would improve long-term water quality in Malibu Creek by removing a major fish barrier and restoring the Dam area to a natural riparian habitat, allowing natural riverine processes to re-establish. Fish barriers are currently listed by the RWQCB as a water quality impairment on Malibu Creek. Since the spillway does not represent a fish barrier itself, removal of the spillway does not provide any additional benefits beyond those provided by removal of the dam.

Under all alternatives, material associated with dam and spillway removal will be disposed of at the Calabasas Landfill. Under mechanical transport options, additional material that is not beach compatible would also be disposed of at the Calabasas landfill. Impacts at the Calabasas Landfill are associated with potential erosion of the disposal material and potential water quality impacts associated with disposal and storage of the material. Previous analyses, addressed in **3.1 Earth Resources**, revealed the impounded sediment is sufficiently free of contaminants, and therefore no adverse water quality impacts are expected at the Calabasas landfill. The Dam and access ramp materials are also not expected to contain water quality contaminants that could adversely affect water quality at the Calabasas Landfill.

<u>Upstream Barrier Removal</u>

Construction Impacts

Potential impacts to water resources and water quality at the upstream barrier sites would be similar in nature to potential impacts at the dam and impounded sediment site. Impacts are primarily associated with potential increases in water turbidity and contaminants from construction at the barrier sites (Criteria 1). The quality of surface water in Malibu Creek could also potentially be impacted if any potentially harmful materials are accidentally spilled. Some of the materials of concern include: diesel fuel, gasoline, lubricant oils, hydraulic fluid, antifreeze, transmission fluid, lubricant grease, and other fluids.

There will be a potential for increased turbidity during the winter season during and immediately after the construction season at the upstream barriers due to sediment not yet vegetated being exposed to flow of water. These impacts are adverse but will be temporary, seasonal and limited in duration. As with the removal of sediment behind Rindge Dam, removal of the upstream barriers could potentially contaminate the creek with trash, fuels, oils, grease, coolants, vehicle fluids, and other construction-related pollutants accidentally released during construction by construction equipment and crews. The effect of this impact is expected to be minor due to the proposed construction in the dry described in the sediment hauling and placement section, mitigation measure ER-2, and compliance with the CWA. This requires receipt of a 401 WQC and development of a SWPPP prior to construction. Removal of the upstream barriers will not result in impacts under Criteria 2-6 during construction.

Long Term Impacts

Removal of the upstream barriers will return the stream to a more natural condition and have little or no long-term adverse effect on stream stability, sediments or turbidity. The removal of the upstream barriers would improve water quality by restoring the creek to a natural riparian habitat. Fish barriers are currently listed by the RWQCB as water quality impairment on Malibu Creek. Removal of the upstream barriers will not result in any long-term impacts under Criteria 2-6.

<u>Sediment Hauling and Placement</u>

Construction Impacts

Both natural transport and mechanical removal of the impounded sediment would result in increases in downstream water turbidity in the form of water-borne silts and clays disturbed by excavation (Criteria 1). It is estimated that between 15,000 and 55,000 cy of sediment would be transported downstream during each winter season during construction under the mechanical transport option, while up to 129,400 cy of sediment would be transported under the natural transport option. This transport of sediment would substantially increase the potential for increased turbidity of stream flows during the winter during construction under the natural transport options. The quality of surface water in Malibu Creek could also potentially be impacted if any potentially harmful materials are accidentally spilled. Some of the materials of concern include: diesel fuel, gasoline, lubricant oils, hydraulic fluid, antifreeze, transmission fluid, lubricant grease, and other fluids.

Construction-related turbidity and spill-related impacts would have the potential to occur during construction and over the winter season during the period of Dam removal. Under the mechanical transport option, this period would be five years, while under the natural transport option this period would be 20-50 years. Both natural transport and mechanical removal of impounded sediments would include measures to minimize the effect of these impacts through the following measures (as described in measure ER-2 of Chapter 5.2): 1) removal of accumulated sediments behind the Dam to an upland disposal area; 2) excavation during the dry (summer) season; 3) dewatering the sediment using dewatering wells; 4) building a cofferdam that will capture and settle Malibu Creek flows, including Tapia Water Treatment plant effluent; 5) installing a pumping and piping system to move this water around the work site and back into Malibu Creek downstream of the construction site; and, 6) armoring construction ramps to minimize erosion during winter season. Measures 2 through 5 are referred to as “in-the-dry” construction. Construction equipment and the dewatering system would be removed from the Dam site prior to the winter season. Water quality will be monitored during construction and adaptive Best Management Practices (BMPs) implemented to address impacts that may arise. Mitigation measure ER-2 would apply and further reduce construction impacts to water quality.

There would be a potential for increased turbidity during the winter season during and immediately after the construction season due to sediment at cleared excavation areas not being vegetated and being exposed to flow of water. The increased turbidity associated with this alternative would be similar to turbidity levels under larger storm events. These impacts are adverse but will be temporary, seasonal and limited in duration.

Malibu Creek flows could be contaminated by trash, fuels, oils, grease, coolants, vehicle fluids, and other construction-related pollutants accidentally released during construction by construction equipment and crews. The effect of this impact is expected to be minor due to the proposed construction in the dry described above, mitigation measure ER-2, and compliance with the CWA through receipt and implementation of the 401 WQC and preparation and implementation of the SWPPP.

Under the natural transport option, deposition of sediments in the flood-prone lower reaches (Reaches 1 to 3) of Malibu Creek is expected to result in increased water surface elevations, therefore, increasing the risk of flooding to downstream properties (Criteria 3). To address this, construction of flood walls within these areas to prevent increased risk of flooding to the adjacent residential and commercial properties is included.

Impacts at the Calabasas Landfill disposal site and beach nourishment sites are associated with potential erosion of the disposal material and potential water quality impacts associated with disposal and storage of the material at these sites (Criteria 1). Under beach placement options, potential erosion of stored material could occur at Upland Site F and at any temporary stockpile utilized at the Malibu Pier parking lot. Under the nearshore placement option, no temporary stockpiles will be utilized, avoiding any potential for erosion of temporarily stockpiled materials. As previously described in the 3.2 Earth Resources, the impounded sediment is sufficiently free of contaminants, and therefore no adverse water quality impacts are expected at the Calabasas landfill or beach nourishment sites. The Dam and access ramp materials are also not expected to contain water quality contaminants that could adversely affect water quality at the Calabasas Landfill.

Under mechanical transport options, beach compatible materials would be placed either on the beach adjacent to Malibu Pier, or offshore via barge in the same general vicinity. The impounded sediment has been tested and is sufficiently free of contaminants that no adverse water quality impacts are expected as the result of the placement, or potential erosion of this material from the placement sites. While short term increased in turbidity may occur during the offshore placement, or as a result of erosion from the beach placement site, the surf zone and nearshore areas have naturally high turbidity and sand transport. Therefore, these impacts are expected to be temporary and less than significant. In addition, the placement of material via barge in the nearshore would be accompanied by monitoring (see Mitigation Measure WR-2) to ensure no impacts to water quality occurred.

Regardless of sediment removal methods and haul routes, there are no impacts under Criteria 4-6. Under natural sediment transport alternatives, and as discussed below, floodwalls would be constructed to reduce potential impacts under Criteria 3. No construction related impacts are expected under Criteria 2, although long-term impacts may occur as described below.

Long Term Impacts

Under both natural and mechanical transport options, substantial stream morphology changes are expected due to sediment that would normally be trapped by the Dam being transported downstream as described in **Appendix B**. **Section 3.2** details the impact evaluation of these changes. Under the mechanical transport option, a short-term increase in turbidity is expected after construction as residual silts and clays in and adjacent to the stream bed are washed downstream. Temporarily disturbed areas would be revegetated with native plants and long-term water turbidity is expected to be similar to the conditions that would occur under the No Action Alternative.

Under the natural transport option, channel widening (lateral erosion) and long-term channel aggradation/degradation is anticipated. However since the adjacent property is owned by CDPR as part of the state park, and therefore no potential damage to private property, utility lines, or structures is expected (Criteria 2). The increase in turbidity associated with the natural transport option is expected during the winter flows after the construction period for each year in which the dam is shortened a notch. The increase in turbidity would result from sediments behind the dam, including any fines and silts that are trapped there, being transported through the system. The duration of this increased turbidity could be as short as 21 yrs, but based on sediment modeling the total time could exceed 100-yrs.

Beyond the construction related sediment and turbidity elements described above, water quality of Malibu Creek is not expected to change significantly during construction or beyond (Criteria 1). In a 2005 report[1], the USACE evaluation could not identify any significant potential impact from the Malibu Creek Watershed on the impounded sediments. Concentrations or levels of dissolved oxygen (DO), temperature, pH, algae, nutrients, metals, and other pollutants, including the 303(d) listed impairments noted in **Section 2**, would not be altered by mechanical removal of the impounded sediment. The report did note that sediment samples included concentrations of ammonia, minor amounts of lead, copper, and PCBs. Ammonia samples were noted as having higher concentrations in more deeply buried, finer grained sediments. The report, however, concluded that the amounts of these pollutants did not warrant an environmental concern/impact for sediments that may be used as beach nourishment or other disposal. While impacts are expected to be less than significant, the project will follow the 2005 report suggested activity of confirmatory testing of the sediments as excavation occurs to ensure acceptable sediment quality.

Some long-term improvements in water quality may be expected throughout the watershed as a result of implementation of NPDES stormwater programs and the Malibu Creek Watershed Integrated TMDL Implementation Plan by the LACDPW. It should be expected that these long-term improvements will be seen in the project area along Reach 5. The RWQCB and other regulatory agencies will continue to regulate and monitor the quality of water in the study area and enforce water quality regulations. In addition, advancements in controlling runoff from development is likely to improve water quality over the foreseeable period of analysis.

There are current flood-prone areas along lower Malibu Creek. Several residential areas downstream of the canyon mouth are at risk of flooding during events more frequent than the 1% AEC flood. Mechanical removal of the sediment, accompanied with dam removal, will result in a pattern of deposition downstream of the Dam very similar those that will occur under the No Action Alternative, and therefore no appreciable increase in flood risk is expected (Criteria 3). The predicted with-project 2% AEC floodplain (Plate 40 of **Appendix B**) is very similar to the Alternative 1 2% AEC floodplain (Plate 38), which can be expected from the minimal difference in deposition after 50 years.

There are only minimal groundwater recharge capabilities within the Malibu Creek Watershed and no usable groundwater resource. In the absence of groundwater resources to impact, no significant groundwater-related impact will occur as a result of removing the sediment behind Rindge Dam, regardless of whether the sediment is natural or mechanically transported (Criteria 4). While natural

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transport would result in an increased flow of sediments and turbidity to the reaches below the dam (Reaches 1-4) that could result in an interference with any groundwater flow or recharge if the streambed downstream lay over a groundwater basin and was a significant source of recharge, it is assumed that potential impacts will result in minimal changes, or a less than significant impact on long-term groundwater supplies due to the minimal recharge capabilities. No long-term impacts under Criteria 5-6 as a result of sediment removal and placement are expected.
Sediment placement, regardless of whether the shore or nearshore locations are used, is not anticipated to result in any long-term impacts. The quantity of sediment being deposited relative to the quantity of natural sediment occurring in the vicinity of Malibu is not significant, the sediment is not contaminated, and sediment placement will occur over a relatively short period of time. Therefore, no long term impacts under any significance criteria at either sediment placement location are anticipated.

Floodwalls

Floodwalls would be constructed to protect against the increased flood risk associated with the natural transport options (Alternatives 3 and 4). The flood walls would have no significant impact on water resources or water quality, either during construction or long-term under any of the significance criteria. Floodwalls would be constructed in compliance with the CWA through implementation of the 401 WQC and SWPPP.

5.3.3 *Alternative Analysis*

Hydrologic, hydraulic, and sedimentation studies were conducted as part of this Integrated Report to supplement existing information and help analyze the environmental impacts and improvements potentially associated with the removal of Rindge Dam. The results of that study are included and referenced in this alternatives analysis and can be found in detail in the **Appendix B**, which describes the results of sediment transport and hydraulic modeling of Malibu Creek under the without-project conditions and conditions that would exist after implementation of the alternatives.

For purposes of the water resources discussion, Malibu Creek is divided into five reaches, numbered 1 to 5, with Reaches 2 and 4 further subdivided into 2a and 2b, and 4a and 4b, as described in shown in **Figure 1.10-1**.

Alternative 1: No Action

The No Action Alternative represents the continuation of the existing condition at Rindge Dam and downstream Malibu Creek and Malibu Lagoon, with no project-related impacts. While Rindge Dam's original purpose was to provide a water supply reservoir, sediment has almost completely filled in the reservoir pool area since the 1950's, resulting in a loss of the original function. Most sediment transported by Malibu Creek would pass over the Dam, although some additional sediment deposition is expected upstream of the Dam due to locally-flattened stream bed slope caused by the Dam, as described in **Appendix B**. Upon reaching equilibrium in 100 yrs, all sediment transported by Malibu Creek would pass over the Dam and into downstream reaches.
Construction of the separate Malibu Lagoon restoration project has been completed. Under the No Action Alternative, no change to this area, located downstream of Rindge Dam, is expected.

Construction Impacts

Under the No Action Alternative there would be no project-related construction and therefore no impacts. Existing water quality, sedimentation issues, and hydrological characteristics described in Section 3.3 would remain unchanged.

Long-Term Impacts in Malibu Creek

The No Action Alternative would have no long term project-related effects on water resources. Currently, under without-project conditions, Malibu Creek runs at the elevation of the crest of Rindge Dam along gravel lines of the impounded sediment. As areas upstream are further developed (in the upper Malibu Creek watershed areas), there is the potential to increase erosion and add additional sediment and other contaminants to Malibu Creek. The No Action Alternative will not change these future effects.

Soils in the Malibu Creek watershed are highly erodible. Flows originating in the upper watershed proceed at high velocities through narrow and steep portions of the area, carrying a sediment load. Even though the Dam is effectively full of sediment, the relatively flat slope of this sediment prism will cause a portion of this sediment load to continue to deposit upstream of the Dam. Up to 530,000 cy additional sediment is expected to be deposited in this area in the long-term, increasing the depositional slope in the area from approximately 0.5 to 1.6% in 100 yrs.

Substantial stream morphology changes are expected due to sediment that would normally be trapped by the Dam being transported downstream. These effects are described in Section 5.2 and in **Appendix B**. It is expected that all reaches of Malibu Creek Watershed downstream of the Dam site would be in approximate sediment equilibrium in approximately 100 yrs, meaning the amount of sediment entering the study area would equal the amount leaving the area.

Turbidity levels, as a measure of water clarity, are expected to be naturally elevated during large storm events due to disturbance of bed sediments and transport of watershed sediment, but are not be expected to change significantly under most conditions and most storm events under the No Action Alternative.

The water quality characteristics of Malibu Creek described in Section 3.3 would not be changed by the No Action Alternative. Existing water quality impairments would remain. Some long-term improvements in water quality may be expected as a result of implementation of NPDES storm water programs and the Malibu Creek Watershed Integrated TMDL Implementation Plan by the LACDPW. The RWQCB and other regulatory agencies will continue to regulate and monitor the quality of water in the study area and enforce water quality regulations. In addition, advancements in controlling runoff from development are likely to improve water quality over the foreseeable period of analysis.

There is a potential for flooding along lower Malibu Creek as described in **Appendix B** (See Plates 21 and 35 to 38). Depending on the flood return period, the overbank flood potential extends from approximately the ocean outlet to Palm Canyon Lane approximately 1 mi upstream of the ocean. Several residential areas are at risk of flooding during events more frequent than the 1% AEC. Under Without Project conditions, sediment deposition in the lower creek bed will result in an increased flood risk in this area. Up to 12 ft of deposition in some locations could be expected in the lower reaches over the next 50 yrs. Flood risk increases will take the form of expanded floodplain limits, increased frequency of overbank flooding, and higher flood levels. Flood risk increases are expected on relatively frequent (10% AEC and 5% AEC), as well as larger flood events, as described in **Appendix B**.

Alternative 2: Mechanical Transport

With regards to water resources, the differences of impacts associated with the range of variations of Alternative 2 are minimal (**Table 5.3-1**). Under all variations, minor natural transport of sediments during winter and potential turbidity increases associated with construction are the primary potential impacts. Any potential impacts will be reduced due to implementation of management measures described below, and through compliance with the project's 401 WQC and SWPPP. The addition of upstream barriers will result in minor, additional impacts associated with potential erosion, turbidity, and the potential construction related contaminants, but with implementation of mitigations measures these would be less than significant (Class II). The inclusion or exclusion of the spillway does not alter the significance of impacts.

Another difference among variations of Alternative 2 is whether beach or near-shore disposal is utilized. Under beach placement options, beach-compatible sands would be mechanically spread along the beach adjacent to Malibu Pier, resulting in potential, temporary increases in turbidity in the surf zone environment. Under the near-shore placement option, temporary increases in turbidity would occur farther offshore during placement. However, given that the material being placed is anticipated to be mostly sands, and not fine material, and is not contaminated, any increases in turbidity will be both spatially and temporally minimal. Potential impacts from near-shore placement would be minimized by implementation of measure WR-2. With the inclusion of mitigation measures, Alternative 2 variations would not violate water quality standards or WDRs or otherwise substantially degrade water quality.

Mitigation Measures

Mitigation measures ER-2 (discussed in 5.2 Earth Resources) and WR-1 would apply to BMPs for water quality control during construction and during the winter season.

- **ER-2 Implement Best Management Practices (BMPs).** An erosion-control and spill response plan will be prepared and implemented to include erosion-control best-management practices during construction and implementation of geotechnical recommendations described in the **Appendix D**, including revegetation of disturbed areas, sloping the final impound surface at the end of each construction year, cutting the Dam simultaneously with reducing impound elevations, construction of a cofferdam for control of flows, removal of the cofferdam during the winter season, dewatering sediments, diverting water around construction through pumping and/or piping, development of slope stability measures for groundwater saturation, construction ramp stability measures, and erosion-control measures at disposal sites.
- **WR-1 Best Management Practices during Construction.** Prior to construction a Stormwater Pollution Prevention Plan (SWPPP) will be prepared to address potential impacts to stormwater from construction equipment, construction crews, and construction practices. The SWPPP will include best management practices to prevent accidental spills and other contamination of Malibu Creek, and will include provisions for in-the-dry construction at the barrier sites, and regular monitoring of water quality, including turbidity,

during construction and in the winter runoff season. The SWPPP will include a provision for adaptive measures to be taken in the event of excess contamination or turbidity.

- **WR-2 Water Quality Monitoring During Nearshore Placement**. If material is placed off shore utilizing a barge (2a2, 2b2, 2c2, and 2d2), appropriate water quality monitoring would occur during sediment placement to ensure no significant impacts to water quality occurred.

Level of Significance

Water quality impacts from construction and sedimentation may be adverse, but are minor and temporary in nature. With implementation of mitigation measures ER-2 and WR-1, water quality impacts associated with variations of Alternative 2 would be less than significant with mitigation (Class II). Flood risk impacts are negligible and are not considered significant (Class III). Impacts related to stream morphology changes are described in Section 3.2 and would be significant.

Table 5.3-1 Significance of Water Resources Impacts Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	LTS			Class II			No
2a2	LTS				Class II		No
2b1	LTS		Class II	Class II			No
2b2	LTS		Class II		Class II		No
2c1		LTS		Class II			No
2c2		LTS			Class II		No
2d1		LTS	Class II	Class II			No
2d2		LTS	Class II		Class II		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Alternative 3: Natural Transport</u>

Similar to Alternative 2, the differences of impacts associated with the range of variations of Alternative 3 are minimal (**Table 5.3-2**). Under all variations, the primary significant impacts are associated with the natural transport of sediments downstream upon removal of the dam, which are unavoidable. As described below, natural transport of sediment is expected to result in significant, unavoidable impacts to water quality which did not occur under Alternative 2. The addition of upstream barriers will result in minor, additional impacts associated with potential erosion, turbidity, and the potential construction related contaminants, but with implementation of mitigation measures would be less than significant (Class II). The inclusion or exclusion of the spillway does not alter the significance of impacts. Since no mechanical sediment transport occurs under any variation of Alternative 3, there are no near-shore or beach placement impacts.

Mitigation Measures

Mitigation measures WR-1 and ER-2 would apply.

Level of Significance

Malibu Creek is considered impaired due to sedimentation/siltation. Natural transport and notching activities would result in substantial additional sediment deposition. Increased turbidity is expected over the 40-100 yr construction period. Although mitigation measure WR-1 would apply, long-term turbidity increases are due to the natural sediment transport, which is anticipated to substantially degrade water quality. Water quality impacts associated with turbidity are therefore expected to be significant (Class I). Other water quality impacts associated with accidental release of contaminants during construction would be mitigated by measures ER-2 and WR-1 and are Class II.

Increase in flood risk will be avoided by the flood walls and are not significant (Class III). Impacts related to stream morphology changes, lateral erosion and long-term aggradation and degradation due to sediment deposition downstream will not result in damage to any private properties or utilities with mitigation (Class II).

Table 5.3-2 Significance of Water Resources Impacts Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	Class I					LTS	Yes
3b	Class I		Class II			LTS	Yes
3c		Class I				LTS	Yes
3d		Class I	Class II			LTS	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Alternative 4: Hybrid Mechanical & Natural Transport</u>

The differences among variations of Alternative 4 are generally the same as those described previously for Alternatives 2 and 3. Similar to Alternative 3, the primary driver of impacts to water resources associated with variations of Alternative 4 are associated with the natural transport of sediments downstream upon removal of the dam (**Table 5.3-3**), which will result in significant impacts to water quality(substantial degradation). The addition of upstream barriers will result in minor, additional impacts associated with potential erosion, turbidity, and the potential construction related contaminants, but these with implementation of mitigation measures would be less than significant (Class II). The inclusion or exclusion of the spillway does not alter the significance of impacts.

Mitigation Measures

Mitigation measures ER-2 and WR-1 would apply.

Level of Significance

The level of significance for variations of Alternative 4 are generally the same as for Alternative 3. Although mitigation measures ER-2 and WR-1 would apply, long-term turbidity increases are due to the mechanism of sediment removal, which is by natural sediment transport. Water quality impacts associated with turbidity are therefore expected to be significant (Class I). Other water quality impacts associated with accidental release of contaminants during construction would be mitigated by measure WR-1 and are Class II.

Flood impacts will be avoided by the flood walls and are not significant (Class III). Impacts related to stream morphology changes, lateral erosion and long-term aggradation and degradation due to sediment deposition downstream of the Dam will not result in damage to any private properties or utilities with mitigation (Class II).

Table 5.3-3 Significance of Water Resource Impacts Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	Class I			Class II		LTS	Yes
4a2	Class I				Class II	LTS	Yes
4b1	Class I		Class II	Class II		LTS	Yes
4b2	Class I		Class II		Class II	LTS	Yes
4c1		Class I		Class II		LTS	Yes
4c2		Class I			Class II	LTS	Yes
4d1		Class I	Class II	Class II		LTS	Yes
4d2		Class I	Class II		Class II	LTS	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Comparison of Alternatives

The largest potential impacts associated with any of the alternatives to water resources occur as a result of allowing natural sediment transport to occur under Alternatives 3 and 4. These impacts are greatest for the full natural transport option (Alternative 3), but also significant for all variations of Alternative 4 as well. Under Alternative 2, the impacts associated with sediment transport are mitigable, as the majority of the impounded sediment would be mechanically transported to its final destination (Class II). Overall variations of Alternative 2 have the lowest impacts to water resources. Addition of the upstream barriers to any alternative results in minor, mitigable additional impacts (Class II), and the exclusion of the spillway does not alter the significance of any alternative.

5.4 Biological Resources

A detailed description of potentially affected biological resources can be found in **Section 3.4** and in **Appendices I and J**.

5.4.1 *Impact Significance Criteria*

The following criteria apply for both NEPA and CEQA compliance. The impact criteria below were taken from Appendix G of the CEQA guidelines and USACE internal guidance. An impact to biological resources would be considered significant if a project alternative resulted in:

1. Substantial adverse effect, either directly or through habitat modifications, on any species identified as a threatened, endangered, candidate, sensitive or special-status species in local or regional plans, policies, or regulations, or by the CDFW or USFWS.
2. Substantial adverse effect or net loss in the habitat value of a sensitive biological habitat or area of special biological significance.
3. Substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act through direct removal, filling, hydrological interruption, or other means.
4. Substantial impedance to the movement or migration of native fish or wildlife, or impede the use of nursery sites
5. Substantial loss to the population of any native fish, wildlife, or vegetation. For purpose of this analysis, substantial is defined as a change in population or habitat that is detectable over natural variability for a period of five years or more.
6. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.
7. Conflict with the provisions of an adopted Habitat Conservation Plan (HCP), NCCO, or other local, regional, or site habitat conservation plan.
8. Substantial loss in overall diversity of the ecosystem.

Each of the alternatives has the potential to affect biological resources including sensitive habitats and special-status species. Potential effects can be direct, indirect, cumulative, short-term, long-term, temporary, or permanent. The alternatives analysis describes both construction and long-term impacts to the project area.

5.4.2 *Analysis of Alternative Components*

<u>Re-vegetation and Planting Plan</u>

The following areas will require re-vegetation post-construction, depending on the alternative selected:

- Rindge Dam upland areas and riparian areas;
- Construction areas for upstream barrier removals/modifications;
- Construction areas for downstream floodwalls; and
- All other construction sites such as access roads and staging areas.

A Habitat Restoration Program will be developed to revegetate riparian areas of Malibu Creek, in coordination with the appropriate resource agencies and stakeholders during Pre-construction Engineering Design.

<u>Dam and Spillway Removal</u>

This section discusses removal of the dam structures and impacts to the sediment impoundment area only and does not address sediment removal. Sediment removal and downstream impacts are discussed below under the impacts for alternatives 1-4.

Based on coordination with resource agencies, including USFWS, NMFS, and CDFW, and by complying with applicable wildlife regulations, there will be no short or long-term conflicts with any local policies or ordinances (Criteria 6), or conflicts with any adopted HCP, NCCO, or similar plans (Criteria 7) as a result of removing the dam and/or spillway.

Construction Impacts

Removing only the dam, and leaving the spillway in place, will result in the similar impacts as removing both. The primary difference would be a shorter duration of construction and the removal of the intermittent micro-blasting or use of similar methods required to remove the spillway concrete. Continued indirect habitat degradation by other parties with the retention of the spillway is expected, via habitat damage along illegal trails, and deposition of human waste, trash and graffiti. However, this is the same as would occur under the No Action Alternative. The discussion below pertains to both options as the impacts are similar regardless of whether the spillway is left intact or removed.

Site preparation activities would begin in the fall and would be completed prior to the bird nesting season. Construction activities within Malibu Creek would include sediment and Dam removal as well as installation of a coffer dam and dewatering system to be installed at the upstream end of the sediment excavation area. Dewatering activities upstream of Rindge Dam would begin in March, and sediment excavation and disposal operations would begin in April and end around October 15.

Construction debris would be removed from the site by trucking to the Calabasas Landfill. This is an existing, permitted, operating landfill for trash and debris that is licensed to accept construction debris. As such there would be no direct environmental impacts to biological resources beyond those addressed in landfill operations.

During these activities, construction BMPs would be in place to avoid and reduce erosion of disturbed areas. Work would stop, all equipment would be removed, and the site stabilized prior to the rainy season. Work would commence again in early spring, weather permitting.

Following removal of the Dam and impounded sediment, the stream bed would be restored to a natural condition. As the majority of sediment in the stream is currently begin carried over the Dam, no major changes in sediment deposition downstream in Malibu Creek are expected under this alternative.

Vegetation and Sensitive Habitat Impacts

Currently, the reach from Rindge Dam to Cold Creek includes 28 acres of riparian/aquatic habitat, all of which is considered to be a sensitive biological habitat. This includes approximately 7.5 acres of jurisdictional waters on Malibu Creek, and includes patchily distributed minor wetlands. During construction, impacts include temporary fill, removal, and disruption of wetland function. However, upon complete removal of the dam, wetland habitats are expected to recover and return to a more natural state than pre-construction conditions as natural hydrology returns to the site. Since the reservoir behind the dam is currently filled with sediment, and incoming sediment predominantly passes through the system as a result, removing the dam itself will not result in substantial changes, compared to the no action scenario, to downstream sedimentation or impacts to waters or wetlands downstream (except as discussed under the natural sediment transport options below). As such, impacts under variations of Alternative 2 to habitats and protected waters are short-term and not considered substantially adverse effects (Criteria 2 and Criteria 3).

Natural transport options (Alternatives 3 and 4) are expected to result in significant deposition of sediment below Rindge Dam as a result of natural sediment transport. This would include fill to wetlands and waters of the United States, and would constitute a substantial adverse impact (Criteria 3) for Alternatives 3 and 4).

Vegetation at the sediment impoundment area behind Rindge Dam consists of riparian woodland, including native and non-native species. Much of the vegetation has colonized the impounded sediment as well as the riparian corridor behind the Dam and would be removed during Dam and sediment removal. Upon completion of sediment removal, the natural channel would be restored to pre-Dam contours to the extent possible, and the riparian corridor would be re-vegetated with native species. The native trees and shrubs observed contributing to the canopy include southern California black walnut (*Juglans californica),* Mexican elderberry (*Sambucus mexicana*), and California bay laurel (*Umbellularia californica*), with native shrubs such as coyote brush (*Baccharis pilularias*), mule fat (*Baccharis saliscifolia*), Plummer Baccharis (*Baccharis plummerae* var. *plummerae*), virgin's bower (*Clematis ligusticifolia*), pipestem clematis (*Clematis lasiantha*), toyon (*Heteromeles arbutifolia*), laurel sumac (*Malosma laurina*), monkey flower (*Mimulus guttatus*), and nightshades (*Solanum* spp.). Non-native species include gum (*Eucalyptus* spp.) and Peruvian pepper tree (*Schinus molle*) would not be included in the re-vegetation efforts and would be removed during post-construction maintenance of the planted areas.

Existing and new access ramps from the sediment impoundment are to Malibu Creek Road would traverse a vegetation community consisting of laurel sumac co-dominated in some areas by black sage (*Salvia mellifera)* or California lilac (*Ceanothus spp.).*

Construction of all the project features includes the temporary loss of vegetation and sensitive habitats at the Dam site due to clearing and grubbing, borrow, staging, and other construction activities. Upon completion of construction, all disturbed areas, including access ramps, would be re-vegetated with the appropriate native vegetation. This would include planting native riparian vegetation and removing non-native vegetation along the restored channel banks of Malibu Creek. Areas along access ramps between the Dam and Malibu Canyon Road would be restored with laurel sumac and associated native vegetation. Since native, diverse vegetation will be replanted upon completion of construction, no impacts to vegetative diversity are anticipated as the result of any project alternative (Criteria 8). As a result of the project's restoration activities, there would be no substantial net loss of habitat or habitat value, or substantial loss to any native wildlife or plant populations (Criteria 2 and 5).

Wildlife Impacts

Construction of all the project features includes the use of numerous construction vehicles. Contact between these vehicles and wildlife may injure or kill reducing local population numbers. While construction may cause adverse impacts by temporarily barring movement of fish or wildlife, or cause harm through contact with construction equipment, these impacts are not expected to be substantial (Criteria 4). Additionally, construction materials, such as soil, fuels, or lubricants, may spill or otherwise enter the river during construction. Construction materials often have chemical properties that can be detrimental to fish, amphibians, and other aquatic species. Furthermore, in-stream construction would require diversion of the stream flow and work within the stream channel. These activities may induce sediment movement or may cause harm to fish through contact with construction equipment. Finally, introduction of loud noises into the environment may alter feeding, nesting, and resting habits of wildlife, particularly birds.

Many wildlife species would be expected to move away from construction areas such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. Therefore, there is not expected to be a substantial loss to the population of any native fish or wildlife species (Criteria 5).The more mobile wildlife species such as birds would be expected to move away from the disturbances created by construction activities, unless they occur during nesting season. Migratory birds are protected by the Migratory Bird Treaty Act (MBTA). Impacts to nesting species will be avoided by conducting clearing and grubbing activities prior to the start of the nesting season thus removing potential nesting habitat from the construction areas. Project alternatives will not result in a substantial loss in the overall diversity of wildlife species within the project footprint, and therefore less than significant impacts under Criteria 8 are anticipated.

Special-Status Species Impacts

Removal of Rindge Dam has the potential to impact special-status species in the same manner as vegetation and wildlife impacts described above. **Table 5.4-1** and **Table 3.4-3** lists special-status species analyzed as part of this Integrated Report (compiled from the USFWS list for Los Angeles County and CNDDB list for Malibu Beach quadrangle) and the location where each species has the potential to occur. Species listed as having no potential to occur in **Table 3.4-2** were not carried forward into this section for assessment. The following abbreviations are used throughout this section: FE-Federally Endangered, FT-Federally Threatened, SE-State Endangered, ST-State Threatened, CSC-California Species of Concern, and CNPS- California Native Plant Society.

Table 5.4-1 also provides information on the potential for each species to be affected by the removal of Rindge Dam and spillway. (Impacts to protected species due to other project components are discussed in the appropriate sections below). Those species that have some potential to be affected are summarized in the paragraphs following **Table 5.4-1**, with Proposed Conservation Measures, which are incorporated as project features, to reduce potential effects to each species. Based on the species-specific discussions contained below, no substantial adverse effects, either direct or indirect, or through habitat modification, to any special status or sensitive species are anticipated (Criteria 1).

Table 5.4-1 Potential for Impacts on Special-Status Species due to Removal of Rindge Dam

Species	Status	Potential for Occurrence	Potential for Impacts
Plants			
Braunton's milk vetch (*Astragalus brauntonii*)	FE, 1B	No potential.	No effect.
Coulter's goldfields (Lasthenia glabrata ssp. Coulteri)	1B	Low potential.	No direct impacts.
Davidson's saltscale (Atriplex serenana var. davidsonii)	1B	Low potential	No direct impacts.
Lyons's pentachaeta (*Pentachaeta lyonii*)	FE, CE, 1B	No potential	No effect
Malibu baccharis (Baccharis malibuensis)	1B	Low potential	May affect, if present.
Marcescent dudleya (Dudleya cymosa ssp. marcescens)	FT, CR, 1B	Low potential	May affect, if present.
Santa Monica dudleya (Dudleya cymosa ssp. ovatifolia)	FT, 1B	Low potential	May affect, if present
Plummer's mariposa lily (*Calchortus plummerae*)	4.2	No potential	No direct impacts.
Round-leaved filaree (*California macrophylla*)	1B	Potential	Direct impact, if present.
Sonoran maiden fern (Thelypteris puberula var. sonorensis)	2B	Low potential	Direct impact, if present.
Fish			
Arroyo chub (*Gila orcutti)*	CSC	Observed in Malibu Creek and potential to occur in upstream tributaries.	Direct impact, if present.
Southern California steelhead (*Oncorhynchus mykiss)*	FE, CSC	Observed in Malibu Creek downstream of Rindge Dam	Likely to affect. Likely to adversely modify critical habitat.
Tidewater goby (Eucyclogobius newberryi)	FE, CT	Observed in Malibu Lagoon.	No affect.
Amphibians			

Species	Status	Potential for Occurrence	Potential for Impacts
Coast range newt (Taricha torosa torosa)	CSC	Low potential.	Direct impact, if present.
Reptiles			
California horned lizard (Phrynosoma coronatum frontale)	CSC	Low potential	Direct impact, if present.
Coast patch-nosed snake (Salvadora hexalepis vigultea)	CSC	Low potential	Direct impact, if present.
Coastal whiptail (Aspidoscelis tigris stejnegeri)	CSC	Low potential	Direct impact, if present.
San Diego mountain kingsnake (Lampropeltis zonata parvirubra)	CSC	Low potential	Direct impact, if present.
Silvery legless lizard (Anniella pulchra pulchra)	CSC	Low potential	Direct impact, if present.
Two-striped garter snake (*Thamnophis hammondii)*	CSC	Potential	Direct impact, if present.
Western pond turtle (*Emys marmorata)*	CSC	Low potential	Direct impact, if present.
Birds			
Peregrine falcon (Falco peregrinus anatum)	CE	Low potential	No direct impacts.
California least tern (Sterna antillarum browni)	FE, CE	No potential	No effect.
Cooper's hawk (Accipiter cooperii)	CSC	Low potential	No direct impacts.
Golden eagle (Aquila chrysaetos)	CSC	Potential to occur.	No direct impacts.
Least Bell's vireo (Vireo bellii pusillus)	FE; CE	Low potential.	May affect if present.
Western snowy plover (Charadrius nivosus nivosus)	FT	No potential	No affect.
Mammals			
California leaf-nosed bat (*Macrotus californicus*)	CSC	Potential	Indirect impacts, if present.
Spotted bat (Euderma maculatum)	CSC	Potential	Indirect impacts, if present.
Western Mastiff Bat (Eumops perotis californicus)	CSC	Potential	Indirect impacts, if present.
Yuma myotis (Myotis yumanensis)	CSC	Potential	Indirect impacts, if present.

FE= Federal Endangered
FT = Federal Threatened Species
FC = Federal candidate species
CE = California Endangered
CT = California Threatened
CSC = California Species of Concern
CNPS = California Native Plant Society

Special-Status Species with Potential to Occur and Proposed Conservation Measures

Plants

Malibu baccharis (Baccharis malibuensis), Marcescent dudleya (Dudleya cymosa ssp. marcescens), Santa Monica dudleya (Dudleya cymosa ssp. ovatifolia), Round-leaved filaree (California macrophylla), Sonoran maiden fern (Thelypteris puberula var. sonorensis)

These species have low potential to occur at the dam site or within the access road. Pre-construction surveys at the appropriate time of year will determine of any are present. If not present, the project would have no effect/no direct impact. If present, conservation measures would mitigate impacts to less than significant.

Proposed Conservation Measures

Prior to the implementation of vegetation removal or sediment deposition, a USFWS-approved biologist would conduct surveys. If no special-status plant species are observed, then no further conservation measures would be implemented. If any of these special-status plant species are determined to be present on site, then individual plants would be enumerated, photographed, and flagged. Timing of field surveys would correspond with blooming or growth seasons when species are conspicuous and recognizable. Seed collection from individuals with mature seed that are likely to be impacted would be conducted for post-construction propagation.

Fish

Arroyo Chub (Gila orcutti) CSC

Arroyo chub may occur within Malibu Creek both downstream and upstream of Rindge Dam in areas that are slow moving and contain mud bottoms. They may also be present in upstream tributaries with suitable habitat. Direct effects could occur if arroyo chub are present within waters where construction would occur for Dam and sediment removal efforts and for removal/modification of upstream barriers. Habitat for arroyo chub would also be affected during these activities. During and following Dam removal, release of sediment would have the potential to affect arroyo chub and its habitat. BMPs listed in the Mitigation Measures for water quality (Section 5.3) will reduce the likelihood for accidental releases or chemical contaminants as well as reducing turbidity impacts to waters below the dam.

Proposed Conservation Measures

During work within channels where arroyo chub could occur (including upstream tributaries), measures would be taken to avoid or reduce impacts on arroyo chub under the supervision of a qualified fisheries biologist and in coordination with USFWS and CDFW. Surveys will be conducted within the sediment and dam removal areas. If needed, a fish rescue and relocation effort plan will be developed prior to commencing work in areas where this species occurs and exclusion barriers are needed to divert flow around the work area. The fish rescue and relocation will be conducted under the supervision of a qualified biologist and will entail measures to reduce effects to arroyo chub and other fish associated with in-water construction activities.

Southern California Steelhead (Oncorhynchus mykiss) FE

The proposed project has the possibility of adversely modifying critical habitat by the addition of fine sediments during project construction. Some downstream areas are expected to accumulate sediments while others may see increased erosion. The reach immediately downstream of the dam is expected to be one of those areas. Due to the higher likelihood of impacts to the immediate downstream reach, the USACE is proposing to catch and relocate any steelhead found in the pool located at the face of the dam prior to the initiation of construction activities. Catch, transport, and relocation will be conducted in consultation with the NMFS and will be repeated each year prior to the initiation of construction activities for that year. Construction will not be conducted during the winter rainy season, thus not affecting the species or its critical habitat during times when the lagoon is more likely to be open allowing access to and from the ocean.

Construction impacts at the dam and in the downstream reaches will likely adversely impact critical habitat. Construction BMPs will minimize turbidity effects to the maximum extent feasible. These include channelizing the creek flow around the work area, revegetation of disturbed areas, sloping the final impound surface at the end of each construction year, cutting the Dam simultaneously with reducing impound elevations, construction of a cofferdam for control of flows, removal of the cofferdam during the winter season, development of slope stability measures for groundwater saturation, and construction ramp stability measures. Additionally, a storm water pollution prevention plan (SWPPP) will be prepared to address potential impacts to storm water from construction equipment, construction crews, and construction practices. The SWPPP shall include best management practices to prevent accidental spills and other contamination of Malibu Creek, and shall include provisions for in-the-dry construction at the barrier sites, and regular monitoring of water quality, including turbidity, during construction and in the winter runoff season. The SWPPP will include a provision for adaptive measures to be taken in the event of excess contamination or turbidity. However, long term impacts are beneficial and will lead to performance of an important recommendation of the southern California recovery plan. BMPs listed in the Environmental Commitments will reduce the likelihood for accidental releases or chemical contaminants as well as reducing turbidity impacts to waters below the dam.

Proposed Conservation Measures

In order to avoid direct affects to steelhead during Dam removal activities, pre-construction surveys will be conducted to identify the presence/absence of fish below the Dam within the construction zone. The construction zone will be defined in the engineering designs. While construction would occur outside of the migratory season for steelhead, juvenile steelhead are likely to occur in the Malibu Lagoon and in Malibu Creek pools below Rindge Dam. A fish rescue and relocation effort plan will be developed prior to commencing work in pools in the reach downstream of the Dam. The fish rescue and relocation will be conducted under the supervision of a qualified biologist and will entail measures to reduce effects to steelhead.

Tidewater Goby (Eucyclogobius newberryi)

Construction practices for controlling construction debris will ensure that no debris enters Malibu Creek in sufficient quantity to affect water quality at the lagoon. Therefore, dam removal would have no effect on this species.

Amphibians

Coast Range Newt (Taricha torosa torosa) CSC

Chaparral, oak woodlands, and grasslands within the project area could provide habitat for the coast range newt. Construction activities such as sediment and Dam removal will alter existing habitat and may cause direct mortality due to heavy equipment usage should newts occur in the area. As with all construction activities, accidental release of fuel, oil, and other contaminants may occur. Construction BMPs listed in the Mitigation Measures for Water Quality (Section 5.3) will reduce the likelihood for accidental releases.

Prior to the implementation of construction activities, a qualified biologist would conduct surveys to ensure no newts are present within the area in which construction activities are to occur. If no newts are observed, then no further conservation measures would be implemented. If newts are present, they will be captured and relocated to suitable habitat in consultation with CDFW.

Reptiles

California Horned Lizard (Phrynosoma coronatum frontale) CSC, Coast patch-nosed snake (Salvadora hexalepis virgultea) CSC, Coastal whiptail (Aspidoscelis tigris stejnegeri) CSC, San Diego mountain kingsnake (Lampropeltis zonata parvirubra) CSC, Silvery legless lizard (Anniella pulchra pulchra) CSC, Two-striped garter snake (Thamnophis hammondii) CSC, Western Pond Turtle (Emys marmorata) CSC

These species have low potential to occur at the dam site or within the access road. Pre-construction surveys at the appropriate time of year will determine of any are present. If not present, the project would have no effect/no direct impact. If present, conservation measures would mitigate impacts to not significant.

<u>*Proposed Conservation Measures*</u>

Prior to the implementation of construction activities, a qualified biologist would conduct surveys to ensure no special statues reptiles are present within the area in which construction activities at Malibu Creek are to occur. If no special status reptiles are observed, then no further conservation measures would be implemented. If any of these species are present, they will be captured and relocated to suitable habitat in consultation with CDFW.

Birds

Peregrine Falcon (Falco peregrinus anatum)

Peregrine falcons may use the Project Site for nesting and foraging. Heavy equipment usage would create a high level of noise disturbance. This noise disturbance could affect nesting success and may alter feeding behavior.

Cooper's hawk (Accipiter cooperii)

Cooper's hawk may use the Project Site for foraging. Heavy equipment usage would create a high level of noise disturbance. This noise disturbance may alter feeding behavior. However, construction noise would encourage non-nesting Cooper's hawks to relocate to other portions of their large, extensive ranges.

Golden Eagle (Aquila chrysaetos)

Golden eagles are protected by the Bald and Golden Eagle Protection Act and are not a listed species under the Endangered Species Act. The Act prohibits the "take" of golden eagles, which includes intentional disturbance. Golden eagles may use the Project Site for nesting and foraging. Heavy equipment usage would create a high level of noise disturbance. This noise disturbance could affect nesting success and may alter feeding behavior. In order to minimize effects on these three species the following conservation measures will be implemented.

Proposed Conservation Measures

Removal of vegetation at the project site will occur prior to the start of bird nesting in order to avoid impacts to nesting birds, such as the golden eagle. This timing will prevent project-related impacts to nesting golden eagles. Construction noise would encourage non-nesting golden eagles to relocate to other portions of their large, extensive ranges.

Least Bell's Vireo (Vireo bellii pusillus) FE, SE

This species is found within riparian habitats. They are not known to occur within the project area, but suitable habitat for the species has been identified. The USACE shall conduct pre-construction surveys for least Bell's vireo in all areas supporting suitable habitat that may be affected by the project. Presence/absence of this species shall be determined prior to construction activities.

Proposed Conservation Measures

Prior to the implementation of construction activities, a qualified biologist would conduct pre-construction surveys for presences/absences of territorial males within the area in which construction activities at Malibu Creek are to occur. If no vireo are observed, then no further conservation measures would be implemented. If these species are present a monitoring and avoidance plan shall be worked out in consultation with the USFWS.

Mammals

California leaf-nosed bat (Macrotus californicus) CSC, Spotted bat (Euderma maculatum) CSC, Western Mastiff Bat (Eumops perotis californicus) CSC, Yuma myotis (Myotis yumanensis)

Bat species may occur throughout the project area in trees, along cliffs, and foraging over project habitats. Dam and sediment removal activities may directly remove trees along Malibu Creek that may be used as roosting habitat or may cause noise disturbance to other roosting colonies. This noise disturbance could affect reproductive success and may alter feeding behavior. In order to minimize effects on these two species the following conservation measures will be implemented.

Proposed Conservation Measures

Prior to the implementation of construction activities, a qualified biologist would conduct surveys to determine if bat roosts are present within the project area, particularly trees to be removed. If no bats are observed, then no further conservation measures would be implemented. If bats are found during an August – October survey, appropriate exclusion devices approved by CDFW and the USFWS shall be installed by a qualified bat biologist. Once the bats have been excluded, tree removal may occur. Exclusion devices shall be placed by a qualified bat biologist in accordance with CDFW and USFWS guidance.

Long-Term Impacts

Long term impacts associated with removal of only the dam arch, compared to removal of both the dam arch and spillway, are identical. Therefore the following discussion of long term impacts apply to both.

Vegetation and Sensitive Habitat Impacts

After Rindge Dam and impounded sediments behind the Dam have been removed, significant changes in sediment bed elevation would occur in areas of the creek as a more natural hydrologic and sediment regime is reestablished. The USACE's hydrodynamic model predicts that directly downstream of the Dam location, up to 2.9 ft of scour would occur, whereas reaches further downstream would experience significant sediment deposition, up to 12.8 ft. The model predicts that by 50 yrs following Dam removal, the creek's sedimentation regime will have stabilized, with one-decade changes in bed elevation of less than one foot.

In the years immediately following Dam removal, vegetation composition and habitat diversity may be impacted in riparian areas along reaches where significant scour occur. For instance, riparian vegetation that has become established in the low-gradient areas upstream of the Dam caused by the Dam's presence could be lost from scour. However, native riparian vegetation such as willow (*Salix*, spp.), is adapted and can quickly reestablish following scour, whereas non-native, invasive vegetation such as giant reed or Arundo (*Arundo donax*) is less able to reestablish after scour. In addition, habitat restoration efforts, as described Revegetation and Planting Plan above, would be conducted to restore native vegetation and remove and control invasive vegetation. This would be a beneficial impact.

In the long-term, wetlands and associated aquatic vegetation would be reestablished with the stabilization of a natural hydrologic and sediment regime. Once the Dam is removed, natural sediment regeneration will occur. Aquatic vegetation will benefit from associated nutrient movement downstream. Therefore, while there will be temporary impacts to wetlands, no long-term substantial adverse impacts are anticipated (Criteria 3).Upland construction areas include access ramps from the Dam and the staging area at Sheriff's Overlook. These areas consist of vegetation dominated by laurel sumac, as described above. Although construction will have adverse impacts due to temporary removal and modification of these habitats, project features calling for re-vegetation of the site and a habitat restoration program would offset temporary construction-related impacts.

After construction is completed, the project would require minimal operation and maintenance (O&M) usually during dry seasons. These measures are usually related to removal of invasive plant species and the maintenance of native plant species. The efforts would be the same as for Alternative 1, the No Action Alternative. Therefore, no long-term substantial adverse effect or net loss of sensitive habitat or habitat value is expected as a result of removing the dam and/or spillway (Criteria 2).

Wildlife Impacts

In the years immediately following Dam removal, significant scour and/or deposition is predicted to occur in several areas of Malibu Creek. This may result in reduction of numbers of local populations of aquatic invertebrates. However, aquatic wildlife species are adapted to the “flashy” hydrology of Malibu Creek and are able to quickly recover from local changes in their habitat.

Long-term improvement to riparian and other creek habitats will provide benefits to wildlife as the natural vegetation composition of riparian and aquatic habitats would be reestablished and non-native vegetation removed and controlled. Native vegetation communities provide foraging and breeding habitat to which wildlife are adapted.

Additionally, with the removal of the Dam an important wildlife corridor would be reestablished along Malibu Creek, and wildlife, including fish, amphibians, reptiles, small mammals and invertebrates, would be able to move from areas downstream of the Dam to upstream, and vice versa. This will provide benefits in increasing the amount of habitat available for these species, making them less vulnerable to disease and other environmental stressors. Increased movement could also increase genetic diversity in previously separate populations. Therefore, no substantial impedance of movement or migration of wildlife is expected, and the long-term impacts on wildlife movement will be beneficial (Criteria 4).

Long-term impacts to wildlife within upland construction areas would be similar to those discussed under vegetation. Long-term restoration of the native vegetation community would provide foraging and breeding habitat for wildlife in these areas. No substantial long-term loss of any native fish, wildlife, or vegetation populations are expected (Criteria 5).

Long-term impacts from increased turbidity in the nearshore and marine habitats of the three proposed beach replenishment locations is not anticipated to exceed existing conditions. Therefore, long-term impacts will be less than significant. Beaches would benefit from the addition of sand providing enhanced recreational activities and protection from oceanic storm waves to coastal infrastructure.

Special-Status Species Impacts

The amount of sedimentation predicted in downstream reaches following removal of Rindge Dam and mechanical transport of sediments is not expected to adversely impact steelhead, tidewater goby, or other native fish species. Overall, modifications to natural habitats would result in long-term benefits to special-status species through the enhancement of riparian and aquatic habitat. Specifically, steelhead would benefit from additional habitat that would be made available upstream of the Dam. In the long term, a more natural sediment regime would increase the diversity of aquatic habitat types, including spawning and rearing habitat for steelhead.

Special-Status Species Conservation Measures and Mitigation Measures would reduce long-term impacts to any special-status species with potential to occur in upland construction areas. Therefore, no long-term substantial adverse effects through habitat modifications to any special status species are anticipated (Criteria 1). Restoration of the native vegetation community would provide foraging and breeding habitat in the long-term.

Level of Significance

Impacts from dam removal would be insignificant with implementation of mitigation and conservation measures for either removal of the entire dam, including the spillway, or removal of the dam only.

Upstream Barriers

Construction Impacts

Impacts to vegetation and sensitive habitats, wildlife, and special-status species are described for each upstream barrier in the following paragraphs. Based on coordination with resource agencies, including USFWS, NMFS, and CDFW, and by complying with applicable wildlife regulations, there will be no short or long-term conflicts with any local policies or ordinances (Criteria 6), or conflicts with any adopted HCP, NCCO, or similar plans (Criteria 7) as a result of removing the upstream barriers.

As described below for each barrier, and similarly to the impacts described above for dam and/or spillway removal, no substantial net loss of habitat value or sensitive biological habitats will occur due to removal of upstream barriers (Criteria 2). No substantial adverse effects due to habitat modification to any special status species would occur as a result of upstream barrier removal (Criteria 1). Removal of upstream barriers will result in a long-term benefit to wildlife movement, particularly for aquatic species, and therefore there will be no substantial impedance to movement or migration (Criteria 4). Removal of upstream barriers will not result in a substantial loss to any fish, wildlife, or vegetation populations (Criteria 5), and will not result in a substantial loss in overall ecosystem biodiversity (Criteria 8).

Within the project footprint at upstream barrier sites, approximately 0.65 acres of waters of the United States on Cold Creek and approximately 1.7 acres of waters of the United States on Las Virgenes Creek will be temporarily impacted. As described for dam removal above, temporary impacts include temporary fill, and removal and disruption of wetland function. Impacts to wetlands during construction will be minimized through the implementation of Mitigation Measures described in this section, as well as Section 5.3, and are not considered substantial adverse impacts (Criteria 3).

Upstream Barrier Removal LV1 – Crags Road Culvert Crossing

Removal and replacement of this crossing would require removal of native riparian and wetland vegetation along the creek, and removal of upland vegetation within the staging area. The creek flow would have to be diverted during construction, and the creek bottom would be graded.

All areas that are cleared will be restored once construction is complete. Construction would take approximately 13 days.

Temporary impacts would occur to vegetation and wildlife habitats. There would be potential for direct mortality or harm to wildlife from contact with construction vehicles in aquatic and upland habitats. Stream macroinvertebrates, a prey source for many aquatic species, would be depleted in this localized area. Many common wildlife species would be expected to move away from the localized construction areas at each barrier such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. The more mobile wildlife species such as birds would be expected to move away from the construction disturbances, unless they occur during nesting season. During water diversion, there could be adverse effects to aquatic species from increased turbidity from releases of disturbed soils to the surface waters and water quality effects from releases of construction-related hazardous materials.

In addition, there would be potential for direct mortality or harm to special-status species with potential to occur within the construction area for LV1, including arroyo chub, coast range newt, western pond turtle, least Bell's vireo, California leaf nosed bas, spotted bat, western mastiff bat and Yuma myotis. Plants could be removed or destroyed, and there could be impacts to wildlife from contact with construction vehicles in aquatic and upland habitats, modification of habitat, or disturbance during nesting. Proposed Conservation Measures specific to these species would be implemented to reduce these impacts to less than significant.

Temporary impacts to vegetation, common wildlife species, and special-status species would be potentially significant. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant. In addition, restoration measures calling for re-vegetation of the site and a habitat restoration program would reduce impacts to vegetation communities to a less-than-significant level. Implementation of the mitigation measures will ensure that impacts on wildlife are less than significant. With implementation of the proposed Special-Status Species Conservation Measures and mitigation measures, impacts to special-status species would be less than significant.

Construction noise would likely cause motile species to avoid the site during construction. Plentiful nesting/foraging habitat exist in the immediate vicinity that would allow species to shift temporarily with no adverse impact during the short construction duration for the site.

With re-vegetation and natural colonization of macroinvertebrates to the stream, there would be no long-term effects to vegetation or wildlife. In the long-term, removal of this barrier would provide benefits by allowing fish, including steelhead, access to Las Virgenes Creek and Liberty Canyon Creek.

Upstream Barrier Removal LV2 – White Oak Farm Dam

Removal of the Dam would require removal of native riparian and wetland vegetation along the creek, and removal of upland vegetation within the staging area. However, work in the creek would be kept limited as the White Oak Dam will be removed by a backhoe stationed on the creek bank. Water diversion would not be required. Demolition is estimated to take 15 days over the course of three years. Vegetation clearing would be limited to a small area for the backhoe, and would be cleared every year of White Oak Dam removal. All areas that are cleared will be restored once the White Oak Dam removal is completed. Once the White Oak Dam is removed no further work will be done to restore the creek.

Temporary impacts would occur to vegetation and wildlife habitats. There would be potential for direct mortality or harm to wildlife from contact with construction vehicles within the limited area of disturbance. Impacts to the macroinvertebrate population would be very limited. Common wildlife species would be expected to move away from the localized construction areas at each barrier such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. The more mobile wildlife species such as birds would be expected to move away from the construction disturbances, unless they occur during nesting season.

In addition, there would be potential for direct mortality or harm to special-status species with potential to occur within the construction area for LV2, including arroyo chub, coast range newt, western pond turtle, least Bell's vireo, California leaf-nosed bat, spotted bat, western mastiff bat, and Yuma myotis. Plants could be removed or destroyed, and there could be impacts to wildlife from contact with construction vehicles in aquatic and upland habitats, modification of habitat, or disturbance during nesting. Proposed Conservation Measures specific to these species would be implemented to reduce these impacts to less than significant.

Temporary impacts to vegetation, common wildlife species, and special-status species would be limited to the small work area required for White Oak Dam removal. In addition, restoration measures calling for re-vegetation of the site and the habitat restoration program would ensure less than significant impacts to vegetation communities. Implementation of the mitigation measures will ensure that impacts on wildlife are less than significant. With implementation of the proposed Special-Status Species Conservation Measures and mitigation measures, impacts to special-status species would be less than significant.

With re-vegetation and natural colonization of macroinvertebrates to the stream, there would be no long-term effects to vegetation or wildlife. In the long-term, removal of this barrier would provide benefits by allowing fish, including steelhead, further access to Las Virgenes Creek.

<u>Upstream Barrier Removal LV3 and LV4 – Lost Hills Road Culvert and Meadow Creek Lane Crossing</u>

At these barriers, a low flow channel would be constructed along the invert of each structure and along the portion of the stream between LV3 and LV4. The low flow channel for LV3 will be built on top of the existing concrete invert, and the drop at the downstream end of the concrete invert of LV4 would not be modified. The invert of the creek between LV3 and LV4 will have to be cleared and re-graded to provide a low flow channel to connect the concrete channels along LV3 and LV4. Additional clearing would be required at the designated staging area for the project and along any invert access ramps. The creek flow would be diverted during construction of both of the concrete low flow channels and while the creek invert between LV3 and LV4 is being re-graded. Limited dewatering would be necessary along the creek between LV3 and LV4 to ensure adequate working conditions for construction equipment. Disturbed areas will be restored once construction is complete. Construction is estimated to take 50 days.

Temporary impacts would occur to vegetation and wildlife habitats. However, the existing concrete channel does not support macroinvertebrates and there is limited in-channel vegetation in locations where sediment collects. There would be potential for direct mortality or harm to wildlife from contact with construction vehicles within the limited area of disturbance. Common wildlife species would be expected to move away from the localized construction areas at each barrier such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. The more mobile wildlife species such as birds would be expected to move away from the construction disturbances, unless they occur during nesting season.

Given the disturbed nature of the habitats at LV3 and LV4, no special-status species are expected to occur there or be affected during construction activities.

Temporary impacts to vegetation and common wildlife species would be limited due to the small work area required and the lack of biological resources in these concrete structures. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to less than significant. In addition, restoration measures calling for re-vegetation of the site and the habitat restoration program would ensure less than significant impacts to vegetation communities. Implementation of the mitigation measures will ensure that impacts on wildlife are less than significant. With implementation of the proposed Special-Status Species Conservation Measures and mitigation measures, impacts to special-status species would be less than significant.

With re-vegetation, there would be no long-term effects to vegetation or wildlife. In the long-term, removal of this barrier would provide benefits by allowing aquatic species, including steelhead, further access to Las Virgenes Creek.

Upstream Barrier Removal CC1- Piuma Pipe Arch Culvert

Removal and replacement of this culvert would require removal of native riparian and wetland vegetation along the creek, and removal of upland vegetation within the staging area. The creek flow would have to be diverted during construction, and the creek bottom would be re-graded.

The concrete invert of the creek will be replaced with a natural channel. All areas that are cleared will be restored once construction is complete. Construction would take 30 days.

Temporary impacts would occur to vegetation and wildlife habitats. There would be potential for direct mortality or harm to wildlife from contact with construction vehicles in aquatic and upland habitats. Stream macroinvertebrates, a prey source for many aquatic species, would be depleted in this localized area. Many common wildlife species would be expected to move away from the localized construction areas at each barrier such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. The more mobile wildlife species such as birds would be expected to move away from the construction disturbances, unless they occur during nesting season. During water diversion, there could be adverse effects to aquatic species from increased turbidity from releases of disturbed soils to the surface waters and water quality effects from releases of construction-related hazardous materials.

In addition, there would be potential for direct mortality or harm to special-status species with potential to occur within the construction area for CC1, including arroyo chub, coast range newt, western pond turtle, least Bell's vireo, California leaf-nosed bat, spotted bat, western mastiff bat, and Yuma myotis. Plants could be removed or destroyed, and there could be impacts to wildlife from contact with construction vehicles in aquatic and upland habitats, modification of habitat, or disturbance during nesting. Proposed Conservation Measures specific to these species would be implemented to reduce these impacts to less than significant.

Temporary impacts to vegetation, common wildlife species, and special-status species would be potentially significant. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant. In addition, restoration measures calling for re-vegetation of the site and a habitat restoration program would reduce impacts to vegetation communities to a less-than-significant level. Implementation of the mitigation measures will ensure that impacts on wildlife are less than significant. With implementation of the proposed Special-Status Species Conservation Measures and mitigation measures, impacts to special-status species would be less than significant. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant.

Construction noise would likely cause motile species to avoid the site during construction. Plentiful nesting/foraging habitat exist in the immediate vicinity that would allow species to shift temporarily with no adverse impact during the short construction duration for the site.

With re-vegetation and natural colonization of macroinvertebrates to the stream, there would be no long-term effects to vegetation or wildlife. In the long-term, removal of this barrier would provide benefits by allowing fish, including steelhead, access to Cold Creek.

Upstream Barrier Removal CC2 – Malibu Meadows Road Bridge

Removal and replacement of this bridge would require removal of native riparian and wetland vegetation along the creek, and removal of upland vegetation within the staging area. The creek flow would have to be diverted during construction, and the creek bottom would be re-graded.

The concrete invert of the creek will be replaced with a natural channel. All areas that are cleared will be restored once construction is complete. Construction would take 30 days.

Temporary impacts would occur to vegetation and wildlife habitats. There would be potential for direct mortality or harm to wildlife from contact with construction vehicles in aquatic and upland habitats. Stream macroinvertebrates, a prey source for many aquatic species, would be depleted in this localized area. Many common wildlife species would be expected to move away from the localized construction areas at each barrier such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. The more mobile wildlife species such as birds would be expected to move away from the construction disturbances, unless they occur during nesting season. During water diversion, there could be adverse effects to aquatic species from increased turbidity from releases of disturbed soils to the surface waters and water quality effects from releases of construction-related hazardous materials.

In addition, there would be potential for direct mortality or harm to special-status species with potential to occur within the construction area for CC2, including arroyo chub, coast range newt, western pond turtle, least Bell's vireo, California leaf-nosed bat, spotted bat, western mastiff bat, and Yuma myotis. Plants could be removed or destroyed, and there could be impacts to wildlife from contact with construction vehicles in aquatic and upland habitats, modification of habitat, or disturbance during nesting. Proposed Conservation Measures specific to these species would be implemented to reduce these impacts to less than significant.

Temporary impacts to vegetation, common wildlife species, and special-status species would be potentially significant. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant. In addition, restoration measures calling for re-vegetation of the site and a habitat restoration program would reduce impacts to vegetation communities to a less-than-significant level. Implementation of the mitigation measures will ensure that impacts on wildlife are less than significant. With implementation of the proposed Special-Status Species

Conservation Measures and mitigation measures, impacts to special-status species would be less than significant.

Construction noise would likely cause motile species to avoid the site during construction. Plentiful nesting/foraging habitat exist in the immediate vicinity that would allow species to shift temporarily with no adverse impact during the short construction duration for the site.

With re-vegetation and natural colonization of macroinvertebrates to the stream, there would be no long-term effects to vegetation or wildlife. In the long-term, removal of this barrier would provide benefits by allowing fish, including steelhead, access to additional habitat on Cold Creek.

Upstream Barrier Removal CC3 – Crater Camp Road Bridge

Construction activities and duration for removal and replacement of this bridge would be similar to that discussed for the Malibu Meadows Road Crossing (CC2). Impacts would be similar to those discussed for the Malibu Meadows Road Crossing.

Upstream Barrier Removal CC4 – Cold Creek Barrier (Dam)

Removal of the Cold Creek Barrier was completed by the Mountains Restoration Trust in 2016.

Upstream Barrier Removal CC5 – Cold Canyon Road Culvert

The existing 25 ft diameter concrete culvert cannot be removed so a low flow channel would be built along the culvert’s invert to allow fish passage upstream. The creek invert near the inlet of the culvert will have to be cleared and re-graded to ensure flows can enter the low flow channel. Creek flows would need to be diverted during construction, which is estimated to take 15 days.

Temporary impacts would occur to vegetation and wildlife habitats. While the existing culvert does not support macroinvertebrates or vegetation, these resources do exist at the inlet which would be re-graded. There would be potential for direct mortality or harm to wildlife from contact with construction vehicles in aquatic and upland habitats. Stream macroinvertebrates, a prey source for many aquatic species, would be depleted in this localized area. Many common wildlife species would be expected to move away from the localized construction areas at each barrier such that local populations of common wildlife species would be expected to quickly recover even if the loss of some individuals occurs. The more mobile wildlife species such as birds would be expected to move away from the construction disturbances, unless they occur during nesting season. During water diversion, there could be adverse effects to aquatic species from increased turbidity from releases of disturbed soils to the surface waters and water quality effects from releases of construction-related hazardous materials.

In addition, there would be potential for direct mortality or harm to special-status species with potential to occur within the construction area for CC5, including arroyo chub, coast range newt, western pond turtle, least Bell’s vireo, and western mastiff bat. Plants could be removed or destroyed, and there could be impacts to wildlife from contact with construction vehicles in aquatic and upland habitats, modification of habitat, or disturbance during nesting. Proposed Conservation Measures specific to these species would be implemented to reduce these impacts to less than significant.

Temporary impacts to vegetation, common wildlife species, and special-status species would be potentially significant. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant. In addition, restoration measures calling for re-vegetation of the site and a habitat restoration program would reduce impacts to vegetation communities to a less-than-significant level. Implementation of the mitigation measures will ensure that impacts on wildlife are less than significant. With implementation of the proposed Special-Status Species Conservation Measures and mitigation measures, impacts to special-status species would be less than significant.

With re-vegetation and natural colonization of macroinvertebrates to the stream, there would be no long-term effects to vegetation or wildlife. In the long-term, removal of this barrier would provide benefits by allowing fish, including steelhead, access to additional habitat on Cold Creek.

Upstream Barrier Removal CC6

This is a natural flow barrier that does not need action to restore access for steelhead and will be left in place.

Upstream Barrier Removal CC7 – Cold Creek Check Dam

Removal of the Cold Creek Barrier was completed by the Mountains Restoration Trust in 2014.

Upstream Barrier Removal CC8 – Stunt Road Culvert

Removal of this barrier is uneconomical. The barrier will remain in place.

Level of Significance

Impacts from upstream barrier removal would be insignificant with implementation of conservation measures for removal of one or all identified barriers.

Sediment Hauling and Placement

Alternatives utilizing mechanical removal of sediments from behind the dam (Alternatives 2 and 4) are addressed in this section. The alternatives using natural transport only (Alternative 3) are not addressed. The details of mechanical removal are addressed separately below, which for the vast majority of sediments, is limited to placement at the Calabasas landfill. Placement of sand that is beach compatible has two options that are addressed in this section. The first option is beach placement at Surfrider Beach immediately east of the Malibu Pier. The second option is nearshore placement off shore of this same area. Only one option would be performed.

The USACE has determined, in consultation with the Southern California Dredged Material Management Team (SC-DMMT), that the quality of the sand is suitable for direct placement on beaches or into the nearshore based on initial testing. To ensure that the material placed on beaches or in the nearshore is of beach quality, additional sediment testing would be conducted prior and during excavation of the sand-rich layer from behind the Dam to confirm that the material is acceptable for direct placement on beaches or in the near shore. Sampling for grain-size gradation of the receiving beach or near shore placement area would also be performed. Quality assurance measures would also be developed during the design phase to ensure that only beach quality material is transported and placed on the beach or in the near shore.

Based on coordination with resource agencies, including USFWS, NMFS, CDFW, and the CCC, and by complying with applicable wildlife regulations, there will be no short or long-term conflicts with any local policies or ordinances (Criteria 6), or conflicts with any adopted HCP, NCCO, or similar plans (Criteria 7) as a result of placing beach compatible material in either the shoreline or nearshore locations. As described below in the species specific beach placement and nearshore placement sections, there will be no substantial, adverse effects to any special status or protected species (Criteria 1).

Beach Placement

Beach placement of sands requires temporary stockpiling at Site F, an upland area, prior to transportation to the beach for placement. Impacts at Site F include burial of flora and fauna similar to the project site. Lyon's pentachaeta (*Pentachaeta lyoni*) may occur at Site F. If beach placement is selected, a pre-construction survey of Site F will be conducted to look for this listed species (FE, CE, 1B). If not present, no further conservation measures are required. If present, mitigation will be worked out in consultation with USFWS, including removal and return following the end of construction. The site will be revegetated with California native species, following the completion of construction.

Temporary increase in turbidity and suspended solids may decrease the amount of dissolved oxygen near the placement site, thus affecting fish and other marine life within the area. Motile species are expected to relocate out of the area until placement activities are finished, and placement of beach compatible materials will not substantially impede the movement or migration of any native fish or wildlife (Criteria 4). Benthic marine populations would be buried, but would be expected to recolonize and recover. Therefore, no substantial loss to the population of any fish, wildlife, or vegetation will occur as the result of beach placement (Criteria 5). Increased beach widths as a result of placement will beneficially affect shore birds and benthic organisms in the long run as well as California grunion (see below). Therefore, beach placement of sediment will not result in a substantial loss in overall ecosystem biodiversity (Criteria 8) and will not result in an adverse effect or net loss in habitat value of any sensitive biological habitats (Criteria 2).

Boulders in a small boulder field located east of the placement site support surf grass. The surf grass is sporadic and is spread over a large area. Sand placed on the beach is likely to move downcoast into the boulder field. Due to the size of the boulders and the relatively small volumes to be placed on the beach each year, it is considered unlikely that the boulders would be buried by the additional sand as it moved downcoast. Surf grass is adapted to a high energy environment with substantial volumes of sand and can even survive burial for lengths of time up to one year. If this placement option is selected monitoring of the surf grass would have to be conducted to ensure no surf grass is lost as a result of sand placement. Placement of comparatively sized boulders taken from behind the dam could also be used to provide additional surf grass habitat offsetting any losses.

<u>California Grunion (Leuresthes tenuis)</u>

While not a special-status species, the California grunion is a native fish species that, due to its unique life history, could be affected by beach placement activities associated with the project alternatives. California grunion spawn on southern California beaches between March 15 and September 1 of each year. Beach placement activities could disrupt spawning activities and bury eggs if they occur during the spawning season on a suitable beach. Beach nourishment activities take place outside the spawning season, and the beach is unsuitable for grunion spawning due to erosion, therefore no conservation measures are required.

California Least Tern (Sternula antillarum browni) FE, CE

The beach and nearshore receiver sites are located more than thirteen miles north of the California least tern nesting site located within on Venice Beach. Sediment placement activities would not directly affect any nest sites owing to distance. The area is not likely to be used for foraging by California least tern also due to distance from the nearest nest site. Additionally, this migratory species will not be present during beach placement activities, so that these activities would have no effect on this species. The USACE, therefore, has determined that the placement of sand on the beach at the Malibu Pier Beach will not affect California least tern.

Western snowy plover (Charadrius nivosus nivosus) FT

There were reports of nesting plovers on Surfrider Beach in 2013 (Chris Dellith, personal communication), which is highly unusual and not in the location currently being considered for beach placement. The beach fronting Malibu Lagoon is critical habitat for snowy plover, but would not be modified by the proposed placement adjacent to Malibu Pier. Movement of sand onto the beach placement site would be away from beach areas occupied by snowy plovers and is sufficiently far that delivery and placement activities would have no effect on any snowy plovers. Additionally, the beach placement site is too narrow with no suitable beach for snowy plovers to roost. The USACE, therefore, has determined that the project will not affect western snowy plover.

Near Shore Placement

Temporary increase in turbidity and suspended solids may decrease the amount of dissolved oxygen near the placement site, thus affecting fish and other marine life within the area. Motile species are expected to relocate out of the area until placement activities are finished, and placement of beach compatible materials in the near shore area will not substantially impede the movement or migration of any native fish or wildlife (Criteria 4). Benthic marine populations would be buried, but would be expected to recolonize and recover. Therefore, no substantial loss to the population of any fish, wildlife, or vegetation will occur as the result of beach placement (Criteria 5). Adjacent beaches would experience less erosion due to elevated sand levels in the near shore while some of the placed sand may actually migrate onto adjacent beaches increasing beach widths down coast of the placement site, which will beneficially affect shore birds and benthic organisms in the long run as well as California grunion (see below). Therefore, near shore placement of sediment will not result in a substantial loss in overall ecosystem biodiversity (Criteria 8) and will not result in an adverse effect or net loss in habitat value of any sensitive biological habitats (Criteria 2).

California Least Tern (Sternula antillarum browni) FE, CE

The beach and nearshore receiver sites are located more than thirteen miles north of the California least tern nesting site located within on Venice Beach. Sediment placement activities would not directly affect any nest sites owing to distance. The area is not likely to be used for foraging by

California least tern also due to distance from the nearest nest site. The USACE, therefore, has determined that the placement of sand in the nearshore at the Malibu Pier Beach will not affect California least tern.

Western snowy plover (Charadrius nivosus nivosus) FT

There were reports of nesting plovers on Surfrider Beach in 2013 (Chris Dellith, personal communication), which is highly unusual and not in the location currently being considered for beach placement. The beach fronting Malibu Lagoon is critical habitat for snowy plover, but would not be modified by the proposed placement adjacent to Malibu Pier. . Placement in the nearshore would have no effect on this shore species as they would not be encountered at the near shore site. The USACE, therefore, has determined that the project will not affect western snowy plover.

Level of Significance

Impacts from sand placement either on the beach or in the nearshore would be insignificant for either option.

Floodwall

This section discusses potential impacts as a results of floodwall construction. Based on coordination with resource agencies, including USFWS, NMFS, and CDFW, and by complying with applicable wildlife regulations, there will be no short or long-term conflicts with any local policies or ordinances (Criteria 6), or conflicts with any adopted HCP, NCCO, or similar plans (Criteria 7) as a result of removing the dam and/or spillway. Due to the limited footprint of the floodwalls, no substantial loss to any native plant or wildlife population (Criteria 5) or substantial loss in overall ecosystem biodiversity (Criteria 8), either short or long-term, are expected.

Construction Impacts

Floodwalls would be required for Alternatives 3 and 4 only to offset increased flood risks to the city of Malibu. Floodwall construction would start at the mouth of the Malibu Creek, moving north along the channel towards Rindge Dam between Cross Creek Bridge and PCH. Construction activities would require some grading, concrete work and pile driving. Construction of floodwalls would require a ten-foot high wall for Alternative 3 and a five-foot high wall for Alternative 4. The path of the floodwall is identical for both alternatives.

Ground disturbance during construction of floodwalls is expected to create an opportunity for non-native vegetation present in this area to increase, resulting in a loss of native vegetation along the path of the proposed flood walls. Wildlife could be impacted by contact with heavy equipment, resulting in injury or mortality to individuals and a reduction of local population numbers. Additionally, construction materials, such as soil, fuels, or lubricants, may spill or otherwise enter the creek during construction and have adverse effects on fish and other aquatic species. Introduction of loud noises into the environment may alter feeding, nesting, and resting habits of wildlife, particularly birds.

In the reaches between Cross Creek Bridge and PCH, habitat impacts are expected to occur as a result of the floodwalls. Construction of the floodwalls requires a 45-foot wide area to be disturbed along their lengths for a total loss of 6 acres of vegetative cover; an overall 5% reduction in this reach. Maintenance roads for the floodwall would result in the permanent loss of 0.6 acres of vegetative cover (15-ft access road along 1,700 ft of wall requiring construction of a permanent access road), a reduction of 0.5% in vegetative cover. Impacts under Criteria 2 and Criteria 3 would be less than significant.

The construction of floodwalls under this alternative could result in additional impacts to least Bell's vireo, western least bittern, and other migratory birds if they are nesting in riparian habitat along the reach from PCH to Cross Creek Bridge (Criteria 1). Special status reptiles (California horned lizard, coast punch-nosed snake, coastal whiptail, San Diego mountain kingsnake, silvery legless lizard, two-and striped garter snake), American badger, vole, shrew, and bats (California leaf-nosed bat, spotted bat, western mastiff bat, and Yuma myotis) may be present in the floodwall impact area. With implementation of mitigation measures and Special-Status Conservation Measures, including protocol-level surveys for least Bell's vireo and removal of vegetation prior to the nesting season, pre-construction surveys, trapping and relocation of any detected species, and cordoning of the construction area to prevent reintroduction, impacts to special-status species would be less than significant.

However, construction of floodwalls is expected to create a barrier to wildlife moving between the riparian habitat of Malibu Creek and the habitat to the east of the creek, which connects to the open space area of the Santa Monica Mountains beyond (Criteria 4). The floodwalls would extend 10 ft above the ground surface. They would extend for approximately 3,100 linear ft on the west side of the creek and approximately 2,700 linear ft on the east side, for a total length of approximately 5,800 linear ft.

Wildlife habitat is heavily fragmented by residential development to both the east and west of the creek in the location where floodwalls would be constructed. On the west side of the creek there is significant commercial development very close to the creek. On the east side of the creek, there is an approximately 600-foot wide area of open space directly adjacent to the creek extending east to Serra Road, with additional open space among residential developments further east and to the north. The floodwall to be constructed along Serra Road would have an approximately 700-foot long gap where it would tie into higher ground. Wildlife would be able to move through this gap in the floodwall to access open space areas toward the east. Therefore, impacts to wildlife movement from the construction of floodwalls would be less than significant.

Long Term Impacts

After construction is completed, the floodwall would require periodic visual inspections and maintenance, which may involve the use of heavy equipment. Frequency of operation and maintenance activities are expected to be low, with equipment restricted to a maintenance path located on the outside of the floodwall, minimizing encroachment into the habitat adjacent to Malibu Creek in this section and resulting impacts would be short-term in duration. Mitigation measures would apply, if appropriate based on the intensity and duration of required repairs. Therefore, the longer term O&M activities associated with the floodwall are not expected to create significant biological impacts.

Level of Significance

Impacts from construction of flood walls would be insignificant, with mitigation, for either height option.

5.4.3 *Analyses of Alternatives*

<u>Alternative 1: No Action</u>

This section describes effects on biological resources from the No Action Alternative.

Construction Impacts

No construction activities would occur under the No Action Alternative. Therefore, no impacts to biological resources would occur as a result of the No Action Alternative.

Long-Term Impacts

<u>Vegetation and Sensitive Habitat Impacts</u>

Under the No Action Alternative, Rindge Dam, upstream barriers on Cold Creek and Las Virgenes Creek, as well the beach adjacent to Malibu Pier, would remain unchanged.

<u>Wildlife Impacts</u>

Malibu Creek is a vital wildlife corridor in the Malibu Creek ecosystem. Wildlife movement is limited to east-west movement by Malibu Canyon Road and Malibu Creek's steep canyon slopes. The continued existence of Rindge Dam would be a barrier to fish, amphibians, reptiles, small mammals, and invertebrates. These include the southern California steelhead (*Oncorhynchus mykiss* southern California DPs), coast range newt (*Taricha torosa torosa*), and the western pond turtle (*Emys marmorata*). Although larger mammals such as mountain lion, deer, and bobcat would be able to traverse the slopes around the Dam, this movement requires them to move near Malibu Creek Road, where they would continue to be impacted by noise, motion, light, and startle impacts associated with highway traffic. On a regional scale, lack of wildlife movement below and above the Dam may result in decreased genetic dispersal between coastal and interior populations and a decrease of genetic diversity in impacted species.

<u>Special-Status Species Impacts</u>

With the Dam in place, 5.5 mi of upstream habitat will remain unavailable to steelhead and other fish species such as the Pacific lamprey (*Lampetra tridentata*), which was historically known to inhabit Malibu Creek (Dagit and Abramson 2007). Since the quantity of suitable habitat is limited, steelhead and other fish species are less able to escape environmental pressures and more vulnerable to disease. For example, the cause of widespread fish mortality observed in Malibu Creek below Rindge Dam has not been determined; however, if these fish were able to escape to upstream habitat, some may have survived (Dagit and Abramson 2007). Additionally removal of Rindge Dam and the upstream barriers is identified as a critical recovery action by the National Marine Fisheries Service (NMFS) in its Southern California Steelhead Recovery Plan (NMFS 2012). Failure to implement this action impedes recovery of this species.

As with general wildlife impacts, the Dam would continue to function as a wildlife barrier and impacts on special-status species would be similar to those discussed under wildlife impacts.

Alternative 2: Mechanical Transport

This section addresses the downstream effects of mechanical removal of all sediments in the sediment impound area, and placement at the land fill; beneficial reuse of the sand fraction is discussed above for beach and nearshore placement.

Alternative 2 involves incremental Dam removal during the summer and fall over the span of 5-8 years. The impounded sediment behind the Dam would be mechanically removed and transported at the same rate that the Dam is lowered. The beach compatible material would be transported to three beach receiver sites and all other material would be taken to the Calabasas Landfill. Prior to Dam removal, site preparation activities would require vegetation removal within the following areas:

- Sediment impoundment area,
- Existing access ramp,
- New access ramp, and
- Staging area at Sheriff's Overlook.

All versions of Alternative 2 consist of mechanically transporting all sediment removed from behind Rindge Dam. Variations of Alternative 2 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. beach placement. The significance of each variation is based on the combination of significance of each of the subcomponents, which are summarized in **Table 5.4-2**.

Sediment excavated from behind the dam would be removed from the site by trucking to the Calabasas Landfill. This is an existing, permitted, operating landfill for trash and debris that is licensed to accept construction debris. As such there would be no direct environmental impacts to biological resources beyond those addressed in landfill operations.

Construction Impacts

Vegetation and Sensitive Habitat Impacts

Impacts to vegetation and sensitive habitats at the Dam and sediment impoundment area would be as described for Dam removal above (Criteria 2). There would also be the impacts associated with vegetation clearing for the construction of ramps to the Dam to create access for heavy equipment used for Dam demolition. Construction of a haul road would also require clearing of vegetation and placement of material from the impound area to allow for the safe removal of soils for placement at the Calabasas Landfill or the beach or nearshore area (for the sand layer). During construction, BMPs listed in mitigation measures below would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant (Criteria 3). In addition, restoration measures calling for re-vegetation of the site, including construction ramps and haul road, and implantation of habitat restoration program would reduce impacts to vegetation communities to a less-than-significant level. The haul road would be removed, but the construction ramp would be maintained to allow access to the creek bed for State Park access for maintenance activities.

Indirect impacts from construction would only include downstream sediment flushing during sediment removal. However, the amounts of sediment flushed downstream are expected to be minor and within the normal range of existing conditions. Therefore, no impacts are expected downstream of the dam during construction.

Wildlife Impacts

There would be no direct or indirect impacts to wildlife, including any protected or special status species, downstream of the dam during construction utilizing mechanical transport to remove all impounded sediments (Criteria 1). There would be no substantial loss to any native plant or wildlife populations (Criteria 5), or any substantial loss in ecosystem biodiversity (Criteria 8). Variations of Alternative 2 would not result in any substantial impedance of migration to wildlife or fish (Criteria 4).

Special-Status Species Impacts

Plants

Coulter's goldfields (Lasthenia glabrata ssp. Coulteri) CNPS List 1B, and Davidson's saltscale (Atriplex serenana var. davidsonii) CNPS List 1B

The two species have been observed in the vicinity of Malibu Lagoon. Mechanical transport of impounded sediment would result in no impact to either of these two species. No recommended conservation measures.

Fish

Tidewater Goby (Eucyclogobius newberryi) FE

The tidewater goby inhabits Malibu Lagoon and short stretches of Malibu Creek upstream of the lagoon. Indirect impacts from construction would only include downstream sediment flushing during sediment removal. However, the amounts of sediment flushed downstream are expected to be minor and within the normal range of existing conditions. Long-term impacts include changes to river hydrology associated with a free-flowing creek including degradation and aggradation of stream reaches. The removal of Rindge Dam and restoration of more natural sediment regimes will provide long-term benefits for Malibu Lagoon. Therefore, no specific conservation measures are proposed for the tidewater goby. BMPs listed in the Mitigation Measures will reduce the likelihood for accidental releases or chemical contaminants as well as reducing turbidity impacts to waters below the dam. The USACE, therefore has determined that the project will not affect tidewater goby.

Long Term Impacts

Vegetation and Sensitive Habitat Impacts

Long-term impacts include changes to river hydrology associated with a free-flowing creek including degradation and aggradation of stream reaches. The removal of Rindge Dam and restoration of more natural sediment regimes will provide long-term benefits for the creek below Rindge Dam.

Wildlife Impacts

The removal of Rindge Dam and restoration of more natural sediment regimes will provide long-term benefits for wildlife in Malibu Canyon. Additionally, with the removal of the Dam an important wildlife corridor would be reestablished along Malibu Creek, and wildlife, including fish, amphibians, reptiles, small mammals and invertebrates, would be able to move from areas downstream of the Dam to upstream, and vice versa. This will provide benefits in increasing the amount of habitat available for these species, making them less vulnerable to disease and other environmental stressors. Increased movement could also increase genetic diversity in previously separate populations.

Level of Significance

With incorporation of Mitigation Measures and Special-Status Species Conservation Measures discussed for dam removal, impacts associated with Alternative 2 would be insignificant. In addition to the criteria described earlier, there would be no significant impacts under Criteria 6 or 7. Mitigation Measures would reduce the overall impact, minimize effects on vegetation critical to wildlife, and minimize disturbance and direct mortality to wildlife. Additionally, Mitigation Measures will ensure that affected habitats are restored to as near to pre-project conditions as possible.

Table 5.4-2 - Significance of Biological Resource Impacts Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	Class II			LTS			No
2a2	Class II				LTS		No
2b1	Class II		Class II	LTS			No
2b2	Class II		Class II		LTS		No
2c1		Class II		LTS			No
2c2		Class II			LTS		No
2d1		Class II	Class II	LTS			No
2d2		Class II	Class II		LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Alternative 3: Natural Transport

This section address the downstream effects of natural transport removal of all sediments in the sediment impound area, and placement at the land fill.

Alternative 3 involves incrementally removing the Dam in 5-foot increments and allowing the impounded sediment to flow downstream with the flow of the creek. It is estimated to take 22 “episodes” of notching the Dam 5 feet at a time over a period of 20-100 years for the sediment impounded behind the Dam to move downstream via natural transport until pre-Dam conditions are reached. For purposes of this assessment a 50-year construction period is assumed. Access to the Dam and sediment impoundment area would be the same as under Alternative 2.

Natural transport of impounded sediment would result in sedimentation downstream of the Dam and the potential for flooding of residential and commercial structures adjacent to Malibu Creek. To address this, flood mitigation measures in the form of floodwalls would be constructed from Cross Creek Bridge to Pacific Coast Highway.

All versions of Alternative 3 consist of natural transport of all sediments impounded behind Rindge Dam. Variations of Alternative 3 include dam removal options (arch & spillway vs. only arch), and options to remove upstream barriers. Note the lack of beach or nearshore placement due to lack of that component for Alternative 3. The significance of each variation is based on the combination of significance of each of the subcomponents, which are summarized in **Table 5.4-3**.

Construction Impacts

Vegetation and Sensitive Habitat Impacts

Impacts to vegetation and sensitive habitats would be the same at the Dam and sediment impoundment area as described for Dam removal and Alternative 2 (Criteria 2). There would also be the same impacts associated with vegetation clearing for the construction of ramps to the Dam to create access for heavy equipment used for Dam demolition. However, haul roads to transport sediment to landfill or beach disposal sites would not be required as under Alternative 2, so there would be fewer impacts to vegetation in upland areas. Additional impacts under Alternative 3 could occur to sensitive wetland and riparian habitats along Malibu Creek from construction of floodwalls in downstream areas from Cross Creek Bridge to Pacific Coast Highway.

Under Alternative 3, natural transport of impounded sediment would result in impacts to downstream wetland and riparian habitat (Criteria 2 and 3). Removing the Dam in 5-foot increments during 22 episodes over a period of 50 years would somewhat limit the amount of sediment deposition in downstream reaches. However, some channel aggradation would occur during removal episodes, and would alter wetland and riparian communities (Criteria 2 and 3). Because the Malibu Creek system is adapted to regular storm events that regularly alter these communities, this is not anticipated to be a significant impact given the slow rate of Dam removal proposed. Willows and other native riparian vegetation would be anticipated to quickly reestablish following disturbance.

Ground disturbance during construction of floodwalls is expected to create an opportunity for non-native vegetation present in this area to increase, resulting in a loss of native vegetation along the path of the proposed flood walls.

Wildlife Impacts

Wildlife impacts under Alternative 3 would be similar to those under Alternative 2. Additional impacts to wildlife within Malibu Creek could occur with natural transport of impounded sediment. Increased turbidity immediately following sediment release (during the first flush storm event following each incremental Dam removal) could impair respiration, reduce food availability and foraging ability, and cause other behavioral changes for aquatic species. Sedimentation would alter habitat suitability by reducing depth of pools and filling interstitial spaces of stream substrates. Moreover, with the slow rate of Dam removal (5 feet per year for 50 years), increased turbidity is anticipated to be long-term and sedimentation would not be limited to localized areas. Wildlife that inhabit Malibu Creek system are adapted to regular storm events that mobilize sediment and cause disturbance, however most wildlife would not be able to move away from areas of increased turbidity and sedimentation. Therefore, natural transport under Alternative 3 would be anticipated to cause significant effects on wildlife species at the population level (Criteria 5), and there would be no measures that could sufficiently avoid or reduce these impacts. This includes potential impacts to the movement or migration of native fishes (Criteria 4). There are not expected to be any overall losses of ecosystem biodiversity (Criteria 8). Therefore, impacts to wildlife downstream in Malibu Creek under Alternative 3 would be significant and unavoidable.

Special-Status Species Impacts

Impacts to individuals of aquatic special-status species inhabiting Malibu Creek (e.g., steelhead, tidewater goby, arroyo chub, and western pond turtle) would occur under Alternative 3 from increased turbidity and localized sedimentation that could occur due to natural transport of impounded sediments behind the Dam. Some species could move away from these disturbances, but some could not.

Increased turbidity could adversely affect steelhead in downstream reaches of Malibu Creek during natural transport of sediments from behind the Dam. The effect of turbidity on salmonids varies by life stage, with juveniles generally subject to a greater number of factors than adults. Although low to moderate turbidity levels can enhance survival of juvenile salmonids by providing cover from predation (Gregory and Levings 1998), high levels can reduce feeding efficiency and food availability, clog gillrakers, and erode gill filaments (Bruton 1985; Gregory 1993). Sedimentation could reduce macroinvertebrate food resources and suitable pool habitat, which are important wintering and refuge areas for juvenile salmonids. Increased turbidity and sedimentation under this alternative is expected to result in the loss of all spawning in Malibu Creek as well as the potential loss of all life stages resulting in the complete loss of steelhead during construction and immediately after.

Other special-status aquatic species that may occur in downstream reaches of Malibu Creek (e.g., arroyo chub, tidewater goby, two-striped garter snake, and western pond turtle) could also be affected by increased sediment and turbidity. These species prefer slow water areas, and most amphibian egg deposition and rearing likely occur in tributaries and off-channel areas. Reptiles such as the pond turtle lay eggs in upland areas, so their egg life stage would largely not be affected by sediment in the mainstem of Malibu Creek, however, the increased likelihood of flooding could result in adverse impacts to these species in the long term. Amphibian tadpoles in the mainstem of Malibu Creek would be adversely affected by suspended sediment and from reduced food availability if their food source (algae and diatoms) is affected. Juvenile (post-metamorphic) and adult frogs, as well as turtles and snakes, are assumed to be able to move out of the mainstem during peak suspended sediment concentrations, but could experience indirect effects from a decrease in food supply if macroinvertebrate populations decrease during Dam removal.

Because special-status species are already vulnerable to population-level threats, these impacts would be potentially significant, and there would be no measures that could sufficiently avoid or reduce these impacts. Therefore, impacts to steelhead and other aquatic special-status species downstream in Malibu Creek under Alternative 3 would be significant and unavoidable.

Long-Term Impacts

Vegetation and Sensitive Habitat Impacts

The types of impacts that would occur on vegetation and sensitive habitats after Dam removal with natural transport are anticipated to be similar to those discussed for Alternative 2, except that they would occur over a much longer time frame with the slow rate of Dam removal proposed. While the sediment volume moving downstream in this alternative is substantially higher than for the other alternatives, it is also spread out over many more years of construction impacts. Nevertheless, this alternative would result in added sedimentation downstream potentially covering existing gravel beds as well as aquatic vegetation. Impacts are likely as far as the Malibu Lagoon, which could see substantial sedimentation adversely affecting this estuarine habitat. In the very long-term (>50 years), wetlands and riparian vegetation would be reestablished following disturbance associated with natural transport of impounded sediment. Once the Dam is removed, a more natural hydrologic and sediment regime will be established and natural sediment transport will occur after > 50 years of being in a disturbed state. Wetland and riparian vegetation will benefit from associated nutrient movement downstream.

After construction is completed, the project alternatives would require minimal operation and maintenance (O&M) usually during dry seasons. These measures are usually related to removal of invasive plant species and the maintenance of native plant species.

Wildlife Impacts

Impacts to wildlife would be expected to be similar to those described in the short-term under Alternative 2 except that they would extend for a much longer period of time (50 vs. 5 years). Long-term improvement to riparian and other creek habitats will provide benefits to wildlife as the natural vegetation composition of riparian and aquatic habitats would be reestablished and non-native vegetation removed and controlled. Native vegetation communities provide foraging and breeding habitat to which wildlife are adapted.

Additionally, with the removal of the Dam an important wildlife corridor would be reestablished along Malibu Creek, and wildlife, including fish, amphibians, reptiles, small mammals and invertebrates, would be able to move from areas downstream of the Dam to upstream, and vice versa. This will provide benefits in increasing the amount of habitat available for these species, making them less vulnerable to disease and other environmental stressors. Increased movement could also increase genetic diversity in previously separate populations.

However, construction of floodwalls is expected to create a barrier to wildlife moving between the riparian habitat of Malibu Creek and the habitat to the east of the creek, which connects to the open space area of the Santa Monica Mountains beyond. As described in Section 3, floodwalls would be constructed from Pacific Coast Highway to Cross Creek Bridge. The floodwalls would extend 10 feet above the ground surface. They would extend for approximately 3,100 linear feet on the west side of the creek and approximately 2,700 linear feet on the east side, for a total length of approximately 5,800 linear ft.

Wildlife habitat is heavily fragmented by residential development to both the east and west of the creek in the location where floodwalls would be constructed. On the west side of the creek there is significant commercial development very close to the creek. On the east side of the creek, there is an approximately 600-foot wide area of open space directly adjacent to the creek extending east to Serra Road, with additional open space among residential developments further east and to the north. The floodwall to be constructed along Serra Road would have an approximately 700-foot long gap where it would tie into higher ground. Wildlife would be able to move through this gap in the floodwall to access open space areas toward the east. Therefore, impacts to wildlife movement from the construction of floodwalls would be less than significant.

<u>Special-Status Species Impacts</u>

With implementation of Special-Status Species Conservation Measures and mitigation measures, most long-term impacts to special-status species within construction areas would be less than significant. However, depending on the severity of the significant and unavoidable impacts to special-status species downstream in Malibu Creek (due to the increased likelihood of flooding, see discussion under construction impacts above), there could also be long-term significant and unavoidable impacts to certain species (Criteria 1). This could result in conflicts with local policies or ordinances, or other regional or site-related habitat conservation plans (Criteria 6 and 7). Over time, Dam removal would result in long-term benefits to special-status species through the restoration of more natural hydrologic and sediment regimes. In addition, steelhead and other special-status aquatic species would benefit from additional habitat that would be made available upstream of the Dam.

Level of Significance

Natural transport of sediment downstream of Rindge Dam is expected to result in a greater level of significance of impacts to biological resources. With incorporation of Mitigation Measures and Special-Status Species Conservation Measures, most impacts associated with Alternative 3 would still be significant. Mitigation Measures would reduce the overall impact acreage, minimize effects on vegetation such as trees that is critical to wildlife, and minimize disturbance and direct mortality to wildlife. Additionally, Mitigation Measures will ensure that directly affected habitats are restored as much as possible to pre-project conditions. Special-Status Species Conservation Measures would avoid or reduce many impacts to special-status species; however, significant and unavoidable impacts could occur due to increased turbidity and sedimentation. Due to their low numbers and other existing environmental stressors, any additional impacts could affect these species at the individual as well as population level.

Table 5.4-3 - Significance of Biological Resource Impacts Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	Class I					Class II	Yes
3b	Class I		Class II			Class II	Yes
3c		Class I				Class II	Yes
3d		Class I	Class II			Class II	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Alternative 4: Hybrid Mechanical & Natural Transport</u>

This section address the downstream effects of a combination of mechanical and natural transport removal of all sediments in the sediment impound area, and placement at the land fill; beneficial reuse of the sand fraction is discussed above for either beach or nearshore placement.

Alternative 4 involves a combination of Alternative 2 and 3. The arch Dam height would be lowered at the same rate as the impounded sediment is removed from behind the Dam using mechanical means (excavators, bulldozers etc.) during the summer and fall. At the end of the construction season an additional 5-feet of Dam would be removed along the top of the arch below the sediment elevation to allow a controlled volume of sediment to naturally erode during the winter storm season and transport downstream. The mechanically removed sediment would be transported to the same locations identified in Alternatives 2. As with Alternative 3, flood mitigation measures in the form of floodwalls would be constructed from Cross Creek Bridge to Pacific Coast Highway. Floodwalls would run along the same path as for Alternative 3, but would be shorter only requiring a height of five feet.

Sediment excavated from behind the dam would be removed from the site by trucking to the Calabasas Landfill. This is an existing, permitted, operating landfill for trash and debris that is licensed to accept construction debris. As such there would be no direct environmental impacts to biological resources beyond those addressed in landfill operations.

Variations of Alternative 4 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. beach placement of any mechanically transported sediment. The significance of each variation of Alternative 4 is based on the combination of significance of each of the subcomponents (**Table 5.4-4**).

Construction Impacts

Vegetation and Sensitive Habitat Impacts

Construction-related impacts to vegetation and sensitive habitats would include those described for Alternative 2. However, Alternative 4 would include sediment deposition in downstream reaches that would impact vegetation and sensitive habitat areas. During construction, BMPs would be implemented to avoid and/or reduce erosion of disturbed soils into surface waters, thereby reducing impacts to sensitive wetland habitats to less than significant (Criteria 2 and 3). In addition, restoration measures calling for re-vegetation of the site, including construction ramps and haul road, in a habitat restoration program that would reduce impacts to vegetation communities to a less-than-significant level. The haul road would be removed, but the construction ramp would be maintained to allow access to the creek bed for State Park access for maintenance activities

Wildlife Impacts

Construction-related impacts to wildlife would include those described for Alternative 2. As with Alternative 2, there are no anticipated significant losses of native populations of plants or wildlife (Criteria 5), nor substantial losses of ecosystem biodiversity (Criteria 8). Mitigation measures will ensure that impacts on wildlife during construction are less than significant.

Special-Status Species Impacts

Construction-related impacts to special-status species would be the same as those described for Alternative 2. Special-Status Conservation Measure and mitigation measures will avoid or reduce impacts to special-status species during construction to less than significant (Criteria 1).

However, as described for Alternative 3, there could be significant and unavoidable impacts to individuals of aquatic special-status species inhabiting Malibu Creek (e.g., steelhead, tidewater goby, arroyo chub, and western pond turtle) from increased turbidity and localized sedimentation that could occur due to natural transport of impounded sediments behind the Dam (Criteria 1). This could result in conflicts with local policies or ordinances, or other regional or site-related habitat conservation plans (Criteria 6 and 7). In contrast to Alternative 3, these impacts would occur for a shorter duration under Alternative 4, confined largely to the 5-year construction period. Because special-status species are already vulnerable to population-level threats, these impacts would be potentially significant, and there would be no measures that could sufficiently avoid or reduce these impacts. Therefore, impacts to special-status species downstream in Malibu Creek under Alternative 4 would be significant and unavoidable, albeit for a shorter time period than under Alternative 3.

Long-Term Impacts

Vegetation and Sensitive Habitat Impacts

Long-term impacts on vegetation and sensitive habitats under Alternative 4 is anticipated to be similar to those discussed for Alternative 2. While the sediment volume moving downstream in this alternative is substantially higher than for Alternative 2, it is substantially less than for Alternative 4, over a shorter duration. This alternative would result in added sedimentation downstream potentially covering existing gravel beds as well as aquatic vegetation. Impacts are likely as far as the Malibu Lagoon, which could see substantial sedimentation adversely affecting this estuarine habitat (Criteria 2). In the long-term, wetlands and riparian vegetation would be reestablished following disturbance associated with natural transport of impounded sediment. Once the Dam is removed, a more natural hydrologic and sediment regime will be established and natural sediment transport will occur. Wetland and riparian vegetation will benefit from associated nutrient movement downstream.

After construction is completed, the project alternatives would require minimal operation and maintenance (O&M) usually during dry seasons. These measures are usually related to removal of invasive plant species and the maintenance of native plant species.

Wildlife Impacts

Long-term impacts to wildlife would be similar to those described for Alternative 2. Long-term improvement to riparian and other creek habitats will provide benefits to wildlife as the natural vegetation composition of riparian and aquatic habitats would be reestablished and non-native vegetation removed and controlled. Native vegetation communities provide foraging and breeding habitat to which wildlife are adapted. Removal of the Dam will restore an important wildlife corridor along Malibu Creek and will provide benefits in increasing the amount of habitat available for these species, making them less vulnerable to disease and other environmental stressors. Increased movement could also increase genetic diversity in previously separate populations. However, floodwall construction near the Pacific Coast Highway Bridge would create a less than significant impact barrier to wildlife movement (Criteria 4).

Special-Status Species Impacts

With implementation of Special-Status Species Conservation Measures and mitigation measures, long-term impacts to special-status species within construction areas would be less than significant. Over time, Dam removal would result in long-term benefits to special-status species through the restoration of more natural hydrologic and sediment regimes. In addition, steelhead and other special-status aquatic species would benefit from additional habitat that would be made available upstream of the Dam.

Level of Significance

With incorporation of mitigation measures and Special-Status Species Conservation Measures, most impacts associated with Alternative 4 would be significant. Mitigation measures would reduce the overall impact acreage, minimize effects on vegetation such as trees that is critical to wildlife, and minimize disturbance and direct mortality to wildlife. Additionally, mitigation measures will ensure that affected habitats are restored as much as possible to pre-project conditions. Special-Status Species Conservation Measures would avoid or reduce many impacts to special-status species; however, significant and unavoidable impacts under Criteria 1 could occur due to increased turbidity and sedimentation over a long period of time from natural transport of impounded sediment. Due to their low numbers and other existing environmental stressors, any additional impacts could affect these species at the individual as well as population level.

Table 5.4-4 - Significance of Biological Resources Impacts Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	Class I			LTS		Class II	Yes
4a2	Class I				LTS	Class II	Yes
4b1	Class I		Class II	LTS		Class II	Yes
4b2	Class I		Class II		LTS	Class II	Yes
4c1		Class I		LTS		Class II	Yes
4c2		Class I			LTS	Class II	Yes
4d1		Class I	Class II	LTS		Class II	Yes
4d2		Class I	Class II		LTS	Class II	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

5.4.4 *Mitigation Measures*

The following Mitigation Measures, in addition to Special-Status Species Conservation Measures, will help to avoid or reduce impacts.

- **BIO-1 Qualified Biologist.** A qualified biologist will be responsible for overseeing compliance with protective measures for the biological resources during clearing and construction activities within designated areas.
- **BIO-2 Oil Spill Control.** Oil-absorbing floating booms will be kept onsite and the contractor will respond to aquatic spills during construction.
- **BIO-3 Equipment Maintenance.** Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
- **BIO-5 Vegetation Removal Outside of Nesting Season.** Vegetation will be removed outside of the nesting season for migratory birds (February 1 through August 15) to the extent possible. If vegetation removal must be conducted during the nesting season, the area will be surveyed by a qualified biologist and appropriate buffers will be identified in consultation with the USFWS and CDFW to ensure impacts to nesting birds do not occur.
- **BIO-6 Construction Speed Limit.** Construction crews will be required to maintain a 15-m.p.h. speed limit on all unpaved roads to reduce the chance of wildlife being harmed if struck by construction equipment.
- **BIO-7 Vehicle Travel During Daylight Hours.** Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at night.

- **BIO-8 SWPPP.** A Storm Water Pollution Prevention Plan (SWPPP) will be required to prevent construction materials (fuels, oils, and lubricants) from spilling or otherwise entering the creek.
- **BIO-9 Employee Education Program.** An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the proposed project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the project area the following information:
    - A detailed description of all listed species including color photographs;
    - The protection listed species receive under the Endangered Species Act and possible legal action or that may be incurred for violation of the Act;
    - The protective measures being implemented to conserve all listed species during construction activities associated with the proposed project; and
    - A point of contact if listed species are observed.
    - Provisions of water quality Best Management Practices (BMP) and provisions of the SWPPP will be provided along with consequences for violations incurred by non-compliance with BMP and SWPPP provisions.
    - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting for the listed species that may be encountered during construction.
    - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- **BIO-10 Fish Rescue and Relocation.** A fish rescue and relocation plan will be developed prior to commencing work in areas where impacts to special status fish species may occur. The fish rescue and relocation will be conducted under the supervision of a qualified biologist and will entail measures to reduce effects to steelhead and other fish associated with in-water construction activities.
- **BIO-11Special status plant species.** Pre-construction surveys at the appropriate time of year will determine of any are present in the construction areas. If present, conservation measures would planned and conducted in consultation with the USFWS and CDFW to mitigate impacts including relocation or collection of propagules of perennial species, collection of propagules of annual species, or waiting for seed set mitigation.

5.4.5 *Essential Fish Habitat*

For the Pacific region, EFH has been identified for over 90 species, covered by three Fishery Management Plant (FMPs). Action alternatives with beach or nearshore placement (Alternatives 2 and 4) have areas located within an area designated as EFH for two of these FMPs: Coastal Pelagic Species (CPS) Fishery Management Plan and Pacific Coast Groundfish (PCG) Fishery Management Plan. For the CPS, EFH extends from the shoreline to the edge of the exclusive economic zone, and for the PCG it covers all areas from the mean higher high water line to depths of 3500 meters. The CPS covers pelagic schooling species such as the sardine and anchovy, while the PCG protects groundfish such as rockfish, flounder, and some species of skates, and sharks.

Impacts to EFH at the beach or nearshore will be limited to disturbances during sand placement. Turbidity effects will be localized and temporary for both options, and no loss of rocky intertidal or rocky subtidal fish habitat will occur. Loss of soft-bottom fish habitat will be temporary, but no significant or long-term effects to fish foraging or spawning habitat will occur. Beach placement will result in the burial of sandy beach and adjacent sandy intertidal habitat resulting in the burial and extirpation of any burrowing organisms. Recolonization will be rapid and the widened beach would provide added beach habitat for species such as grunion that currently do not have a beach suitable for spawning at this location. Nearshore placement will result in the burial and extirpation of benthic, burrowing organisms, which are expected to recover rapidly from adjacent, unaffected habitat. The added sand will move into the sand system and will feed nearby beaches protecting them and adding width resulting in improved beach habitat. Impacts will be temporary and less than significant, while overall impacts to aquatic habitats are determined to be short term and insignificant. The USACE has determined that the proposed project may adversely affect EFH, but the project is not expected to have a substantial adverse effect to EFH. No mitigation measures are required to offset impacts.

5.4.6 *Additional Biological Resources Issues*

This section provides additional issues related to biological resources that should be taken into account as part of this project.

Habitat Evaluation

Appendix J describes the development and application of a Habitat Evaluation (HE) to provide a quantitative valuation of existing and future conditions in the Malibu Creek Ecosystem in support of the Malibu Creek Environmental Restoration Feasibility Study. The HE provides an assessment of mainstem reaches of Malibu Creek downstream of Rindge Dam as defined by the USACE' hydrodynamic modeling. In addition, the HE assessment includes several reaches upstream of Rindge Dam on Cold Creek and Las Virgenes Creek, as defined by existing fish passage barriers on these upstream tributaries. The HE does not evaluate the shoreline or near shore placement sites.

The HE assessed the numerical gains/losses in habitat value to the project area located in Malibu Creek for purposes of assisting with the incremental cost analysis and to assist in the impact assessment for the various alternatives, including the no action alternative. The HE used a methodology created and implemented by a Technical Advisory Committee (TAC), whose membership is listed in Appendix A of the Habitat Evaluation (Appendix J of this Integrated Report). Members included resource agency representatives, non-governmental organizations, and local sponsors with detailed, up-to-date knowledge about conditions within and adjacent to the project area. Their knowledge was used to select the appropriate indices and scoring criteria for quantifying gains/losses to habitat value.

A summary of the results by alternative is presented in **Table 5.4-5** below. These results include removal of seven out of the eight upstream barriers evaluated. Removal of the eighth barrier (CC8) was determined to uneconomical in a preliminary economic evaluation, so its benefits are not included in this final summary.

The resulting evaluation is the result of available resources present in publication or present in the knowledge of the TAC members. It was not feasible to conduct further field investigations that might have improved accuracy of this HE owing to both schedule and budget constraints. This project is considered to be a high priority for the continued existence of southern California steelhead in general, and the southern California steelhead distinct population segment in particular, by the National Marine Fisheries Service in their Southern California Steelhead Recovery Plan (NMFS 2012) and delays resulting from additional studies are not warranted.

The biggest gain from any of the action alternatives is Alternatives 2b (including both 2b1: Dam and Spillway Removal with Mechanical Transport, Upstream Barrier Removal, and Beach Placement and 2b2:Dam and Spillway Removal with Mechanical Transport, Upstream Barrier Removal, and Nearshore Placement) and 2d (including 2d1: Dam Removal with Mechanical Transport, Upstream Barrier Removal, and Beach Placement and 2d2: Dam Removal with Mechanical Transport, Upstream Barrier Removal, and Nearshore Placement). While dam removal alone results in an increase in habitat value, it is dam removal coupled with the removal of small upstream barriers that results in the biggest gain. That additional gain comes at a relatively small monetary cost. Removal of the spillway has no effect on HE scoring. Alternatives 4b (including 4b1: Dam and Spillway Removal with Hybrid Mechanical and Natural Transport, Upstream Barrier Removal, and Beach Placement and 4b2: Dam and Spillway Removal with Hybrid Mechanical and Natural Transport, Upstream Barrier Removal, and Nearshore Placement) and 4d (including 41: Dam Removal with Hybrid Mechanical and Natural Transport, Upstream Barrier Removal, and Beach Placement and 4d2: Dam Removal with Hybrid Mechanical and Natural Transport, Upstream Barrier Removal, and Nearshore Placement) are the next highest increase in habitat quality. However, there are other factors that make this alternative less desirable that are not fully reflected in the relative scores. The natural transport of sediments downstream results in increased flood risks to the city of Malibu and there are significant unavoidable impacts to Special Status Species. Floodwalls are proposed to reduce this increased flood risk, but cannot eliminate it. This risk is exacerbated in Alternative 3 (Dam Removal with Natural Transport) although much lower scores reflect the long-term impacts associated with these alternatives.

Alternative 1 (the No Action Alternative) shows a small decline in habitat values over time (from 85 Habitat Units at year 0 to 84 Habitat Units at year 50 with an Average Annual Habitat Unit (AAHU) of 82 Habitat Units) with no positive value added by the continued presence of the dam to water storage or flood safety.

Table 5.4-5 - Summary of Habitat Evaluation Results by Alternative

Alternative	AAHU	Gain/Loss
Alternative 1 No Action	610	-
Alternatives 2a1, 2a2, 2c1, & 2c2: Dam Removal with Mechanical Transport	656	46
Alternatives 2b1, 2b2, 2d1, & 2d2: Dam Removal with Mechanical Transport and Upstream Barrier Removal	761	151
Alternative 3a & 3c: Dam Removal with Natural Transport	588	-22
Alternative 3b & 3d: Dam Removal with Natural Transport and Upstream Barrier Removal	627	17
Alternative 4a1, 4a2, 4c1, & 4c2: Dam Removal with Hybrid Mechanical and Natural Transport	646	36
Alternative 4b1, 4b2, 4d1, & 4d2: Dam Removal with Hybrid Mechanical and Natural Transport and Upstream Barrier Removal	751	141
Gain/Loss is relative to Alternative 1 No Action		

Re-vegetation and Planting Plan

The following areas, described in previous sections above, will require re-vegetation post-construction, depending on the alternative selected:

- Rindge Dam upland areas and riparian areas;
- Construction areas for upstream barrier removals/modifications;
- Construction areas for downstream floodwalls; and
- All other construction sites such as access roads and staging areas.

A re-vegetation and planting plan will be developed in coordination with the appropriate resource agencies and stakeholders during Pre-construction Engineering Design.

Climate Change Impacts

Salmonid. Many environmental factors affect the abundance and distribution of marine species, including ocean temperatures, ocean circulation patterns, and climate. Additionally, for species such as salmonids that also depend upon freshwater systems, environmental factors such as water quality may also affect species reproduction and survival. Global climate change has the potential to alter these environmental factors. The following section provides a brief summary of climate change effects on salmonid species presented by various entities.

The global climate exhibits natural variability that often causes fluctuations in marine fish populations (Rothschild 1996, PFEL 2008, Watson et al. 1997). For example, scientific research has “found that salmon returns in the Northwest show long-term behavior which closely follows climate cycles” (Taylor and Southards 1997). However, changes in climate beyond normal oscillations, in particular global warming, have the potential to alter marine fish populations on a more permanent basis. As ocean temperatures rise marine fish are most likely to shift geographic location to match their preferred temperature range (Sharp 2003, Watson et al. 1997). This may cause regional and local shifts in fish stocks (Rothschild 1996, Sharp 2003, Watson et al. 1997). Additionally, increases in sea level may change the amount and distribution of near shore estuaries, marshes and wetlands that many marine species depend upon (Rothschild 1996, Sharp 2003). Finally, alterations in climate that affect quantities and timing of rain events and subsequent freshwater flows have the potential to shift salmonid spawning patters and juvenile survival in freshwaters (Watson et al. 1997).

For the Malibu Creek Watershed, changes in global climate have the potential to alter Malibu Lagoon habitats and the species that depend on them. Sea level rises may alter the flow patterns into and out of Malibu Lagoon, altering the salinity and subsequent plant and wildlife species composition. As for the southern California steelhead, which depends upon both salt and freshwater habitats; growth, survival, reproduction, and spatial distribution may be affected (Watson et al. 1997). Warmer ocean temperatures may shift the southern California steelhead's distribution northward and "warmer river water and reduced flows in the late summer may increase mortalities and reduce spawning success" (Watson et al. 1997).

Terrestrial. Climate change may affect the Malibu Creek watershed by increasing the severity of individual storm events while reducing the frequency of storms. This could result in reduced erosion of sediments during Alternative 3 elongating the construction period past the currently estimate of 50 years. Any increase in this period results in greater impacts due to the continued presence of Rindge Dam and its accumulated sediments for a longer period of time and the longer time required for the system to be restored to a more natural state. This is likely to be a beneficial impact to Alternative 4 as reduced storms would reduce the amount of sediments likely to be washed down the creek during the winter periods, making these alternatives look closer to Alternative 2. Benefits to truck traffic and air emissions for Alternative 4 would be reduced as well.

5.5 <u>Cultural Resources</u>

5.5.1 *Impact Significance Criteria*

Determination of the significance of impacts on cultural resources associated with the proposed project alternatives are based on criteria provided in federal and state statutes and their implementing guidelines. Federal agencies must consider project impacts on cultural resources under both NEPA and the NHPA. Whereas NEPA more broadly includes review of impacts on cultural resources as part of the affected human environment, including sacred sites and non-NRHP eligible archaeological sites and collections, the NHPA only considers effects on "historic properties" that are listed or eligible for inclusion in the NRHP. State agencies must consider project impacts on "historical resources," defined as listed in or eligible for the CRHR, as part of the environment under CEQA.

The impact criteria below were taken from Appendix G of the CEQA guidelines. Cultural resource impacts would be considered significant for CEQA under the following conditions:

1. Cause a substantial adverse change in the significance of a historical resource as defined in CEQA Guidelines Section 15064.5.
2. Cause a substantial adverse change in the significance of an archaeological resource pursuant to Section 15064.5.
3. Disturb any human remains, including those interred outside of formal ceremonies.

In addition to the above CEQA requirements, the USACE must comply with NHPA section 106 and assess impacts to historic properties based on its definition of adverse effect. Under the NHPA and NEPA, cultural impacts would be significant if the project alternatives would adversely affect a historic property by altering the characteristics that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property. (36 C.F.R. § 800.5; 40 C.F.R. § 1508.27, subd. (b).)

Integrity is the ability of a property to convey its significance, based on its location, design, setting, materials, workmanship, feeling, and association. Adverse effects can be direct or indirect. They include reasonably foreseeable impacts that may occur later in time, be farther removed in distance, or be cumulative. (ACHP, 2003.)

5.5.2 *Analysis of Alternative Components*

<u>Dam and Spillway Removal</u>

Construction Impacts

Removal of the dam and spillway, and associated actions within Malibu Canyon, have the potential to impact the following cultural resources:

- **P-19-186946 (Rindge Dam):** All action alternatives of the project propose to remove Rindge Dam, although some alternatives allow for the spillway to remain intact. Since the dam is considered eligible for the NRHP and the CRHR, removal of Rindge Dam would constitute an adverse effect on a historic property under Section 106 of the NHPA (significant impact for NEPA), and a significant impact to an historical resource under CEQA. The proposed demolition and removal of Rindge Dam would destroy most of the characteristics that make it eligible for the NRHP (Criteria 1). Retention of the spillway could allow for one feature of the Rindge Dam to be maintained in situ. Previous alternatives analysis has shown that options to avoid or minimize impacts to the dam are infeasible, thus mitigation measures which compensate for the loss of the structure will need to be finalized in consultation with the SHPO and other consulting parties.
- **P-19-004429 (Rindge Water Pipeline):** P-19-004429 is a contributor to the Rindge Dam (P-19-186946), and is considered eligible for the NRHP and CRHR. At this time, it is not known whether removal of all or a part of the Rindge pipeline will be included as part of the removal of Rindge Dam. Presumably, at least a portion of the pipeline connecting to Rindge Dam structure would have to be removed and would thus be considered an adverse effect on a historic property under Section 106 of the NHPA, and a significant impact to an historical resource under CEQA (Criteria 1). Project design should minimize the amount of pipeline that would need to be removed from Malibu Canyon and still meet project goals. Consultation with the SHPO and other consulting parties will be required concerning eligibility, assessment of adverse effects, and to resolve these effects for removal of a portion of the pipeline.
- **P-19-004428 (Sheriff's Honor Camp site):** Temporary construction staging is proposed within the boundaries of the NRHP and CRHR eligible P-19-004428, which operated as a prison labor camp c. 1945-1952 for the construction of Malibu Canyon Road. Extensive mortared rock retaining walls, as well as concrete foundations remain at this historical archaeological site. The project proposes construction staging for dam removal as well as

construction of an interpretive feature, preservation of the rock retaining walls, and construction of a short-term parking pullout at the site. Any construction work taking place at this site shall avoid all historic features related to the honor camp. A qualified archaeologist will monitor construction staging set-up and construction of the interpretive overlook to ensure that character-defining features of the site are not impacted. As a result, the project would result in no adverse effect or significant impacts to P-19-004428 (Criteria 2).

Long Term Impacts

Cultural resources are a non-renewable part of the environment. Once removed or altered, the historic fabric of the resource is forever gone and cannot be replaced with the exact materials and construction. The proposed removal of Rindge Dam and portions of the Rindge Water Pipeline would therefore result in long-term impacts on the human environment. There are no construction or long-term related impacts anticipated under Criteria 3 at the Rindge Dam site.

Upstream Barriers

Construction Impacts

Removal of the upstream barriers has the potential to impact the following cultural resources:

- **P-19-190759 (White Oak Dam and Pumphouse; LV2**): P-19-190759 has been determined eligible for individual listing on the NRHP and the CRHR, and as a contributing element to a larger White Oak Farm Historic District. All alternative options with upstream barrier removals propose to remove the White Oak Dam as part of upstream barrier removals along the Las Virgenes tributary to Malibu Creek, which would constitute an adverse effect on a historic property under Section 106 of the NHPA, and a significant impact on an historical resource under CEQA (Criteria 1). Alternatives for meeting project objectives while preserving White Oak Farm Dam have been evaluated and determined not feasible.
- **P-19-190760 (Piuma Culvert; CC1):** The Piuma Culvert has been determined not eligible for the NRHP or CRHR; therefore, removal of the culvert and replacement with a new freespan bridge and reconstructed wing walls would not result in an adverse effect or significant impacts to P-19-190760 nor constitute a significant impact on the environment under NEPA or CEQA.

Long Term Impacts

Cultural resources are a non-renewable part of the environment. Once removed or altered, the historic fabric of the resource is forever gone and cannot be replaced with the exact materials and construction. The proposed removal of the White Oak Dam could potentially result in long-term impacts on the human environment. There are no anticipated impacts under Criteria 2 or 3 at any of the upstream barrier locations.

Sediment Hauling and Placement

Construction Impacts

The placement of beach compatible material on the beach near Malibu Pier has the potential to impact the following cultural resources:

- **P-19-177472 (Adamson House):** Several alternatives propose to enrich the beach adjacent to Malibu Pier with sediments recovered from impounded sediment behind Rindge Dam. This beach nourishment would serve to further protect the Adamson Saltwater Tank and provide additional beach protection for the entire NRHP-listed Adamson House property (P-19-177472). With avoidance measures in place to protect the Saltwater Tank, there would be no adverse effect to this NRHP resource (Criteria 1). Consultation with the SHPO and other consulting parties will be required concerning assessment of effects.
- **CA-LAN-264 (Village of Humaliwo):** Although the archaeological deposits of the NRHP-listed CA-LAN-264 do not extend to the beach sands, beach nourishment activities are proposed directly adjacent to known deposits. It is recommended that initial beach nourishment in these areas is monitored by a CDPR archaeologist in order to ensure that no impacts to the site occur as a result of these activities. With the implementation of this mitigation measure, there will be no adverse effect to CA-LAN-264 (Criteria 2). Consultation with the SHPO and other consulting parties will be required concerning assessment of effects.
- **Surfrider Beach at Malibu:** Several alternatives propose to enrich the beach adjacent to Malibu Pier with sediments recovered from impounded sediment behind Rindge Dam. While beach nourishment would provide additional beach protection for the Adamson House and Humaliwo, beach nourishment in this area requires evaluation regarding effects to contributing factors for the National Register eligibility of the Surfrider Beach at Malibu, such as long, consistent, and well-shaped waves. Consultation with the SHPO and other consulting parties will be required concerning eligibility and assessment of effects.
- **American Boy Shipwreck:** Due to the wooden construction of this fishing vessel which burned and sunk, it is unlikely that any parts of the wreck remain; therefore, the proposal for nearshore placement of sediments would not constitute a significant impact on the environment under NEPA or CEQA, and result in a No Historic Properties Affected finding under Section 106 of the NHPA.

Long-Term Impacts

Cultural resources are a non-renewable part of the environment. Implementation of proposed avoidance and mitigation measures at the Saltwater Tank/Adamson House property and CA-LAN-264 will ensure no adverse effects to either property. There are no anticipated impacts under Criteria 3 as a result of any sediment hauling and placement option.

Floodwall

Construction Impacts

Construction of a floodwall along Malibu Creek has the potential to impact the following cultural resources:

- **CA-LAN-264 (Village of Humaliwo):** Alternatives 3 and 4 require a 10-ft high floodwall on top of a 3-ft pile cap, constructed with 25-ft deep concrete sheet pilings, along the west shoulder of Serra Road from the north side of PCH for a length of approximately 975 ft, including an approximately 15-ft wide maintenance corridor. Construction would require an approximately 45-ft wide footprint. Three areas of previous archaeological excavations have been mapped within the portion of the NRHP-listed site of *Humaliwo* north of the highway, including the historic-period Chumash cemetery block excavation, designated as Area 1 (Gamble, Russell and Hudson 1995).

Portions of Area 1 are located within the APE for the flood mitigation facilities. No previous archaeological excavation or testing has been conducted within the shoulder of Serra Road to determine the presence of archaeological deposits or features where the floodwall installation will occur. Given the extensive excavation that will be required to construct the floodwall using concrete sheet piles, and the proximity to a known cemetery, construction of the proposed floodwalls along Serra Road north of PCH would constitute an adverse effect on a historic property under Section 106 of the NHPA, and a significant impact to an historical resource under CEQA (Criteria 1). Mitigation measures which compensate for impacts to that portion of CA-LAN-264, which would likely include archaeological data recovery, will need to be finalized in consultation with the SHPO and local tribes in order to resolve the adverse effects to the historic property.

Long Term Impacts

Cultural resources are a non-renewable part of the environment. Once removed or altered, the historic fabric of the resource is forever gone and cannot be replaced with the exact materials and construction. The proposed removal of portions of Area 1 of CA-LAN-264 (Village of Humaliwo) could potentially result in long-term impacts on the human environment.

5.5.3 *Analysis of Alternatives*

Alternative 1: No Action

Construction Impacts

Under the No Action Alternative there would be no project-related construction and therefore no impacts. Existing cultural resources described in **Section 3.5** would remain largely unchanged, except for those natural processes currently acting upon them.

Long-Term Impacts

The No Action Alternative is the continuation of the existing condition, which means that the Rindge Dam, the Rindge Pipeline, the upstream barriers, including the White Oak Dam, and the Sheriff's Honor Camp site would all remain in their current conditions. Over the long-term, without regular use or maintenance, these structures will eventually deteriorate; however, deterioration to the degree of resulting in adverse effects to the historical significance of the resources is not anticipated within the 50-yr horizon considered as part of this study.

Alternative 2: Mechanical Transport

Variations of Alternative 2 have the potential to impact cultural resources at the Rindge Dam Site, at the upstream barrier locations, and at the beach placement area. A summary of potential impacts associated with each variation of Alternative 2 is contained in **Table 5.5-1**.

Mitigation Measures

Measures to reduce adverse impacts to cultural resources, including avoidance, minimization and mitigation measures, are required to be considered under NEPA, and must be implemented to substantially lessen significant impacts under CEQA. To address project impacts for variations of Alternative 2, the following measures shall be implemented, pending consultation with SHPO and tribes:

- **CR-1: Archaeological Monitoring of Earth Moving Activities at Rindge Reservoir.** Because the reservoir behind Rindge Dam is filled with 780,000 cy in sediments, it is unknown whether archaeological sites were buried during sedimentation. Therefore, a qualified archaeologist shall monitor earth removal activities as needed where the native stratigraphy (i.e. along the canyon walls and bottom) becomes exposed in order to locate, record and assess impacts to any buried archaeological resources. As the project intent is solely to remove sediments built up since the dam was constructed, no further excavation should be required once the originally topography is reached. Therefore, implementation of this archaeological monitoring requirement would reduce any potential impacts to unknown archaeological deposits to a less than significant level.
- **CR-2: Archaeological Monitoring of Beach Nourishment adjacent to Malibu Pier.** Initial beach nourishment at the beach adjacent to Malibu Pier shall be monitored by a qualified archaeologist and Native American observer in order to ensure that no impacts occur to the Adamson Saltwater Tank or archaeological site CA-LAN-264 as a result of the sand delivery and spreading activities. Since the project would involve the addition of sediments and could be re-directed as necessary in order to avoid potential impacts to archaeological resources, implementation of this archaeological monitoring requirement would reduce any potential impacts to historic resources or archaeological deposits to a less than significant level.
- **CR-3: Archaeological Monitoring of Construction Staging at the Sheriff's Honor Camp Site (Sheriff's Overlook).** A qualified archaeologist will monitor construction staging set-up at the Sheriff's Honor Camp site, and perform periodic spot-checks of the staging area throughout the life of the project construction to ensure that no impacts occur to the historic features associated with the Camp. Implementation of this archaeological monitoring requirement would reduce any potential impacts to the Sheriff's Honor Camp site to a less than significant level.
- **CR-4: Completion of Historic American Engineering Record (HAER) Documentation** of the Rindge Dam and the Associated Rindge Water Pipeline. Prior to removal, a complete record of the Rindge Dam and the associated Rindge Water Pipeline will be prepared according to HAER program guidelines, as administered under the National Park Service. Only those sections of the Pipeline shall be removed as necessary to allow for removal of

the dam and restoration of the creek channel; all other intact sections of Pipeline shall remain in place.

- **CR-5: Incorporation of Interpretive Exhibits and Restoration of the Sheriff's Honor Camp site.** Following project completion, the Sheriff's Honor Camp site will be restored as an interpretive road turnout with overlooks of the Rindge Dam site and Malibu Canyon. Interpretive exhibits explaining the historical significance of Rindge Dam and the historic and prehistoric significance of the Malibu Canyon area, including the Honor Camp, will be developed and installed in consultation with CDPR interpretive and cultural resource staff. The design for the proposed interpretive features at this location shall preserve and incorporate the rock retaining walls and associated features to the extent possible in accordance with the *Secretary of the Interior Standards for the Treatment of Historic Properties,* and in consultation with the SHPO. A qualified archaeologist will monitor construction of the interpretive overlook in order to ensure that there are no impacts to historic features of the Honor Camp site.
- **CR-6: Completion of Historic American Engineering Record (HAER) and Historic American Building Survey (HABS).** Documentation of the White Oak Farm Historic District. During the project design phase, all feasible measures for minimizing the portion of the dam requiring removal in order to meet project objectives shall be explored. Prior to dam removal, a complete record of the White Oak Dam and associated Powerhouse will be prepared according to HAER program guidelines, as administered under the National Park Service.

Level of Significance

Avoidance measures and implementation of environmental commitments described above will reduce impacts to a less than significant level for four of the six identified cultural resources potentially affected by variations of Alternative 2. Although proposed mitigation measures for documentation and interpretation will lessen the significant impacts on the Rindge Dam, complete demolition of this resource still constitutes a Class I significant effect on the environment, per 14 CCR 15126.4(b)(2). In addition, removal of White Oak Dam under Alternative 2b and 2d variations would constitute an adverse effect on a historic property under Section 106 of the NHPA, a significant impact under NEPA, and a significant impact on an historical resource under CEQA (Criteria 1).

Table 5.5-1 - Significance of Impacts to Cultural Resources Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	Class I			LTS			Yes
2a2	Class I				LTS		Yes
2b1	Class I		Class I	LTS			Yes
2b2	Class I		Class I		LTS		Yes
2c1		Class I		LTS			Yes
2c2		Class I			LTS		Yes
2d1		Class I	Class I	LTS			Yes
2d2		Class I	Class I		LTS		Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

<u>Alternative 3: Natural Transport</u>

Variations of Alternative 3 have the potential to impact cultural resources at the Rindge Dam Site, and at the upstream barrier locations. Since there is no beach placement of sediment under any variation of Alternative 3, there are no impacts to beach placement areas. A summary of potential impacts associated with each variation of Alternative 3 is contained in **Table 5.5-2**.

Mitigation Measures

Measures to reduce adverse impacts to cultural resources, including avoidance, minimization and mitigation measures, are required to be considered under NEPA, and must be implemented to substantially lessen significant impacts under CEQA. To address project impacts for variations of Alternative 3, the measures would include those implemented under Alternative 2 with the exclusion of CR-2. The following additional mitigation measure would also be implemented with variations of Alternative 3:

1. **CR-7: Perform Archaeological Testing and Data Recovery for Serra Road Floodwall Impacts to CA-LAN-264.** Due to the high potential to encounter human remains during the proposed Alternative 3a floodwall construction along the west shoulder of Serra Road, all design options to avoid or minimize the flood mitigation structures in this area should be explored, per 14 CCR 15126.4(b)(3). If further review shows that structures are still required in this vicinity, an archaeological testing program shall first be employed to determine the presence or absence of archaeological deposits of CA-LAN-264 along the Serra Road shoulder in order to assist with developing design options that would minimize project impacts to the extent feasible.

To mitigate the impacts that construction of flood control structures would cause within the impacted portion of the site, archaeological data recovery using modern techniques shall be undertaken within the impact area prior to start of construction. The program of data recovery should also take into account data from previous site excavations in developing a complete published synthesis of CA-LAN-264, with particular emphasis on the area of the site north of PCH. Consultation with Native American descendant communities will need to be intensive and meaningful during all phases of planning for testing and mitigation efforts, due to the sensitive nature of the resources involved, per 14 CCR 15064.5(d).

Level of Significance

A summary of the significance of each component of variations of Alternative 3 are contained in **Table 5.5-2**. Avoidance measures and implementation of environmental commitments described above will reduce impacts to a less than significant level for two of the four identified cultural resources potentially affected by project Alternative 3. Although proposed mitigation measures for documentation and interpretation will lessen the significant impacts on the Rindge Dam, complete demolition of this resource still constitutes a Class I significant effect on the environment, per 14 CCR 15126.4(b)(2). In addition, removal of White Oak Dam under b and d variations would constitute an adverse effect on a historic property under Section 106 of the NHPA, a significant impact under NEPA, and a significant impact on an historical resource under CEQA (Criteria 1).

At this time, the NRHP-listed significance of CA-LAN-264 is based on archaeological information potential, and implementation of a data recovery program would be sufficient to reduce project impacts to a less than significant level (Class II). However, consultation with Native American tribes may reveal that additional categories of significance are relevant to the site, in which case, archaeological data recovery alone may not be sufficient to reduce project impacts to the resource to a less than significant level, resulting in a Class I significant effect.

Table 5.5-2 - Significance of Impacts to Cultural Resources Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	Class I					Class I or II	Yes
3b	Class I		Class I			Class I or II	Yes
3c		Class I				Class I or II	Yes
3d		Class I	Class I			Class I or II	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

Alternative 4: Hybrid Mechanical & Natural Transport

Under variations of Alternative 4, seven cultural resources may be impacted by removal of the dam with natural transport and beach nourishment actions. These include all of the cultural resources associated with variations of Alternative 2, as well as the cultural resource described under Alternative 3.

Mitigation Measures

Measures to reduce adverse impacts to cultural resources, including avoidance, minimization and mitigation measures, are required to be considered under NEPA, and must be implemented to substantially lessen significant impacts under CEQA. To address project impacts for variations of Alternative 4, all of the mitigation measures described under variations of Alternative 2 and Alternative 3 would be included where appropriate.

Level of Significance

A summary of the significance of each component of variations of Alternative 4 are contained in **Table 5.5-3**. Generally, the significance of variations of Alternative 4 are the same as those previously discussed under Alternative 2 and Alternative 3.

Table 5.5-3 - Significance of Impacts to Cultural Resources Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	Class I			LTS		Class I or II	Yes
4a2	Class I				LTS	Class I or II	Yes
4b1	Class I		Class I	LTS		Class I or II	Yes
4b2	Class I		Class I		LTS	Class I or II	Yes
4c1		Class I		LTS		Class I or II	Yes
4c2		Class I			LTS	Class I or II	Yes
4d1		Class I	Class I	LTS		Class I or II	Yes
4d2		Class I	Class I		LTS	Class I or II	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III)

Comparison of Alternatives

The greatest impacts to cultural resources associated with the evaluated array of alternatives comes from full removal of Rindge Dam, which is considered a Class I impact. Therefore, any alternative that includes this option (all alternatives with a or b designations) would be considered to be significant. In addition, removal of White Oak Dam under b and d variations would constitute a significant impact on an historical resource under CEQA and would constitute an adverse effect on a historic property under Section 106 of the NHPA, a significant impact for NEPA (Class I). All alternatives that require flood walls (Alternatives 3 and 4) also have the potential to result in Class I impacts to historic properties of traditional and religious significance to consulting Tribes. Impacts associated with other upstream barriers than White Oak Dam are mitigable (Class II). Alternatives that include removing only the dam and leaving the spillway intact (all alternatives with c or d designations), have reduced impacts compared to those including the entire removal of Rindge Dam, as a portion of the historic structure would be left intact. Therefore, Alternative 2c is expected to affect the least number of historic properties and other cultural resources.

5.5.4 *Tribal Consultation Summary*

On May 6, 2013, the USACE requested via fax, a list of Native American groups and individuals associated with the APE vicinity from the NAHC. The NAHC provided the list via emailed letter on May 7, 2013. The letter provided by the NAHC also included the results of a SLF search conducted for the APE and indicated that Native American cultural resources have not been identified within the APE. A revised list was requested and received via email on March 29, 2016. The 2016 letter provided by the NAHC noted that sites on the Malibu Beach quadrangle may be impacted by the project. A California Assembly Bill 52 (AB52) notification was also provided by CDPR for one Tribe.

On April 13, 2016, the USACE mailed a consultation meeting invitation for a meeting on April 29, 2016, to the Native American groups and individuals indicated by the NAHC. CDPR called individuals on the list on April 22, 2016 to provide a reminder about the meeting. The USACE made follow-up calls and sent reminder emails on April 25 and April 27, 2016 regarding the meeting to everyone on the NAHC list.

An initial Tribal Consultation Meeting was held on April 29, 2016; representatives from the Santa Ynez Band of Chumash Indians, Wishtoyo Chumash Foundation, and the Tongva Ancestral Territorial Tribal Nation attended in person or via teleconference.

<u>Summary of Native American Consultation</u>

Native American consultation conducted to date strongly indicates that the Malibu Ecosystem Restoration Project area should be considered sensitive for Native American resources. Consultation under Section 106 of the NHPA, CEQA, and USACE and CDPR Tribal Consultation policies is ongoing.

5.6 <u>Socioeconomics and Environmental Justice</u>

5.6.1 *Impact Significance Criteria*

This section also includes an analysis of the project's compliance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (59 FR 7629; February 16, 1994) and State Government Code § 65040.12, subd. (e) and State Government Code section 11135. The criteria established below apply to both NEPA and CEQA compliance.

The impacts on socioeconomics would be considered significant if the project would:

1. Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)
2. Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere
3. Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere
4. Disproportionately affect minorities, low income residents, or children.
5. Result in a labor shortage, or significant decrease in local employment.

Impacts on environmental justice considerations would be considered significant if the project would:

6. Have disproportionately high and adverse human health or environmental effects on minority and, or low-income populations

5.6.2 *Analysis of Alternative Components*

This section analyzes the impacts of the alternatives on socioeconomics and environmental justice based on the significance criteria listed above.

<u>Dam and Spillway Removal</u>

Construction Impacts

Removal of the dam arch alone, compared to removal of both the dam arch and spillway, have identical socioeconomic and environmental justice impacts for both short and long term impacts. Therefore the following discussion applies to both options.

During the short-term, dam and/or spillway removal would create temporary employment for construction workers, which would be a temporary benefit to the regional economy with the increased employment and income. Workers are expected to be from the local region, including communities within Los Angeles and Ventura Counties. As a result, and because of the temporary nature of these impacts, the population is not expected to increase (Criteria 1) nor would dam and spillway removal result in the displacement (Criteria 2-3) or need for additional housing in the region. There are no project features that would cause a labor shortage (Criteria 5), or significant decrease in local employment. This alternative would also not disproportionately affect minorities, low income residents, or children during the construction period (Criteria 4 & 6). The removal of the dam and spillway would not result in significant impacts to socioeconomic resources.

The populations of the cities of Calabasas and Malibu have a very low density of low-income and minority residents. Removing the dam and spillway, along with the associated hauling of debris, would result in a temporary reduction in air quality, transportation impacts, and noise impacts in the immediate project area and local truck hauling routes to the landfill. There are no residences in the immediate area of Rindge Dam, however the adjacent Malibu Canyon Road are utilized by all populations. The dam and spillway removal alternative would also utilize road segments (Malibu Canyon Road, Las Virgenes Road, Lost Hills Road, PCH, and US 101) that do have adjacent residences in the cities of Calabasas and Malibu, for worker and truck hauling trips. All populations adjacent to the transportation routes would be affected equally, rather than minorities or low income residents being disproportionately affected. With implementation of mitigation measures as identified for those resources, impacts would be reduced. Dam and spillway removal is not expected to significantly affect environmental justice populations during construction. Removal of the dam alone would have the same potential impacts as removal of the dam and spillway.

Long-Term Impacts

In the long-term, operations and maintenance activities would not result in a change in zoning or land use that could induce socioeconomic impacts. Removal of the dam and spillway would not result in the construction of permanent structures or buildings, nor would it displace housing or create a need for new housing (Criteria 2-3) nor would it directly or indirectly induce growth in the area (Criteria 1). When complete, the removal of the Rindge dam and spillway would not result in the creation of permanent jobs, and therefore would not result in a labor shortage (Criteria 5). The alternative would not disproportionately affect minorities or children (Criteria 4 & 6). The project area is surrounded by some of the most affluent communities in Los Angeles County and therefore will not adversely affect low income residents. Removal of the dam and spillway would not result in significant impacts to socioeconomic resources or environmental justice populations.

Upstream Barrier Removal

Construction Impacts

Short-term impacts to socioeconomic resources would be the same as those described for the dam and spillway removal above. Noise impacts resulting from construction may be adverse and significant at a number of the upstream barrier sites, however, these impacts would not result in disproportionately high and adverse human health or environmental effects to low-income or minority populations. Noise, air quality, and transportation impacts associated with construction work at the barrier sites would be temporary and short term in nature. Removal of upstream barriers would not result in significant impacts to socioeconomic resources or environmental justice populations under any of the significance criteria.

Long-Term Impacts

The addition of the removal of upstream barriers would have no appreciable bearing on the impacts described for other alternatives. Therefore, removal of the upstream barriers would not result in any long-term impacts to socioeconomic resources and environmental justice to any alternative they are associated with under any of the significance criteria.

Sediment Hauling & Placement

Construction Impacts

From a socioeconomic standpoint, sediment hauling and placement impacts are generally the same as dam and spillway removal impacts. The increase in construction activities associated with mechanical transport of sediment would not result in significant impacts to socioeconomic resources or environmental justice populations. While shoreline placement of impounded sediment would utilize a different hauling route than nearshore placement of material via barge, neither option would result in any additional or different socioeconomic or environmental justice-related impacts. The primary impacts associated with haul routes are air quality impacts, but these would be equally distributed as emissions along the entirety of all haul routes, and would not disproportionately affect minorities or children (Criteria 4 & 6). Beach placement of material would utilize the Malibu Pier parking lot, which could reduce business associated with parking lot use at Malibu Pier and increase traffic. However, this will not result in a decrease of local employment, nor would it have impacts under any of the significance criteria.

As discussed under dam and spillway removal, the haul routes associated with material placement have adjacent residences. In addition to those roads mentioned above, the off shore placement option would utilize road segments in Ventura, California including Olivas Park Road, Harbor Blvd, Schooner Drive, and Anchors Way. While Ventura has a significantly higher minority population than the Malibu and Calabasas area, it still has a lower minority population than the general Ventura and Los Angeles County trends. Private residences only occur along Schooner Drive and Anchors Way but any potential impacts to these residences do not differ from those in the vicinity of Malibu. Less than significant impacts in this area may occur from the creation of minor noise and traffic, as described in each resource chapter. However, these are expected to be no different than existing background levels, and no significant impacts will occur in the vicinity of Ventura under any of the socioeconomic significance criteria. Since air quality impacts will be distributed across the entirety of haul routes, these will not disproportionately affect minorities or children. Neither beach placement nor nearshore placement would result in socioeconomic or environmental-justice related impacts under any of the significance criteria.

Long-Term Impacts

Any benefits to the regional economy would be temporary, providing increased employment and income. The magnitude and duration of benefits would be in proportion to the amount of sediment removed and the timeline of removal as proposed in Alternatives 2 and 4. Neither sediment removal scenario would result in significant impacts under any of the significance criteria.

<u>Floodwall</u>

Construction Impacts

Potential impacts described under the dam removal alternative would be similar to those incurred during floodwall construction, except that impacts would occur over the anticipated 40-100 yr period of active construction, which would result in a temporary, seasonal benefit to the regional economy with the increased employment and income. All other potential impacts would be the same as dam removal and would not result in significant impacts to socioeconomic resources or environmental justice under any of the significance criteria.

Long-Term Impacts

Potential impacts from the floodwall alternative, post-construction operations and maintenance would be the same as for dam removal. Construction of floodwalls under this alternative would address the increased flood risk associated with the natural transport of sediments. It would not induce population growth in the area, displace existing housing or people, disproportionately affect minorities, low income residents, or children, or result in a labor shortage or significantly decrease local employment. Floodwall construction would not result in significant impacts to economic resources or environmental justice under any of the significance criteria.

5.6.3 *Analysis of Alternatives*

<u>Alternative 1: No Action</u>

The No Action Alternative involves leaving Rindge Dam, the impounded sediment, and upstream barriers in place. No construction would be implemented as a result of this alternative.
The No Action Alternative would not cause a labor shortage (Criteria 5) or significant decrease in local employment, nor will it provide employment opportunities. The No Action Alternative would not provide for the construction of housing or infrastructure that would potentially induce direct or indirect growth. No housing or people will be displaced (Criteria 2-3). Population growth will not be induced as a result of this alternative (Criteria 1). The No Action Alternative would also not disproportionately affect minorities, low income residents, or children (Criteria 4 & 6). Environmental justice considerations would not be altered or affected by the No Action Alternative. Therefore, impacts on socioeconomics and environmental justice are considered not significant.
Alternative 2: Mechanical Transport

Each variation of Alternative 2 results in slightly different socioeconomic impacts regarding the number and location of temporary jobs. However, as described above, none of the alternative components result in significant impacts under any of the significance criteria, and therefore impacts under any variation of Alternative 2 are less than significant (**Table 5.6-1**).

Table 5.6-1 - Significance of Socioeconomic Impacts Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	LTS			LTS			No
2a2	LTS				LTS		No
2b1	LTS		LTS	LTS			No
2b2	LTS		LTS		LTS		No
2c1		LTS		LTS			No
2c2		LTS			LTS		No
2d1		LTS	LTS	LTS			No
2d2		LTS	LTS		LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Mitigation Measures

No mitigation measures would be necessary as the impacts from Alternative 2 are considered not significant.

Level of Significance

Project-related impacts associated with Alternative 2 are less than significant (Class III).

Alternative 3: Natural Transport

All versions of Alternative 3 consist of allowing natural transport of impounded material from behind Rindge Dam over a period of 40-100 years, as opposed to mechanical transport of this sediment under the shorter timeframe associated with Alternative 2. Alternative 3 also requires the construction of downstream floodwalls to protect adjacent properties downstream of the dam from an increased flood risk due to increased sediment deposition associated with the natural transport of sediments. Each variation of Alternative 3 results in slightly different socioeconomic impacts regarding the number and location of temporary jobs. However, as described above, none of the alternative components result in significant impacts under any of the significance criteria, and therefore impacts under any variation of Alternative 3 are less than significant (**Table 5.6-2**). The option to allow natural sediment transport, compared to the mechanical sediment transport in Alternative 2, does not alter the significance of any of the alternatives.

Table 5.6-2 = Significance of Socioeconomic Impacts Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	LTS					LTS	No
3b	LTS					LTS	No
3c		LTS	LTS			LTS	No
3d		LTS	LTS			LTS	No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Mitigation Measures

No mitigation measures would be necessary as the impacts from Alternative 3 are not significant.

Level of Significance

Project-related impacts associated with Alternative 3 are less than significant (Class III).

Alternative 4: Hybrid Mechanical & Natural Transport

Alternative 4 is a hybrid of Alternatives 2 and 3 and consists of mechanically transporting some sediment from behind Rindge Dam, and allowing some to transport naturally downstream. As with Alternative 3, a longer time frame is associated with this range of Alternatives and beach/nearshore placement is avoided. Overall, the significance of socioeconomic and environmental justice impacts is the same for all variations of Alternative 4 (**Table 5.6-3**). There are no significant differences among any of the alternatives relative to socioeconomic or environmental justice impacts, as all are expected to result in less than significant impacts under all of the significance criteria.

Table 5.6-3 - Significance of Socioeconomic Impacts Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	LTS			LTS			No
4a2	LTS				LTS		No
4b1	LTS		LTS	LTS			No
4b2	LTS		LTS		LTS		No
4c1		LTS		LTS			No
4c2		LTS			LTS		No
4d1		LTS	LTS	LTS			No
4d2		LTS	LTS		LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Mitigation Measures

No mitigation measures would be necessary as the impacts from Alternative 4 are not significant.
Level of Significance

Project-related impacts associated with Alternative 4 are less than significant (Class III).

Comparison of Alternatives

There are minor differences to potential socioeconomic and environmental-justice related impacts among alternatives. Any alternative that includes upstream barriers will require work in a residential area with additional minor and less than significant impacts. In addition, the two different sediment hauling options under Alternative 2 result in potential impacts in different areas, one adjacent to Malibu Pier and the other in the vicinity of Ventura Harbor. However, socioeconomic impacts at both of these locations are considered less than significant. Finally, the timeframe associated with Alternative 2 is much shorter than that proposed for Alternatives 3 and 4. However, regardless of alternative, any potential socioeconomic and environmental justice impacts are less than significant. Therefore, all of the alternatives generally have the same impacts.

5.7 Aesthetics

5.7.1 *Impact Significance Criteria*

The criteria established below apply to both NEPA and CEQA compliance. Impacts to aesthetics would be considered significant if the project:

1. Created substantial adverse permanent effect on public viewing areas and/or scenic vistas along public highways, trails, parklands, and beaches, such as obstruction and degrading of views along scenic highways (PCH and Malibu Canyon Road) or public viewing areas, as designated in the Malibu Local Coastal Plan Land Use Plan, Santa Monica Mountains Local Coastal Program Land Use Plan or City of San Buenaventura Comprehensive Plan;
2. Created substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway, including alterations of natural land forms in a manner not compatible with the character of surrounding areas;
3. Created a substantial adverse effect on protection and enhancement of visual quality in visually degraded areas in public viewing areas and within corridors of designated scenic highways;
4. Created a substantial adverse effect of not incorporating aesthetic design considerations into reconstruction or maintenance of designated scenic highways; or,
5. Created a substantial adverse effect on preservation, protection, and enhancement of natural open space as a scenic resource of great value and importance to the quality of life of residents and to the enhancement of the scenic experience of visitors.
6. Create a new source of substantial light or glare.

5.7.2 *Analysis of Alternative Components*

Dam & Spillway

Construction Impacts

Potential short-term impacts to aesthetic and scenic resources would occur as a result of temporary construction activities associated with dam and/or spillway removal. Leaving the spillway intact would generally have the same potential aesthetic impacts as removing both the dam and spillway, but a small portion of the dam structure would remain visible in the future. However, this difference does not alter any of the short or long term significance determinations, and whether leaving the spillway intact results in a positive or negative aesthetic impact is subject to personal interpretation. Implementation of dam and/or spillway removal would temporarily degrade views during construction. For mechanical transport this impact would be for up to 8 years, while under natural transport options this impact could occur at intervals for 40-100 years. Degraded views could occur at public viewing areas or scenic vistas along public highways, including scenic highways, State parklands, and trails, but these would be temporary (Criteria 1). The Sheriff's Overlook is visible from Malibu Canyon Road, a county designated scenic highway, Malibu Creek State Park, and nearby trails. The Sheriff's Overlook would be temporarily closed to public access during construction. During construction, Sheriff's Overlook would be used as a staging and oversight area for construction teams. Upon completion of construction activities any debris or equipment located at Sheriff's Overlook would be cleared from the area. As part of restoration efforts at the Sheriff's Overlook, potential general recreation and educational improvements may incorporate a small dirt turnout parking area and educational features with reference kiosks or signage to provide history and photos of Rindge Dam.

Trails in the vicinity of the project area are not designated scenic corridors. The Backbone Trail System has been designated a scenic corridor by the National Park Service but does not offer views of the Dam site or Sheriff's Overlook.

Disposal of materials at a landfill would not impact aesthetic and scenic resources as this is an accepted use for a landfill. Rindge Dam is only visible from two locations: Malibu Creek looking upstream towards the Dam for a short distance from the Dam before Malibu Creek turns northwards and Piuma Road. At the Sheriffs Overlook, off of Malibu Canyon Road, the Dam is visible after parking and walking to the side of the parking area towards Malibu Creek. Rindge Dam is not visible from Malibu Canyon Road. **Photo 5.7-1** illustrates the current view of the Dam. A photo-simulation, **Figure 5.7-1** illustrates the removal of the Dam at the mid-point of construction with 50 ft of the structure remaining.

Views of construction in the immediate work vicinity of the dam would be most visible. However, as activities extend up the canyon wall, and encompass the entire riparian zone for approximately ¾ mile upstream, other temporary viewshed disturbances include:

- Clearing and grubbing native vegetation at access roads and the Sheriff's Overlook; and 1 mile along Malibu Creek (Criteria 2)
- Views of construction equipment, laydown areas, stockpiling, and other construction related activities from Malibu Canyon and Piuma Roads and scenic overlooks along Piuma Road;
- Temporary loss of a public viewing point at Sheriff's Overlook during construction.
- Obstruction of beach and coastal views caused by construction equipment, stockpiling, and other construction related activities from Malibu Canyon Road, Malibu Pier, PCH, trails, and residences.

While there will be temporary impacts to viewpoints, vistas, and scenic resources such as vegetation, during construction, these impacts are all temporary and not significant (Criteria 1). In addition, Malibu Canyon Road is not a state designated scenic highway and therefore impacts under Criteria 2 do not apply. Removal of the dam and/or spillway will result in no construction related impacts under Criteria 3-6.

Photo 5.7-1 - Rindge Dam – Existing conditions – June 2008

Figure 5.7-1 - Rindge Dam Mid-Point of Construction - 50% Removal

Long Term Impacts

Aesthetics are somewhat subjective, and based on the perspective of the viewer. Some may consider the removal of the dam and restoration of the creek as beneficial to the long term viewshed, while other perspectives may consider the Rindge Dam structure of aesthetic value. After removal of the dam, habitat restoration of the construction areas, including the Sheriff's Overlook, access roads, sediment removal area, dam site, and truck routes is proposed. Habitat restoration and re-vegetation of disturbed areas with a native plant palette to match existing vegetation is included in this alternative to minimize visual disturbances. Sediment removal and sideslope excavation to match existing canyon slopes would result in restoration of the creek to pre-dam conditions allowing for fish passage and potential recreational uses.

In the interim, after construction and prior to maturity of vegetation, disturbance areas would remain visible. A five-year period is estimated for vegetative cover to be established, wish is considered temporary. Therefore, a substantial adverse permanent effect on public viewing areas and/or scenic vistas along public highways, trails, and parklands would not occur under this alternative (Criteria 1). A substantial adverse impact to visual quality in visually degraded areas within public viewing areas and within corridors of designated scenic highways would not occur. Removal of the dam and impounded sediments would restore the area from its currently degraded state to a more natural appearance, prior to construction of the dam, providing a positive aesthetic impact (Criteria 2). **Figure 5.7-2 pr**ovides a photo-simulation of the area after removal of the dam and full restoration with mature vegetation.

Removal of the dam alone, compared to removal of the dam and spillway would generally have the same long term effects. If the spillway is left in place, the cement structure of the spillway would still be visible after construction. The spillway would continue to attract illegal trespass, and be damaged by graffiti, trash and debris. The continued nuisance traffic associated with the spillway, if left in place, could result in impacts to vegetation and may reduce the long term natural aesthetics compared to removing both the spillway and dam. However, this is similar to the baseline condition which includes the spillway remaining in place. Leaving the spillway in place would not alter the restoration of the creek and associated slopes and vegetation. Therefore, the final results would be aesthetically similar.

Figure 5.7-2 - Post-Dam Removal

Rindge Dam is a historically significant structure at the state and local levels and eligible for listing in the National Register of Historic Places. As a scenic resource, visibility of the Dam is limited to the Sheriff's Overlook, Piuma Road, a scenic overlook along Piuma Road, and walking upstream in Malibu Creek towards the Dam. Visibility at the Sheriff's Overlook is limited to walking toward the edge of the parking area. Potential restoration of the Sheriff's Overlook may incorporate improvements, such as interpretative signs regarding Rindge Dam and its history. Interpretive signs will be installed to ensure that any scenic views are not blocked by the signs. Substantial damage to other scenic resources non-inclusive of the Dam would not occur within the areas surrounding Malibu Canyon Road. In addition, Malibu Canyon Road is not a state designated scenic highway and therefore Criteria 2 does not apply. Scenic resources include but are not limited to, trees, rock outcroppings, and natural land forms.

A potentially significant aesthetic impact could occur if the proposed road improvement plan does not incorporate aesthetic design considerations for repairs or maintenance associated with the county designated scenic highway, Malibu Canyon Road (Criteria 4). Heavy construction traffic associated with the project has the potential to cause damage to Malibu Canyon Road and other roads. As a county designated scenic highway any reconstruction or maintenance must incorporate aesthetic design consideration.

As proposed, dam and/or spillway removal would not impact the preservation, protection, and enhancement of natural open space as a scenic resource of great value and importance to the quality of life of residents and to the enhancement of the scenic experience of visitors (Criteria 3 & 5). The project area is currently preserved within Malibu Canyon State Park, and dam removal would not impact preservation of the area as natural open space. There will be no need for lighting and therefore no impacts under Criteria 6.

Upstream Barrier Removal

Construction Impacts

Upstream barrier removal would occur over the first three years of the project. Potential short-term significant impacts to aesthetic and scenic resources would occur as a result of temporary construction activities associated with barrier removal, but since these impacts are temporary they are not substantive (Criteria 1). Upstream barrier removal would temporarily degrade views during removal of fish barriers potentially at residences, public viewing areas or scenic vistas along public highways, including scenic highways, State parklands, and trails. Since these impacts are temporary and will occur only during construction, these impacts are not substantial, and therefore no construction-related impacts under Criteria 1-5 would occur. No night work, and therefore no lighting, are being proposed and therefore there are no impacts under Criteria 6. The Backbone Trail System has been designated a scenic corridor by the National Park Service. There is a potential that one or more barrier removal sites may be potentially viewed from vantage points on the Backbone Trail System.

Temporary viewshed disturbances include:

- Clearing and grubbing native vegetation in the vicinity of fish barriers;
- Temporary alteration of habitat degrading aesthetics at barrier sites;
- Views of construction equipment, laydown areas, conveyance equipment, stockpiling, and other construction related activities from residences, public viewing areas or scenic vistas along public highways, including scenic highways, State parklands, and trails.

Long Term Impacts

Along with the removal of upstream barriers, habitat restoration of the construction areas is proposed. Habitat restoration and revegetation of disturbed areas with a native plant palette to match existing vegetation is included to minimize visual disturbances. Removal of the barriers and habitat restoration would allow for fish passage.

In the interim after construction and prior to maturity of vegetation, disturbance areas would remain visible. A substantial adverse permanent effect on residential views and public viewing areas and/or scenic vistas along public highways, trails, and parklands would not occur under this alternative (Criteria 1). Removal of the fish barriers would restore the areas from their currently degraded states to their natural appearance, providing a positive aesthetic impact (Criteria 2).

Substantial damage to scenic resources would not occur during barrier removal. Scenic resources include, but are not limited to, trees, rock outcroppings, and natural land forms. The majority of the barriers are manmade structures, such as culverts, concrete channels, low flow channels, and dams that are not historically significant. LV-2, however, is considered to be an eligible historic property. This property is not easily visible from any public access points. Portions of LV-2 might remain in place, depending on the outcome of SHPO consultation. However, since the structure is not generally visible, whether it is retained partially or not does not alter the overall impacts to aesthetic resources. Removal of the barriers would not exacerbate any damage previously attributed to the initial construction of the barriers.
A potentially significant aesthetic impact could occur if any road improvements associated with fish barrier removal do not incorporate aesthetic design considerations for repairs or maintenance

associated with the county designated scenic highway, Malibu Canyon Road (Criteria 4). As a county designated scenic highway any reconstruction or maintenance must incorporate aesthetic design consideration.

As proposed, upstream barrier removal would not impact the preservation, protection, and enhancement of natural open space as a scenic resource of great value and importance to the quality of life of residents and to the enhancement of the scenic experience of visitors (Criteria 4 & 6). Removal of fish barriers would enhance and restore natural open space. This alternative would not impact preservation of the area as natural open space.

Sediment Hauling & Placement

Construction Impacts

Potential short-term impacts to aesthetic and scenic resources at the Rindge Dam construction site as a result of sediment hauling from the dam site would be similar to impacts incurred from dam and spillway removal. In addition, sediment hauling would expand temporary degradation of views during hauling and stockpiling activities along highways, trails, and parks, and to the Malibu Pier area under shoreline placement or Ventura Harbor under nearshore placement.

The proposed shoreline placement site is on the beach directly east of Malibu Pier, just south of PCH. This location is east of Surfrider Beach, near Malibu Lagoon State Beach on the east side of the lagoon and south of the PCH. Under this placement option, material would be delivered to the Malibu Pier parking area between Labor Day and Memorial Day, stockpiled temporarily, and transferred to the adjacent beach for placement. Sand placement would nourish the existing beach, which is eroded almost entirely up to the existing rip-rap protection along the parking lot. Sand placement would mimic natural conditions of existing and adjacent beaches. Placement along the beach would be limited to the west by Malibu Pier and to the east by the end of the parking area and adjacent Malibu Beach Inn. The temporary daily stockpile, after maximum deliveries for the day, would reach a maximum peak of 26 ft above the existing grade and cover approximately 8,438 ft^2 assuming no material is spread on the beach during that day.

Shoreline replenishment activities, including the need for a temporary stockpile, would be visible from the PCH and Malibu Pier, creating a temporary aesthetic disturbance and reducing visual quality from public viewing areas during construction (Criteria 3). Shoreline replenishment would be partially visible from Surfrider Beach, but would be predominantly obstructed by Malibu Pier, and would also be visible from nearby trails and residential areas. Construction equipment storage would be required in the Malibu Pier parking lot. Shoreline replenishment would also require the use of Upland Site F for temporary storage during the construction season, creating additional temporary aesthetic disturbance in Malibu Creek State Park and from adjacent Mulholland Hwy. Shoreline placement would not result in any permanent substantive impacts to aesthetics (Criteria 1). PCH is not a state designated scenic highway in the Malibu area, and therefore Criteria 2 does not apply. There are no impacts under Criteria 4-6 associated with sediment placement option.

The proposed nearshore placement site is several hundred feet off-shore of the proposed shoreline placement site adjacent to Malibu Pier. Under this placement option, sediment would be trucked from the Rindge Dam site north to US 101 and west along US 101 to Ventura Harbor. At Ventura Harbor, trucks would deliver sediment directly into a waiting barge without the need for a temporary stockpile area. The barge would be in the existing Ventura Harbor, which is currently utilized for private and commercial boat traffic. No building or construction work would occur in the vicinity of Ventura Harbor, and no obstructions of the existing views would occur, and the overall viewshed in the area would not be altered. Therefore, utilization of the harbor for sediment loading would not result in any aesthetic impacts under any of the significance criteria.

Once full, the barge would deliver sediment to the offshore placement location. This option would avoid visual impacts associated with the temporary stockpile of material in the Malibu Pier parking area, and would avoid the impacts associated with heavy machinery use to place material along the beach. The barge would be visible during placement from Surfrider Beach, Malibu Pier, a limited length of PCH, and adjacent residential areas. However, private and commercial boat traffic offshore is a normal occurrence in the Malibu Area, and off-shore placement of the sediment would not result in any additional aesthetic impacts under any of the significance criteria.

Construction activities at the sediment removal areas would only be visible from Malibu Canyon Road over a very limited stretch; as well as along Piuma Road, a scenic overlook along Piuma Road, and looking upstream from Malibu Creek below the Dam. Temporary viewshed disturbances caused by sediment hauling and placement, in addition to those disturbances caused by dam and spillway construction activities include:

- Temporary alteration at beach replenishment area degrading aesthetics;
- Temporary loss of parking spaces as a result of construction activities at beach area;

Long Term Impacts

At the conclusion of beach replenishment activities, the replenished sand would not block or obstruct current scenic views from any of the available vantage points (Criteria 1). Replenishment would replace sand lost to erosion over multiple years and the loss of natural replenishment activities. The existing beach is almost entirely eroded, and the tide currently comes up to the existing rip-rap protection around the Malibu Pier parking area, with sand beach exposed only during lower tides. Beach replenishment activities would not result in substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, natural land forms, or historic buildings (Criteria 2). Trees are not typically present at beaches in the vicinity of Malibu Pier, and no trees are present in the replenishment areas.

Minor rock outcroppings are not present in the replenishment area. East of the placement area, a boulder field exists that is partially under water and partially exposed. This boulder field may experience minor inundation with sand due to erosion and ocean transport of beach material. However, any burial of these features would be temporary and partial. Replenished sand would be contoured to match existing contours and adjacent beaches.

As proposed, beach replenishment would not impact the preservation, protection, and enhancement of natural open space as a scenic resource of great value and importance to the quality of life of residents and to the enhancement of the scenic experience of visitors. Beach replenishment would not hinder the preservation, protection, and enhancement of the area. Beach replenishment would increase the available beach area and restore areas lost to erosion providing a beneficial impact (Criteria 5 & 6). Since sediment placement does not result in the construction of any buildings or features, there are no potential impacts under Criteria 4.
Under the offshore placement option, material would sink readily to the bottom. Long-term, this sediment would be transported by natural ocean processes and would incorporated into the existing

sediment load. Given the large amount of sediment transport occurring, the addition of this minor amount would not result in any significant changes to deposition patterns along the beach, or other visible areas, and would result in no long term impacts to aesthetics under any of the significance criteria.

Floodwall

Construction Impacts

Allowing for some or all of the impounded sediment behind the dam to be transported via natural processes would require the construction of floodwalls on both sides of Malibu Creek between the Cross Creek Crossing and the PCH as illustrated in **Section 4**. The flood walls are designed to mitigate for increased flood risk to property downstream of Rindge Dam as a result of increased sediment deposition in this area resulting in higher water surface elevations. On the west side of the creek the floodwalls would extend for approximately 3,100 linear ft and on the east side for approximately 2,700 linear ft for a total length of approximately 5,800 linear ft.

The northern segment of the wall on the east side of the creek would require a dedicated 15 ft wide access road to facilitate inspections and maintenance. The southern segment would not require an access road as it is adjacent to Serra Road. On the west bank, the floodwall would not require an access road, but would require that industrial and commercial property owners abutting the wall allow access to the wall for inspections and maintenance and maintain a 15 ft wide unobstructed space adjacent to the wall.

The proposed, conceptual floodwalls would utilize an I-wall design consisting of below ground sheet piles and an above ground cap and wall. The sheet piles would be driven into the ground at a depth of approximately 20 to 25 ft and would not be visible. A pile cap would be placed on top of the sheet piles of approximately 3 ft wide by 3 ft deep. On top of the pile cap a 5 to 10-ft high concrete floodwall would be constructed. The 5-ft height would be used under variations of Alternative 4, while the 10-ft height would be used under variations of Alternative 3. During construction a 45-ft wide area would be needed throughout the length of the wall. Upon completion of construction, disturbed areas would be revegetated using a native plant palette to match existing vegetation except for the roads and unobstructed areas required for access.

Trails in the vicinity of the flood walls are not designated scenic corridors. The Backbone Trail System has been designated a scenic corridor by the National Park Service. However, the trail does not offer views of proposed floodwall locations.

Construction activities at the floodwalls proposed for both sides of Malibu Creek from Cross Creek Bridge downstream to the PCH would be visible from PCH, Malibu Canyon Road, Malibu Creek State Park, Malibu Lagoon State Beach, residences, and commercial and industrial parcels. Construction would take approximately 7 months during the first year of construction.

Temporary viewshed disturbances include:

- Clearing and grubbing native vegetation at the flood wall area and access points;
- Temporary alteration of habitat at flood wall construction area degrading aesthetics;

Long Term Impacts

The proposed floodwalls would be visible from Malibu Lagoon State Beach, Malibu Creek State Park, Adamson House, Malibu Canyon Road, PCH, nearby trails, residences, and commercial and industrial areas. The walls would be visible from these areas and would obstruct and/or diminish views dependent upon the viewing location (Criteria 1 & 2). The floodwalls would be permanent structures. Upon completion of the floodwalls construction areas, except for the required access roads and unobstructed areas, would be restored. Habitat restoration and revegetation of disturbed areas, except areas required for permanent access, would occur using a native plant palette to match existing vegetation is included in this alternative to minimize visual disturbances. In the interim after construction and prior to maturity of vegetation, disturbance areas would remain visible. Required access roads and unobstructed areas would remain permanently visible.

A substantial adverse permanent effect on public viewing areas and/or scenic vistas along public highways, trails, beaches and parklands would occur under this alternative (Criteria 1). A substantial adverse impact to visual quality in visually degraded areas within public viewing areas and within corridors of designated scenic highways would occur (Criteria 3). At the conclusion of wall construction, the wall would block or obstruct current scenic views from vantage points at Malibu Lagoon State Beach, Adamson House, Malibu Canyon Road, PCH, nearby trails, and commercial and residential areas.

Construction of the walls would result in substantial damage to scenic resources, including, but not limited to, trees, rock outcroppings, natural land forms, or historic buildings (Criteria 2). Removal of trees and vegetation would be required to construct the wall. In areas required for access trees and vegetation would not be replanted.

As proposed, the walls would impact the preservation, protection, and enhancement of natural open space as a scenic resource of great value and importance to the quality of life of residents and to the enhancement of the scenic experience of visitors (Criteria 5). The walls and access roads would be constructed on a combination of public and private property, including land designated by the City of Malibu as public open space. Floodwall construction and maintenance would not require reconstruction or maintenance of a scenic highway (Criteria 4), nor would it require additional new lighting (Criteria 6).

5.7.3 ***Analysis of Alternatives***

<u>Alternative 1: No Action</u>

No construction would be implemented as a result of this alternative. Most sediment transported by Malibu Creek would pass over the Dam, although some sediment would continue to deposit upstream of the Dam due to a locally-flattened stream bed slope caused by the Dam. Upon reaching equilibrium in 100 years, all sediment transported by Malibu Creek would pass over the Dam and into the downstream reaches.

As no other projects are planned in the area, under the No Action Alternative there would be no construction scheduled and therefore no aesthetic or scenic resource impacts. With implementation of this alternative, scenic views from public viewing areas or scenic vistas along public highways, including scenic highways, trails, parklands, and beaches would not be temporarily disturbed.

Under the No Action Alternative, Rindge Dam would remain and there would be no long-term impacts to aesthetic and scenic resources. Vegetation would continue to grow in impounded sediments and the riparian habitat present behind the Dam would continue to mature. Public viewing areas and/or scenic vistas along public highways, trails, parklands, and beaches would not be altered. The No Action Alternative would not alter or damage the potentially historic Rindge Dam within the Malibu Canyon Road, a county scenic highway corridor. Under this alternative, the visual quality in public viewing areas would not be impacted. Aesthetic designs would not be incorporated into reconstruction of Malibu Canyon Road as road reconstruction would not be necessary under this alternative. Rindge Dam and the impounded sediment area would remain within Malibu Creek State Park. These areas would remain as protected and natural open space under the No Action Alternative.

Alternative 2: Mechanical Transport

Generally, the differences among variations of Alternative 2 are minor with regards to aesthetic impacts. Alternatives that include removal of upstream barriers have additional potential short-term impacts that are less than significant with mitigation. Placement of sediment at the beach placement site has additional short-term impacts that are less than significant with mitigation which are avoided in the options that utilize barge placement in the nearshore. Options to remove the dam alone, compared to the dam and spillway, do not differ in potential impacts to aesthetic resources as the underlying rock outcropping will still remain even if the spillway is removed and the resulting view will be generally similar. A summary of the differences among variations of Alternative 2 is provided in **Table 5.7-1**.

Mitigation Measures

Mitigation measures are recommended to reduce potential impacts to aesthetic and scenic resources to a level that is not significant during the short-term (construction) and long- term (post-construction). Short-term aesthetic and scenic resource impacts during construction, as discussed above, would be reduced to a level that is not significant with implementation of the following environmental commitment:

- **AES-1 .** Reduce visibility of construction activities and construction related equipment. Construction activities and construction related equipment, including staging areas, laydown areas, stockpiles, and equipment storage will be temporarily screened throughout construction when visible from roads, trails, scenic overlooks, or residences to the extent practicable. Screening will consist of temporary screening fences with colors and materials to reflect the natural surroundings.

Long-term aesthetic and scenic resources impacts after completion of construction, as discussed above, would be reduced to a level that is not significant with implementation of the following mitigation measures:

- **AES-2 Restoration of disturbed areas to blend with surrounding areas.** Slopes will be constructed to match existing slopes. A re-vegetation plan will be developed with a native plant palette. Areas visible from Malibu Canyon Road and/or residences will be planted with native plants to obscure scarring from construction activities. The revegetation plan should include a plant palette and proposed sizes, maintenance procedures during establishment period, including irrigation, if any, and replanting of dead vegetation. All areas disturbed by construction, including cleared areas, will be restored to their original condition or an improved condition.
- **AES-3 Incorporate aesthetic considerations into road improvement plans.** The contractor will develop road improvement plans for required reconstruction or maintenance incorporating the use of aesthetic features. Plans will be submitted to the USACE for review and approval prior to implementation. Aesthetic features include, but are not limited to, drainage, slopes, retaining walls, and screenings to match surroundings.
- **AES-4 Incorporation of interpretative signs into restoration of the Sheriff's Overlook.** Interpretive signs featuring the historical significance of Rindge Dam will be installed as a component of the restoration efforts at the Sheriff's Overlook. Plans for the interpretative signs will be designed by the CDPR Department and USACE.
- **AES-5 Minimize stockpiling of sand on beach to prevent obstruction of coastal views.** Stockpile maximum heights will be kept to a minimum to avoid obstruction of coastal views.
- **AES-6 Minimize construction equipment storage areas at beach replenishment site.** Construction equipment storage areas will be minimized to reduce temporary disturbances to coastal views. If public parking areas are used for construction equipment storage, temporary removal of parking spaces will be minimized in order to maximize public access to coastal scenic areas.

Level of Significance

With incorporation of mitigation measures AES-1 through AES-6, all aesthetic impacts associated with Alternative 2 would be less than significant (Class II), with the exception of impacts related to preservation, protection, and enhancement of natural open space, which are not significant (Class III). Mitigation measure AES-1 would reduce the visibility of construction activities and construction related equipment. Mitigation measure AES-2 would restore disturbed areas to blend with surrounding areas. Short-term aesthetic impacts at a less than significant level would remain for multiple years after completion of the project as vegetation matures. Mitigation measure AES-3 would incorporate aesthetic considerations into road improvement plans to improve the aesthetics of the impacted areas. Mitigation measure AES-4 would incorporate education features into the restoration of the Sheriff's Overlook highlighting the historical significance of Rindge Dam. Mitigation measure AES-5 would minimize temporary stockpiling of sand on beaches to reduce obstructions of coastal views. Mitigation measure AES-6 would minimize construction equipment storage areas at the beach replenishment site to minimize the loss of parking spaces and to reduce disturbances to coastal views.

Table 5.7-1.

Table 5.7-1 - Significance of Impacts to Aesthetics Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	Class II			Class II			No
2a2	Class II				LTS		No
2b1	Class II		Class II	Class II			No
2b2	Class II		Class II		LTS		No
2c1		Class II		Class II			No
2c2		Class II			LTS		No
2d1		Class II	Class II	Class II			No
2d2		Class II	Class II		LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Alternative 3: Natural Transport</u>

Under Alternative 3, any potential impacts at the beach placement site are avoided as all beach compatible sediment will be transported naturally downstream. Impacts associated with upstream barriers and removal of the spillway are the same as described under Alternative 2. Under Alternative 3, the construction period will be significantly longer but construction will be less frequent with longer intervening periods. Therefore, aesthetic impacts as a result of the time period are not significantly different than those under Alternative 2. The primary different between Alternatives 2 and 3 is that Alternative 3 requires construction of floodwalls. As described under Level of Significance below, floodwalls would result in long-term significant impacts to aesthetics. A summary of the differences among variations of Alternative 3 is provided in **Table 5.7-2**.

Mitigation Measures

Mitigation measures are recommended to reduce potential impacts to aesthetic and scenic resources during the short-term (construction) and long-term (post-construction) where possible. As previously discussed, long-term impacts associated with the floodwalls cannot be reduced to a level of less than significant. Mitigation measures AES-1 through AES-4 are applicable to this alternative.

Level of Significance

With incorporation of mitigation measures AES-1 through AES-4 impacts associated with Alternative 3 would be less than significant (Class II) in the short and long-term for all project components, except for the flood wall component. Long-term aesthetic impacts associated with the flood walls would be significant and mitigatable (Class I). AES-1 would reduce the visibility of construction activities and construction related equipment. Mitigation measure AES-2 would restore disturbed areas to blend with surrounding areas. Short-term aesthetic impacts at a less than significant level would remain visible for multiple years after completion of the project as vegetation matures. Mitigation measure AES-3 would incorporate aesthetic considerations into road improvement plans to improve the aesthetics of the impacted areas. Mitigation measures AES-4 would incorporate education features into the restoration of the Sheriff's Overlook highlighting the historical significance of Rindge Dam.

Table 5.7-2 - Significance of Impacts to Aesthetics Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	Class II					Class I	Yes
3b	Class II					Class I	Yes
3c		Class II	Class II			Class I	Yes
3d		Class II	Class II			Class I	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Alternative 4: Hybrid Mechanical & Natural Transport</u>

Alternative 4 is a hybrid of Alternatives 2 and 3, and therefore the impacts are generally a hybrid of those alternatives as well. As with Alternative 4, the primary difference between Alternative 2 is the inclusion of floodwalls, which result in significant impacts to aesthetic resources. As with Alternative 3 the prolonged time period does not change the significance of the alternative relative to similar plans under Alternative 2. As with Alternative 2, beach placement options under Alternative 4 result in additional, but mitigable, impacts at the beach placement site. A summary of the differences among variations of Alternative 4 is provided in **Table 5.7-3**.

Mitigation Measures

Mitigation measures are recommended to reduce potential impacts to aesthetic and scenic resources during the short-term (construction) and long-term (post-construction). As previously discussed, long-term impacts associated with the floodwalls cannot be reduced to a level of less than significant. Mitigation measures AES-1 through AES-4 are applicable to this alternative.

Level of Significance

With incorporation of mitigation measures AES-1 through AES-6 impacts associated with Alternative 4 would be less than significant (Class II) in the short and long-term for all project components, except for the flood wall component. Long-term aesthetic impacts associated with the flood walls would be significant and mitigatable (Class I). AES-1 would reduce the visibility of construction activities and construction related equipment. Mitigation measure AES-2 would restore disturbed areas to blend with surrounding areas. Short-term aesthetic impacts at a less than significant level would remain visible for multiple years after completion of the project as vegetation matures. Mitigation measure AES-3 would incorporate aesthetic considerations into road improvement plans to improve the aesthetics of the impacted areas. Mitigation measure AES-4 would incorporate education features into the restoration of the Sheriff's Overlook highlighting the historical significance of Rindge Dam. AES-5 would minimize temporary stockpiling of sand on beaches to reduce obstructions of coastal views. Mitigation measure AES-6 would minimize construction equipment storage areas at the beach replenishment site to minimize the loss of parking spaces and to reduce disturbances to coastal views.

Table 5.7-3 - Significance of Impacts to Aesthetics Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	Class II			Class II		Class I	Yes
4a2	Class II				LTS	Class I	Yes
4b1	Class II		Class II	Class II		Class I	Yes
4b2	Class II		Class II		LTS	Class I	Yes
4c1		Class II		Class II		Class I	Yes
4c2		Class II			LTS	Class I	Yes
4d1		Class II	Class II	Class II		Class I	Yes
4d2		Class II	Class II		LTS	Class I	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Comparison of Alternatives

The primary difference among alternatives is the inclusion of floodwalls under Alternative 3 and Alternative 4. Floodwalls, once completed, block or obstruct current scenic views from vantage points at Malibu Lagoon State Beach, Adamson House, Malibu Canyon Road, PCH, nearby trails, and commercial and residential areas. The floodwalls will have a significant impact on aesthetic resources.

The remaining differences among alternatives are relatively minor. The removal of the dam and/or spillway, removal of upstream barriers, and mechanical transport placement options utilizing the Malibu Pier beach & Upland Site F will all result in short term, temporary impacts to aesthetics that will be less than significant upon implementation of the mitigation measures described under Alternative 2. Utilization of Ventura Harbor for nearshore placement of sediment under some variations of Alternative 2 would not result in any additional aesthetic impacts. Therefore, when comparing impacts to aesthetics, Alternatives 3 and 4 both result in significant impacts. All variations of Alternative 2 would result in similar, short term and mitigable impacts to aesthetics, and would have less impacts than any variations Alternatives 3 and 4.

5.8 Recreation Resources

5.8.1 *Impact Significance Criteria*

The criteria established below apply to both NEPA and CEQA compliance. The impacts on recreation would be considered significant if the proposed project:

1. Increased the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated;
2. Required the construction or expansion of recreational facilities which would have an adverse physical effect on the environment; or,
3. Required new or expanded recreational facilities for future residents.

5.8.2 *Analysis of Alternative Components*

Dam & Spillway

Construction Impacts

Removal of the dam arch alone, compared to removal of both the dam and spillway, would result in similar short term impacts to construction and therefore the following discussion applies to both. Sheriff's Overlook is currently closed to public access due to the access it provides to Rindge Dam, and associated damage to structures and habitat. If the overlook were reopened in the future, removal of the dam and/or spillway would require the temporarily closure of the Sheriff's Overlook area to public access during construction as the area would be used as a staging and oversight area for construction teams. Upon completion of construction activities any debris or equipment located at Sheriff's Overlook would be cleared from the area and public access restored. Other existing turnout areas along Malibu Canyon Road would remain open throughout construction.

Within the immediate area surrounding Rindge Dam there are no formal hiking trails and limited recreational use due to limited accessibility, although trespassing and illegal recreation does occur. Closure of this area during construction would have minimal or no impact on recreation resources as other portions of Malibu Creek State Park would remain open during construction. As a result of the closure, the project will not increase the use of existing recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated due to the existing limited usability of the area for recreational purposes (Criteria 1). Neither removal of the dam alone, nor removal of both the dam and spillway, would result in any impacts under Criteria 2 or 3.

Under variations of Alternative 3, the overall duration of dam removal would take place over several decades but short term impacts during construction would remain the same as other alternatives. Removal of the dam and spillway would not result in significant impacts to recreational resources.

Removal of the dam alone and removal of both the dam and spillway do not differ greatly in their potential to impact recreational resources. Leaving the spillway intact would continue to support the use of the site for recreation due to trespassing, but this does not differ from the no action scenario. The same staging areas, closures, and general construction timelines are associated with both options, and neither would result in significant impacts to recreational resources.

Long-Term Impacts

Removal of the dam arch alone, compared to removal of both the dam and spillway, would result in the same long term impacts. Therefore the following discussion applies to both. After construction, access will be restored to the dam area and Sheriff's Overlook. Mitigation measure AE-4 (Section 5.7) would result in the incorporation of interpretative signs as part of restoration of the Sheriff's Overlook, optimizing recreational use of this area. While no formal trails would be constructed, the removal of the Dam would allow access both upstream and downstream of the former barrier and are therefore considered beneficial to a degree. Operations and maintenance activities would be limited to monitoring fish passage improvements and associated project improvements. These activities will not impede the use of recreational resources.

Removal of the dam and/or spillway would not permanently increase the use of existing parks or other recreational facilities. The project does not result in the construction of structures that would induce the need for expansion or new recreational parks or facilities (Criteria 1). Neither removal of the dam alone, nor removal of both the dam and spillway, would result in any long term impacts under Criteria 2 or 3.

Removal of the dam alone and removal of both the dam and spillway do not differ greatly in their potential long-term impacts to recreational resources. Under variations of Alternative 3, the removal process would be elongated to a 40-100 year period. While the same long term impacts would occur under Alternative 3 as those under Alternative 2 and 4, the timeline associated with those impacts would be delayed. However, the impacts to recreation as a result of removing the dam and/or spillway under any alternative timeline are considered less than significant.

<u>Upstream Barrier Removal</u>

Construction Impacts

Upstream barrier removal is assumed to occur over the first three years of the project. Barrier LV1 at Craggs Road is a bridge within Malibu Creek State Park. The bridge currently provides vehicular access for maintenance vehicles and fire trucks. Public vehicular access is prohibited although hikers can utilize the bridge. Construction at this barrier is estimated to occur over 15 days as a pre-manufactured clean span bridge will be installed to replace the existing bridge. Removal of the bridge would not restrict access to recreational areas or trails as other trails are available that provide access to both sides of the bridges. All other barrier removals are located outside of recreational areas and would not impact recreation resources.

The removal of the remaining upstream barriers would not result in any impacts to recreation under any of the significance criteria during construction, and therefore removal of all upstream barriers will result in less than significant impacts to recreational resources.

Long-Term Impacts

Operations and maintenance activities after construction associated with removal of the upstream barriers would be limited to monitoring fish passage improvements. No project improvements would result in any increased use of existing recreational facilities (Criteria 1), or require the expansion of recreational parks or facilities for current or future residents (Criteria 2-3). No improvements associated with upstream barrier removal would impede the use of recreational resources.

Therefore, upstream barrier removal would not result in additional significant long-term impacts to recreational resources.

Sediment Hauling & Placement

Construction Impacts

Disposal of beach compatible materials at the beach adjacent to Malibu Pier would result in temporary impacts to this recreational resource. Sand would be hauled from the sediment removal area to the Malibu Pier parking lot, which would be used for temporary sediment stockpiling and staging. Temporary stockpiles, staging areas, and sand placement have been determined in coordination with LACDBH. During stockpiling and spreading activities, public access to the active work area, including portions of the beach and the entire Malibu Pier parking lot, would be restricted for public safety concerns. However, the existing beach at this location is predominantly eroded and little to no open sand remains in front of the rip-rap protection around the parking area. The proposed beach replenishment area is located just south/east of Malibu Pier directly adjacent to the Malibu Pier parking lot. Assuming a 5-yr construction period, sand would be delivered to the site in the second year of construction. LACDBH has imposed restrictions on sand delivery periods. Sand is anticipated to be delivered to the site during the week from September 3rd to October 15th between 7:00am and 3:30-4:30pm, with no delivery during weekends, summer months, and holidays. The parking lot would remain closed throughout the delivery season, restricting recreational use of the area throughout the beach replenishment operation. Spreading operations would follow the same schedule as sand delivery. During spreading operations the replenishment area would be restricted for public safety concerns. Sand spreading operations would not occur during the weekend or summer months when recreational use is at a peak reducing this impact to less than significant.

Sediment placement at replenishment sites would not increase the temporary use of other beaches such that substantial physical deterioration would occur or be accelerated with the time period restriction imposed on sand delivery and spreading (Criteria 1).

Disposal of beach compatible material offshore utilizing a barge would avoid any use of the Malibu Pier parking area and beach, and would therefore avoid any temporary closures or potential recreational impacts at this location. The barge routes and exact offshore placement area would also avoid any impacts to prime surfing areas along Surfrider Beach and Malibu Point.

The immediate vicinity surrounding the impounded sediment area contains no formal hiking trails and limited to no recreational uses due to limited accessibility. Impacts to this area are discussed under the dam and spillway removal alternative. Closure of the area during construction would have minimal or no impact on recreation resources as other portions of Malibu Creek State Park would remain open during construction. As a result of the closure, the project will not increase the use of existing recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated due to the existing limited usability of the area for recreational purposes (Criteria 1).

Under Alternative 4 a portion of the impounded sediment would be naturally transported downstream during the winter months. It is anticipated that there would be less beach-compatible materials available to transport to the beach nourishment sites and therefore a potential reduction in the number of days of limited beach restrictions for public safety. Additionally, there may be fewer days when parking spaces at the beaches would be closed in comparison to Alternative 2. There are no additional potential impacts during construction related to differences between this and other sediment removal alternatives.

Overall, none of the sediment hauling and placement options would require the construction or expansion of existing facilities, nor would they require the construction of new facilities for future residents (Criteria 2 and 3). Therefore, impacts to recreation as a result of any of the sediment hauling and placement options are not significant.

Long-Term Impacts

After construction, sediment placement at the beach adjacent to Malibu Pier would reduce erosion. Similar to the removal of the dam and spillway, sediment hauling and placement would not permanently increase the use of existing parks or other recreational facilities and would not result in the construction of new structures (Criteria 1). Adjacent beaches are heavily used, and while there may be a temporary increase in beach use directly adjacent to Malibu Pier, where the beach is currently eroded, this would be temporary in nature as the beach is anticipated to erode relatively quickly after sediment placement. This temporary and minor increase would not increase the physical degradation of any recreational resource substantially.

Nearshore placement of the sediment would likely result in the transport of some additional sands to the beach, potentially increasing beach use directly adjacent to Malibu Pier temporarily as described for beach placement. However, neither shoreline nor nearshore placement would require the construction or expansion of existing facilities, nor would they require the construction of new facilities for future residents (Criteria 2 and 3). Overall, neither sediment hauling and placement option would result in significant impacts to recreational resources.

<u>Floodwall</u>

Construction Impacts

Potential short-term impacts during the construction of floodwalls would be the same as those incurred during dam and spillway removal. Floodwalls would be constructed on both sides of Malibu Creek between the Cross Creek Crossing and the PCH. There are no formal access points or trails in the area that will be between the walls. The only access to the area is from Malibu Lagoon State Beach south of the PCH and then walking under the PCH. Construction work would not impede access to this area. Construction of floodwalls would not increase the use of existing neighborhood and regional parks or other recreational facilities (Criteria 1). Construction of floodwalls would not require expansion of existing recreational facilities or the construction of new facilities (Criteria 2 and 3).

Under Alternative 4, the exposed portion of concrete floodwalls would be limited to an overall height of approximately 5 ft versus 10 ft for Alternative 3. However, this size difference does not alter the significance of impacts. Potential short-term impacts during construction would be the same as described above. Floodwall construction would not result in significant impacts to recreational resources.

Long-Term Impacts

As described above under the construction related impacts, the long-term impacts of floodwalls associated with Alternatives 3 and 4 would not result in significant impacts to recreational resources.

5.8.3 *Analysis of Alternatives*

<u>Alternative 1: No Action</u>

No construction would be implemented as a result of this alternative. Most sediment transported by Malibu Creek would pass over the Dam, although some sediment would continue to deposit upstream of the Dam due to a locally-flattened stream bed slope caused by the Dam. Upon reaching equilibrium in 100 yrs, all sediment transported by Malibu Creek would pass over the Dam and into the downstream reaches. There would be no need to deposit sand from behind the Dam at any disposal sites and the upstream barriers would not be impacted.

While the current location of the impounded sediment lies within Malibu Creek State Park, it serves little to no recreation purpose. There are no formal trails within this area and the Dam serves as a barrier for anyone attempting to hike above or below the Dam. The No Action Alternative would not increase the use of existing parks or recreational facilities. The No Action Alternative would not result in the construction of housing thereby increasing the population and thus requiring construction of recreational facilities. Therefore, impacts on recreation resources are considered not significant (Class III) and no mitigation measure would be necessary as the impacts from the No Action Alternative are considered not significant.

<u>Alternative 2: Mechanical Transport</u>

All variations of Alternative 2 involve mechanical removal and disposal of sediments impounded behind Rindge Dam at either the beach adjacent to Malibu Pier or the nearshore environment just offshore of the same location. For shoreline placement, temporary storage at Upland Site F would also be required. Non-beach compatible material would be disposed of at the Calabasas Landfill. While temporary impacts to recreation in the direct vicinity of Malibu Pier will potentially occur under all beach placement options, these impacts are not significant based on the significance criteria established. As described above in the Analysis of Alternative Components, none of the components of the various Alternative 2 options would result in significant impacts to recreational resources (**Table 5.8-1**).

Table 5.8-1 - Significance of Impacts to Recreational Resources Associated with Variations of Alternative

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	LTS			LTS			No
2a2	LTS				LTS		No
2b1	LTS		LTS	LTS			No
2b2	LTS		LTS		LTS		No
2c1		LTS		LTS			No
2c2		LTS			LTS		No
2d1		LTS	LTS	LTS			No
2d2		LTS	LTS		LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Mitigation Measures

No mitigation measures would be necessary as the impacts from any variation of Alternative 2 are considered not significant.

Level of Significance

Project-related impacts associated with Alternative 2 are not considered significant (Class III).

<u>Alternative 3: Natural Transport</u>

Variations of Alternative 3 involves Dam removal with natural transport of the impounded material. Under all variations of Alternative 3, floodwalls are required to protect adjacent properties downstream of Rindge Dam from an increased flood risk due to increased sediment deposition associated with the natural transport of sediments. Use of the Malibu Pier parking area and beach are avoided, and therefore the temporary impacts described under Alternative 2 are avoided. Dam removal would occur in 5-ft increments and allow the impounded sediment to flow downstream over a period of 40-100 years. Under this alternative, floodwalls would be constructed to protect adjacent properties downstream of Rindge Dam from an increased flood risk due to increased sediment deposition associated with the natural transport of sediments. As described above in the Analysis of Alternative Components, none of the components of the various Alternative 3 options would result in significant impacts to recreational resources (**Table 5.8-2**).

Table 5.8-2 - Significance of Impacts to Recreational Resources Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	LTS					LTS	No
3b	LTS					LTS	No
3c		LTS	LTS			LTS	No
3d		LTS	LTS			LTS	No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Mitigation Measures

No mitigation measures would be necessary as the impacts from variations of Alternative 3 are considered not significant.

Level of Significance

Project-related impacts associated with variations of Alternative 3 are not considered significant (Class III).

Alternative 4: Hybrid Mechanical & Natural Transport

Variations of Alternative 4 involve a combination of natural sediment transport in between cycles of mechanical sediment transport. This alternative is a hybrid of Alternatives 2 and 3. As with Alternative 3, all variations of Alternative 4 would require floodwall construction downstream of Rindge Dam. As with Alternative 2, some variations of Alterative 4 utilize beach placement which would require utilization of the Malibu Pier parking area and the adjacent beach. While temporary impacts to recreation in the direct vicinity of Malibu Pier will potentially occur under all beach placement options, these impacts are not significant based on the significance criteria established. As described above in the Analysis of Alternative Components, none of the components of the various Alternative 4 options would result in significant impacts to recreational resources **(Table 5.8-3**).

Mitigation Measures

No mitigation measures would be necessary as the impacts from Alternative 4 are considered not significant.

Level of Significance

Project-related impacts associated with Alternative 4 are not considered significant (Class III).

Table 5.8-3 - Significance of Impacts to Recreational Resources Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	LTS			LTS			No
4a2	LTS				LTS		No
4b1	LTS		LTS	LTS			No
4b2	LTS		LTS		LTS		No
4c1		LTS		LTS			No
4c2		LTS			LTS		No
4d1		LTS	LTS	LTS			No
4d2		LTS	LTS		LTS		No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Comparison of Alternatives

There are minor differences to potential impacts to recreational resources among alternatives. Mechanical transport options under Alternatives 2 and 4 that utilize shoreline placement will require the temporary closure of the Malibu Pier parking area and adjacent beach. However, the impacts associated with these closures will be temporary and less than significant. Addition of upstream barriers to any alternative would include removal of Craggs Road Bridge in Malibu Creek State Park. This would result in a temporary impact to pedestrian recreational traffic. However, this impact is not significant. Construction of floodwalls associated with Alternatives 3 and 4 would have no significant impact on recreational resources. Therefore, while variations of each alternative may have slightly different temporary impacts on recreational resources, all of these potential impacts are less than significant and all alternatives will result in the same overall level of impacts to recreational resources.

5.9 Transportation

5.9.1 *Impact Significance Criteria*

Impact significance criteria are derived from CEQA guidelines and the Malibu Creek State Park General Plan, using established Level of Service estimates, supplemented by area-specific criteria for the City of Malibu, City of Calabasas, Los Angeles County, City of Ventura, Ventura County, and Caltrans. In addition to impact significance criteria, this section describes limits on the hours of operation for construction equipment. The criteria established below are also applied for NEPA compliance.

CEQA Guidelines

According to the checklist form in Appendix G of the CEQA Statute and Guidelines, traffic and transportation impacts would be considered significant if one or more of the following conditions resulted from project implementation:

1. Conflicts with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit;
2. Conflicts with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways
3. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
4. Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
5. Result in inadequate emergency access; or,
6. Conflicts with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities.

None of the proposed measures or alternatives have any impacts associated with criteria 3 above, therefore this significance criteria will not be discussed further.

Level of Service Criteria

Level of Service (LOS) is the performance measure used to report the operating conditions of roadway segments. It is a qualitative description of traffic flow based on factors including travel speed, travel time, delay, and freedom of maneuver. Six levels of service can be defined for each roadway segment, varying from LOS A to LOS F. LOS A indicates that traffic flows freely, with little or no delay, and LOS F indicates that traffic demand exceeds the capacity, generally resulting in long queues and delays. The LOS definitions for roadway segments are in **Table 5.9-1**.

Table 5.9-1 - Level of Service Criteria for Roadway Segments

Level of Service	Description of Operations
A	Primarily free-flow conditions at 90% of free-flow speed. Vehicles are free to maneuver within the traffic stream.
B	Unimpeded flow at about 70% of free-flow speed. Vehicles can maneuver will slight restriction.
C	Stable operations at about 50% of free-flow speed. Some maneuvers for vehicles may be restricted and difficult to perform.
D	Conditions substantially worsen with a small increase in traffic flow, at about 40% of free-flow speed. Maneuverability becomes more difficult.
E	Substantial delays at intersection approaches and traffic speeds at 30% of free-flow speed. Maneuverability is severely restricted.
F	Extremely low travel speeds and unstable traffic flow. Operating conditions have severe delays at intersection approaches, severe difficulty in maneuvering between lanes, and extremely high driver tension.

The project area includes roadways in the jurisdictions of the City of Malibu, City of Calabasas, City of Ventura, Ventura County, and Los Angeles County. These jurisdictions have adopted certain LOS thresholds for existing and proposed roadway segments as illustrated in their respective General Plans. The relevant minimum standards and thresholds requiring mitigation measures are discussed below.

<u>City of Malibu</u>

According to the City of Malibu, a project would cause a significant transportation impact if the project traffic increases the volume-to-capacity (v/c) ratio of an intersection as shown in Table 5.9-2.

Table 5.9-2 - City of Malibu Thresholds of Significance

Roadway Segment LOS	Project-Related Increase in Volume-to-Capacity Value
A/B	None
C	Equal to or greater than 0.040
D	Equal to or greater than 0.020
E/F	Equal to or greater than 0.010

<u>City of Calabasas</u>

The City of Calabasas 2030 General Plan states that projects degrading roadways or intersections to LOS D or worse cause significant impacts. LOS thresholds for the City of Calabasas are defined in **Table 5.9-3**.

Table 5.9-3 - City of Calabasas Thresholds of Significance

Existing Roadway Segment LOS	Existing Roadway Segment Volume-to-Capacity Ratio	Maximum Peak Hour Volume-to-Capacity Ratio Increase
D	0.81 to 0.90	0.020 or more
E	0.91 to 1.00	0.015 or more
F	1.01 or more	0.010 or more

<u>City of Ventura</u>

Based on review of The City of Ventura General Plan (City of Ventura, 2005a), and the associated Ventura General Plan EIR (City of Ventura, 2005b), traffic impacts would be considered significant if a project resulted in an increase of LOS at an intersection, resulted in an unacceptable LOS at an intersection or road segment (LOS D or >), or an increase in the volume to capacity ration (V/C) exceeding those shown below in **Table 5.9-4**.

Table 5.9-4 - Thresholds for significance for Level of Service (LOS) changes in Ventura.

Existing LOS	Increase in V/C or Trips >
A	0.20
B	0.15
C	0.10
D	10 PHTs
E	5 PHTs
F	1 PHT

PHT = peak hour turning; highest combination of left and opposing through/right turns.

<u>Los Angeles County</u>

Los Angeles County LOS standards are applicable for unincorporated areas located within the county. According to the Traffic Impact Analysis Report Guidelines developed by the Los Angeles County (LADPW, 1997), a project would result in a significant impact if the project would either equal or exceed the LOS thresholds shown in Table 5.9-5 and Table 5.9-6.

Table 5.9-5 - Los Angeles County LOS Thresholds for Intersections

Pre-Project		Project-Related Volume-to-Capacity Increase
LOS	Volume-to-Capacity Ratio	
C	0.71 to 0.80	0.04 or more
D	0.81 to 0.90	0.02 or more
E/F	0.91 or more	0.01 or more

Table 5.9-6 - Los Angeles County LOS Thresholds for Two-Lane Roadways

Directional Split	Total Capacity (PCPH)	Project-Related Percent Increase in PCPH		
		LOS C	LOS D	LOS E/F
50/50	2800	4	2	1
60/40	2650	4	2	1
70/30	2500	4	2	1
80/20	2300	4	2	1
90/10	2100	4	2	1
100/0	2000	4	2	1

Source: Traffic Impact Analysis Report Guidelines, County of Los Angeles DPW, 1997. PCPH – Passenger Car per Hour

Caltrans

According to the Caltrans Guide for the Preparation of Traffic Impact Studies, operational impacts on freeway mainline segments and multi-lane highways are considered significant when project-related traffic:

- Deteriorates the level of service from LOS D or better to LOS E or worse;
- Deteriorates the level of service from LOS E to LOS F; and
- Contributes substantially to traffic congestion on circulation elements operating at unacceptable levels (LOS E or F).

Restriction of Hours

Along with the thresholds of significance requiring mitigation measures, there are also restrictions on the hours of operation for the construction vehicles. The following are the restrictions in various jurisdictions:

City of Malibu

Construction-related activities are permitted between the hours of 7 AM and 7 PM.

City of Calabasas

Construction-related activities are permitted between the hours of 7 AM and 6 PM, Monday through Friday and on Saturday from 8 AM to 5 PM. Construction work is prohibited on Sundays and Federal Holidays.

Los Angeles County

Construction-related activities are permitted between the hours of 7 AM and 7 PM. Traffic is further restricted on LA County Highways to a working day of 9am to 3pm in the Malibu Region. During the school season this window is further restricted to 9am to 2pm.

5.9.2 *Impact Assessment Methodology and Assumptions*

Construction Traffic Trip Distribution

Malibu Canyon Road is the only possible access to Rindge Dam. Malibu Canyon Road can be accessed by four different routes, PCH (SR 1), Hwy 101, Mulholland Highway, and Piuma Road. However, both Mulholland Highway and Piuma Road have very low volumes, so it is assumed that all worker and delivery truck trips would access Malibu Canyon Road using either PCH or Hwy 101. Based on the location of the Dam and existing traffic volumes on PCH and Hwy 101, the worker and delivery truck trips are expected to be evenly distributed along PCH and Hwy 101. The anticipated distribution of project-related construction traffic is provided in **Table 5.9-7**.

Table 5.9-7 - Primary Trip Distribution of Construction Traffic

Type of Construction Traffic	Trip Distribution
Workers and Delivery Trucks	US 101 – 50% and PCH – 50%
Hauling Trucks to Calabasas Landfill	Malibu Canyon Road, Las Virgenes Road, and Lost Hills Road – 100%
Hauling Trucks to Malibu Pier Beach	Malibu Canyon Road, Mulholland HWY, and PCH located east of Malibu Canyon Road – 100%
Hauling Trucks to Ventura Harbor	Malibu Canyon Road and US 101 – 100%

<u>Construction Traffic Trip Generation</u>

When traffic analyses were originally performed, the construction of variations of Alternatives 2 and 4 were estimated to occur for 5-8 years between 2016 and 2024, while variations of Alternative 3 would occur over 20-100 years. Therefore, the traffic analyses were developed based on these construction years. While the updated base year for construction is now 2026, the traffic analyses should generally be accurate relative to evaluating project impacts and comparing the range of alternatives.

For the purposes of this analysis as a reasonable worst case, construction is assumed to occur over a 5 yr period for variations of Alternatives 2 and 4, and 50 yrs for variations of Alternatives 3. Initial traffic estimates assumed a six day work week for hauling material to Calabasas Landfill and a five day work week for hauling material for beach placement. Since estimates of traffic were developed to describe a worst-case scenario, the estimates assumed hauling would occur from 7 AM to 4:30 PM when material would be hauled to Calabasas Landfill, with active hauling operations beginning around 8:30 AM (8 AM when school is not in session) and the last trucks leaving the Dam site around 4:15 PM. When material is hauled for beach placement, it was assumed that active hauling hours would be from 7 AM to 3:30 PM, since contractors would likely propose this schedule to avoid high traffic peak hours.

However, since hauling would involve travel through school areas, trucking would not occur from 8 AM to 8:30 AM and from 2 PM to 3:30 PM when schools are in session, to minimize traffic impacts. Additionally, in coordination with the County of Los Angeles, truck hauling would be limited to 3:30 PM in the afternoon. Therefore, the results of traffic analyses presented in this chapter are an overestimate of actual conditions based on a worst case scenario developed prior to refining the alternative options.

For the traffic estimates presented in this chapter, the following methodology was adopted to estimate the construction-related trip generation:

1. The maximum number of daily, AM peak hour (peak one hour during the AM peak travel period from 7 AM to 9 AM), and PM peak hour (peak one hour during the PM peak travel period from 4 PM to 6 PM). Construction worker and truck trips were identified per construction phase and construction year. The maximum number of construction-related trips was identified by type of construction traffic (construction worker, delivery trucks, hauling trucks to landfill, hauling trucks for beach/nearshore placement). This is because each type of construction traffic has different routing and trip distribution, and hence would

determine the maximum number of construction-related trips expected on certain neighboring roads during the construction period. Additionally, these trips were identified based on the following assumptions:

   a. Construction operations are anticipated to begin around 7 AM. No inbound worker trips are expected to occur during the AM peak hour (peak one hour between 7 AM and 9 AM).
   b. Construction operations are anticipated to end by 4:30 PM. No truck and outbound worker trips would occur during the PM peak hour (peak one hour between 4 PM and 6 PM), except when construction would extend till 4:30 PM to haul material to the landfill.
   c. Since hauling to Calabasas Landfill would end by 4:30 PM latest, a maximum of half of hourly truck trips would occur during the PM peak hour.

2. To compensate for the increased impact a truck would have versus a passenger car, a passenger car equivalent (PCE) factor of 1.5 was used for trucks to estimate construction truck traffic in PCEs.
3. Using the peak construction traffic estimates per construction year and construction phase obtained from Step 1, the maximum number of construction trips that are anticipated to access the project site during the entire construction period was identified.
4. Each of the above mentioned five types of construction traffic might peak at various stages of the construction period. However, to be conservative, all types of construction traffic were assumed to peak in the last year of construction. Thus, the Analysis Year for construction traffic was chosen to be the last year of construction (i.e., year 2021 for Alternatives 2 and 4, and year 2066 for Alternatives 3), since it represents the year with the peak construction traffic.
5. Using the maximum construction traffic that would be accessing the project site during the construction period, as identified in Step 3, traffic analysis was conducted during the Analysis Year.

For each alternative, the maximum anticipated construction traffic that would access the project site during each construction year was projected. A summary of the highest projected traffic for each alternative, based on inclusion of upstream barriers and removal of the entire Rindge Dam and spillway, is exhibited in **Table 5.9-9**. These annual peak construction traffic estimates were derived from the schedule, duration, and construction worker as well as truck estimates developed by the USACE for each construction phase. In addition to annual peak construction traffic estimates, the total number of construction traffic and the maximum number of construction traffic that would access the project site during the entire construction period.

- The peak construction traffic estimates for variations of each alternative vary for the first three years, but remain the same for the rest of the construction years. This is due to the additional construction traffic involved with the removal of upstream barriers included in some alternative variations, which would occur during the first three years of construction. Other minor traffic differences between variations of the same alternative would result from removing versus retaining the spillway. However, the differences within variations of the same alternative are minor compared to the major differences between alternatives, which is driven by the hauling of impounded sediment behind Rindge Dam.
- In general, annual peak construction traffic estimates for variations of Alternative 3 are lower than the counterparts in Alternatives 2 and 4. This is expected since Alternative involves a slower demolition process (extending for a 50-yr period) and does not involve trucking of impounded sediment compared to the remaining project alternatives.

- For all alternatives, the highest number of annual construction trips would generally occur during the last year of construction. Construction activities that are anticipated to occur during the last year of construction and would be responsible for the high construction-related trips include vegetation clearing, hauling to Calabasas Landfill, and dewatering.

Traffic Analysis Methodology

Traffic analysis of the study roadway segments was performed using HCS+ traffic analysis software, nationally accepted software that is based on the concepts and procedures of the Highway Capacity Manual (HCM) 2000. After the initial traffic analyses were run, updated assumptions and routes required that some analyses be modified to encompass the new potential traffic impacts. The initial completed traffic analyses, as well as updated traffic estimates based on the refined array of alternatives and assumptions, are contained in Appendix N.

Analysis Year Background Traffic Development

Background traffic under Analysis Year conditions were developed using county-level vehicle miles traveled (VMT) projections obtained from the Southern California Association of Governments (SCAG) Model, a regional transportation demand model developed by SCAG. These VMT projections are reported for Existing and 2035 Conditions in the 2012-2035 Regional Transportation Plan (RTP) developed by SCAG (SCAG, 2011). Since the SCAG Model is a regional travel demand model, it includes all the planned and approved land use modifications within the region. Hence, background traffic forecasts obtained from the SCAG Model projections reflect cumulative conditions. Detailed traffic growth rate calculations based on the SCAG Model projections are included in in Appendix N.

Since peak construction traffic would be observed during the last year of construction, impacts associated with different Alternatives will be evaluated under the last year of construction as a worst case scenario (year 5 for Alternatives 2 and 4, and year 50 for Alternative 3). When the traffic analyses were initially developed, the construction base year was estimated to be 2016. Therefore, background traffic was developed under Year 2021 and Year 2066 Conditions using traffic growth rates calculated from the SCAG Model projections. A comparison of the background traffic developed for the study roadway segments under Existing, Year 2021, and Year 2066 Conditions is provided in **Table 5.9-8**.

Traffic forecasting tools typically forecast volumes for a 30- to 35-yr horizon period. Year 2066 is 53 yrs away from existing conditions. Hence, currently available traffic forecasting tools cannot reasonably develop traffic volumes under Year 2066 Conditions due to many uncertainties involved with such long-term projections. Therefore, due to lack of reasonable tools to forecast 2066 traffic volumes, background traffic volumes under Year 2066 Conditions and in turn construction impacts for Alternatives 3a and 3b could not be identified with high degree of accuracy. However, they are provided in this report for informational purposes.

Table 5.9-8 - Background Traffic Forecasts under Analysis Year Conditions

Study Roadway Segment	Existing Conditions		Year 2021 Cumulative Conditions		Year 2066 Cumulative Conditions	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Malibu Canyon Road (North of Potter Drive)	1,723	1,555	1,743	1,573	1,866	1,684
Las Virgenes Road (North of Mulholland Highway)	2,387	2,365	2,414	2,392	2,585	2,561
Las Virgenes Road (North of Agoura Road)	1,797	2,731	1,818	2,762	1,947	2,958
Lost Hills Road (South of Agoura Road)	1,722	1,782	1,742	1,802	1,865	1,930
PCH (East of Malibu Canyon Road)	3,751	3,675	3,813	3,736	4,037	3,955
PCH (West of Malibu Canyon Road)	3,081	3,019	3,132	3,069	3,508	3,437
Northbound US 101 (West of Lost Hills Road)	7,204	6,235	7,324	6,339	7,754	6,711
Southbound US 101 (West of Lost Hills Road)	5,816	6,493	5,913	6,600	6,260	6,988
Northbound US 101 (East of Las Virgenes Road)	7,749	6,707	7,877	6,818	8,340	7,218
Southbound US 101 (East of Las Virgenes Road)	6,256	6,983	6,360	7,099	6,733	7,516

Table 5.9-9 - Maximum Anticipated Construction Traffic in Number of Trips during the Construction Period

		Year 1				Year 2				Year 3				Year 4				Year 5 / Year 50*				Total During Construction			
		Worker Trips		Truck Trips		Worker Trips		Truck Trips		Worker Trips		Truck Trips		Worker Trips		Truck Trips		Worker Trips		Truck Trips		Worker Trips		Truck Trips	
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out
Alternative 2	Daily	96	96	40	40	84	84	137	137	72	72	54	54	42	42	62	62	53	53	138	138	347	347	431	431
	AM Peak	0	0	5	5	0	0	18	18	0	0	8	8	1	1	9	9	0	0	19	19	0	0	59	59
	PM Peak	0	96	1	1	0	84	7	7	0	72	1	1	0	42	4	4	0	53	9	9	0	347	22	22
Alternative 3	Daily	100	100	39	39	62	62	7	7	63	63	7	7	37	37	7	7	41	41	138	138	377	377	212	212
	AM Peak	0	0	5	5	0	0	2	2	0	0	2	2	0	0	2	2	0	0	19	19	0	0	34	34
	PM Peak	0	100	1	1	0	62	1	1	0	63	1	1	0	37	1	1	0	34	9	9	0	370	15	15
Alternative 4	Daily	101	101	40	40	57	57	137	137	64	64	54	54	42	42	63	63	48	48	139	139	312	312	433	433
	AM Peak	0	0	5	5	0	0	18	18	0	0	8	8	0	0	9	9	0	0	19	19	0	0	59	59
	PM Peak	0	101	1	1	0	57	7	7	0	64	1	1	0	42	4	4	0	48	9	9	0	312	22	22

* Year 5 applies to variations of Alternative 2 and 4. Year 50 is utilized for Alternative 3. Year 5 under variations of Alternative 3 is identical to Year 4.
** The peak predicted daily impacts, and peak impacts during AM and PM peak hours, associated with each alternative are in red italics.

5.9.3 *Analysis of Alternative Components*

Dam and Spillway Removal

Construction Impacts

Options to remove both the dam and spillway, versus removal of the dam alone, do not differ significantly in the potential impacts to transportation. The removal and hauling of spillway concrete would utilize the same methods and traffic routes as hauling material associated with dam and sediment removal. Removal of the spillway would add only minor additional traffic when compared to the removal of the material associated with the dam and impounded sediment. The majority of potential transportation related impacts are associated with hauling the significant quantities of sediment impounded behind Rindge Dam. Removal of the minor additional material associated with the spillway has little effect on the overall potential traffic impacts of an alternative, and would not result in a change of the significance determination of any alternative it is associated with.

The dam and spillway materials (concrete, rebar, etc.) are being disposed of at the Calabasas Landfill under all alternatives. The 2010 Congestion Management Plan (CMP) designates US 101 as the CMP Freeway in the proposed project's vicinity. All alternatives will utilize US 101 for both worker traffic and construction-related trips. However, none of the alternatives produce traffic in excess of the 2010 CMP's 150 peak hour trip threshold for freeways. As such, the additional trips generated by any of the alternatives can be accommodated by neighboring CMP roadways without causing significant impacts to their operations, and the removal of the dam and spillway and disposal of the associated materials will not conflict with the standards established by the Los Angeles CMP (Criteria 1 and 2).

Access to the project site during construction would be directly to and from a driveway off of Malibu Canyon Road. All construction and construction staging would take place within the project site. Access to and from the site, including for emergency vehicles, would be maintained at all times. All travel lanes along Malibu Canyon Road would be maintained during the construction phase, although the installation of a traffic light may be required. The need for a light will be analyzed during design phase in the Transportation Management Plan (Mitigation Measure T-1), but it is assumed that impacts associated with the light are potentially significant. Impacts related to emergency access are expected to be less than significant (Criteria 5).

Low pedestrian and bicycle activity is currently observed in the vicinity of Rindge Dam. No pedestrian and bicycle facilities, except for a few hiking trails, are available in the immediate vicinity of the project site. Removal of the dam and/or spillway would not modify any of these pedestrian and bicycle facilities. Also, no new bicycle or pedestrian trips from workers would occur. Hence, the removal of the dam and/or spillway would not cause any significant pedestrian and bicycle impacts (Criteria 6).

Long Term Impacts

There are no differences in the potential long term impacts to transportation resources associated with leaving the spillway in place versus removing the spillway. The differences in traffic between these two options are minimal. Post-construction operations and maintenance will be required at the Rindge Dam site regardless of whether or not the spillway is left in place. The estimated transportation related impacts of the projected long-term operations are summarized in **Table 5.9-10** on the following page. Long term impacts associated with either dam removal option are less than significant.

Upstream Barriers

Construction Impacts

Removal of upstream barriers will result in the need to transport relatively minor additional quantities of material to the Calabasas Landfill compared to the quantities associated with the impounded sediment. Transport of this material, and the associated worker trips, would not result in a significant change to the LOS of any associated roadways (Criteria 1). However, removal of the upstream barriers would result in the temporary closure of public roads and would require traffic control as follows:

- Piuma Culvert (CC1) – The construction for the upstream barrier removal at CC1 is estimated to occur for 30 days in the first year of construction (2017). During construction, the two-lane segment of Piuma Road located at CC1 would either be reduced down to a single lane or closed for one to two days. High traffic control is needed. Roadway railing and signage would be removed as part of the demolition. After construction, there will be a need to replace the pavement, striping, roadway metal railings and posts, and signage along Piuma Road.
- Malibu Meadows Road Bridge (CC2) – The construction for the upstream barrier removal at CC2 is estimated to occur for 30 days in the second year of construction (2018). No public roads would be closed during construction. The bridge is currently used for residential access; hence, minimum traffic control would be needed as main roads leading to this area can be closed.
- Crater Camp Road Bridge (CC3) – The construction for the upstream barrier removal at CC3 is estimated to occur for 15 days in the second year of construction (2018). No public road would be closed during construction. Traffic control would be needed during construction for lane or road closure.
- Cold Canyon Road Culvert (CC5) – The construction for the upstream barrier removal at CC5 is estimated to occur for 15 days in the first year of construction (2017). No public road would be closed during construction. No special traffic control would be needed during construction.
- Crag's Road Culvert Crossing (LV1) – The construction for the upstream barrier removal at LV1 is estimated to occur for 15 days in the second year of construction (2018). Traffic control is needed for half of the time, since the project site is the primary access site for Malibu Creek State Park backcountry and the visitor center.
- White Oaks Farm Dam (LV2) – The construction for the upstream barrier removal at LV2 is estimated to occur for 15 days in the first, second, and third years of construction (2017, 2018, and 2019). No public road would be closed during construction. No special traffic control would be needed during construction.

During the construction at CC1, CC2, CC3, CC4, and LV1, segments of Piuma Road, Crag's Road, Crater Camp Road, and a local road in the vicinity of CC4 could either be temporarily narrowed down by reducing the number of lanes from two lanes to one lane or be temporarily closed for a day or two. This reduction in travel lanes, though temporarily, would result in significant impacts along the roads mentioned above during the duration of construction at CC1, CC2, CC3, CC4, and LV1 (about 15 to 30 days; Criteria 1 and 2).

In addition to the impacts described above, heavy equipment operating adjacent to or within a road right-of-way during the construction at CC1, CC2, CC3, CC4, and LV1 would increase the risk of accidents; thereby, resulting in significant roadway hazard-related impacts along Piuma Road, Crag's Road, Crater Camp Road, and a local road in the vicinity of CC4 (Criteria 4). However, these are short-term impacts and, if they were to occur, would be expected to occur only during the duration of construction at CC1, CC2, CC3, CC4, and LV1 (Significance Criteria D).

During the construction at CC1 and LV1, segments of Piuma Road and Crag's Road could either be temporarily narrowed down by reducing the number of lanes from two lanes to one lane or be temporarily closed for a day or two. This reduction in the travel lanes, though temporarily, would result in significant impacts to emergency access along Piuma Road and Crag's Road during the duration of construction at CC1 and LV1 (30 and 15 days, respectively; Criteria 5). Therefore, impacts related to emergency access are expected to be potentially significant for removal of the upstream barriers relative to emergency access.

Table 5.9-10 - Anticipated Truck Traffic for O&M Activities

Construction Activity		Frequency	Maximum Number of Trucks	Notes
Upstream Barriers	Annual Inspection	Annually	3	
	Sediment Management	Bi-Annually	4	
	Habitat Monitoring & Management	Biweekly	5	Dry months; years 1-2
		Monthly	2	Wet months, years 1-2
		Monthly	2	For remaining 3 years
Floodwalls	Annual Inspection	Annually	3	
	Repairs	Annually	12	
	Vegetation Maintenance	Bi-Annually	4	
	Habitat Monitoring & Management	Biweekly	5	Dry months; years 1-2
		Monthly	2	Wet months, years 1-2
		Monthly	2	For remaining 3 years
Rindge Dam Site	Annual Inspection	Annually	3	
	Repair of South Access Road	Every 2 years	12	
	Trash Removal	Annually	3	
	Habitat Monitoring & Management	Biweekly	5	Dry months; years 1-2
		Monthly	2	Wet months, years 1-2
		Monthly	2	For remaining 3 years

Although a few neighboring circulation facilities (Piuma Road and Crag's Road) are anticipated to be closed or narrowed during construction, this is temporary in nature since the number of travel lanes would only be reduced during construction (30 days or less). Therefore, removal of the upstream barriers does not conflict with any applicable plans, policies, or regulations (Significance Criteria A). The material associated with the upstream barrier removal is being disposed of at the Calabasas Landfill. The 2010 Congestion Management Plan (CMP) designates US 101 as the CMP Freeway in the proposed project's vicinity, which will be utilized to access the landfill. However, the number of traffic trips associated with removal of the upstream barriers does not reach the level of significance specified in the CMP. Therefore, removal of the upstream barriers will not conflict with the standards established by the Los Angeles CMP (Criteria 1-2).

Due to heavy truck and construction equipment movements, there is a potential for unexpected damages to occur along roadways, which could increase road hazards. As such, the removal of upstream barriers could potentially result in a significant impact associated with road hazards (Criteria 4).

Low pedestrian and bicycle activity is currently observed in the vicinity of the upstream barriers. Construction actions associated with the removal of the upstream barriers would not modify any of these pedestrian and bicycle facilities. Also, it is not anticipated to result in new bicycle or pedestrian trips from workers. Hence, removal of upstream barriers would not cause any significant pedestrian and bicycle impacts (Criteria 6).

Long Term Impacts

Removal of the upstream barriers would require relatively minor additional traffic associated with long term operations and maintenance (**Table 5.9-10**). Since O&M of the upstream barriers would add relatively few truck trips (fewer than 10 per day), which would also be irregular and infrequent, it would result in less than significant impacts to study road segments long term under all significance criteria.

<u>Sediment Hauling and Placement</u>

Construction Impacts

The largest potential transportation impacts associated with any alternative are those that arise from the mechanical transport of the impounded sediment behind Rindge Dam. These impacts include the traffic related to workers, delivery trucks to the project site, hauling trucks to Calabasas Landfill, and hauling trucks to either the beach adjacent to Malibu Pier (including temporary use of Upland Site F), or the barge at Ventura Harbor. While sediment hauling to any destination is not anticipated to result in any road closures, a traffic light may be required at the construction exit onto Malibu Canyon Road. This light, if required, would be common to all alternatives. In addition, a traffic light may be required along PCH at the exit of the Malibu Pier parking lot. This light would only be required for the beach placement option. The need for these lights will be analyzed during the Transportation Management Plan preparation proposed during the detailed design phase (see Mitigation Measure T-1). For the purpose of this traffic analysis, it is assumed that both lights will be required under the relevant alternatives, and that the impacts associated with the lights would be potentially significant.

Construction-related traffic impacts associated with mechanically removing and hauling impounded sediment are potentially significant, regardless of the destination of that material. Peak construction traffic estimates per construction year and construction phase were produced for variations of Alternative 2 and Alternative 4, and the complete analyses are included in Appendix N. The results of analyses for all alternatives utilizing mechanical transport of impounded sediment resulted similar potential impacts, regardless of variant or alternative. This is due to the bulk of potential impacts being associated with Malibu Canyon Road and Las Virgenes Road, a route which is common to all options. Therefore, only one complete example of a single analysis is provided here (**Table 5.9-11**). A summary of significant impacts across all alternatives is also presented (**Table 5.9-12**). The remaining data can be found in Appendix N.

As shown in **Table 5.9-11**, significant traffic increases are projected to occur along heavily used segments of Malibu Canyon and Las Virgenes Roads during AM and PM peak hours. While the result is a potential increase in the number of passenger cars per hour (PCPH), the traffic increases would not result in a change of LOS of any road segment within the project area. This is true of all methods and routes of transport (Criteria 1 – 2).

Table 5.9-11 - Potential Traffic Impacts to Roadway Segments Associated with Mechanical Transport of Sediment Including Removal of Upstream Barriers (Based on Alternative 2b Schedule)

Study Roadway Segment	Construction Trips Added		2021 Conditions Without Project			2021 Conditions With Project		Project-Related Difference[1]		Significant Impact?
	In	Out	V/C	PCPH	LOS	V/C	PCPH	V/C	PCPH	
AM Peak Hour										
Malibu Canyon Rd (Project - SR 1)	29	29	0.63	2,009	E	0.65	2,076	0.02	3.3%	Yes
Las Virgenes Rd (Project - Lost Hills Rd)	30	30	0.87	2,782	F	0.89	2,852	0.02	2.5%	Yes
Las Virgenes Rd (Lost Hills - 101)	2	2	0.32	-	B	0.32	-	0.00	-	No
Lost Hills Rd (Las Virgenes - 101)	29	29	0.33	-	B	0.34	-	0.01	-	No
PCH (East of Malibu Canyon Rd)	28	28	0.66	-	D	0.67	-	0.01	-	No
PCH (West of Malibu Canyon Rd)	13	13	0.54	-	C	0.55	-	0.01	-	No
Northbound US 101 (West of Lost Hills Rd)	0	2	0.71	-	D	0.71	-	0.00	-	No

Southbound US 101 (West of Lost Hills Rd)	2	0	0.58	-	C	0.58	-	0.00	-	No
Northbound US 101 (East of Las Virgenes Rd)	2	0	0.96	-	E	0.96	-	0.00	-	No
Southbound US 101 (East of Las Virgenes Rd)	0	2	0.77	-	D	0.77	-	0.00	-	No
PM Peak Hour										
Malibu Canyon Rd (Project - SR 1)	0	48	0.57	1,813	E	0.58	1,868	0.01	3.0%	Yes
Las Virgenes Rd (Project - Lost Hills Rd)	14	62	0.86	2,757	E	0.89	2,845	0.03	3.2%	Yes
Las Virgenes Rd (Lost Hills - 101)	0	24	0.48	-	C	0.48	-	0.00	-	No
Lost Hills Rd (Las Virgenes - 101)	14	38	0.30	-	B	0.31	-	0.01	-	No
PCH (East of Malibu Canyon Rd)	0	24	0.78	-	D	0.79	-	0.01	-	No
PCH (West of Malibu Canyon Rd)	0	24	0.64	-	D	0.64	-	0.00	-	No
Northbound US 101 (West of Lost Hills Rd)	0	24	0.62	-	C	0.62	-	0.00	-	No
Southbound US 101 (West of Lost Hills Rd)	0	0	0.64	-	C	0.64	-	0.00	-	No
Northbound US 101 (East of Las Virgenes Rd)	0	0	0.83	-	D	0.83	-	0.00	-	No
Southbound US 101 (East of Las Virgenes Rd)	0	24	0.86	-	D	0.87	-	0.00	-	No

[1]Absolute difference reported for V/C and percent difference reported for PCPH.

V/C – Volume-to-Capacity Ratio, PCPH – Passenger Cars per Hour, and LOS – Level of Service
The initial traffic analyses included beach placement of appropriate sediment. However, as an alternative to avoid impacts to parking and recreation in the vicinity of Malibu Pier, an additional option to transport material to Ventura Harbor and barge the material to the nearshore area off of Malibu Pier was later developed. This option was not included in the original traffic analyses, and therefore a supplemental traffic analysis was performed. Under the barge placement option, traffic would utilize US 101, S. Victoria Drive, Olivas Park Road, Harbor Boulevard, and Schooner Drive to deliver material to the placement barge. Only one intersection along this route is close to achieving the next higher LOS, and therefore at risk of exceeding the Ventura significance criteria, as established in the Ventura Comprehensive Plan, due to increased traffic. This is the intersection at Victoria Avenue and Olivas Park Road. However, due to hauling restrictions in the Malibu and Los Angeles County jurisdictions, no traffic will occur in Ventura during either AM or PM peak hours. In addition, the maximum potential number of hourly trips along this route during construction is anticipated to be 12 (18 PCE), which would not result in an increase of LOS.

Table 5.9-12 - Summary of Potential Traffic Differences between Project Alternatives and Baseline Conditions along Malibu Canyon and Las Virgenes Roads

Alternative	Malibu Canyon AM Peak		Las Virgenes AM Peak		Malibu Canyon PM Peak		Las Virgenes PM Peak	
	V/C**	PCPH	V/C	PCPH	V/C	PCPH	V/C	PCPH
Alternative 2a	0.02	3.30%	0.02	2.50%	0.01	1.90%	0.02	2.40%
Alternative 2b	0.02	3.30%	0.02	2.50%	0.01	3.00%	0.03	3.20%
Alternative 3a	0.00	0.30%	0.02	2.30%	0.01	2.10%	0.03	2.50%
Alternative 3b*	0.00	0.30%	0.02	2.30%	0.01	3.00%	0.03	3.00%
Alternative 4a	0.02	3.30%	0.03	2.50%	0.02	2.20%	0.02	2.60%
Alternative 4b	0.02	3.30%	0.02	2.50%	0.01	3.30%	0.03	3.30%

* Highlighted values for Alternative 3b are non-significant. The remaining values in this Table are indicative of significant traffic impacts.
**(V/C is the absolute difference and PCPH is the % difference relative to the projected impacts during the heaviest traffic years of analysis).

Much of the material removed from behind Rindge Dam will not be compatible with beach or nearshore placement, and will be disposed of at the Calabasas Landfill. Remaining beach compatible material will be transported to either Ventura Harbor along US 101, or to the Malibu Pier beach along PCH. The 2010 CMP designates PCH as the CMP Highway and US 101 as the CMP Freeway in the proposed project's vicinity. None of the alternatives produce traffic in excess of the 2010 CMP's 150 peak hour trip threshold for freeways (US 101), or 50 peak hour trip thresholds for arterials (PCH). As such, the additional trips generated by any of the alternatives can be accommodated by neighboring CMP roadways without causing significant impacts to their operations, and the removal of the dam and spillway and disposal of the associated materials will not conflict with the standards established by the Los Angeles CMP (Criteria 2).

Due to heavy truck and construction equipment movements, there is a potential for unexpected damages to occur along roadways, which could increase road hazards. As such, mechanical sediment transport could potentially result in a significant impact associated with road hazards (Criteria 4). Mechanical sediment transport under any scenario is not expected to result in inadequate emergency access (Criteria 5) Low pedestrian and bicycle activity is currently observed in the vicinity of Rindge Dam. No pedestrian and bicycle facilities, except for a few hiking trails, are available in the immediate vicinity of the project site. Removal of the impounded sediment, regardless of the disposal route options, would not modify any of these pedestrian and bicycle facilities. Also, no new bicycle or pedestrian trips from workers would occur. Hence, the removal of the dam and/or spillway would not cause any significant pedestrian and bicycle impacts (Criteria 6).

Parking Analysis

Per CEQA Guidelines, parking impact analysis is not required. However, this analysis is included as a reference and due to the increased local concern related to potential parking impacts.

Sand would be delivered the parking lot adjacent to Malibu Pier for three years during construction of alternatives that include beach placement. Delivery of this material would only occur outside of the peak summer recreational season. Temporary loss of parking spaces for a total of 12 months over a 3 year period would result due to the need to close the parking lot at Malibu Pier during all beach placement activities. Therefore, any beach placement alternative would cause short-term parking deficiencies at the Malibu Pier.

Long Term Impacts

After construction is completed, minimal operation and maintenance (O&M), usually during dry seasons, will be required. Monitoring of structures to ensure their proper functioning and endurance would be needed. Monitoring frequency would vary, depending on the frequency and severity of storm events. O&M activities required and the associated traffic are summarized in **Table 5.9-7**.

Floodwall Construction

Construction Impacts

The construction of floodwalls under all natural transport alternatives will result in a minor increase in construction-related traffic. However, this traffic increase is offset by the reduction in sediment hauling required. Based on the detailed traffic analyses performed, the construction of floodwalls does not alter the significance of transportation impacts of any associated alternative under any of the significance criteria.

Long Term Impacts

Floodwalls would require relatively minor additional traffic associated with long term operations and maintenance (**Table 5.9-10**). Since O&M of the floodwalls would add relatively few truck trips (fewer than 10 per day), which would also be irregular and infrequent, it would result in less than significant impacts to study road segments long term under any of the significance criteria.

5.9.4 *Analysis of Alternatives*

Alternative 1: No Action Alternative

Under the No Action Alternative, the proposed project would not be implemented and no changes would be made to the Rindge Dam and the surrounding area. Hence, Alternative 1 would not involve any construction or O&M-related traffic or other transportation-related impacts, and no mitigation measures would be required.

Alternative 2: Mechanical Transport

All versions of Alternative 2 consist of mechanically transporting sediment removed from behind Rindge Dam. Each variation of Alternative 2 results in slightly different potential impacts to transportation, as each variation differs in either quantity of material transported (number of truck trips), or route of hauling. However, the differences among the variations are generally minor with respect to transportation, because the bulk of the potential impacts arise from along Malibu Canyon and Las Virgenes Roads as described below. Overall, the significance of transportation-related impacts is the same for all variations of Alternative 2 (**Table 5.9-13**).

Based on the results of the initial traffic analyses, AM and PM peak hour traffic could potentially be significantly impacted along both Malibu Canyon and Las Virgenes Roads (**Table 5.9-10 and Table 5.9-11**). Under the model assumptions, during both the AM and PM peak hours, these roadway segments would operate at LOS E or F and experience an increase in passenger cars per hour (PCPH) by 1.9 to 3.3 percent. This is because the majority of the construction traffic must use these roadway segments to access the project site. However, after the detailed traffic analyses were completed, the hours of sediment hauling were reduced to occur entirely outside of the AM and PM peak hours due to restrictions based on Los Angeles and Malibu regulations, although worker traffic to and from the site will still potentially occur during peak hours.

Table 5.9-13 - Significance of Transportation Impacts Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	Class I			Class I			Yes
2a2	Class I				Class I		Yes
2b1	Class I		Class II	Class I			Yes
2b2	Class I		Class II		Class I		Yes
2c1		Class I		Class I			Yes
2c2		Class I			Class I		Yes
2d1		Class I	Class II	Class I			Yes
2d2		Class I	Class II		Class I		Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

No variation of Alternative 2 is expected to worsen the LOS value of any of the study roadway segments. Also, the projected increase in v/c ratio values of the study roadway segments would neither meet nor exceed the significance thresholds of corresponding jurisdictions during both the AM and PM peak hours. However, the projected increase in PCPH along Malibu Canyon and Las Virgenes Roads would exceed the significance threshold of the Los Angeles County (one percent) during both the AM and PM peak hours. Therefore, construction traffic related to all variations of Alternative 2 would have potential significant impacts to these road segments. Along all other roadway segments under variations of Alternative 2, impacts will be less than significant.

Project-related construction activities from vehicles entering and exiting the sites are expected to slow traffic movements in the vicinity of the project site, Malibu Pier Beach, and the Calabasas Landfill, and may result in potential significant impacts to traffic operations at the site entrances/exits. In addition, the installation of traffic lights at the construction entrance along Malibu Canyon Road, or at the Malibu Pier parking lot, could have potentially significant traffic impacts that will be evaluated in detail during design.

Since no variation of Alternative 2 would significantly worsen the LOS value of any of the study roadway segments, there is not expected to be any substantial delays to the operations of bus lines within the project area (shown in **Table 3.9-3**). Additionally, it is anticipated that the construction workers would access the project site using automobiles. Hence, Alternative 2 is not anticipated to generate any transit-oriented trips and would result in less than significant impacts to neighboring transit operations.

Mitigation Measures

Construction traffic related to all variations of Alternative 2 would cause significant impacts at two roadway segments – Malibu Canyon Road (between project site and PCH) and Las Virgenes Road (between project site and Lost Hills Road). Also, it has the potential to result in significant traffic impacts at the project site, landfill, and beach areas' entrances/exits. Potentially significant traffic impacts may occur if traffic signals are required at either the construction entrance on Malibu Canyon Road, or the Malibu Pier parking lot exit. Mitigation measure T-1 is recommended to lessen construction-related traffic impacts and to minimize traffic delays at the site entrances/exits and elsewhere within the construction area. The following mitigation measures are proposed:

- **T-1 Transportation Management Plan.** During the design phase, a Transportation Management Plan (TMP) will be prepared to address any transportation related issues. This plan will be circulated to the City of Calabasas, City of Malibu, City of Ventura, Los Angeles County, and Caltrans for review and approval to minimize temporary traffic impacts during construction. The TMP will cover all aspects of construction and will include haul routes, material hauling activities to the landfill and beaches, details of public parking closure at the beaches, all traffic control measures required including traffic signals, and all aspects of construction necessary during construction of the project. This plan would be developed by a registered Civil or Traffic Engineer who would be qualified to perform traffic studies and is familiar with the project area.
    - There is a potential for significant impacts by damaging roadway conditions and increasing road hazards. Mitigation measure T-2 is recommended to reduce roadway hazard-related impacts to a less than significant level by ensuring that the neighboring roadways would be in the same condition before and after construction.
- **T-2 Road Repair.** The construction contractor will repair any damage or changes to neighboring roadways that occurred as a result of construction. The construction contractor will coordinate repairs with the appropriate public agencies to ensure that any damage is properly repaired.
    - Additionally, variations of Alternative 2 that include beach placement would cause temporary parking deficiencies at Malibu Pier. Mitigation measure AES-6, as mentioned in **Section 5.7** is recommended to reduce potential short-term parking deficiencies at beach areas.
- **AES-6 Minimize construction equipment storage areas at beach replenishment site.** Construction equipment storage areas will be minimized to reduce temporary disturbances to coastal views. If public parking areas are used for construction equipment storage, temporary removal of parking spaces will be minimized in order to maximize public access to coastal scenic areas.

Level of Significance

As summarized in **Table 5.9-13**, all variations of Alternative 2 are predicted to result in significant traffic impacts. While some transportation impacts are mitigable with the implementation of the proposed mitigation measures, the potential need for traffic lights at the construction entrance and at the Malibu Pier parking lot exit could result in potential unmitigable traffic impacts. However, the specifics will not be known until completion of the Transportation Management Plan (TMP) during design phase. Therefore, these impacts are assumed to be Class I (significant and unavoidable) until the TMP is completed. The TMP will identify measures to reduce impacts to the maximum extent practicable, but impacts are assumed to remain significant and unavoidable.

Alternative 3: Natural Transport

All versions of Alternative 3 consist of allowing natural transport of impounded material from behind Rindge Dam over a long period of time. Each variation of Alternative 3 results in slightly different potential impacts to transportation, as each variation differs in either quantity of material transported (number of truck trips), and routes utilized (for removal of upstream barriers). However, the differences among the variations are generally minor with respect to transportation. Overall, the significance of transportation-related impacts is the same for all variations of Alternative 3 (**Table 5.9-14**). While Alternative 3 will utilize less truck trips and avoid many potential traffic issues associated with Alternative 2, significant impacts are still anticipated due to the increased traffic along Malibu Canyon and Las Virgenes Roads, as well as the potential need for a traffic light at the construction entrance. The significant impacts shown for the dam/spillway removal refer to those potential impacts associated with the entrance on Malibu Canyon Road, and the possibly need for a traffic signal.

Table 5.9-14 - Significance of Transportation Impacts Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill*	Dam*	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	Class I					Class II	Yes
3b	Class I					Class II	Yes
3c		Class I	Class II			Class II	Yes
3d		Class I	Class II			Class II	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).* Since no sediment hauling will occur, but a traffic light may still be necessary on Malibu Canyon Road, potentially significant impacts are assumed under dam and/or spillway removal.

Similar to both Alternatives 2, no variation of Alternative 3 is anticipated to result in an increase in LOS of any road segment, and hence no impacts to existing transit systems are expected. However, PCPH increases are could potentially occur along Malibu Canyon and Las Virgenes Roads. Project-related construction activities from vehicles entering and exiting the sites are also expected to slow traffic movements in these vicinities. In addition, the installation of a traffic light at the construction entrance along Malibu Canyon Road could have potentially significant traffic impacts that will be evaluated in detail during design.

Mitigation Measures

The same mitigation measures apply to all variations of Alternative 3 as those described for Alternative 2 above.

Level of Significance

As summarized in **Table 5.9-14**, all variations of Alternative 3 are predicted to result in significant traffic impacts. While some transportation impacts are mitigable with the implementation of the proposed mitigation measures, the potential need for traffic lights at the construction entrance on Malibu Canyon Road could result in potential unmitigable traffic impacts. Therefore, these impacts are assumed to be Class I (significant and unavoidable) until the TMP is completed. The TMP will identify measures to reduce impacts to the maximum extent practicable, but impacts are assumed to remain significant and unavoidable.

Alternative 4: Hybrid Mechanical & Natural Transport

Alternative 4 is a hybrid of Alternatives 2 and 3. It consists of mechanically transporting some sediment from behind Rindge Dam, and also allowing some sediment to transport naturally downstream. Alternative 4 has generally the same traffic-related impacts as Alternative 2 and 3, with potentially significant traffic impacts along Malibu Canyon and Las Virgenes Roads. Overall, the significance of transportation-related impacts is the same for all variations of Alternative 4 (**Table 5.9-15**).

Table 5.9-15 - Significance of Transportation Impacts Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	Class I			Class I		Class II	Yes
4a2	Class I				Class I	Class II	Yes
4b1	Class I		Class II	Class I		Class II	Yes
4b2	Class I		Class II		Class I	Class II	Yes
4c1		Class I		Class I		Class II	Yes
4c2		Class I			Class I	Class II	Yes
4d1		Class I	Class II	Class I		Class II	Yes
4d2		Class I	Class II		Class I	Class II	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Similar to both Alternatives 2 and 3, no variation of Alternative 4 is anticipated to result in an increase in LOS of any road segment, and hence no impacts to existing transit systems are expected. However, PCPH increases are expected along Malibu Canyon and Las Virgenes Roads. Project-related construction activities from vehicles entering and exiting the sites are expected to slow traffic movements in these vicinities. In addition, the installation of a traffic light at the construction entrance along Malibu Canyon Road could have potentially significant traffic impacts that will be evaluated in detail during design.

Mitigation Measures

The same mitigation measures apply to all variations of Alternative 4 as those described for Alternative 2 above.

Level of Significance

As summarized in **Table 5.9-15**, all variations of Alternative 4 are predicted to result in significant traffic impacts. While some transportation impacts are mitigable with the implementation of the proposed mitigation measures, the potential need for traffic lights at the construction entrance and at the Malibu Pier parking lot exit could result in potential unmitigable traffic impacts. However, the specifics will not be known until completion of the Transportation Management Plan (TMP) during design phase. Therefore, these impacts are assumed to be Class I (significant and unavoidable) until the TMP is completed. The TMP will identify measures to reduce impacts to the maximum extent practicable, but impacts are assumed to remain significant and unavoidable.

Comparison of Alternatives

The results of traffic analyses indicate that all alternatives have potential significant impacts to transportation resources. Shared among all alternatives is the potential increase in traffic along Malibu Canyon and Las Virgenes Roads. This traffic is associated with both worker traffic to and from the construction site, as well as traffic associated with disposing of material at the Calabasas Landfill. Additionally, there is a potential for traffic impacts at the construction site entrance along Malibu Canyon Road if the installation of a traffic signal is required. The need for a signal, as well as any associated potential impacts, will be identified during the development of the Transportation Management Plan (Mitigation Measure T-1).

While all alternatives have similar components resulting in the same significance determination, there are major differences between the other potential traffic and transportation impacts. All alternatives that include upstream barriers (all b and d variations) have increased potential traffic risks associated with lane closures and use of heavy equipment along these roadways, which could impact emergency access and result in traffic hazards. These impacts are Class II, significant but mitigable.

All variations of Alternative 2 have the highest potential traffic impacts associated with the mechanical transport of bulk material behind the dam. Alternative 4 has slightly lower associated impacts due to the allowance of some natural transport of the impounded material. Variations of Alternative 3 have lower potential associated impacts due to the extensive use of natural transport. The minor tradeoff associated with Alternatives 3 and 4 is that minor increased construction traffic would occur during the installation and maintenance of flood walls.

Overall, when comparing alternatives, Alternative 3 has the lowest potential traffic related impacts and Alternative 2 has the highest. Within Alternatives, upstream barrier removal increases potential traffic impacts (b and d variations), while excluding upstream barriers reduces potential traffic impacts. However, even with all of the inter- and intra-alternative variation of impacts to transportation resources, all alternatives have the same overall level of significance and require the same mitigation measures.

5.10 Land Use

Impacts to Land Use were determined not to be significant during the scoping process. Pursuant to Section 15128 of the CEQA Guidelines, as amended, a brief discussion indicating the reasons is provided in **Section 7.2**.

5.11 Noise

5.11.1 *Impact Significance Criteria*

The significance criteria described below are derived from CEQA Guidelines, Federal Highway Administration (FHWA) noise abatement criteria, Los Angeles County Construction Noise Ordinances, Malibu Creek State Park General Plan, City of Malibu Ordinances and Article 4 of the City of Malibu's General Plan, City of Ventura Noise Ordinance, and City of Calabasas Ordinance. The criteria established below apply to both NEPA and CEQA compliance.

Impacts would be significant if implementation of an alternative would result in:

1. Generation of noise levels in excess of standards established in the local general plan, noise ordinances, or applicable standards (an increase in noise greater than 10 dBA, or in excess of the maximum noise levels established in the local plans described in Chapter 3.11).
2. Generation of excessive ground-borne vibration or ground-borne noise levels.
3. A substantial increase in ambient noise levels in the project vicinity above levels existing without the project.
4. A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

Since construction traffic will be a daytime occurrence only, the noise generated by project traffic will be expressed as the 1-hour equivalent noise level (L_{eq}) and will be the difference between the noise from existing traffic and the noise from existing traffic plus project traffic as predicted by TNM2.5.

5.11.2 *Analysis of Alternative Components*

Construction Noise Analysis

Noise from construction activities was estimated using the FHWA Roadway Construction Noise Model (RCNM). The RCNM is a computer model that can estimate three key metrics including L_{max}, L_{eq}, and L_{10} at receptor locations from a construction operation. The RCNM allows the user to specify the type and number of pieces of construction equipment and is capable of estimating the noise level at a receptor from up to 20 pieces of equipment at the same time and at a distance of more than 30 mi away. The construction equipment schedule developed for the study was used to determine the types and numbers of construction equipment for each alternative. For Alternatives 2 and 4, construction is estimated to occur over a 7-8 yr construction period. For Alternative 3, construction is estimated to occur over a 40-100 yr period. The phase of work with the most equipment for each alternative was chosen for the analysis. Typically, during construction, equipment use is staggered, but to simulate a worst-case scenario it was assumed that all construction equipment operated simultaneously. For each piece of equipment, default usage factors were used to calculate noise levels (**Table 5.11-2**; FHWA 2006).

Table 5.11-1 - Construction Equipment Noise Emission Levels and Acoustical Usage Factors

Equipment Description	Acoustical Use Factor (%)	L_{max} @ 50ft (dBA, slow)
Auger Drill Rig	20	85
Backhoe	40	80
Blasting	-- N/A --	94
Chain Saw	20	85
Compactor (ground)	20	80
Compressor (air)	40	80
Concrete Mixer Truck	40	85
Concrete Pump Truck	20	82
Concrete Saw	20	90
Crane	16	85
Dozer	40	85
Drill Rig Truck	20	84
Dump Truck	40	84
Excavator	40	85
Flat Bed Truck	40	84
Front End Loader	40	80
Generator	50	82
Grader	40	85
Hydra Break Ram	10	90
Jackhammer	20	85
Mounted Impact Hammer (hoe ram)	20	90
Pavement Scarifier	20	85
Pickup Truck	40	55
Rock Drill	20	85
Tractor	40	84

Dam and Spillway Removal

Construction Impacts

Removal of the entire dam structure and removal of the dam arch alone, leaving the spillway intact, are generally similar in construction related noise impacts. The primary difference, discussed below, is that removal of the spillway may potentially utilize micro-blasting. Construction activities at Rindge Dam under all scenarios will require the use of heavy equipment for demolition, excavation, material handling, road building, site grubbing, clearing and grading. The major phases of work are site preparation, diversion and control of water, sediment removal, demolition, and disposal of debris. A mix of construction equipment has been proposed for each phase of work. To simulate worst-case noise levels and account for any construction equipment operation overlap, the phase of work with the most amount of equipment was used. All equipment were assumed to be operating simultaneously to predict the $L_{eq.}$ The nearest receptor, private residences along Piuma Road, are approximately 3500 ft away. Modeling predicted no significant noise impacts at this distance (**Table 5.11-2**).

Demolition would involve the arch being cut into blocks using diamond wire saws. Spillway demolition would involve pre-splitting the concrete from the rock substratum, drilling and micro-blasting or use of a similar method on the surface to fracture the concrete, and manually breaking the concrete. Micro-blasting would be intermittent and on short term basis.

Minor differences in noise at Rindge Dam will occur across alternatives. The largest of these is the removal of a 5ft. notch under Alternative 4. Also, under Alternative 3, construction would be staggered over a 40-100 year period. Similar noise levels would occur, but with less frequency and over a longer time period. All minor noise variations associated with slight differences in alternatives are smaller than 3 dBA, which is the threshold of human perception of change in noise levels. Therefore, the minor differences in noise production between different alternatives would be imperceptible, and do not differ significantly from those presented in **Table 5.11-2**.

Malibu Creek flows from north to south along Malibu Canyon. Rindge Dam sits in a remote location along Malibu Canyon Road. The canyon's meandering valley and high walls form a sound barrier in all directions. The geography of the canyon prohibits building structures and therefore no residences exist within the immediate area of the dam. Due to the remote location of Rindge Dam, the closest receptors were determined to be a residence along Piuma Road to the east (Receptor 1: approximately 3,500 ft from Rindge Dam) and the Malibu Creek State Park camp grounds (approximately 1,600 ft from Rindge Dam) to the west (see **Figure 3.11-2**). The State Park is classified by Los Angeles County as a recreational land use with a noise criteria of 60-70 dBA. It is anticipated that the construction activities at Rindge Dam will have little impact on the Malibu Creek State Park due to its recreational land use classification and the sound-insulating properties of Malibu Canyon.

Removing only the dam, and leaving the spillway in place, will result in the similar noise levels as removing both. The primary difference would be a potentially shorter duration of construction and the intermittent micro-blasting required to break and remove the spillway concrete. However, peak noise levels are not anticipated to change from those analyzed for removal of both the arch and spillway. Therefore, this measure will have little impact on the closest noise receptor, Malibu Creek State Park.

Removal of the dam and/or spillway would not generate noise in excess of the standards of any established local plan, noise ordinance, or applicable standard (Criteria 1). Removal of the dam/and or spillway would not generated excessive vibration or ground-borne noise (Criteria 2; see 5.11-4). Removal of the dam/and or spillway would not result in a permanent change to ambient noise levels (Criteria 3). Removal of the dam and/or spillway would result in the generation of potentially significant noise temporarily (Criteria 4). However, with implementation of the mitigation measures described in 5.11-3, the increase in temporary or periodic noise is expected to be less than significant.

Table 5.11-2 - Noise Assessment of Rindge Dam Removal (Based on Alternative 2)

Year	Activity Description	1-hour L_{eq} (dBA)		Noise Increase at Receptor	Increase ≥ 10 dBA?
		@ 50 ft	@ Nearest Receptor		
1	Clear & Grub - Sheriff's Overlook	88.6	52.7	0	No
	Clear & Grub - Sediment Removal Area & Access Rd	91.9	56.1	0	No
	Dewatering	91.3	55.5	0	No
	Temporary Access Road	91.7	55.9	0	No
2	Clear Vegetation	88.4	52.5	0	No
	Dewatering	91.4	55.5	0	No
	Temporary Access Road	88.8	53	0	No
	Coarse Material (Gravel & Larger)	89	53.2	0	No
	Beach Compatible Material Excavation	87.3	51.5	0	No
	Demolition	90.6	54.3	0	No
3	Clear Vegetation	88.4	52.5	0	No
	Dewatering	91.5	55.7	0	No
	Temporary Access Road	88.8	53	0	No
	Beach Compatible Material Excavation	85.3	49.5	0	No
	Demolition	90.1	54.3	0	No
4	Clear Vegetation	88.4	52.5	0	No
	Dewatering	91.5	55.7	0	No
	Temporary Access Road	89.3	53.5	0	No
	Beach Compatible Material Excavation	85.3	49.5	0	No
	Fines to landfill	85.3	49.5	0	No
	Demolition	90.2	54.4	0	No
5	Clear Vegetation	88.4	52.5	0	No
	Landscaping	84.5	48.6	0	No
	Dewatering	91.5	55.7	0	No
	Access Road	89.3	53.5	0	No
	Fines to landfill	85.3	49.5	0	No
	Material from S. Ramp to landfill	89	53.2	0	No
	Material from N. Ramp to landfill	85.3	49.5	0	No
	Road Improvement Plan	89.7	53.9	0	No
5	Demolition	90.0	54.2	0	No

Long Term Impacts

Demolition of the Rindge Dam would eliminate the need for maintenance of the Dam. Improvement to the flow of water through Malibu creek will minimize the need for future heavy equipment operations in the canyon such as dredging and entrenchment. Maintenance activities such as repairs to the south access road and maintenance of the replanted areas would be required periodically. Repair to the south access road would likely involve limited use of heavy equipment to move soil and re-grade the road. Maintenance of the replanted areas would be limited to watering, weeding, and plant replacement as necessary. Frequency of operation and maintenance activities are expected to be low and short in duration. Only a few O&M-related truck trips are required per year, and would infrequently occur primarily during the dry seasons (**Table 5.9-6**). The additional long term impacts associated with a few (< 10 / day) irregular, infrequent truck trips would result in less than significant noise impacts. Overall, operational noise impacts associated with removing the arch and spillway would be less than significant under all of the significance criteria.

<u>Upstream Barriers</u>

Construction Impacts

The noise from the fish barrier demolition and stream restoration activities was evaluated at the following locations (see **Figure 3.11-2**):

- LV1 - Crags Culvert
- LV2 - White Oak Dam
- CC1 - Piuma Culvert and CC-2 Malibu Meadows Road
- CC3 - Crater Camp
- CC-5 Cold Canyon Road
- LV-3 Lost Hills Road Culvert, and
- LV-4 Meadow Creek Lane

The cumulative noise from worst-case construction operations at these locations was estimated for the following mix of equipment (**Table 5.11-2**): 3 dump trucks, 1 dozer, 1 excavator, 1 flatbed truck, and 1 jackhammer.

The close proximity of proposed construction activities to nearby receptors (**Table 5.11-1**) would result in a significant impact above the 10 dBA significance threshold for more than half of the construction locations (Criteria 1 and Criteria 4). As described in **Section 3**, construction activities at each barrier are expected to be staggered so no more than four barriers would be removed within one construction season and no more than two barriers would be removed simultaneously. Removal of the upstream barriers would not result in generation of excessive vibration or ground-borne noises (Criteria 2), or a substantial increase in ambient noise levels (Criteria 3).

Long Term Impacts

O&M activities associated with the former upstream barrier sites would include site visits and visual observations of upstream barrier improvements. O&M and vehicle activity would be limited, therefore, O&M activities are not expected to create significant noise impacts under any of the significance criteria.

Table 5.11-3 - Upstream Barrier Removal

Culvert & Barrier Removal Location	Nearest Receptor	Predicted Noise 1-hour Leq (dBA) Approximate Work Duration			Impact Above 10 dBA Significance Threshold (dBA)		
Year 2017		4/1-21	4/22-5/12	5/13-6/2	4/1-21	4/22-5/12	5/13-6/2
CC1	2	82	81	NA	12	11	NA
CC5	6	73	72	NA	3	2	NA
LV2	8	NA	NA	55	NA	NA	0
Year 2018		4/1-21	4/22-5/12	5/13-6/2	4/1-21	4/22-5/12	5/13-6/2
CC2	3	83	NA	NA	13	NA	NA
CC3	4	NA	NA	89	NA	NA	19
LV1	7	68	NA	NA	0	NA	NA
LV2	8	60	NA	NA	0	NA	NA
Year 2019		4/1-6/9	6/10-7/30		4/1-6/9	6/10-7/30	
LV1	7	67	63		0	0	
LV2	8	59	55		0	0	
LV3	9	81	77		11	7	
LV4	10	79	75		9	5	

Table 5.11-4 - Distance Between Upstream Barriers and Noise Receptors

Barrier ID	Nearest Receptor ID and Land Use	Distance to Barrier (ft)
CC1	(2) Rural Residential	220
CC2	(3) Rural Residential	175
CC3	(4) Rural Residential	80
CC5	(6) Rural Residential	620
LV1	(7) Rural	1,000
LV2	(8) Rural Residential	2,500
LV3	(9) Suburban Residential	200
LV4	(10) Suburban Residential	250

Sediment Hauling and Placement Noise

Construction Impacts

Noise from construction haul trucks for the beach placement option at Malibu Pier was estimated using the United States Department of Transportation, Volpe Center's Traffic Noise Model, Version 2.5 (TNM), which can calculate three different sound-level descriptors including L_{eq}, the average DNL, and the average day-evening-night sound level (CNEL). Since hauling will be restricted to daytime, only the 1-hour L_{eq} based upon morning and evening peak 1-hour traffic was predicted. TNM was used to estimate the noise from haul trucks going to the Calabasas landfill and to the beach areas. While all action alternatives require hauling debris to Calabasas landfill, only Alternatives 2 and 4 require hauling sand to the Malibu Pier beach area or Ventura Harbor. It was anticipated that construction traffic would add little impact to the without project noise environment so to expedite the analysis, only the alternative with maximum construction traffic among all six action alternatives was modeled to predict the worst-case noise levels (**Table 5.11-5**).

Table 5.11-5 - Baseline Traffic & Worst Case Traffic Noise Summary for Year 2021 at 50 feet from the Roadway (1-hr Leg in dBA)

Roadway Segment	Dam Removal with Mechanical Transport		Dam Removal with Natural Transport	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Baseline Traffic Noise				
Malibu Canyon Road (Project Site - SR 1)	70.5	70.1	70.8	70.3
Las Virgenes Road (Project Site - Lost Hills Rd)	73.1	73.1	73.5	73.4
Las Virgenes Road (Lost Hills Road - US 101)	68.0	69.9	68.4	70.2
Lost Hills Road (Las Virgenes Road - US 101)	69.8	69.9	70.1	70.2
PCH (East of Malibu Canyon Road)	73.1	73.0	73.3	73.2
PCH (West of Malibu Canyon Road)	72.2	72.1	72.7	72.6
Northbound US 101 (West of Lost Hills Road)	81.5	81.6	81.8	81.9
Southbound US 101 (West of Lost Hills Road)	83.8	83.4	84.0	83.6
Northbound US 101 (East of Las Virgenes)	81.8	82.0	82.1	82.2
Southbound US 101 (East of Las Virgenes)	84.1	83.7	84.3	83.9
Worst Case With Project Traffic Noise				
Malibu Canyon Road (Project Site - SR 1)	71.2	70.2	71.4	70.4
Las Virgenes Road (Project Site - Lost Hills Rd)	73.6	73.4	73.5	73.9
Las Virgenes Road (Lost Hills Road - US 101)	68.1	69.9	68.4	70.2
Lost Hills Road (Las Virgenes Road - US 101)	70.4	70.3	70.7	70.5
PCH (East of Malibu Canyon Road)	73.4	73.0	73.6	73.3
PCH (West of Malibu Canyon Road)	72.4	72.2	72.9	72.7
Northbound US 101 (West of Lost Hills Road)	81.5	81.7	81.8	81.9
Southbound US 101 (West of Lost Hills Road)	83.8	83.4	84.0	83.6
Northbound US 101 (East of Las Virgenes Rd)	81.8	82.0	82.1	82.2
Southbound US 101 (East of Las Virgenes Rd)	84.1	83.7	84.3	83.9

Based on the predicted 2021 baseline noise conditions and the worst case with-project noise conditions summarized in **Table 5.11-4**, the incremental noise level change was calculated (**Table 5.11-6**). This analysis demonstrates that the maximum increase in noise due to the project traffic would be 0.7 dBA. This noise increment is less than 3 dBA, which is the threshold of human perception of change in noise levels. Therefore, the predicted increase in noise due to haul traffic would not result in a significant impact under any alternative under any of the significance criteria.

Table 5.11-6 - Project Traffic Noise Incremental Increase Summary for Year 2021

Roadway Segment	Dam Removal with Mechanical Transport		Dam Removal with Natural Transport	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak Hour
Baseline Traffic Noise				
Malibu Canyon Road (Project Site - SR 1)	0.7	0.1	0.6	0.1
Las Virgenes Road (Project Site - Lost Hills Road)	0.5	0.3	0.0	0.5
Las Virgenes Road (Lost Hills Road - US 101)	0.1	0.0	0.0	0.0
Lost Hills Road (Las Virgenes Road - US 101)	0.6	0.4	0.6	0.3
PCH (East of Malibu Canyon Road)	0.3	0.0	0.3	0.1
PCH (West of Malibu Canyon Road)	0.2	0.1	0.2	0.1
Northbound US 101 (West of Lost Hills Road)	0.0	0.1	0.0	0.0
Southbound US 101 (West of Lost Hills Road)	0.0	0.0	0.0	0.0
Northbound US 101 (East of Las Virgenes Road)	0.0	0.0	0.0	0.0
Southbound US 101 (East of Las Virgenes Road)	0.0	0.0	0.0	0.0

Placement of beach compatible sand near the Malibu Pier will require the use of heavy equipment, mainly bulldozers. Estimated noise levels as a result of this construction are summarized in **Table 5.11-7**. Based upon a previous noise study conducted by the City of Malibu that is described in their 1995 General Plan, the noise level ranges from 60 to 70 dBA for the area surrounding the PCH including the beaches. Assuming a mixture of single and multifamily dwellings, the construction noise limit would be 65 dBA and based upon the noise level predicted for heavy equipment operations at the beach areas, the difference between the predicted noise and the criteria would not exceed the 10 dBA threshold of significance (Criteria 1 and Criteria 4). Placement of material near Malibu Pier would not result in generation of excessive vibration or ground-borne noise (Criteria 2), and would not result in a substantial permanent increase in ambient noise (Criteria 3).

Additional noise associated with loading of sediment onto the barge at Ventura Harbor for the near-shore disposal alternatives will be minimal. It is anticipated that the delivery truck will dump material directly into the barge, and the sediment will be redistributed within the barge by small construction equipment (Bobcat or similar) without the use of heavy bulldozers as are required for beach placement options. Therefore, noise associated with loading the barge is not expected to exceed traffic-related noise associated with delivery. Based on the City of Ventura Noise Ordinance, construction activities are exempted from noise ordinance requirements if they occur between 7am and 8pm. In addition, traffic related noise is not covered by the noise ordinance. Therefore, the noise associated with barge loading is not anticipated to be significant under any of the significance criteria.

Table 5.11-7 - Noise Assessment for Sediment Application at Beach Areas

Year	Location	1-hour L_{eq} (dBA)		Noise Increase at Receptor	Increase ≥ 10 dBA?
		@ 50 ft	@ Nearest Receptor		
2 - 4	Malibu Pier – West Receptor (225 ft)	87.3	74.2	9.2	No
2 – 4	Malibu Pier – East Receptor (325 ft)	87.3	71.0	6.0	No

Long-Term Impacts

Noise created by sediment hauling and placement will be limited to the construction window, and will cease once construction and placement of sediment is complete. Therefore, there will be no long-term noise impacts associated with sediment hauling and placement.

Floodwall

Construction Impacts

Floodwall construction would start at the mouth of the Malibu Creek, moving north along the channel towards Rindge Dam between Cross Creek Bridge and PCH. Construction activities would require some grading, concrete work and pile driving. Based upon a previous noise study conducted by the City of Malibu that is described in their 1995 General Plan, the noise level ranges from 60 to 70 dBA for the area surrounding the PCH including this area. Assuming a mixed residential and commercial land use, a noise limit of 70 dBA was determined from County of Los Angeles construction noise limits table for stationary noise sources. Noise was predicted for a generic distance between the receptor and source of 100 ft since there are residences within 100 ft of the proposed floodwall. Impact pile driving would be the noisiest activity, therefore, it was used for the analysis. At a distance of 100 ft from a receptor, pile driving operations will result in a 25 decibel impact above the significance threshold (**Table 5.11-8**). Measures to reduce the noise impact include using a sonic pile driver instead of an impact pile driver, which would reduce the noise by 5 decibels at 100 feet. Additionally, mitigation measures for skewing equipment operations and providing site specific noise shielding would further reduce construction-related noise impacts. However, even with mitigation this noise would still exceed the 10 dBA increase threshold (Criteria 1 and Criteria 4), remaining significant. Construction of floodwalls are not expected to result a permanent increase in ambient noise levels (Criteria 3).

Construction of floodwalls will produce potentially significant vibrations or ground-borne noise (Criteria 2). As discussed in Chapter 5.11-4, at a 100 ft distance, pile driving results in vibrations of up to 94 VdB, which falls into the range of potentially unacceptable vibrations if they are continuous or long-term (**Table 5.11-12**).

Long Term Impacts

After construction is completed, the floodwall periodic visual inspections and maintenance, as well as possible periodic repairs which may involve the use of heavy equipment. Frequency of operation and maintenance activities are expected to be low, and resulting noise impacts would be short-term in duration. Mitigation measures would apply, if appropriate based on the intensity and duration of required repairs. Therefore, the longer term O&M activities associated with the floodwall are not expected to create significant noise impacts under any of the significance criteria.

Table 5.11-8 - Floodwall Construction at Malibu Beach State Park

Year	Activity Description	1-hour L_{eq} (dBA)		Noise Increase at Receptor	Increase ≥ 10 dBA?
		@ 50 ft	@ Nearest Receptor		
1	Floodwall Construction	101.0	95.0	25.0	Yes

5.11.3 *Analysis of Alternatives*

Alternative 1: No Action

Construction Impacts

Under the No Action Alternative there would be no construction scheduled and therefore no noise impacts would occur (Class IV).

Long-Term Impacts

In 1992, the Division of Design and Construction, Department of Water Resources conducted a safety inspection of Rindge Dam and concluded that the spillway erosion may have to be repaired at some future date to preserve the safety of the Dam. Under the No Action Alternative, it is possible that future repairs would be needed requiring the use of construction equipment such as cement trucks, bull dozers, jack hammers and excavators. If future repairs to the Dam are needed, this alternative would result in noise impacts.

Alternative 2: Mechanical Transport

All versions of Alternative 2 consist of mechanically transporting all sediment removed from behind Rindge Dam. Variations of Alternative 2 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. beach placement. Inclusion of upstream barriers is the only component of Alternative 2 with anticipated significant noise impacts (Class I). Noise impacts associated with either sediment placement option are anticipated to be less than significant. Similarly, whether the spillway is removed or not, the noise impacts associated with construction at the dam site are anticipated to be generally the same, and be less than significant with implementation of mitigation measures (Class II). The significance of each variation is based on the combination of significance of each of the subcomponents, which are summarized below in **Table 5.11-9**.

Mitigation Measures

The following mitigation measures are recommended to further reduce potential short-term (construction activities) impacts. These measures would include the following:

- **NOISE-1: Noise Ordinances.** The construction contractor will obey all local noise ordinances. Title 12 Section 12.08.440 of the LAC code, restricts construction activities between the hours of 7:00 a.m. and 8:00 p.m. Construction is prohibited on Sundays and legal holidays. Construction and demolition activities are anticipated to occur only during the day.
- **NOISE-2: Heavy Equipment Operations.** The construction contractor will stagger heavy equipment operations to the maximum extent practicable. Noise reduction will be achieved by reducing the numbers and types of equipment that are operating at the same time. The use of equipment such as chainsaws and masonry saws would be scheduled so that they are not being used when other equipment is operating. In addition, standard masonry saw blades will be replaced with “Damped” masonry saw blades. Noise from haul trucks will be reduced by developing a schedule that prevents overlap of trucks entering and exiting the site and would be scheduled so that no more than two haul trucks are at the site at one time and for the sediment hauling option, trucks would be scheduled so that one truck is entering the site immediately after another truck has just left. Bull dozer work would be scheduled so that no more than two bull dozers are operating at a time.
- **NOISE-3: Electrically Powered Tools.** The construction contractor will use electrically powered tools when possible.
- **NOISE-4: Engine Covers and Mufflers.** Heavy equipment will be equipped with manufacturer recommended mufflers and adequate engine covers. Engine covers will be kept shut during operation. .
- **NOISE-5: Terrain Maximization.** Maximization of surrounding terrain, such as a canyon, to reduce noise levels will occur.
- **NOISE-6: Additional Noise Attenuation Techniques.** The construction contractor will implement additional noise attenuation techniques such as sound blankets on noise generating equipment and the placement of temporary sound barriers between construction areas and sensitive receptors.

Table 5.11-9 - Significance of Noise Impacts Associated with Variations of Alternative 2

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
2a1	Class II			LTS			No
2a2	Class II				LTS		No
2b1	Class II		Class I	LTS			Yes
2b2	Class II		Class I		LTS		Yes
2c1		Class II		LTS			No
2c2		Class II			LTS		No
2d1		Class II	Class I	LTS			Yes
2d2		Class II	Class I		LTS		Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Level of Significance

It is estimated that by staggering equipment use and implementation of the other described mitigation measures, project-specific and cumulative noise associated with the dam removal options (arch and spillway vs. arch alone) will not exceed the significance threshold of 10 dBA and therefore would be less than significant with mitigation (Class II). In addition, both placement options (beach vs. nearshore) result in less than significant noise impacts associated with the transport and sediment placement activities. However, several variations of Alternative 2 still have the potential to result in significant short-term noise impacts (Class I) due to the noise impacts associated with removal of upstream barriers (**Table 5.11-9**). Alternatives 2b1, 2b2, 2d1, and 2d2 all include removal of upstream barriers, and therefore these four versions of Alternative 2 would all result in significant, unavoidable noise impacts.

<u>Alternative 3: Natural Transport</u>

Alternative 3 consists of allowing natural stream processes to transport sediment from behind Rindge Dam over time. Rindge Dam would be notched and lowered in 5-ft increments over an estimated 40-100 years. Increment notches are expected to occur every 2-3 years. Since all sediment deposition will occur via natural processes, no nearshore or beach placement will occur under any of the Alternative 3 variations. Similar to Alternative 2, noise impacts anticipated to be significant associated with Alternative 3 are those resulting from removal of the upstream barriers. In addition, construction of floodwalls is also anticipated to result in significant noise-related impacts. As with Alternative 2, inclusion of the spillway in any variation does not result in a different level of noise impacts. The significance of each variation of Alternative 3 is based on the combination of significance of each of the subcomponents (**Table 5.9-14**).

Mitigation Measures

Construction activities at Rindge Dam for this alternative would involve similar types of equipment for Alternative 2 and therefore the mitigation measures for this alternative would be similar. All of the mitigation measures described under Alternative 2 would apply for Alternative 3. In addition, for pile driving activities at the floodwall the following additional mitigation measure is proposed:

- **NOISE-7:** Construction of floodwalls will implement the use of temporary noise barriers, a sonic pile driver instead of an impact pile driver, and limit the hours of operation.

Level of Significance

Noise modeling predicted no significant impacts to the nearest receptor for construction activities at the Rindge Dam. Pile driving activities at the floodwall, while mitigated to some extent by the inclusion of mitigation measures, would still have significant short term impacts (Class I). However, several variations of Alternative 3 still have the potential to result in significant short-term noise impacts (Class I) due to the noise impacts associated with removal of upstream barriers (**Table 5.11-10**). Alternatives 3b and 3d both include removal of upstream barriers, and therefore these two versions of Alternative 3 would all result in significant, unavoidable noise impacts.

Table 5.11-10 - Significance of Noise Impacts Associated with Variations of Alternative 3

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
3a	Class II					Class I	Yes
3b	Class II		Class I			Class I	Yes
3c		Class II				Class I	Yes
3d		Class II	Class I			Class I	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Alternative 4: Hybrid Mechanical & Natural Transport</u>

Alternative 4 is a hybrid of Alternatives 2 and 3. It consists of mechanically transporting some sediment from behind Rindge Dam, and also allowing some sediment to transport naturally downstream. Generally, the differences among variations of Alternative 2 and 3 above also apply to Alternative 4. The noise impacts anticipated to be significant are those associated with removal of the upstream barriers and construction of the floodwall. Options to remove the spillway, and the various sediment placement options, do not result in significantly different noise impacts. The significance of each variation of Alternative 4 is based on the combination of significance of each of the subcomponents (**Table 5.11-11**).

Mitigation Measures

Construction activities at the Rindge Dam for this alternative would involve similar types of equipment for Alternative 2 and therefore the mitigation measures for this alternative would be similar. Floodwall installation would be the same as described for Alternative 3, and therefore the Alternative 3 mitigation measure also applies.

Level of Significance

Floodwall installation would be similar to Alternative 3, but the wall would be shorter in height, likely requiring a shorter construction period and therefore a shorter duration of noise impacts. Floodwall installation, even after implementation of mitigation measures, would result in significant noise impacts. Construction activities at the Rindge Dam are predicted to have little noise impact to nearby receptors but mitigation measures would be implemented to further reduce potential impacts (Class II). As with Alternatives 2 and 3, significant short-term noise impacts (Class I) due removal of upstream barriers are also anticipated under some variations of Alternative 4 **(Table 5.11-11**). Alternatives 4b1, 4b2, 4d1, and 4d2 all include removal of upstream barriers, and therefore these four versions of Alternative 2 would all result in significant, unavoidable noise impacts.

Table 5.11-11 - Significance of Noise Impacts Associated with Variations of Alternative 4

Alternative	Alternative Components						Overall Significance
	Dam and Spill	Dam	Upstream Barriers	Beach	Nearshore	Floodwall	
4a1	LTS			LTS		Class I	Yes
4a2	LTS				LTS	Class I	Yes
4b1	LTS		Class I	LTS		Class I	Yes
4b2	LTS		Class I		LTS	Class I	Yes
4c1		LTS		LTS		Class I	Yes
4c2		LTS			LTS	Class I	Yes
4d1		LTS	Class I	LTS		Class I	Yes
4d2		LTS	Class I		LTS	Class I	Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

<u>Comparison of Alternatives</u>

Any alternative including removal of the upstream barriers is anticipated to result in significant, temporary noise impacts. In addition, all variations of Alternative 3 and Alternative 4 are anticipated to result in significant noise impacts due to floodwall construction. With implementation of the proposed mitigation measures, noise associated with removal of the dam and spillway are expected to be less than significant regardless of which alternative considered (Class II). Noise analyses indicated that the transport and deposition of sediment at either the beach or nearshore will result in less than significant noise impacts. Therefore, the following alternatives would result in significant impacts: 2b1, 2b2, 2d1, 2d2, all variations of Alternative 3, and all variations of Alternative 4. The remaining variations of Alternative 2 would all result in similar, and less than significant noise impacts.

5.11.4 *Construction Vibration*

Construction activities have the potential to produce noise vibration levels that may be annoying or disturbing to humans and may cause damage to structures. Vibration from construction projects is caused by general equipment operations, and is usually highest during pile driving, soil compacting, jack hammering and construction related demolition and micro-blasting activities. Measurements of vibration are expressed in terms of either the peak particle velocity (PPV) in the unit of inches per second (ips) or vibration velocity levels, expressed in terms of vibration decibels (VdB). The PPV, a quantity commonly used for vibration measurements, is the maximum velocity experienced by any point in a structure during a vibration event. It is an indication of the magnitude of energy transmitted through vibration. PPV is an indicator often used in determining potential damage to buildings from stress associated with micro-blasting and other construction activities. U.S. Department of Transportation (USDOT) had developed guidelines for the usual effect of construction related vibration levels on people and buildings (Minor & Associates, 2006; **Table 5.11-1**2).

A large bulldozer creates vibration levels of 0.089 in/s PPV at a distance of 25 ft. Bulldozers and similar earth moving equipment will have a greater impact on vibration to nearby residences when working on hard surfaces rather than soft surfaces such as sand. The work areas with solid surfaces are around the Rindge Dam and near the upstream barrier locations. Work within the vicinity of the Rindge Dam is approximately 3,500 ft from the nearest receptor and therefore not likely to cause PPVs that exceed 0.12 in/s the lower threshold for a weak building. The vibration threshold for damage to fragile buildings is 0.20 in/s. Therefore, except for the pile driving activity at the floodwall, construction-related vibration that is associated with the proposed alternatives is unlikely to have a significant impact to nearby receptors. Pile driving, while capable of producing potentially significant vibrations at close distances as shown in **Table 5.11-12 and Table 5.11-13**, would not produce unacceptable vibrations for short durations.

Table 5.11-12 - Summary of Vibration Levels an Effects on Humans and Buildings

Peak Particle Velocity (in/sec)	Ground-Bourne Vibration (VdB)	Effects on Humans	Effects on Buildings
<0.005	<62	Imperceptible	No effect on buildings
0.005 to 0.015	62 to 72	Barely perceptible	No effect on buildings
0.02 to 0.05	74 to 82	Level at which continuous vibrations begin to annoy people in buildings	No effect on buildings
0.1 to 0.5	88 to 102	Vibrations considered unacceptable for people exposed to continuous or long-term vibration	Minimal potential for Damage to weak or sensitive structures.
0.5 to 1.0	102 to 108	Vibrations considered bothersome by most people, however tolerable if short-term in length	Threshold at which there is a risk of architectural Damage to buildings with plastered ceilings and walls. Some risk to ancient monuments and ruins.
1.0 to 2.0	108 to 114	Vibrations considered unpleasant by most people	U.S. Bureau of Mines data indicates that micro-blasting vibration in this range will not harm most buildings. Most construction vibration limits are in this range.
>3.0	>117	Vibration is unpleasant	Potential for architectural Damage and possible minor structural Damage.

Table 5.11-13 - Vibration Damage and Annoyance Assessment for Pile Driving and Bulldozer Operations

Equipment	Reference Peak Particle Velocity @ 25 ft (in/sec)	Reference Root Mean Square Vibration Source Levels @ 25 ft (VdB)	Distance to Receiver (ft)	Equipment Peak Particle Velocity (in/sec)	Weak Building Vibration Criteria (in/sec)	Vibration Annoyance (VdB)	Vibration Annoyance Criteria (VdB)
Pile Driver (Impact)	1.518	112	100	0.1898	0.12	94	90
Bull Dozer	0.089	87	100	0.0111	0.12	69	90
Pile Driver (Impact)	1.518	112	500	0.0170	0.12	73	90
Bull Dozer	0.089	87	500	0.0010	0.12	48	90

5.12 Air Quality and Global Climate Change

5.12.1 *Impact Methodology and Assumptions*

A construction equipment schedule developed by the USACE was used to determine the types and numbers of construction equipment and estimated distances traveled by haul trucks and construction workers. Each phase of work that was evaluated as a part of this air quality analysis and details of the schedule, duration, and equipment used can be found in **Appendix L**. Typically, during construction, equipment use is staggered because the need for operating one piece of equipment may depend on operating another piece of equipment first. To simulate a worst-case scenario, it was assumed that all construction equipment would operate simultaneously during each phase.

The emissions estimation method was based on the California Emission Estimator Model (CalEEMod), Version 2011.1.1 (SCAQMD 2011a), although the calculations were performed outside of the model for flexibility. Emission factors were developed using several of the California Air Resources Board's (CARB's) emission factor models. Construction is currently anticipated to begin approximately in 2025. Based on this timeframe, and based on SCAQMD air quality analysis guidelines, diesel off-road equipment was assumed to all have certified Tier 3 or higher engines based on CARB/EPA guidelines. Emissions described in the chapter below are all based on vehicles and equipment operating with Tier 3 or higher engines. In addition, it is assumed that any construction beyond 2027 will require the use of model year 2023 or newer engines, further ensuring reduced emissions.

Off-Road Construction Equipment

For off-road construction equipment, the 2011 Inventory Model for In-Use Off-Road Equipment (Construction, Industrial, Ground Support, and Drilling) (CARB 2011a) was primarily used to estimate emissions. An Access database maintained by CARB, the 2011 Inventory Model replaces the OFFROAD2007 Off-Road Emissions Inventory Model (CARB 2006) for most diesel-fueled equipment. If a piece of construction equipment is not identified in the 2011 Inventory Model or the year of construction is not available in the 2011 Inventory Model, then emission factors were developed from OFFROAD2007. Furthermore, the 2011 Inventory Model only estimates emissions for nitrogen oxides (NOx), inhalable particulate matter (PM_{10}), and volatile organic compounds (VOCs); therefore, OFFROAD2007 was used to develop carbon monoxide (CO) and sulfur dioxide (SO_2) emission factors. Initial emission factors were developed for calendar years 2016 to 2029 with the 2011 Inventory Model and for calendar years 2016 through 2040 with OFFROAD2007. However, with the updated construction schedule, including construction commencing at the earliest in 2025, final emissions calculations are based on post-2020 emissions values which assume complete implementation of Tier 3 or higher engines.

The emission factors that were developed for each piece of equipment were multiplied by the total hours of operation for each equipment type used during each phase of construction for each alternative to calculate the annual emissions. Peak daily emissions were calculated based on the annual emissions and the anticipated construction schedule

Fugitive dust emissions from material handling and grading were estimated using methods found in the EPA's *Compilation of Air Pollutant Emission Factors* (AP-42) (2011). Fugitive dust from excavated material from the impoundment site was not estimated because it was assumed to be negligible from being saturated with water in the reservoir.

On-Road Vehicles

Engine exhaust emissions would occur from on-road vehicles including dump trucks, concrete trucks, delivery trucks, water trucks, and pickup trucks. Emissions would also occur from construction workers commuting to the construction sites.

Haul and delivery truck emission factors were estimated using EMFAC2011 Mobile Source Emission Inventory Model (CARB 2011b) for heavy-duty diesel engines while the onsite gasoline and diesel trucks (dump, flatbed, and water trucks) were assumed to be medium-duty vehicles. Construction worker commuting emissions were estimated from the fleet mix in South Coast Air Basin for passenger automobiles and light-duty trucks. Both gasoline and diesel engines were assumed to be used by the construction workers.

For the haul/delivery trucks and construction workers, emission factors based on mileage were estimated from the combined speeds in the various counties (i.e., a "burden" model run), rather than a specific speed. Actual distances were used when possible - - between landfill, beaches, and the construction sites. For unknown distances for suppliers and construction worker commute, default CalEEMod assumptions were used (SCAQMD 2011a). The onsite trucks were assumed to operate at 10 miles per hour (mph), and emission factors based on hours of operation were developed. In addition to engine exhaust emissions, emission factors for tire wear, brake wear, and re-entrained paved road dust were also estimated. The EMFAC2011 model estimates tire wear and brake wear, but paved road dust emissions were estimated using the EPA's AP-42 (2011).

Initial haul truck emissions were calculated based on placement of material at the originally formulated beach locations. After the nearshore placement option was added to the study, analyses for haul truck emission for alternatives utilizing Ventura Harbor for near-shore placement were modified to account for this additional mileage (Alternatives 2a1, 2b1, 4a1, and 4b1). It was assumed that the emissions as a result of use of the updated beach disposal option (Malibu Pier) would generally be consistent with the previous emissions analyses, and therefore beach haul alternatives (2a2, 2b2, 4a2, and 4b2) were not updated. Alternatives which include retaining the spillway (2c-2d and 4c-4d) would generally be consistent with the analyses presented for 2a-2b and 4a-4d, with slightly reduced emissions as a result of leaving the spillway in place. Therefore, the same maximum emissions were utilized for the alternatives that retain the spillway that were generated for the counterpart alternative which includes removal of the entire dam structure.

Greenhouse Gases (GHGs)

Emissions of carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) were estimated to evaluate GHG impacts. Non-CO_2 pollutants have global warming potential (GWP) factors that reflect the degree to which these pollutants affect climate change, as compared to CO_2. The product of each GHG emissions and its GWP is known as carbon dioxide equivalent (CO_2e). The value of GWPs is continually being modified by the Intergovernmental Panel on Climate Change (IPCC) as climate change science is refined. Most mandatory and voluntary reporting registries require the use of the GWPs published in the Second Assessment Report (IPCC 1996); therefore, the GWPs from the Second Assessment Report were used to maintain consistency with the international standard.

The EMFAC2011 model does not estimate emissions of CH_4 and N_2O; therefore, it was necessary to estimate these emissions separately. The Climate Registry's 2013 Default Emission Factors were used to estimate emissions. Emission factors for "Diesel Medium and Heavy-Duty Vehicles (Trucks and Buses)" were used to estimate CH_4 and N_2O emissions for all haul and delivery trucks. Construction worker emission factors were estimated based on the air basin-specific fleet mix of "Gasoline Passenger Cars," "Gasoline Light Trucks (Vans, Pickup Trucks, SUVs)," "Diesel Passenger Cars," and "Diesel Light Trucks."

Localized Significance Thresholds

LST values are based on the size of the construction project, which means the maximum area that will be disturbed (worked over or driven on) each day. SCAQMD recommends using the equipment type to determine the maximum daily disturbed acreage when analyzing air emissions with CalEEMod (SCAQMD 2011b). The CalEEMod User's Guide, Appendix A indicates that each crawler tractor, grader, or rubber-tired dozer operating at the project site could disturb 0.5 acres per workday; a scraper could disturb 1 acre per workday. The appropriate acreage was applied to each construction area based on the number of crawler tractors and graders.

As previously noted, the construction footprint of the proposed project would be located in the Northwest Coastal Los Angeles County SRA. The closest sensitive receptor to each construction area was determined based on Google Earth.

As described in the SCAQMD's LST Methodology (SCAQMD 2008), only on-site emissions, which include fugitive dust and off-road construction equipment, were included the LST analysis and not off-site mobile emissions from the project (e.g., construction worker commuting).

5.12.2 *Impact Significance Criteria*

The following discussion identifies the significance thresholds used to determine whether alternative impacts would be significant under NEPA, CEQA, or both statutes.

Air Quality Significance Thresholds

The following impact significance criteria are derived from Appendix G of the CEQA Guidelines, and are the same criteria utilized by the SCAQMD and VCAPCD, and are also consistent with the Malibu Creek State Park General Plan. The following significance criteria were used to evaluate air quality impacts associated with the project alternatives under CEQA:

1. Conflict with or obstruct implementation of the applicable air quality plan;
2. Violate any air quality standard or contribute substantially to an existing or projected air quality violation;
3. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality

standard (including releasing emissions which exceed quantitative thresholds for O3 precursors);

4. Expose sensitive receptors to substantial pollutant concentrations; or,
5. Create objectionable odors affecting a substantial number of people.

The SCAQMD has developed various quantitative thresholds based on the criteria listed above and on technical evaluations of air pollutant emissions and dispersion. Specifically, daily regional mass emission and localized significance thresholds were used to determine significance under CEQA. The general conformity de minimis applicability thresholds developed by USEPA under the Clean Air Act were used to determine significance under NEPA.

Regional Emission Thresholds

To assess whether a proposed project would violate any air quality standard or contribute substantially to an existing or projected air quality violation, the SCAQMD developed significance thresholds for mass daily emission rates of criteria pollutants for both construction and operational sources (SCAQMD 1993). Regular updates are published on the SCAQMD website (SCAQMD 2011). The VCAPCD also has developed air quality assessment guidelines within Ventura County (VCAPCD, 2003). **Table 5.12-1** summarizes these thresholds.

Table 5.12-1 - Mass Daily Significance Thresholds

Pollutant	SCAQMD		VCAPCD*
	Construction	Operations	
CO	550	550	N/A
NOx	100	55	25
Pb	3	3	N/A
PM_{10}	150	150	N/A
$PM_{2.5}$	55	55	N/A
SOx	150	150	N/A
VOC	75	55	25

Source: SCAQMD 2011 **Key:** all numbers are in lbs. /day = pounds per day, NO_x = nitrogen oxides, SO_x = sulfur oxides. * For N/A categories under the VCAPCD, no daily thresholds exist and the VCAPCD utilizes the NAAQS annual standards for emissions.

Localized Significance Thresholds

To assess whether a proposed project would expose sensitive receptors to substantial pollutant concentrations, the SCAQMD developed localized significance thresholds (LSTs) for NOx, PM2.5, PM10 and CO (SCAQMD 2008 and SCAQMD 2009). LSTs are acceptable emission levels that consider the likely impact on ambient pollutant concentrations based on a project's distance to the nearest sensitive receptor and the general background pollutant concentration in the project vicinity. Other than the criteria in **Table 5.12-1**, the VCAPCD has not established specific LSTs. **Table 5.12-2** presents the LSTs for construction in the Northwest Coastal Los Angeles County Source-

Receptor Area (SRA). LSTs vary by the size of the construction site and the distance to the nearest receptors; therefore, the different sites associated the project alternatives will have different LSTs. The appropriate LSTs used for each alternative and site are included in the impact analysis below.

General Conformity de minimis Levels

To assess whether a proposed project would conflict with the state implementation plan (SIP, the air quality plan for the region), a general conformity applicability evaluation must be completed. A conformity determination is required for each criteria pollutant or precursor where the total of direct and indirect emissions of the criteria pollutant or precursor in a nonattainment or maintenance area caused by a federal action would equal or exceed the de minimis thresholds in 40 CFR 93.153(b). **Table 5.12-3** summarizes these thresholds. The emission rates are expressed in units of tons per year and are compared to the total direct and indirect emissions caused by the Federal action for the calendar year during which the net emissions are expected to be the greatest. This evaluation for NEPA is applied to all alternatives, although the general conformity applicability analysis for Clean Air Act compliance would only be applied to the recommended alternative. **Section 5.12.2**, under Alternative 2b, includes the results of the general conformity applicability analysis **(Table 5.12-17**). Appendix L includes additional details of the analysis.

Table 5.12-2 - Localized Significant Thresholds for Northwest Coastal Los Angeles County Source-Receptor Area.

Pollutant	Site Size (Acres)	Receptor distance from site boundary (m)				
		25	50	100	200	500
CO (lb./day)	1	562	833	1233	237	7724
	2	827	1213	1695	2961	8446
	5	1531	1985	2762	4383	10467
NO_2 (lb./day)	1	103	104	121	156	245
	2	147	143	156	186	262
	5	221	212	226	250	312
PM10 (lb./day)	1	4	12	27	57	146
	2	6	19	34	64	154
	5	13	40	55	84	174
PM2.5 (lb./day)	1	3	4	8	18	77
	2	4	5	10	21	82
	5	6	8	14	29	95
Source: SCAQMD 2008. Final Localized Significance Threshold Methodology. July.						

Table 5.12-3 - General Conformity De Minimis Thresholds

Pollutant	Attainment Status	De Minimis Threshold (tpy)
VOC (O_3 precursor)	Nonattainment, extreme	10
CO	Maintenance	100
NO_2 (O_3 precursor)	Maintenance	10
PM10	Maintenance	100
PM2.5	Nonattainment	100
Pb	Nonattainment	25
Source: 40 CFR 93.153(b); **Key:** tpy = tons per year		

Odors

The SCAQMD, in the CEQA Air Quality Handbook (SCAQMD 1993), indicates that land uses likely to result in odor nuisance complaints include: agriculture, waste water treatment plants, food processing plants, chemical plants, composting, refineries, landfills, dairies, and fiberglass molding. The VCAPCD has a similar list of odor-generating sources (VCAPCD 2003). The project is not listed as a facility that will potentially produce nuisance odors under either the SCAQMD or VCAPCD guidelines. Therefore, it is assumed that odor impacts would be less than significant under both NEPA and CEQA. Brief, qualitative discussions of potential odors associated with the alternatives are included in the discussion of impacts for each alternative.

Cumulative Impacts

The cumulative impact analysis for air quality will be based on the SCAQMD's typical approach to address those impacts, and is covered in Chapter 6 (SCAQMD 2003). The SCAQMD has typically considered projects that exceed the project-specific significance thresholds (such as those discussed above) to be cumulatively considerable. Conversely, projects that do not exceed the project-specific thresholds are generally not considered to be cumulatively significant. This approach will be applied to impacts under CEQA and NEPA. Note that this project will not have long-term air quality impacts since it does not install a facility (structure or building) that generates direct or indirect emissions once construction is completed. Therefore, the project will not have any long-term cumulative impacts.

<u>Global Climate Change Significance Thresholds</u>

CEQA Greenhouse Gas Thresholds

Global climate change refers to an environmental issue on a large, global scale and not necessarily specific, localized or short-term air emission impacts. The CEQA Guidelines were amended in 2010 to require the evaluation of Greenhouse Gas (GHG) emissions in environmental documents. Impacts from a project would be significant if it would do one of the following:

- Generate GHG emissions, either directly or indirectly, that may have a significant impact on the environment; or,

- Conflict with an applicable plan, policy, or regulation adopted for the purpose of reducing the emissions of GHGs.

Although the SCAQMD adopted a quantitative significance threshold for industrial (stationary source) projects, they did not adopt thresholds for restoration projects like the one described in this study. The SCAQMD recommends that the total construction emissions be amortized over the lifetime of the project and then added to annual operational emissions. If the lifetime of a project is not known, then a 30-yr lifetime is assumed. For that reason, within the context of this project, each alternative's total construction emissions were divided by 30 and compared to the 10,000 $MTCO_2e$ per year threshold developed for industrial projects. Note that GHG threshold developed by SCAQMD is a cumulative impact threshold since the impact on climate change is cumulative in nature.

NEPA Greenhouse Gas Statement

There are currently no Federal GHG emission thresholds. Therefore, the USACE will not utilize the SCAQMD quantitative CEQA significance threshold for industrial projects, propose a new GHG threshold, or make a NEPA significance impact determination for GHG emissions anticipated to result from any of the alternatives. Rather, in compliance with the NEPA implementing regulations, the anticipated emissions will be disclosed for each alternative without expressing a judgment as to their significance.

On 1 August, 2016, the Council on Environmental Quality (CEQ) released the Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (CEQ, 2016). This guidance states that if a TSP would be reasonably anticipated to cause direct emissions of 25,000 metric tons or more of CO2 equivalent (MTCO2e) on an annual basis, agencies should consider this an indicator that a quantitative and qualitative assessment may be meaningful to decision makers and the public. A quantitative assessment was conducted for this Integrated Report, as stated above. It is important to note that CEQ does not propose this emissions reference point as an indicator of a threshold of significant effects.

5.12.3 *Analysis of Alternatives*

Alternative 1: No Action

Under the No Action Alternative, the project would not be implemented and, therefore, potential sources of impact associated with the project such as emissions from construction activities and truck trips, would not occur. As the No Action Alternative would not result in any changes or additions to any existing air quality or sources of GHG effecting global climate change (GCC), it is assumed that there is no air quality or GCC impacts as a result of this alternative. Impacts are less than significant (Class III).

In accordance with the SCAQMD's AQMP, air quality would continue to improve into the future within the study area.

Alternative 2: Mechanical Transport

All versions of Alternative 2 consist of mechanically transporting sediment removed from behind Rindge Dam. Variations of Alternative 2 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. shoreline placement. Each variation of Alternative 2 results in different impacts to air quality, as each variation differs in either quantity of material transported (number of truck trips), or distance to transport location (Malibu vs. Ventura Harbor). Alternatives 2a and 2b were quantitatively analyzed as the alternatives with the highest emissions potentials. In addition, LST analyses were performed at the Rindge Dam site (common to all of Alternative 2), and the shoreline placement site (2a2, 2b2, 2c2, and 2d2). Generally, the remaining variations of Alternative 2 will have similar, although slightly lower, air quality impacts.

Construction Impacts

Construction activities associated with variations of Alternative 2 would result in short term (7-8 years) air quality impacts due to diesel and gasoline exhaust emissions from on-site construction equipment, off-site truck trips, construction employee commute, and fugitive dust emissions. **Table 5.12-4** summarizes the maximum daily emissions from the implementation of this alternative. The original data was calculated based on the mileage and truck trips required for the originally formulated beach placement locations, which is generally representative of 2a1 and 2b1 respectively, as these options utilize shoreline placement near Malibu Pier. The updated data is derived from the original data, but increased proportionally to the additional mileage and resulting emissions that are expected based on utilization of the nearshore disposal option, including trucking to Ventura Harbor, and are representative of 2a2 and 2b2. Variations of Alternative 2c and anticipated to have similar, though slightly lower, emissions than the corresponding 2a variations due to the slightly lower work as a result of leaving the spillway intact. The same is true of variations of 2d relative to 2b. Details of all calculations are provided in **Appendix L**.

As shown in **Table 5.12-4**, NO_x emissions exceed the construction significance criteria for regional emissions in the SCAQMD under both the beach and nearshore placement options. However, none of the remaining pollutants reach the SCAQMD significant criteria under any of the haul route assumptions. The results from the original and updated analyses are generally consistent and result in the same determination of significance. As a result, construction activities associated with all variations of Alternative 2 result in a significant impact to air quality (Criteria 1-3).. Regional air quality impacts from the proposed construction activities would exceed the CEQA-related SCAQMD and VCAPCD thresholds for NOx and would remain significant and unavoidable (Class I).

The projected difference between the original and updated date for NOx is 29.1 pounds per day for under 2a2 and 2c2, and 28.7 for 2b2 and 2d2. This increase represents the NOx emissions resulting from the increased haul distance to Ventura Harbor. The majority of this haul route is in Ventura County, and therefore the majority of this NOx increase will occur in the jurisdiction of the VCAPCD. Though not shown in **Table 5.12-3**, the VCAPCD threshold for NOx emissions is 25 pounds per day. Therefore, the emissions associated with the offshore placement of material exceed this threshold.

Table 5.12-4 - Alternative 2 Maximum Daily Emissions (pounds per day)

Pollutant	Original	Updated	SCAQMD (CEQA) Significance Threshold
	2a1 and 2c1	2a2 and 2c2	
Carbon Monoxide, CO	96.2	100.9	550
Reactive Organic Gas, ROG	18.7	19.7	75
Nitrogen Oxides, NO_x	125.7	154.8	100
Sulfur Dioxide, SO_2	0.4	0.5	150
Inhalable Particulate Matter, PM_{10}	13.3	14.3	150
Fine Particulate Matter, $PM_{2.5}$	3.6	3.9	55
	2b1 and 2d1	2b2 and 2d2	
Carbon Monoxide, CO	133.0	137.4	550
Reactive Organic Gas, ROG	18.7	19.7	75
Nitrogen Oxides, NO_x	153.6	182.3	100
Sulfur Dioxide, SO_2	0.5	0.6	150
Inhalable Particulate Matter, PM_{10}	13.3	14.2	150
Fine Particulate Matter, $PM_{2.5}$	4.2	4.5	55
Source of Original Data: CDM Smith 2013, SCAQMD 2011.			

Table 5.12-5 and **Table 5.12-6** summarize the results of the LST analysis at construction area at Rindge Dam and the shoreline placement location near Malibu Pier respectively. The summary displayed in **Table 5.12-5** shows the maximum level of emissions, as a worst case scenario, predicted under the original beach placement LST analyses. **Table 5.12-7 through Table 5.12-11** summarize the LST analyses at each upstream barrier location. Based on the cumulative LST analyses, emissions from any variant of Alternative 2 at the LST locations would be less than the local air quality significance levels under CEQA for NO_x, CO, PM_{10}, and $PM_{2.5}$ (Class III).

Table 5.12-5 - Alternative 2 Maximum Daily Onsite Emissions (pounds per day) – Rindge Dam

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	83	10,467
Nitrogen oxides, NOx	148	312
Inhalable Particulate Matter, PM_{10}	12	174
Fine Particulate Matter, $PM_{2.5}$	6	5
Source: CDM Smith 2013, and SCAQMD 2008; **Prepared by**: CDM Smith 2013. Thresholds are for receptors 500 meters away from a 5-acre construction site in Northwest Coastal Los Angeles County source-receptor area		

Table 5.12-6 - Maximum Daily Onsite Emissions (pounds per day) – Shoreline Placement for Alternatives 2a1 and 2c1

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	20	1,,233
Nitrogen oxides, NOx	38	121
Inhalable Particulate Matter, PM_{10}	1	27
Fine Particulate Matter, $PM_{2.5}$	1	8
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by**: CDM Smith 2013. Thresholds are for receptors 100 meters away from a 1-acre construction site in Northwest Coastal Los Angeles County source-receptor area		

Table 5.12-7 - Maximum Daily Onsite Emissions (pounds per day) – CC1, CC2, and CC3

Pollutant	CC1 Emissions	CC2 Emissions	CC3 Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	27	11	15	562
Nitrogen oxides, NO_x	46	21	24	103
Inhalable Particulate Matter, PM_{10}	2	1	1	3
Fine Particulate Matter, $PM_{2.5}$	2	1	1	3
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by:** CDM Smith 2013. Thresholds are for receptors 25 meters away from a 1-acre construction site in Northwest Coastal Los Angeles County source-receptor area				

Table 5.12-8 - Maximum Daily Onsite Emissions (pounds per day) – CC5

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	26	934
Nitrogen oxides, NOx	5	132
Inhalable Particulate Matter, PM_{10}	<1	36
Fine Particulate Matter, $PM_{2.5}$	<1	11
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by:** CDM Smith 2013. Thresholds are for receptors 130 meters away from a 1-acre construction site in Northwest Coastal Los Angeles County source-receptor area		

Table 5.12-9 - Maximum Daily Onsite Emissions (pounds per day) – LV1

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	25	7,724
Nitrogen oxides, NOx	40	245
Inhalable Particulate Matter, PM_{10}	2	146
Fine Particulate Matter, $PM_{2.5}$	2	77
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by:** CDM Smith 2013. Thresholds are for receptors 500 meters away from a 1-acre construction site in Northwest Coastal Los Angeles County source-receptor area		

Table 5.12-10 - Maximum Daily Onsite Emissions (pounds per day) – LV2

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	6	6,618
Nitrogen oxides, NOx	8	237
Inhalable Particulate Matter, PM_{10}	<1	124
Fine Particulate Matter, $PM_{2.5}$	<1	62
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by:** CDM Smith 2013. Thresholds are for receptors 400 meters away from a 2-acre construction site in Northwest Coastal Los Angeles County source-receptor area		

Table 5.12-11 - Maximum Daily Onsite Emissions (pounds per day) – LV3 & 4

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	17	827
Nitrogen oxides, NOx	33	147
Inhalable Particulate Matter, PM_{10}	1	6
Fine Particulate Matter, $PM_{2.5}$	1	4
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by**: CDM Smith 2013. Thresholds are for receptors 25 meters away from a 2-acre construction site in Northwest Coastal Los Angeles County source-receptor area		

The potential for exposure to objectionable odors during the project alternatives is low, based on existing land use and distances to sensitive receptors (Criteria 5). The nearest receptor to Rindge Dam is a residence approximately 3,500 ft away on a hilltop 900 ft above the Dam. Residences along Cold Creek and Las Virgenes Creek may detect some odors due to construction equipment emissions associated with removal of upstream barriers (2b and 2d). However, construction activities are expected to be short-term in duration. Therefore, potential impacts from odors would be less than significant (Class III). No variations of Alternative 2 are expected to expose any sensitive receptors to substantial pollutant concentrations (Criteria 4).

The NEPA significance determination is based on the general conformity *de minimis* thresholds. As shown in **Table 5.12-12** below, maximum emissions associated with all variations of Alternative 2 are under the NEPA significance criteria for all pollutants (Criteria 2).

Alternative 2d1 is the NER. Therefore, a conformity applicability analysis was conducted for this alternative. The South Coast Air Basin is classified as an extreme non-attainment area for O_3, a maintenance area for PM_{10}, CO, and NO_2, and a non-attainment area for $PM_{2.5}$ and lead. Therefore, this alternative is subject to the general conformity *de minimis* thresholds in 40 CFR 93.153(b). As shown in **Table 5.12-12**, the maximum annual construction emissions for Alternative 2d1 do not exceed the *de minimis* thresholds, therefore general conformity is not applicable to Alternative 2d1.

Long Term Impacts

Air quality impacts resulting from long term operation and maintenance activities would be limited to repair of the south access road every other year and maintenance of the replanted areas. Repair to the south access road would likely involve limited use of heavy equipment to move soil and re-grade the road. Maintenance of the replanted areas would be limited to watering, weeding, and plant replacement as determined necessary. Frequency of operation and maintenance activities are expected to be low and short in duration. Resulting emissions would be substantially lower than during construction. As discussed in Sectopm 5.9 (Transportation), only a few operation and maintenance (O&M) -related truck trips are required per year for Alternative 2a. Additionally, these trips would be infrequent and would occur primarily during the dry seasons. Since Alternative 2a would add only a few truck trips (fewer than 10 per day) which would also be irregular and infrequent, it would result in less than significant impacts to the study roadway segments. Overall, potential operational impacts to air quality would be less than significant under all significance criteria.

Mitigation Measures

No mitigation measures are recommended associated with variations of Alternative 2.

Level of Significance

For the CEQA-related SCAQMD and applicable VCAPCD thresholds for NO_x, air quality impacts would remain significant and unavoidable (Class I) for all variations of Alternative 2. Under the NEPA significance determination, there are no significant impacts for any pollutants, as shown in **Table 5.12-12** (Class III). All other air quality impacts would be less than significant (Class III).

Table 5.12-12 - Alternative 2 Maximum Annual Emissions (tons per year)

Pollutant	Original	Updated	NEPA Significance Threshold
	2a1 and 2c1	2a2 and 2c2	
Carbon Monoxide, CO	5.1	5.4	100
Volatile Organic Compounds	0.5	0.8	10
Nitrogen Oxides, NO_x	6.8	7.8	10
Lead, Pb	0.0	0.0	25
Inhalable Particulate Matter, PM_{10}	0.9	1.4	100
Fine Particulate Matter, $PM_{2.5}$	0.2	0.4	100
	2b1 and 2d1	2b2 and 2d2	
Carbon Monoxide, CO	5.4	5.7	100
Volatile Organic Compounds	0.5	0.8	10
Nitrogen Oxides, NO_x	7.0	8.0	10
Lead, Pb	0.0	0.0	25
Inhalable Particulate Matter, PM_{10}	0.9	1.4	100
Fine Particulate Matter, $PM_{2.5}$	0.2	9.4	100
Source of Original Data: CDM Smith 2013, 40 CFR 93.153(b).			

Table 5.12-13 - Significance of Air Quality Impacts Associated with Alternative 2

<table>
<tr><th rowspan="2">Alternative</th><th colspan="4">Significance Components</th><th rowspan="2">Overall Significance</th></tr>
<tr><th>Onsite Emissions Rindge Dam</th><th>Onsite Emissions Malibu Pier</th><th>Daily Emissions (CEQA)</th><th>Annual Emissions (NEPA)</th></tr>
<tr><td>2a1 & 2c1</td><td rowspan="4">LTS</td><td>LTS</td><td rowspan="4">Class I
NOx emissions exceed SCAQMD criteria for all alternatives.
NOx emissions exceed VCAPCD criteria where applicable (2a2, 2b2, 2c2, 2d2)</td><td rowspan="4">LTS</td><td>Yes</td></tr>
<tr><td>2a2 & 2c2</td><td></td><td>Yes</td></tr>
<tr><td>2b1 & 2d1</td><td>LTS</td><td>Yes</td></tr>
<tr><td>2b2 & 2d2</td><td></td><td>Yes</td></tr>
</table>

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Alternative 3: Natural Transport

Alternative 3 consists of removing Rindge Dam by periodically carving incremental notches from the structure, and allowing natural stream processes to transport sediment from behind Rindge Dam over time. Rindge Dam would be notched and lowered in 5-ft increments over an estimated 20-100 years. Increment notches are expected to occur every 2-3 years. Since all sediment deposition will occur via natural processes, no nearshore or beach placement will occur under any of the Alternative 3 variations. However, removal of the dam structure (concrete, reinforcement bars) will require trucking to Calabasas Landfill. Variations of Alternative 3 include dam removal options (arch & spillway vs. only arch) and options to remove upstream barriers.

Construction Impacts

Construction activities associated with variations of Alternative 3 would result in short term air quality impacts due to diesel and gasoline exhaust emissions from on-site construction equipment, off-site truck trips, construction employee commutes, and fugitive dust emissions. Due to the nature of this alternative, the construction schedule would include 20 construction episodes or events over an estimated 40 to 100 yrs. **Table 5.12-14** summarizes the maximum daily emissions from the implementation of the most impactful variation, Alternative 3b. The remaining variations of Alternative 3 would all have lower daily emissions than those shown in **Table 5.12-13**. Details of the calculations are provided in **Appendix L**.

Construction activities under Alternative 3b and related emissions would be the same as Alternative 3a with the addition of upstream barrier removal. The removal of upstream barriers under Alternative 3 would result in similar emissions as the removal of the same barriers under Alternative 2 (see **Table 5.12-7 to Table 5.12-11**). LST analysis for upstream barrier removal sites indicate emissions are less than the local air quality significance values under CEQA for NOx, CO, PM_{10}, and $PM_{2.5}$ (Class III).

Table 5.12-14 - Alternative 3b Maximum Daily Emissions (pounds per day)

Pollutant	Emissions	SCAQMD (CEQA) Significance Threshold
Carbon monoxide, CO	179.3	550
Reactive organic Gas, ROG	21.0	75
Nitrogen oxides, NOx	77.7	100
Sulfur dioxide, SO_2	0.7	150
Inhalable Particulate Matter, PM_{10}	11.2	150
Fine Particulate Matter, $PM_{2.5}$	3.2	55
Source: CDM Smith 2013, and SCAQMD 2011. **Prepared by:** CDM Smith 2013.		

Emissions for Alternative 3b (the most impactful variation under Alternative 3) do not exceed the construction significance criteria for the SCAQMD for any pollutants (**Table 5.12-14**). As described for Alternative 2, addition of the upstream barriers does not result in significant emissions under the SCAQMD or CEQA criteria. Therefore, construction activities associated with this alternative would not result in a significant impact to air quality for CEQA-related SCAQMD thresholds (Criteria 1-3).

LST analysis at the Rindge Dam construction area for Alternative 3 indicate that emissions would be lower than the local air quality significance values under CEQA for NO_x, CO, PM_{10}, and $PM_{2.5}$ (**Table 5.12-15**, Class III).

No sensitive receptors are anticipated to be exposed to substantial pollutant concentrations under any variation of Alternative 3 (Criteria 4). The potential for exposure to objectionable odors during the project alternatives is low, based on existing land use and distances to sensitive receptors. The nearest receptor to Rindge Dam is a residence approximately 3,500 f away on a hilltop 900 ft above the Dam. Therefore, impacts associated with creation of objectionable odors are less than significant (Criteria 5).

Table 5.12-15 - Alternative 3 Maximum Daily Onsite Emissions (pounds per day) – Rindge Dam

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	165	10,467
Nitrogen oxides, NOx	112	312
Inhalable Particulate Matter, PM_{10}	11	174
Fine Particulate Matter, $PM_{2.5}$	5	95

Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by**: CDM Smith 2013.
Thresholds are for receptors 500 meters away from a 5-acre construction site in Northwest Coastal Los Angeles County source-receptor area

The NEPA significance determination is based on the general conformity *de minimis* thresholds. Annual construction-related emissions for this alternative show that none of the criteria pollutants would exceed construction significance criteria under NEPA (**Table 5.12-16**). As a result, construction emissions from activities associated with all variations of Alternative 3 would be less than significant (Class III) with respect to the NEPA significance criteria.

Table 5.12-16 - Alternative 3b Maximum Annual Emissions (tons per year)

	VOC	NOx	CO	PM_{10}	$PM_{2.5}$	Pb
Maximum Annual Emissions	0.4	4.7	3.2	0.8	0.3	0
NEPA Significance Threshold	10	10	100	100	100	25

Source: CDM Smith 2013 and 40 CFR 93.153(b). **Prepared by:** CDM Smith 2013.

Long Term Impacts

Potential long term impacts from operation and maintenance activities would be similar to those described for Alternative 2 with the addition of impacts from maintenance of the floodwalls. Periodic repairs of the floodwalls and access roads, and vegetation clearing may involve the use of heavy equipment. Frequency of operation and maintenance activities are expected to be low, and resulting emissions would be substantially lower than during construction. Impacts to air quality would be less than significant.

Mitigation Measures

No mitigation measures are recommended associated with variations of Alternative 2.
Level of Significance

For the CEQA-related SCAQMD threshold for NO_x, air quality impacts would be less than significant (Class III). Since Alternative 3 does not utilize the offshore placement under any variation, and the entire project is within Los Angeles County under Alternative 3, the VCAPCD criteria do not apply. Under the NEPA significance determination, construction emissions from activities associated with this alternative would be less than significant (Class III). All other air quality impacts would be less than significant (Class III).

Table 5.12-17 - Significance of Air Quality Impacts Associated with Alternative 3

Alternative	Significance Components				Overall Significance
	Onsite Emissions Rindge Dam	Onsite Emissions Malibu Pier	Daily Emissions (CEQA)	Annual Emissions (NEPA)	
3a	LTS		LTS	LTS	No
3b					No
3c					No
3d					No

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Alternative 4: Hybrid Mechanical & Natural Transport

Alternative 4 is a hybrid of Alternatives 2 and 3. It consists of mechanically transporting some sediment from behind Rindge Dam, and also allowing some sediment to transport naturally downstream. Similar to Alternative 2, material will be disposed of at both the Calabasas Landfill and on either the beach/nearshore. Variations of Alternative 4 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. beach placement of any mechanically transported sediment.

Construction Impacts

Construction activities associated with this Alternative will result in short term (approximately 7-8 years), air quality impacts due to diesel exhaust emissions from on-site construction equipment, off-site truck trips, and fugitive dust emissions. Alternatives 4a and 4b were quantitatively analyzed as the alternatives with the highest emissions potentials. In addition, the beach placement and LST analyses performed at the upstream barrier sites for Alternative 2 (**Table 5.12-5 to Table 5.12-10**) also apply to variations of Alternative 4. Generally, the remaining variations of Alternative 4 will have similar, although slightly lower, air quality impacts than Alternative 4a and 4b, and therefore the 4a-4b analyses are also applied to 4c and 4d.

As described for Alternative 2, the original analyses of daily and annual emissions for the two most impactful variations (4a and 4b) were updated to cover the haul routes associated with the nearshore disposal route. All calculations are contained in Appendix L. Also as discussed for Alternative 2, the VCAPCD criteria apply for all variations utilizing Ventura Harbor (4a2, 4b2, 4c2, and 4d2).

The projected difference between the original and updated date for NOx is 23.5 pounds per day under 4a2 and 4c2, and 23.5 for 4b2 and 4d2. This increase represents the NOx emissions resulting from the increased haul distance to Ventura Harbor. The majority of this haul route is in Ventura County, and therefore the majority of this NOx increase will occur in the jurisdiction of the VCAPCD. Though not shown in **Table 5.12-18**, the VCAPCD threshold for NOx emissions is 25 pounds per day. Therefore, the emissions associated with the offshore placement of material under Alternative 4 would not exceed the VCAPCD criteria.

Table 5.12-18 - Alternative 4 Maximum Daily Emissions (pounds per day)

Pollutant	Original	Updated	SCAQMD (CEQA) Significance Threshold
	4a1 and 4c1	4a2 and 4c2	
Carbon Monoxide, CO	412.4	416.7	550
Reactive Organic Gas, ROG	52.7	53.4	75
Nitrogen Oxides, NO_x	486.1	509.6	100
Sulfur Dioxide, SO_2	1.9	2.0	150
Inhalable Particulate Matter, PM_{10}	17.2	17.6	150
Fine Particulate Matter, $PM_{2.5}$	7.0	7.1	55
	4b1 and 4d1	4b2 and 4d2	
Carbon Monoxide, CO	449.2	453.6	550
Reactive Organic Gas, ROG	52.9	53.6	75
Nitrogen Oxides, NO_x	514.1	537.6	100
Sulfur Dioxide, SO_2	2.0	2.0	150
Inhalable Particulate Matter, PM_{10}	17.7	18.1	150
Fine Particulate Matter, $PM_{2.5}$	7.2	7.3	55
Source of Original Data: CDM Smith 2013, SCAQMD 2011.			

As shown in **Table 5.12-18**, NO_x, ROG, and CO emissions are higher for variations of Alternative 4 than Alternative 2 and Alternative 3. NOx emissions exceed the construction significance criteria for the SCAQMD. However, where applicable, the VCAPCD criteria are not exceeded. As a result, construction activities associated with this alternative would result in a significant impact to air quality (Criteria 1-3). Overall, regional air quality impacts from the construction activities proposed for any variation of Alternative 4 would exceed the CEQA related SCAQMD threshold for NO_x and would remain significant and unavoidable (Class I).

Table 5.12-19 summarizes the results of the LST analysis at the Rindge Dam construction area for this alternative. The emissions from this alternative would be less than the local air quality significance values under CEQA for CO and PM_{10} at all construction areas. NOx, however, exceeds the LST at Rindge Dam and would be significant (Class I). LST analyses, as shown in the Alternative 2 section (**Table 5.12-7 to Table 5.12-11**), would be less than significant (Class III) at the upstream barrier locations and at the beach placement area.

Table 5.12-19 - Alternative 4 Maximum Daily Onsite Emissions (pounds per day) Rindge Dam

Pollutant	Emissions	Localized (CEQA) Significance Threshold
Carbon monoxide, CO	368	10,467
Nitrogen oxides, NOx	379	312
Inhalable Particulate Matter, PM_{10}	6	174
Fine Particulate Matter, $PM_{2.5}$	5	95
Source: CDM Smith 2013, and SCAQMD 2008. **Prepared by:** CDM Smith 2013. Thresholds are for receptors 500 meters away from a 5-acre construction site in Northwest Coastal Los Angeles source-receptor area.		

No sensitive receptors are anticipated to be exposed to substantial pollutant concentrations under any variation of Alternative 3 (Criteria 4). The potential for exposure to objectionable odors during the project alternatives is low, based on existing land use and distances to sensitive receptors (Criteria 5). The nearest receptor to Rindge Dam is a residence approximately 3,500 ft away on a hilltop 900 ft above the Dam. However, construction activities would be short-term in duration. Therefore, potential impacts from odors would be less than significant (Class III).

Table 5.12-20 - Alternative 4 Maximum Annual Emissions (tons per year)

Pollutant	Original	Updated	NEPA Significance Threshold
	4a1 and 4c1	4a2 and 4c2	
Carbon Monoxide, CO	5.1	5.3	100
Volatile Organic Compounds	0.5	0.5	10
Nitrogen Oxides, NO_x	6.6	7.6	10
Lead, Pb	0.0	0.0	25
Inhalable Particulate Matter, PM_{10}	0.9	0.9	100
Fine Particulate Matter, $PM_{2.5}$	0.2	0.2	100
	4b1 and 4d1	4b2 and 4d2	
Carbon Monoxide, CO	5.4	5.6	100
Volatile Organic Compounds	0.5	0.5	10
Nitrogen Oxides, NO_x	6.8	7.8	10
Lead, Pb	0.0	0.0	25
Inhalable Particulate Matter, PM_{10}	0.9	0.9	100
Fine Particulate Matter, $PM_{2.5}$	0.2	0.2	100
Source of Original Data: CDM Smith 2013, 40 CFR 93.153(b).			

The NEPA significance determination is based on the general conformity *de minimis* thresholds. Emissions would not exceed construction significance criteria under NEPA for any variations of Alternative 4 for any pollutant, and would not result in significant impacts to air quality (Class III). The remaining emissions are all below significance criteria levels for Alternative 4. Implementation of mitigation measure AQ-1 would reduce NO_x emissions to less than significant (Class II).

Long Term Impacts

Potential long term impacts from operation and maintenance activities would be similar to those described for Alternative 2 with the addition of impacts from maintenance of the floodwalls. Periodic repairs of the floodwalls and access roads, and vegetation clearing may involve the use of heavy equipment. Frequency of operation and maintenance activities are expected to be low, and resulting emissions would be substantially lower than during construction. Impacts to air quality would be less than significant.

Mitigation Measures

No mitigation measures are recommended associated with variations of Alternative 2.
Level of Significance

For the CEQA-related SCAQMD threshold, NO_x emissions for all variations of Alternative 4 would be significant (Class I). All other pollutants would be less than significant (Class III). As described earlier, the potential emissions in Ventura County do not exceed the VCAPCD significance criteria for applicable alternatives (4a2, 4b2, 4c2, and 4d2). Under the NEPA significance determination, construction emissions from activities associated with all variations of Alternative 4 would be less than significant (Class III). All other air quality impacts would be less than significant (Class III). LST analyses at Rindge Dam indicated that NO_x levels would be significant (Class I).

Table 5.12-21 - Significance of Air Quality Impacts Associated with Alternative 4

Alternative	Significance Components				Overall Significance
	Onsite Emissions Rindge Dam	Onsite Emissions Malibu Pier	Daily Emissions (CEQA)	Annual Emissions (NEPA)	
4a1 & 4c1	Class I NOx emission exceed SCAQMD criteria.	LTS	Class I NOx emissions exceed SCAQMD criteria.	LTS	Yes
4a2 & 4c2					Yes
4b1 & 4d1		LTS			Yes
4b2 & 4d2					Yes

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

Cumulative Impacts

The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. Several development projects in Los Angeles County could occur in the vicinity of the proposed project and alternatives during the same period and would contribute to cumulative effects.

The significance thresholds developed by the SCAQMD serve to evaluate if a proposed project could either 1) cause or contribute to a new violation of a CAAQS or NAAQS in the study area or 2) increase the frequency or severity of any existing violation of any standard in the area.

Construction activities associated with Alternatives 2 and 4 would result in individually significant air quality impacts for NOx emissions under CEQA. Under NEPA, construction activities associated with all alternatives would not result in individually significant air quality impacts for any pollutant. Based on the exceedance of daily NOx emissions thresholds and the multi-year construction schedule, each alternative's incremental contribution to cumulative air quality impacts would be considerable.

Comparison of Alternatives

Alternative 3 has the lowest air quality impacts. CEQA impacts for all variations of Alternative 3 are mitigatable (Class II), and NEPA impacts are less than significant (Class III). For Alternative 2, NEPA impacts are less than significant (Class III), but impacts under CEQA for variations of Alternative 2 remain significant and unavoidable (Class I). Variations of Alternative 4 have the highest air quality impacts. All variations of Alternative 4 have significant unavoidable CEQA impacts (Class I) for both daily emissions and the LST analysis at Rindge Dam. All variations of Alternative 4 are less than significant (Class III) under NEPA criteria (Class III). None of the alternatives are anticipated to have significant GHG impacts under CEQA. Further investigations of GHG emissions are unwarranted under NEPA.

5.12.4 *Greenhouse Gas Emissions*

The construction GHG emissions for the initial array of alternatives are summarized in **Table 5.12-22**. These results are compared to the CEQA-related GHG threshold developed by SCAQMD and the CEQ GHG guidance. This comparison indicates that the project GHG emissions would be less than significant under CEQA. Furthermore, GHG emissions would not exceed the CEQ recommended reference point of 25,000 metric tons as warranting further review.

Table 5.12-22 - Significance of Air Quality Impacts Associated with Alternative 4

Alternative	Unmitigated CO_2	SCAQMD (CEQA) Significance Threshold	CEQ GHG Guidance
Alternative 2a	244	10,000 MT/yr	25,000 MT/yr
Alternative 2b	252		
Alternative 3a	270		
Alternative 3b	275		
Alternative 4a	248		
Alternative 4b	257		
Source: CDM Smith 2013, and SCAQMD 2011. Prepared by: CDM Smith 2013.			

5.13 Safety and Hazards

5.13.1 *Impact Significance Criteria*

The following significance criteria are derived from CEQA Guidelines Appendix G and the Malibu Creek State Park General Plan. These criteria are also being adopted for NEPA compliance. Safety and hazards impacts could be considered significant if the project:

1. Creates a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous material;
2. Creates a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment;
3. Emits hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school;
4. Is located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment;
5. Impairs implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan;
6. Exposes people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

5.13.2 *Analysis of Alternative Components*

Dam and Spillway

Construction Impacts

Removal of the dam arch alone, and removal of both the dam arch and spillway, result in generally the same potential safety and hazard impacts. Therefore the discussion below applies to both dam removal options. The primary difference is that leaving the spillway in place would allow for its continued illegal recreational use. While this use does pose a potential safety risk to those participating in the illegal use, this does not differ from the no action condition in which the structure would also remain in place.

During construction at Rindge Dam, hazardous materials associated with equipment maintenance would be used and stored, including oil, fuel, and other equipment fluids. Any spills of hazardous materials could potentially result in soil or water contamination. Equipment that is improperly maintained could leak fluids during operation or while stored. During equipment maintenance there is also the potential to spill hazardous materials (Criteria 1-2). The dam site is not within a quarter mile of any schools (Criteria 3).

Impounded sediments at the dam were tested in 2002 to determine if contaminants were present. Leachate test results indicated the sediments are suitable for disposal. Additionally, testing indicated the sediment has neither observable characteristics nor any test results indicative of characteristics of ignitability, corrosiveness, reactivity, or toxicity, nor any history of specific industrial processing that would indicate such characteristics. Overall, the sediment was found to not be classified as hazardous waste and is suitable for upland disposal. Upland disposal includes all non-ocean placement of the sediment, including on-beach placement, landfill cover, and wasting in a landfill. A detailed discussion regarding sediment is **Appendix D.** According to the California Department of Toxic Substances Control, the project is not located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (Criteria 4). Removal of the dam and/or spillway would not impair the implementation of or physically interfere with any local emergency plans (Criteria 5).

The construction site is located in an open space area with undeveloped hillside covered in native vegetation. In May, 2012 CAL Fire recommended classification of this area as a Very High Fire Severity Zone. During dry periods these hillsides can become a high fire hazard. Structures would not be constructed as part of this alternative. However, during construction the use of equipment in the project area could potentially increase the chances of human-caused wildfires. This impact is potentially significant (Criteria 6).

Long Term Impacts

Significant human health and safety impacts could occur if the project would expose residents, employees, facility users and nearby land users to concentrations of hazardous materials exceeding regulatory levels, or high risk of injury or death from wildland fires. No structures are being constructed as a part of any alternative, and therefore no increased use of the area is anticipated. No hazardous materials are required after construction. The Rindge Dam site is not located within a ¼ mile of an existing or proposed school, or public airport or private airstrip (Criteria 3).

None of the alternatives would impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan in the long-term, nor would they result in any changes to existing travel lanes or emergency evacuation routes (Criteria 5).

Operations and maintenance activities would be limited to monitoring fish passage improvements, habitat restoration efforts, and associated project improvements. These activities will not cause safety or hazard impacts. The project is an environmental restoration project that will leave the area in a natural condition. Except as otherwise described above, no long-term project features are applicable to any of the significance criteria listed above. Therefore, there are no significant long-term safety and hazard impacts that would arise from removal of the dam or spillway.

<u>Upstream Barriers</u>

Construction Impacts

Potential construction related impacts at the upstream barrier locations are the same as those described for the dam and spillway, but with an increase in vehicular traffic due to the incorporation of upstream barrier removal. Barrier removal would require additional haul trips to remove debris to the Calabasas Landfill.

Temporary lane closures would potentially be required in the vicinity of the following barriers: CC1, CC2, CC3, and LV1. Additional traffic control measures would be required to address traffic control for barrier removal. Due to heavy truck and construction equipment movements there is a greater potential for unexpected road hazards to occur, thereby increasing the chance of accidents. A detailed discussion regarding the number of construction related trips is provided in **Section 5.9**.

Additionally, heavy equipment operating adjacent to or within a road right-of-way during the construction at CC1, CC2, CC3, and LV1 would increase the risk of accidents; thereby, resulting in significant roadway hazard-related impacts along Piuma Road, Craggs Road, and Center Camp Road. However, these are short-term impacts and, and if they were to occur would be expected to occur only during the duration of construction at CC1, CC2, CC3, and LV1 (about 15 to 30 days). During the construction at CC1 and LV1, segments of Piuma Road and Craggs Road could either be temporarily narrowed down by reducing the number of lanes from two lanes to one lane or be temporarily closed for a day or two. This reduction in the travel lanes, though temporarily, would result in significant impacts to emergency access along Piuma Road and Craggs Road during the duration of construction at CC1 and LV1 (30 and 15 days, respectively). This would potentially physically interfere with an adopted emergency response plan or emergency evacuation plan (Criteria 5).

The barriers are not located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (Criteria 4). The barriers are not located within a ¼ mile of any schools (Criteria 3). However, during removal of the barriers there is the potential to encounter previously unknown contaminated soil (Criteria 1-2).

Long Term Impacts

Potential long-term impacts related at the upstream barrier locations are similar to those described for the Rindge Dam site. Significant human health and safety impacts would occur if the project would expose residents, employees, facility users and nearby land users to concentrations of hazardous materials exceeding regulatory levels, or high risk of injury or death from wildland fires. Removal of the upstream barriers will not add the need for the use of hazardous materials after construction is completed. None of the upstream barriers are located within a ¼ mile of an existing or proposed school, or within 2 mi of a public airport or public use airport, or in the vicinity of a private airstrip (Criteria 3). After removal of the upstream barriers is complete, there would be no significant risk of exposing residents to hazardous materials (Criteria 1-2) or increased wildfire risk (Criteria 6).

Removal of the upstream barriers will not impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan (Criteria 5). Long-term flood risks and operations and maintenance activities are also unaffected by removal of the upstream barriers. Therefore, there are no significant long-term safety and hazard impacts that would arise from removal of the upstream barriers.

Sediment Hauling and Placement

Construction Impacts

During construction, truck traffic will increase along Malibu Canyon Road, and depending on the disposal location, along PCH, US 101, and surface roads in the vicinity of Ventura Harbor. Trucks will be entering and exiting Malibu Canyon Road and PCH at a slow rate of speed during the construction period. Traffic lights may be necessary at the Malibu Canyon entrance to the project, or along PCH at the Malibu Pier Parking lot. Potential traffic related hazards are discussed in Chapter 5.9. The project would not require lane closures on any surface roads. At the beach adjacent to Malibu Pier, construction equipment would be operating near the popular public beaches. While equipment operation could be in close proximity to beach patrons for the beach disposal option, the beach adjacent to Malibu Pier where placement would occur has eroded nearly entirely and currently does not support significant beach use. Adjacent portions of Surfrider Beach on the opposite side of Malibu Pier does support substantial beach use. All travel lanes along Malibu Canyon Road would be maintained during the construction phase. No temporary road closures are anticipated and access to and from the site, including for emergency vehicles, would be maintained at all times. Beach stockpiles at Surfrider Beach will not obstruct any roadways. Therefore, sediment hauling and placement is not expected to impair the implementation of or physically interfere with any local emergency plans (Criteria 5).

Sediment hauling and placement will not create a significant hazard related to transport, use, or disposal of hazardous materials, and is not expected to result in a reasonably foreseeable release of hazardous materials (Criteria 1-2). The shoreline and nearshore placement locations are not within ¼ mile of a school (Criteria 3). Neither placement location is on a designated hazardous site (Criteria 4). Sediment hauling and transport will not result in an increased exposure of people or structures to wildland fires (Criteria 6).

Long Term Impacts

Neither beach placement nor nearshore placement of material will alter the long-term impacts of any of the alternatives under any of the established significance criteria. Therefore, the long-term impacts described above for the Dam and Spillway removal are applicable.

Floodwall

Construction Impacts

Flood walls would be constructed on both sides of Malibu Creek between Cross Creek Crossing and the PCH. The flood walls are designed to mitigate for increased flood risk to property downstream of Rindge Dam as a result of increased sediment deposition in this area and water surface elevations. On the west side of the creek the floodwalls would extend for approximately 3,100 linear ft. and on the east side for approximately 2,700 linear ft. for a total length of approximately 5,800 linear ft. According to the DTSC Envirostor website, the floodwalls are not located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 (Criteria 4). However, during construction of the floodwalls there is the potential to encounter previously unknown contaminated soil (Criteria 1-2).

Impounded sediments transported downstream during rain events would raise the existing height of the streambed. The floodwalls would be constructed during the first year to compensate for the additional sediment loading associated with this alternative and reduce flood risks.

Construction of floodwalls is not anticipated to impair the implementation of or physically interfere with any local emergency plans (Criteria 5). The floodwall site is within a ¼ mile of a school (Criteria 3). However, floodwall construction does not involve handling or emissions of hazardous materials other than normal construction vehicle related fuels and lubricants, and therefore these potential effects are not considered significant.

Long Term Impacts

The floodwall is designed to mitigate the increased risk of flooding associated with this alternative. Operations and maintenance activities would be limited to monitoring fish passage improvements and associated project improvements. These activities will not cause safety or hazard impacts under any of the significance criteria. As such, no additional long-term impacts are anticipated associated with the floodwall.

5.13.3 *Analysis of Alternatives*

Alternative 1: No Action

Construction Impacts

The No Action Alternative involves leaving the approximately 780,000 cy of sediment impounded behind Rindge Dam and upstream barriers in place. No construction would be implemented as a result of this alternative. Most sediment transported by Malibu Creek would pass over the Dam, although some sediment would continue to deposit upstream of the Dam due to a locally-flattened stream bed slope caused by the Dam. Upon reaching equilibrium in 100 yrs, all sediment transported by Malibu Creek would pass over the Dam and into the downstream reaches. There would be no need to deposit sand from behind the Dam at any disposal sites and the upstream barriers would not be impacted.

A HTRW analysis has been conducted on the impounded soil and has been found to be relatively clean. Therefore, the No Action Alternative is not expected to release hazardous materials into the environment. The No Action Alternative will not result in the transportation of hazardous materials. The site is not located on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5. Rindge Dam is a non-flammable structure and will not expose people or structures to significant risk of loss, injury or death involving wildland fires nor does it constitute a potential fire hazard. The Dam structure will not further alter the existing drainage pattern of the area under the No Action Alternative. The Dam is projected to remain intact and in-place as it ages over the next 50 yrs but will eventually begin to degrade. Removal or structural stabilization of the Dam may be required at some future date.

Rindge Dam also poses as a safety concern with regard to human injuries and deaths. Under the No Action Alternative, CDPR would likely continue to perform park ranger patrols of the Rindge Dam area, post signage, and implement a closure order to reduce illegal access and associated safety concerns.

Long-Term Impacts

There are no long-term impacts associated with the No Action Alternative.

Alternative 2: Mechanical Transport

Construction Impacts

All versions of Alternative 2 consist of mechanically transporting all sediment removed from behind Rindge Dam. Variations of Alternative 2 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. shoreline placement. The significance of each variation is based on the combination of significance of each of the subcomponents. As described in the Analysis of Alternative Components, hazardous materials would be used during construction, primarily in the form of vehicle and equipment fluids.

All variations of Alternative 2 require vehicle traffic and associated traffic risks. While traffic risks are primarily discussed in Chapter 5.9, lane closures can result in the impairment of implementation of local emergency plans. Variations of Alternative 2 that include the upstream barriers have potentially significant impacts on the implementation of local emergency plans. All variations of Alternative 2 have some risk associated with wildfires. Implementation of the mitigation measures described below will reduce the potential risks described above to less than significant levels. These include the development of a Traffic Control Plan that will be coordinated with local emergency service agencies (HAZ-3). Lane closures will be minimized to the extent practicable and access to emergency services will be maintained.

Long-Term Impacts

None of the components of the variations of Alternative 2 are anticipated to have significant long-term impacts. After construction is completed, the project will no longer require hazardous materials and no permanent or long changes to traffic, roadways, or emergency response are anticipated. No significant increase in the long term flood risk is anticipated. Therefore, long term effects associated with all variations of Alternative 2 are less than significant.

Mitigation Measures

The following mitigation measures are recommended to reduce potential safety and hazards impacts during construction to a level that is not significant:

- **HAZ-1 Reduce risk of wildfires.** The construction contractor will develop a fire prevention and response plan appropriate for the use of heavy equipment in a high fire hazard area, approved by the USACE, the CDPR Department, and the Los Angeles County Fire Department, prior to the initiation of construction.
- **HAZ-2 Hazardous Substances Control Plan.** The construction contractor will prepare a Hazardous Substance Control and Emergency Response Plan. The plan will develop an emergency response plan for the safe cleanup up accidental hazardous substance spills. To reduce the potential for spills during construction and equipment maintenance the plan will include hazardous materials handling procedures. Areas where refueling, equipment

maintenance activities, and storage of hazardous materials, will be identified in the plan. This plan will be implemented during all project activities.

- **HAZ-3 Traffic Control Plan on Surface Streets.** The construction contractor will prepare a traffic control plan. The plan will address the safe exit and entry of trucks and construction equipment onto surface streets, including the use of flagging personnel where needed. The plan will be developed in coordination with local emergency service providers to ensure access for emergency services are not impacted. This plan will be implemented during all project activities.
- **HAZ-4 Beach Safety Plans.** The construction contractor will prepare a beach safety plan. At a minimum, the plan will address fencing around stockpiles and construction equipment, closures of portions of parking lots during sand delivery, and closures of beach areas during spreading operations to ensure the safety of the public. This plan will be implemented during all project activities.
- **HAZ-5 Contingency Plan for Contaminated Soil.** Prior to the initiation of construction the contractor will develop a contingency plan for the detection and removal of contaminated soil that may be encountered during construction. This plan will be approved by the USACE prior to the initiation of construction. This plan will be implemented during all project activities.

Level of Significance

With incorporation of mitigation measures HAZ-1 through HAZ-4 impacts associated with Alternative 2 related to utilization of hazardous materials, wildfires, traffic safety, and beach safety impacts would be less than significant (Class II). Mitigation measure HAZ-1 would reduce the risk of wildfires. Mitigation measure HAZ-2 would ensure that accidental hazardous materials spill associated with the operation and maintenance of construction equipment would be properly contained and cleaned up. Any impacts related to hazardous materials would be less than significant with this environmental commitment. Mitigation measure HAZ-3 would result in the development of a traffic control plan to reduce vehicular accidents on surface streets throughout construction. Mitigation measure HAZ-4 would develop a plan to protect the safety of the public during beach disposal operations. HAZ-5 would ensure that any potentially contaminated soils are handled in a manner to protect human health and the environment and in compliance with all applicable local, state, and Federal, requirements. This mitigates against any possible impacts due to contaminated soils at the upstream barrier sites, which have not been tested. All other safety and hazards impacts are considered less than significant (Class III).

<u>Alternative 3: Natural Transport</u>

Construction Impacts

Alternative 3 consists of allowing natural stream processes to transport sediment from behind Rindge Dam over time. Rindge Dam would be notched and lowered in 5-ft increments over an estimated 40-100 years. Increment notches are expected to occur every 2-3 years. Since all sediment deposition will occur via natural processes, no nearshore or beach placement will occur under any of the Alternative 3 variations, therefore no beach safety risks would occur. The remaining construction risks at Rindge Dam, traffic risks associated with use of Malibu Canyon Road, and fire risks described in the Analysis of Alternative Components are generally the same as for Alternative 2. In addition, Alternative 3 includes the impacts discussed under the flood walls section of the components analysis.

Long-Term Impacts

None of the components of the variations of Alternative 3 are anticipated to have significant long-term impacts. After construction is completed, the project will no longer require hazardous materials and no permanent or long changes to traffic, roadways, or emergency response are anticipated. No significant increase in the long term flood risk is anticipated with implementation of the flood walls.

Mitigation Measures

Mitigation measures are recommended to reduce potential safety and hazards impacts to a level of less than significant during the short-term (construction). Mitigation measures HAZ-1 through HAZ-3, and HAZ-5 are applicable to this alternative. No mitigation measures would be implemented during the long-term for this alternative.

Level of Significance

As discussed for Alternative 2, implementation of measures HAZ-1 through HAZ-3, and HAZ-5 will reduce impacts to less than significant. Traffic control and hazardous soils plans would be more expansive than for Alternative 3, to include coverage of the floodwall site. All other safety and hazards impacts are not considered significant (Class III).

<u>Alternative 4: Hybrid Mechanical & Natural Transport</u>

Construction Impacts

Alternative 4 is a hybrid of Alternatives 2 and 3. It consists of mechanically transporting some sediment from behind Rindge Dam, and also allowing some sediment to transport naturally downstream. Variations of Alternative 4 include dam removal options (arch & spillway vs. only arch), options to remove upstream barriers, and nearshore vs. beach placement of any mechanically transported sediment. Alternative 4 generally has the same components as Alternative 2, but with the addition of the potential flood wall related impacts.

Long-Term Impacts

As described for Alternative 2 and Alternative 3, none of the components of the different variations are expected to result in significant, long-term impacts.

Mitigation Measures

Mitigation measures are recommended to reduce potential safety and hazards impacts to a level of less than significant during the short-term (construction). Mitigation measures HAZ-1 through HAZ-5 are applicable to this alternative. No mitigation measures would be implemented during the long-term for this alternative.

Level of Significance

As discussed for Alternative 2, implementation of measures HAZ-1 through HAZ-5 will reduce impacts to less than significant. Traffic control and hazardous soils plans would be more expansive as with Alternative 3, to include coverage of the floodwall site. All other safety and hazards impacts are not considered significant (Class III).

Comparison of Alternatives

All alternatives have generally similar impacts at during construction at Rindge Dam, and similar potential traffic impacts to Malibu Canyon Road **(Table 5.13-1**). Alternatives with upstream barriers included (b and d designations) all require implementation of HAZ-5 to mitigate risk associated with potential soil contaminants at the upstream barrier sites. All variations of Alternative 3 and 4 also require implementation of HAZ-5 at the floodwall site. Beach and nearshore disposal options have increased risk to traffic impacts, but are mitigated with implementation of a Traffic Control Plan (HAZ-3). Beach placement options (1 designations) all have potential beach safety issues, and require development of a Beach Safety Plan (HAZ-4). All variations of Alternative 3 and 4 also have minor additional risk associated with the flood walls. However, with implementation of the described mitigation measures, HAZ-1 through HAZ-5, with the appropriate alternatives, all alternatives result in less than significant impacts to safety and hazards (Class II).

Table 5.13-1 - Significance of Safety and Hazard Impacts for each Alternative

<table>
<tr><th rowspan="2">Alternative</th><th colspan="4">Significance Components</th><th rowspan="2">Overall Significance</th></tr>
<tr><th>Rindge Dam Site</th><th>Upstream Barriers</th><th>Beach Placement</th><th>Floodwall</th></tr>
<tr><td>2a1</td><td rowspan="20">Class II Impacts

Hazardous Substance Control Plan Required

(HAZ-1 and HAZ-2)</td><td></td><td>Class II (HAZ-3 & 4)</td><td></td><td>No</td></tr>
<tr><td>2a2</td><td></td><td></td><td></td><td>No</td></tr>
<tr><td>2b1</td><td rowspan="2">Class II (HAZ-5)</td><td>Class II (HAZ-3 & 4)</td><td></td><td>No</td></tr>
<tr><td>2b2</td><td></td><td></td><td>No</td></tr>
<tr><td>2c1</td><td></td><td>Class II (HAZ-3 & 4)</td><td></td><td>No</td></tr>
<tr><td>2c2</td><td></td><td></td><td></td><td>No</td></tr>
<tr><td>2d1</td><td rowspan="2">Class II (HAZ-5)</td><td>Class II (HAZ-3 & 4)</td><td></td><td>No</td></tr>
<tr><td>2d2</td><td></td><td></td><td>No</td></tr>
<tr><td>3a</td><td></td><td></td><td rowspan="12">Class II

(HAZ-3 & 5)</td><td>No</td></tr>
<tr><td>3b</td><td>Class II (HAZ-5)</td><td></td><td>No</td></tr>
<tr><td>3c</td><td></td><td></td><td>No</td></tr>
<tr><td>3d</td><td>Class II (HAZ-5)</td><td></td><td>No</td></tr>
<tr><td>4a1</td><td></td><td>Class II (HAZ-3 & 4)</td><td>No</td></tr>
<tr><td>4a2</td><td></td><td></td><td>No</td></tr>
<tr><td>4b1</td><td rowspan="2">Class II (HAZ-5)</td><td>Class II (HAZ-3 & 4)</td><td>No</td></tr>
<tr><td>4b2</td><td></td><td>No</td></tr>
<tr><td>4c1</td><td></td><td>Class II (HAZ-3 & 4)</td><td>No</td></tr>
<tr><td>4c2</td><td></td><td></td><td>No</td></tr>
<tr><td>4d1</td><td rowspan="2">Class II (HAZ-5)</td><td>Class II (HAZ-3 & 4)</td><td>No</td></tr>
<tr><td>4d2</td><td></td><td>No</td></tr>
</table>

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

5.14 Utilities

5.14.1 *Impact Significance Criteria*

Impact significance criteria for utilities are based on CEQA guidelines, and also adopted for NEPA compliance, and are also derived from documentation from the County of Los Angeles. The impacts on utilities associated with the project alternatives would be considered significant if one or more of the conditions described below were to occur as a result of implementation of the project. Utilities impacts would be considered significant based on Appendix G of the CEQA guidelines if an alternative were to:

1. Result in exceedance of wastewater treatment requirements of the applicable Regional Water Quality Control Board
2. Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects
3. Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects
4. Require new or expanded water entitlements to serve the project
5. Result in a determination by the wastewater treatment provider which serves or may serve the project that does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments
6. Be served by a landfill without sufficient permitted capacity to accommodate the project's solid waste disposal needs
7. Not comply with federal, state, and local statutes and regulations related to solid waste
8.

The project is in Los Angeles County. The County of Los Angeles General Plan Comprehensive update and amendment includes specific significance criteria for utilities. Based on these criteria, utilities impacts would be considered significant if one of the following questions is answered in the affirmative:

1. Is the project site in an area known to have an inadequate public water supply to meet domestic needs or to have an inadequate ground water supply and proposes water wells?
2. Is the project site in an area known to have an inadequate water supply and/or pressure to meet firefighting needs?
3. Could the project create problems with providing utility services, such as electricity, gas, or propane?
4. Are there any other known service problem areas (e.g., solid waste)?
5. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services or facilities (e.g., fire protection, police protection, schools, parks, roads)?
6. If served by a community sewage system, could the project create capacity problems at the treatment plant? Could the project create capacity problems in the sewer lines serving the project site?

Of the Los Angeles County criteria above, 8-12 do not apply to any of the project alternatives. The project does not consist of development requiring domestic groundwater supply, nor will the project impact any existing utilities. The project does not consist of any development or construction that would require firefighter coverage. Other fire related concerns are covered in Section 5.14. There are no known service problem areas, and there are no anticipated impacts to government operated facilities. In addition, Criteria 13 above is covered under the earlier Criteria 2. Therefore, none of the Los Angeles criteria will be discussed further below.

The City of Malibu General Plan contains recommendations for developing new utility requirements within city limits, but otherwise does not contain any other utility related criteria. Since the project does not include development or movement of any existing utilities, and will not require the need to develop new utilities, no criteria from the Malibu Creek General Plan apply. Since no construction or waste generation occurs in Ventura County under any of the alternatives utilizing nearshore placement, and all work in Ventura County would occur along existing roads and at existing facilities, there are no anticipated impacts to utilities in Ventura County, and there are no significance criteria specific to Ventura County that apply.

5.14.2 *Analysis of Alternative Components*

Dam and Spillway Removal

Construction Impacts

Removal of the dam arch alone, and removal of both the dam arch and spillway, result in generally the same potential utility impacts. Therefore, the following discussion applies to both options. No potential short-term impacts to utilities would occur as a result of temporary construction activities associated with construction at the Rindge Dam site. During the construction period wastewater would not be generated except through the use of portable toilets for workers. The small amount of wastewater collected from portables toilets would be disposed at a wastewater treatment facility on a routine basis. No exceedances of wastewater treatment requirements would occur at receiving wastewater treatment plants (Criteria 1). No impacts to wastewater treatment facilities or storm-water drainage facilities requiring expansion or new facilities would occur in the short term (Criteria 2-3). Removal of the dam and/or spillway will not result in a wastewater treatment provided having in adequate capacity (Criteria 5).

Water use during construction would be limited to temporary use for revegetated areas and routine dust suppression. Revegetated areas requiring irrigation would be watered via a water truck until the plants are established. Temporary water use of this nature would not substantially impact public water supplies and would not require any new or expanded water entitlements (Criteria 4).

Construction at Rindge Dam would not result in temporary disruptions or impacts to existing gas, electric, water, or other utilities during construction. There are no utilities in the immediate vicinity of Rindge Dam that would be impacted by removal of impounded sediments and the Dam structure. The Sheriff's Overlook would serve as a temporary staging area and oversight area during construction. At the Sheriff's Overlook there are overhead power lines, extending north and south along Malibu Canyon Road and across Malibu Creek. The project would not impact the overhead power lines. Although impacts to utilities are not anticipated, mitigation measures are proposed below to ensure any potential impacts are less than significant.

Under all alternatives, any debris that is not compatible with beach or nearshore placement will be disposed of at the Calabasas Landfill. For alternatives including removal of both the dam and spillway, approximately 503,600 cy of sediment and construction debris would require disposal at the landfill. Calabasas Landfill has been identified as the only feasible site available to receive the larger sized impounded material (gravel, cobble, boulders), and fine material (silts and clays). All material not compatible with beach placement would be permanently disposed of at the landfill. The landfill has identified an area of approximately 12 ac that would accommodate the estimated maximum 503,600 cy of material. Currently, the landfill can accept 3,400 tons per day, but is receiving approximately 1,700 tons per day, therefore capacity is available (Criteria 6). The landfill is expected to remain open until 2046 given the current daily disposal volume. During construction all applicable federal, state, and local statutes and regulations related to solid waste would be followed (Criteria 7).

Under alternatives that leave the spillway in place (c and d designations), the primary difference would be the volume of debris disposed of at Calabasas Landfill. Cement and other debris associated with removing the spillway would be left in place, reducing the 503,600 cy maximum volume for disposal. However, the minor reduction in disposal needs would not alter the significance level of associated alternatives. Therefore, the utility related impacts associated with dam and spillway removal and associated debris disposal are generally the same for all alternatives.

Long Term Impacts

None of the alternatives would result in the construction of new buildings or structures. In the long-term no wastewater or additional stormwater would be generated, except through the use of portable toilets for workers, as needed. The small amount of wastewater collected from portables toilets would be disposed at a wastewater treatment facility on a routine basis. None of the alternatives would not generate any solid waste post-construction. The provision of new or physically altered government facilities would not be required in order to maintain acceptable service ratios, response times, or other performance objectives.

Post-construction there would be no long-term demands on existing water supplies. For areas revegetated near the end of the construction period, a water truck would provide temporary post-construction irrigation until the plants are established. All vegetation would consist of compatible native vegetation that does not require permanent irrigation. Therefore, removal of the dam and/or spillway in any of the alternatives would not permanently interfere with existing utilities in the area and would not result in any long term impacts under any of the significance criteria.

Upstream Barrier Removal

Construction Impacts

Water use during the removal or modification of upstream barriers would be limited to temporary use for revegetated areas and routine dust suppression. Revegetated areas requiring irrigation would be watered via a water truck until the plants are established. Temporary water use, in addition to that utilized for restoration associated with activities described in Dam and Spillway Removal, above, would not substantially impact public water supplies and would not require any new or expanded water entitlements (Criteria 4).

Removal of upstream barriers would not result in any exceedances at wastewater treatment facilities (Criteria 1), nor would it result in the need for any new or expanded wastewater or storm-water facilities (Criteria 2, 3, and 5).

Approximately 2,400 additional cy of construction debris would be taken to the Calabasas Landfill from the barrier removal. Calabasas Landfill has more than adequate capacity to handle the additional disposal of approximately 2,400 cy (Criteria 6). All solid waste would be handled in compliance with all applicable regulations (Criteria 7). Removal of upstream barriers would not result in significant impacts to existing gas, electric, water, or other utilities during construction. The bridge at barrier CC2 has a 3-inch gas line that runs on the side of the bridge, as well as nearby overhead powerlines and a water line. At barrier LV1, there is an adjacent water line owned by Las Virgenes Municipal Water District that could potentially be impacted. During barrier removal the gas line at CC2 would require relocation. Other utilities at LV1 and CC2 may require relocation, temporary or permanent, or modification. Any utility infrastructure requiring modification or relocation associated with barrier removal would be coordinated directly with utility providers to avoid significant impacts (Class II). In addition, any potential impacts to the water line at CC2 would be coordinated with the homeowners. Therefore, removal of upstream barriers would not result in any significant impacts under any of the significance criteria.

Long Term Impacts

Sediment management would be required at upstream barriers CC2, CC3, LV2, and LV3. Any sediment removed could be reused for other purposes or transported to the Calabasas Landfill for disposal. Any material disposed of at the landfill would be within the available landfill capacity (Criteria 6). Material handling and disposal would be performed in accordance with all applicable laws and regulations (Criteria 7). Post-construction there would be no long-term demands on existing water supplies. For areas revegetated near the end of the construction period, a water truck would provide temporary post-construction irrigation until the plants are established. All vegetation would consist of compatible native vegetation that does not require permanent irrigation. Removal of upstream barriers would not result in impacts under any of the other significance criteria. Therefore, long term impacts would not be significant (Class III).

Sediment Hauling and Placement

Construction Impacts

Sediment hauling will utilize existing roads and will not require the construction of new buildings. Neither beach placement of sediment near Malibu Pier, or nearshore placement of material utilizing barges from Ventura Harbor, are anticipated to have any impacts on utilities. No vegetation removal or dust control are anticipated associated with trucking and disposal options, and therefore will not result in additional water needs. Portable toilets may be required at the beach disposal site. The small amount of wastewater collected from portable toilets would be disposed at a wastewater treatment facility on a routine basis. No exceedances of wastewater treatment requirements would occur at receiving wastewater treatment plants. Therefore, no significant impacts under any of the significance criteria are anticipated for either mechanical sediment removal option.

Long Term Impacts

Sediment hauling and placement are not anticipated to result in any long term impacts to utilities under any of the significance criteria (Class III).

Floodwall

Construction Impacts

Natural transport alternatives (3 and 4) would require the construction of floodwalls on both sides of Malibu Creek between the Cross creek Crossing and the PCH. Water use during construction of the floodwalls would be limited to temporary use for revegetated areas and routine dust suppression. Revegetated areas requiring irrigation will be watered via a water truck until the plants are established. Temporary water use, in addition to that utilized for restoration associated with activities described in Dam and Spillway Removal, above, would not substantially impact public water supplies. Any utilities identified within the floodwall construction area would be verified during the PED phase and a determination made if any existing utilities could be avoided during construction or if relocation or modification would be required, in coordination with the utility providers. Impacts to utilities are expected to be less than significant under all of the significance criteria.

Long Term Impacts

Repairs to the floodwalls and access roads would be required during the operation and maintenance period. Potential impacts are expected to be less than significant under all of the significance criteria. Any sediment removed could be reused for other purposes or transported to the Calabasas landfill for disposal. Any material disposed of at the landfill would be within the available landfill capacity (Criteria 6). Material handling and disposal would be performed in accordance with all applicable laws and regulations (Criteria 7). Post-construction there would be no long-term demands on existing water supplies. For areas revegetated at the floodwall site, a water truck would provide temporary irrigation until the plants are established. All vegetation would consist of compatible native vegetation that does not require permanent irrigation. Long term impacts would not be significant.

5.14.3 *Analysis of Alternatives*

Alternative 1: No Action

The No Action Alternative involves leaving the approximately 780,000 cy of sediment impounded behind Rindge Dam and upstream barriers in place. No construction would be implemented as a result of this alternative. There would be no need to deposit sediment from behind the Dam at any disposal sites and the upstream barriers would not be impacted. No materials and/or debris would require disposal in a landfill.

Alternative 1 would have no effect on utilities. Rindge Dam is an obsolete water storage facility with the water storage area completely impounded with sediments. The Dam does not generate or consume electricity nor does it store water for use. No wastewater would be generated. Therefore, there would be no potential to result in exceedances of wastewater treatment requirements. The No Action Alternative would not require the use of water or construction of new or expansion of existing stormwater facilities. The presence of the dam does not increase the risk of fires since it is constructed of non-flammable materials. Therefore, the dam would not increase water needs associated with firefighting. No solid waste would be generated. No changes would occur to existing utility services in the region. The No Action Alternative would not require the construction or alteration of government facilities. Therefore, impacts on utilities are considered not significant (Class III).

No mitigation measures would be necessary and there would be no project-related impacts associated with the No Action Alternative, therefore impacts are not considered significant (Class III).

Alternative 2: Mechanical Transport

Construction Impacts

There are no significant differences between full dam removal variations (2a-2b) and dam arch only variations (2c-2d) relative to impacts to utilities. In addition, there are no significant differences in impacts to utilities between shoreline placement and nearshore options. Upstream barrier removal alternatives (2a and 2c) do have additional utility considerations, as described in the Analysis of Alternative Components, but are not anticipated to result in increased impacts to utilities after implementation of U-1 and U-2. Although significant impacts to utilities are not anticipated, mitigation measures are proposed below to ensure any potential impacts are less than significant.

Long-Term Impacts

As described in the Analysis of Alternative Components section, no long term impacts to utilities are anticipated from any of the construction components. Therefore, none of the variations of Alternative 2 are anticipated to result in long-term impacts to utilities.

Mitigation Measures

The following mitigation measure is proposed to avoid or reduce potential impacts.

- **U-1** Prior to construction during the PED phase, utility locations within the vicinity of each project feature shall be identified and verified, in coordination with each utility provider. If relocation of a utility line is determined to be required and cannot be avoided, the appropriate utility service provider would be consulted to sequence construction activities to avoid or minimize interruptions in service. Any relocation or modification to utilities shall comply with permit conditions and such conditions shall be included in the contract specifications.
- **U-2** If utility service disruption is necessary, residents and businesses in the project area would be notified a minimum of two to four days prior to service disruption through local newspapers, and direct mailings to affected parties.

Level of Significance

Project-related impacts associated with Alternative 2 are not considered significant (Class III) for all variations that do not include upstream barriers. Upstream barriers have avoidable impacts upon implementation of the described mitigation measures (Class II).

Alternative 3: Natural Transport

Construction Impacts

Variations of Alternative will have the same general impacts as those described for Alternative 2 above. Addition of upstream barriers (3b and 3d) is not anticipated to result in increased impacts to utilities upon implementation of the proposed mitigation measures (Class II). The primary differences from Alternative 2 are that construction will occur over a longer period of time, and that downstream flood walls will be constructed. The elongation of the construction period will not alter the significance of utility impacts. Floodwall construction will require additional water use for revegetation and dust control, but will not substantially impact water supplies, or other utilities.

Long-Term Impacts

As described in the Analysis of Alternative Components section, no long term impacts to utilities are anticipated from any of the construction components. For areas revegetated at the floodwall site, a water truck would provide temporary irrigation until the plants are established. All vegetation would consist of compatible native vegetation that does not require permanent irrigation. Therefore, none of the variations of Alternative 3 are anticipated to result in long-term impacts to utilities.

Mitigation Measures

Mitigation measures U-1 and U-2 are proposed for Alternative 3.
Level of Significance

Project-related impacts associated with Alternative 3 are not considered significant (Class III) for all variations that do not include upstream barriers. Upstream barriers have avoidable impacts upon implementation of the described mitigation measures (Class II).

Alternative 4: Hybrid Mechanical & Natural Transport

Construction Impacts

Construction activities associated with Alternative 4 would be a combination of those associated with Alternatives 2 and 3 described above, and impacts associated with utilities would not differ substantially from those described for Alternatives 2 or 3. No potential short-term impacts to utilities are anticipated as a results of temporary construction activities.

Long-Term Impacts

Similarly to Alternatives 2 and 3, no long term impacts to utilities are anticipated, and potential impacts are expected to be less than significant.

Mitigation Measures

Mitigation measures U-1 and U-2 are proposed for Alternative 4.

Level of Significance

Project-related impacts associated with Alternative 4 are not considered significant (Class III) for all variations that do not include upstream barriers. Upstream barriers have avoidable impacts upon implementation of the described mitigation measures (Class II).

<u>Comparison of Alternatives</u>

All variations of Alternatives 2, 3, and 4 are expected to result in less than significant impacts utilities. Within each alternative, addition of the upstream barriers to the project results in additional utility considerations. However, the addition of upstream barriers will not result in any significant impacts to utilities.

Table 5.14-1 Significance of Utilities Impacts for each Alternative

<table>
<tr><th rowspan="2">Alternative</th><th colspan="4">Significance Components</th><th rowspan="2">Overall Significance</th></tr>
<tr><th>Rindge Dam Site</th><th>Upstream Barriers</th><th>Beach Placement</th><th>Floodwall</th></tr>
<tr><td>2a1</td><td rowspan="20">Class III</td><td></td><td>Class III</td><td></td><td>No</td></tr>
<tr><td>2a2</td><td></td><td></td><td></td><td>No</td></tr>
<tr><td>2b1</td><td rowspan="2">Class III</td><td>Class III</td><td></td><td>No</td></tr>
<tr><td>2b2</td><td></td><td></td><td>No</td></tr>
<tr><td>2c1</td><td></td><td>Class III</td><td></td><td>No</td></tr>
<tr><td>2c2</td><td></td><td></td><td></td><td>No</td></tr>
<tr><td>2d1</td><td rowspan="2">Class III</td><td>Class III</td><td></td><td>No</td></tr>
<tr><td>2d2</td><td></td><td></td><td>No</td></tr>
<tr><td>3a</td><td></td><td></td><td rowspan="12">Class II</td><td>No</td></tr>
<tr><td>3b</td><td>Class III</td><td></td><td>No</td></tr>
<tr><td>3c</td><td></td><td></td><td>No</td></tr>
<tr><td>3d</td><td>Class III</td><td></td><td>No</td></tr>
<tr><td>4a1</td><td></td><td>Class III</td><td>No</td></tr>
<tr><td>4a2</td><td></td><td></td><td>No</td></tr>
<tr><td>4b1</td><td rowspan="2">Class III</td><td>Class III</td><td>No</td></tr>
<tr><td>4b2</td><td></td><td>No</td></tr>
<tr><td>4c1</td><td></td><td>Class III</td><td>No</td></tr>
<tr><td>4c2</td><td></td><td></td><td>No</td></tr>
<tr><td>4d1</td><td rowspan="2">Class III</td><td>Class III</td><td>No</td></tr>
<tr><td>4d2</td><td></td><td>No</td></tr>
</table>

(Class I = significant, unavoidable impacts; Class II = significant but mitigable or avoidable; LTS = less than significant, Class III).

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6.0 CUMULATIVE PROJECT IMPACTS

6.1 Introduction

An evaluation of cumulative environmental impacts associated with the Tentatively Selected Plan (TSP) and its relationship to other past, present, and reasonably foreseeable future actions is required by CEQA Guidelines and NEPA regulations. CEQA Guidelines require a discussion of significant environmental impacts that would result from project-related actions in combination with “closely related past, present, and probable future projects” located in the immediate vicinity (CEQA Guidelines, § 15130 [b][1][A]). These cumulative impacts are defined as “two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts” (CEQA Guidelines, § 15355). NEPA regulations (40 C.F.R. §§ 1500-1508) define a cumulative impact as an “impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions” (40 C.F.R. § 1508.7).

In accordance with CEQA and NEPA, past, present, and reasonably foreseeable future projects are assessed by resource area. Cumulative effects may arise from single or multiple actions and may result in additive or interactive effects. The factors considered in determining the significance of cumulative effects are similar to those presented for each resource earlier in Chapter 5. While the discussion below specifically addresses the NER, the potential Locally Preferred Plan (LPP) does not differ significantly in its cumulative impacts on the environment. Therefore, the following discussion also provides coverage of the potential LPP.

Identification of relevant projects entailed the following:

1. Consultation with appropriate entities including: City of Malibu, County of Los Angeles, CDPR, Heal the Bay, USACE, USFWS, NOAA, CDFW, City of Calabasas, Las Virgenes Municipal Water District, Caltrans, TAC, and other relevant stakeholders.
2. Review of adopted planning documents such as Southern California Area Governments (SCAG), local, and regional general plans designed to project regional or area-wide conditions and future growth.
3. Review of USACE Regulatory Division database for Regulatory actions within the Malibu Creek hydrologic unit.

Table 6.1-1 presents the list of projects that were identified potentially contributing to cumulative effects. The addresses and/or geographic locations of the projects for the cumulative analysis are also provided in the cumulative project list in **Table 6.1-1**. The majority of the projects in the **Table 6.1-1** are located within the Cities of Malibu and Calabasas. One project is located at Pepperdine University, within the jurisdiction of Los Angeles County. Cumulative projects include: Residential, commercial, road improvements, Lechuza Beach access and Broad Beach improvements, fire station reconstruction, parking improvements, Solstice Creek fish passage, sports field lighting, Malibu High and Middle School campus improvements, other institutional improvements, and the Civic Center Wastewater Treatment Facility. The area of cumulative analysis is defined for each resource area in the issue area sub-sections.

Table 6.1-1 Cumulative Projects List

West Malibu

Project Name	Brief Description	Location	Status	Size	Planner
Trancas Town	New residential development	6155 TCR	Pending CDP submittal; zone change UPR	Zone change from Rural Residential to Multi-Family; 32 detached townhomes (preliminary)	B. Blue
HOWS / Trancas Country Market	Remodel and expansion of existing retail	30745 PCH (at TCR)	PA; pre-BPC	53,423 sf total (27,695 sf existing; 25,728 sf new); 339 parking spaces	R. Mollica
SMMC Lechuza Beach Public Access Improvements	Several public access improvements along the areas of East Sea Level, West Sea Level and Bunnie Lane, including stairways	31720.5 PCH	UPR	Beach access	S. Danner
Sea Star Estates	5 NSFRs (infill)	6270, 6304, 6312, 6282, and 6398 Sea Star Dr	UPR	5 NSFRs on 5 existing parcels	A. Fernandez
Malibu High and Middle School Campus Improvement Project	New admin building, remodel existing buildings, new parking area and site improvements	30215 Morning View Drive	UPR	35,315 sf of new construction, 12,509 sf of renovation/modernization of existing buildings, new 150 space parking lot, various parking and site improvements	J. Smith
Broad Beach Restoration Project	Beachwide rock revetment, off-shore sand dredging, sand nourishment, dune restoration	Broad Beach Road	UPR	Beach-wide	CA State Lands Commission / Coastal Commission, S. Danner
Malibu Athletic Field Lighting Project	Sports field lighting	30215 Morning View Drive	BPC (State)	Four 70 ft tall lights installed on the MHS football field/track (limited usability allowed - 16 nights/yr till 10:30pm between Nov to May and 45 nights/yr till 7:30pm between Nov to Mar - no lights used between June to Aug per year)	J. Smith
28811 PCH Subdivision	3 lot subdivision	28811 PCH	UPR	Potential development for each lot equals a maximum TDSF of 8,620 sf; 8,342 sf; and 8,470 sf	S. Danner
Portshead	New office building	6551 Portshead Dr	PA expired; pending new CDP submittal	14,950 sf; 60 parking spaces	R. Mollica
LA County Fire Station No. 71	Fire station reconstruction	28722 PCH	UPR	6,033 sf total (2,881 sf existing; 3,152 sf new); 12 parking spaces; temporary fire station relocation to Zuma Beach Lifegaurd HQ	J. Smith
Solstice Creek Fish Ladder	New fish ladder project at mouth of Solstice Creek / across a portion of Dan Blocker Beach	26036.5 PCH	BPC (State)	Bridge culvert and stream channel reconstruction with rock weirs and step-pools for a total length of 436 feet	S. Edmondson
Galahad Subdivision	5 lot subdivision; 4 buildable lots and 1 open space lot	6061 Galahad Rd	UPR	Potential development for each lot equals a maximum TDSF of 7,044 sf, 7,142 sf, 7,234 sf, and 6,414 sf	A. Fernandez
Zuma Mesa	LLA and 2 NSFR	6271 and 6277 Zuma Mesa Dr	PA; BPC	5,329 sf and 6,984 sf	A. Fernandez
Trancas Highlands Water Assessment District	Water tank/line, buster pump station and NSFR	31537 Anacapa View Dr, Anacapa View Dr and TCR	PA, assessment district formation process underway	500,000 gallon water tank, +/- 12,400 linear feet of trenching, assessment district (+/- 66 existing lots), one NSFR +/- 11,000 sf	B. Blue
Sea Level	2 NSFR (infill) and road widening project	31864 and 31866 Sea Level Dr	UPR	2,165 sf and 1,925 sf, 2,000 sf; and 130 linear feet of road widening (Sea Level Dr)	A. Fernandez
N/A	2-lot LLA and 2 NSFR	5905 and 5909 Latigo Canyon Rd	UPR	Lot line adjustment and construction of 2 NSFR - 8,223 sf and 5,935 sq respectively	S. Danner
Puerco Canyon Road Extension	Road extension	3500 Puerco Canyon Rd	UPR	3,500 linear feet of road extension to provide access to 7 residentially zoned lots (1 City lot/6 County lots)	S. Danner

Los Angeles County

Pepperdine Campus Life Project	Project would develop and re-develop property within an existing approximately 365 acre area on the Pepperdine campus through a two-phase development program that will take 12 years	24255 PCH	PA; pending approval of an amendment at CCC	Six components of proposed development include approximately 394,137 sf of net new development comprised of the following: 1) Student Housing Rehabilitation; 2) Athletics and Events Center and Parking Structure; 3) Upgraded NCAA Soccer Field and Maintenance Facilities; 4) Town Square and Welcome Center over Subterranean Parking; 5) Enhanced Recreation Center Area; and 6) School of Law Parking Structure.	County of Los Angeles, Regional Planning, S. Danner

Civic Center Area

Project Name	Brief Description	Location	Status	Size	Planner
Crummer	7 lot subdivision (5 for residential)	24120 PCH	UPR; final project scope pending	(Preliminary) 5 NSFRs; expanded parking for Bluffs Park; 2 acre dedication to City for recreation use	H. Ly
Towing Subdivision	7 lot subdivision (4 for residential)	23915 Malibu Rd	PA; BPC	4 NSFRs	S. Danner
Rancho Malibu Hotel	New hotel and spa	4000 MCR (NW corner of MCR and PCH, along Winter Canyon Rd)	UPR	146-room luxury hotel with related facilities. The hotel's 141,426 sf main building contains a retail component, day spa, fitness center, lobby, restaurant, bar, banquet and meeting facilities, and guest rooms. Development also includes 133,873 sf of detached casitas which include guest rooms. A large swimming pool, subterranean parking structure, function lawn, landscaping, and hardscape. CUP for live entertainment, events, alcohol sales and a TTM for a commercial airspace subdivision (146 hotel rooms and 2 retail spaces will be available for private ownership).	S. Danner
SMMC Beach Public Access Improvements	Public beach access improvements and a new stairway	24038 Malibu Rd	PA; pre-BPC	Beach access	R. Mollica
La Paz Shopping Center	New retail, office and institutional development	23465 Civic Center Way	PA; BPC	112,056 sf retail and office; 20,000 sf institutional; 543 parking spaces	S. Edmondson
Whole Foods Shopping Center	New retail development	23401 CCW	UPR	25,000 sf grocery; 14,839 sf retail/commercial (up to 4,000 sf restaurant)l; 220 parking spaces	B. Blue
Civic Center Wastewater Treatment Facility	Wastewater treatment and recycling facility	unknown	Testing and prelimnary design underway, pending CDP submittal	Scheduled to be online by November 2015 to serve first phase of Civic Center (commercial parcels); second phase by 2019 (residential parcels)	B. Blue
Santa Monica College	New satellite campus on County Civic Center parcel	23555 CCW	Pending CDP submittal	+/- 25,000 sf building to replace vacant County Sheriff facility; will serve +/- 200 FTE; 2 classrooms, 3 lab/studios, multipurpose room, 2,100 sf lecture hall, 5,700 sf sheriff substation, interpretive center	B. Blue
Housing Element Update	Overlay to allow up to 20 dwelling units per acre on three sites	APN 4467-013-022, 28401 Pacific Coast Highway, 3700 La Paz Lane (APNs 4458-022-023 and 4458-022-024)	UPR	5.12, 3.25 and 2.3 ac sites -> change from allowing 6 units per ac up to 20 units per ac	S. Danner, R. Mollica
Malibu Sycamore Village	New non-residential mixed use commercial project	23575 CCW (APN 4458-022-011); addressed as 23789 Stuart Ranch Rd per LA County Assessor	UPR	Two projects alternatives submitted: 1) 76,000 sf retail, restaurant, and office space with a public benefit of a 5,000 sf urgent care facility, and 380 pkg spaces ; 2) 60,000 sf of retail, restaurant, and office space with 300 pkg spaces; project site is a 10 acre commercial parcel and both alternatives include outdoor exhibition space.	J. Smith

East Malibu

Project Name	Brief Description	Location	Status	Size	Planner
Pierview	New restaurant	22716 PCH	PA; UC	7,100 sf; 70 parking spaces (joint use parking agreement with 22706 PCH to donate 10 spaces - total of 59 spaces required for this use with 1 extra)	S. Edmondson
Windsail	New restaurant	22706 PCH	PA; UC	5,904 sf; 64 parking spaces (joint use parking agreement with 22716 PCH for 10 additional spaces - total of 74 spaces required for this use)	S. Edmondson
Hajian	New office	24903 PCH	PA; UC	9,685 sf; 44 parking spaces	H. Ly
N/A	New office and retail	22959 PCH	UPR	2,630 sf of office; 4,517 sf retail; 31 parking spaces	J. Smith
N/A	New office	22729 PCH	PA; pre-BPC	2,499 sf; 32 parking spaces	H. Ly
Carbon Condominiums	New condominium	22065 PCH	UC	8 units	J. Smith
N/A	LLA and 3 NSFRs	18805, 18807 & 18809 PCH	PA; BPC	9,559 sf, 9,141 sf, and 7,429 sf	S. Edmondson
N/A	4 NSFRs	22301, 22303, 22305 and 22309 PCH	PA; BPC	9,529 sf, 8,649 sf, 8,271 sf, and 9,249 sf	S. Edmondson
N/A	LLA and 2 NSFRs	21997 and 22003 PCH	PA; BPC	9,818 sf and 8,542 sf	A. Fernandez
Serra Retreat	3 lot subdivision	3314 Serra Rd	PA; pending Final Parcel Map approval	Development potential for each lot equals a maximum TDSF of 7,037 sf, 7,033 sf, and 7,740 sf	S. Danner
N/A	2 NSFR	20624 and 20630 PCH	UPR	2,911 sf and 2,911 sf	R. Mollica
N/A	TPM	27537 PCH	PA	Subdivision of 1 lot into 2 lots	H. Ly

Project Title	Location	Project Type
Entrada at Malibu Canyon	4240 Las Virgenes Road, Calabasas	86 residential units (condominiums) in three buildings over one level of underground parking that connects the three buildings. Approximately 16 of the 21 acres (75% of the site) was dedicated open space.
Las Virgenes Road/Thousand Oaks Blvd. Commercial Center	NW corner of Las Virgenes Road/ Thousand Oaks Boulevard, Calabasas	A neighborhood shopping center and 110 single-family residences (Mont Calabasas). The final proposal includes a commercial center with 25,820 ft2 of retail space and 35,074 ft^2 of office space.
Lost Hills Interchange Improvement Project	US 101 FWY/Lost Hills Road Interchange, Calabasas	$25 million overhaul of the Lost Hills Road/US 101 interchange. It will involve widening the Lost Hills Road overpass to five lanes, providing improvements to the on/off ramp design onto US 101, and ensure safe access for all pedestrians.
The Horizons - Senior Condominiums	26705 Malibu Hills Road (APN: 2064-004-051), Calabasas	Construct a 60 unit Senior Condominium development and to remove one oak tree and encroach into the protected zone of another oak tree. Design consists of a three-story building over a one level subterranean parking structure, with an adjacent one-story community building and pool. The site, located at the eastern terminus of Malibu Hills Road is situated between commercial and residential properties.
The Messenger Project	Intersection of Las Virgenes and Agoura Roads, Calabasas	Located on 77.55 ac at the intersection of Las Virgenes and Agoura Roads, the Messenger project is proposing to build 2.52 ac for commercial uses (21,400 ft2), 0.55 ac for senior affordable housing (8 units), 4.71 ac for multi-family residential units (75 townhome units), 14.97 ac for single family residential units (75 units), 54.07 acre of dedicated open space, and 0.73 ac for public streets. The project would also

		include remediation of an ancient landslide on the southern portion of the site.
AZ Winter Mesa, LLC, Towing Site Subdivision Project	23915 Malibu Road, Malibu	The proposed project consists of the subdivision of APN 4458-018-004 into seven individual parcels and the development of new single-family residences (NSFR) on four of the seven parcels. The remaining three parcels would be maintained by an established homeowners' association (HOA) and include open space/ landscaping, a private street and gatehouse, a wastewater dispersal area, and an OWTS package plant to serve the four residences and gatehouse. The site consists of a 5.45-acre lot, Assessor's Parcel Number (APN) 4458-018-004, bordered by PCH on the north, Malibu Road on the south, and vacant, undeveloped land on the west and east.

Sources: City of Malibu, County of Los Angeles, City of Calabasas, 2013

In addition to the projects listed in **Table 6.1-1**, a review of USACE Regulatory actions over a period from 1990 to 2013 revealed over 300 permit actions in and/or near the Malibu Creek hydrologic unit. Majority of those permit actions were under the Nationwide Permit (NWP) program, with over 230. Others include Standard Permits (SP) and Regional General Permits (RGP), and a few Letters of Permission (LOP). Common project types include commercial and residential construction, public works maintenance and repairs, infrastructure, restoration, and bank stabilization. Impact types include biological resources, water resources, construction noise and dust. Habitat types associated with these projects included all the major wetland habitat types. Of these projects, approximately 8 required compensatory mitigation totaling less than 4 acres.

6.2 Earth Resources

The cumulative analysis area for earth resources includes the Malibu Creek watershed within the vicinity of Malibu Creek, Las Virgenes Creek, and Cold Creek. The No Action Alternative would not result in impacts to earth resources, and therefore not contribute to cumulative impacts. Impacts to earth resources would be less than significant for all variations of Alternative 2 with mitigation, and therefore Alternative 2 (including both the NER and LPP) would not result in significant cumulative impacts in conjunction with other known projects. However, impacts related to possible slope destabilization along Malibu Creek under all variations of Alternatives 3 and 4 would be significant and could contribute towards creating a cumulative impact in conjunction with known projects within the watershed.

During the operational phase, there is the potential for slope stability issues within the vicinity of Rindge Dam, however project features and mitigation measures would ensure the impacts would be less than significant. Additional earth resources impacts expected to occur during the operational phase would be limited to access road repairs. No known projects are in the immediate vicinity of Rindge Dam. Therefore, the project alternatives would not be expected to incrementally contribute towards creating slope stability issues.

The action alternatives involve restoration and revegetation of the project area upon completion of the project. The construction activities of the action alternatives are not located on expansive soils and do not involve the construction of structures. The project alternatives do not involve the construction of septic tanks or alternative waste disposal systems. Except for stream morphology and erosion impacts identified above, the project alternatives would not incrementally contribute towards creating significant impact due to operations in conjunction with other known projects.

6.3 Water Resources and Water Quality

The cumulative analysis area for water resources and water quality includes the Malibu Creek floodplain within the vicinity of Malibu Creek, Las Virgenes Creek, and Cold Creek, and Malibu Lagoon. The No Action Alternative would not result in impacts to water resources or water quality. Impacts on water resources and water quality associated with the project action alternatives, restoration of the Rindge Dam area and barrier removal, are mainly confined to the construction phase.

Impacts to water resources and water quality, as a result of the NER and likely LPP, are temporary, construction related impacts as described in detail in Section 5.3. Water quality impacts under variations of Alternative 3 and 4 would be significantly greater due to the natural transport of impounded sediments. During construction there is the potential for turbidity and spill related impacts to occur over the duration of the construction period for each of the action alternatives (7-8 yrs for variations Alternative 2 and 4; 40-100 yrs for variations of Alternatives 3) Project features and mitigation measures would ensure the impacts under the NER and likely LPP would be less than significant. Other known projects may contribute to water quality issues. As part of the action alternatives, a temporary coffer dam to settle flows from Malibu Creek upstream of the Dam and piping the water below the construction site. The coffer dam would reduce any increases in turbidity levels associated with other known upstream projects. During the winter season between construction episodes, there is a potential for water quality impacts from increased turbidity levels similar to turbidity levels under larger storm events under the action alternatives.

As described in Section 5.3 and summarized above, construction related impacts associated with variations of Alternative 2 (including the NER and LPP) are less than significant with mitigation, and there are no long term water resource related detrimental impacts associated with variations of Alternative 2. Therefore variations of Alternative 2 will not result in a significant cumulative impact to water resources in conjunction with other known projects.

However, turbidity and water quality impacts under variations of Alternatives 3 and 4 would be significant due to the natural sediment transport element of those alternatives. Currently, the only known project downstream of Rindge Dam is the Malibu Lagoon Restoration Project, which was completed in 2013. It is expected that by the time construction of any of the alternatives begins, the re-contoured lagoon and planted vegetation would be well established. Increases in turbidity in Malibu Creek resulting from the variations of Alternatives 3 and 4 could be long term, particularly for Alternative 3, and therefore would result in significant cumulative impacts to water quality in conjunction with other known projects.

6.4 Biological Resources

The cumulative analysis area for biological resources includes the Malibu Creek watershed, including Malibu Creek and its tributaries. As described in 5.4, variations of Alternative 2 (including the NER and LPP) will not result in significant negative impacts to biological resources. The long term impacts of variations of Alternative 2 are beneficial to biological resources, and include significant restoration of habitat value and connectivity. Therefore, the contributions of variations of Alternative 2 to cumulative impacts are wholly beneficial in conjunction with other known projects.

Impacts to biological resources associated with all variations of Alternatives 3 and 4 during the construction phase are potentially significant due to increase sediment deposition and turbidity levels. Therefore, impacts to biological resources associated with Alternatives 3 and 4 would be cumulatively significant when considered in conjunction with other known projects. Other known projects identified above are not located in the immediate vicinity of the project area and are not expected to simultaneously disrupt connected riparian and other habitat areas which could disturb sensitive species. All action alternatives includes measures to restore aquatic and riparian habitat, which will provide a net benefit to biological resources when the project is completed. The project will restore fish passage, particularly to the federally endangered steelhead, remove wildlife barriers, and increase accessible aquatic habitat to fish and other aquatic species.

6.5 Cultural Resources

The cumulative analysis area for cultural resources includes the areas within and in the vicinity of Malibu Creek, Cold Creek, Calabasas Landfill, beach replenishment sites, and Ventura Harbor, as well as the areas proposed for development of cumulative projects identified above. The No Action Alternative would not result in impacts to cultural resources and therefore, would not contribute to cumulative impacts.

All action alternatives require the removal of Rindge Dam, which as described in Section 5.5, is considered a significant impact to a cultural resource. All alternatives that include removal of the upstream barriers require the removal of White Oak Dam. Therefore, implementation of any action alternative, including both the NER and LPP, would result in significant cumulative effects when considered in conjunction with other known projects. While multiple mitigation measures would be in effect to reduce any impacts on cultural resources, as described in Section 5.5.2-3, impacts would remain significant. In addition to those impacts associated with removal of the dam under all alternatives, floodwall construction under variations of Alternatives 3 and 4 has additional impacts that would remain significant after mitigation. Mitigation measures would result in archaeological monitoring, data recovery, and detailed recordation of cultural resources. These measures would preserve the cumulative scientific and cultural values of the resources and prevent the loss of any undiscovered sites.

6.6 Socioeconomics

The cumulative analysis area for socioeconomics includes the cities of Malibu, Ventura, and Calabasas, and unincorporated areas within northwest Los Angeles County. The No Action Alternative would not result in impacts to socioeconomics or environmental justice. During construction under any of the action alternatives, temporary employment opportunities for construction workers will occur. The action alternatives in conjunction with the cumulative projects identified above, would not result in a labor shortage. It is not anticipated that all the projects would enter the construction phase simultaneously. Even if the schedules of the projects overlap, construction worker demand could be met with the large labor pools present in Los Angeles and Ventura Counties. This demand would not displace housing or people. The action alternatives would not disproportionately affect minorities, low income residents, or children. Therefore, the action alternatives would not incrementally contribute towards creating a cumulative impact during construction in conjunction with the cumulative projects identified above.

No structures or facilities would be constructed as part of the project alternatives. The project alternatives would not displace housing, create a need for housing, or result in permanent job creation. The project alternatives would not disproportionately affect minorities, low income residents, or children. Therefore, none of the action alternatives would contribute towards creating a significant cumulative impact in conjunction with the projects identified above.

6.7 Aesthetics

The cumulative analysis area for aesthetics includes the area within and in the vicinity of Malibu Creek, Cold Creek, Calabasas Landfill, beach replenishment sites, as well as the areas proposed for development of cumulative projects identified above. The No Action Alternative would not result in impacts to aesthetic resources, and therefore, would not contribute towards creating a cumulative impact in conjunction with cumulative projects listed above. The action alternatives would result in multiple temporary aesthetic impacts during construction that will temporarily degrade the public viewshed. These temporary impacts are limited to specific sites, and would be less than significant with implementation of mitigation measures. However, the construction of floodwalls under variations of Alternatives 3 and 4 would be significant and could contribute to cumulative aesthetic impacts in the immediate vicinity.

Projects identified above are not expected to cumulatively combine to further exacerbate degradation of views as completion of these projects are expected to be staggered and not all coincide with implementation of variations of Alternative 2. Listed projects are not expected to cumulatively combine with the project alternatives and result in a cumulative aesthetic impact. In the long term, under variations of Alternatives 2, aesthetic resources would benefit as the degraded area in the vicinity of Rindge Dam is restored. In the interim, prior to maturity of vegetation, the construction areas will remain visible. Aesthetic design measures would be incorporated into repair of Malibu Canyon Road, a designated scenic highway, to fix any road damage attributed to the project. This would further enhance the aesthetic qualities of Malibu Canyon Road. Beach replenishment would also increase the aesthetic qualities of the receiver sites. Therefore, neither the NER nor LPP would incrementally contribute towards creating a cumulative long-term adverse impact in conjunction with the projects identified above. However, variations of Alternative 3 and 4 contribute to significant cumulative effects, when considered in conjunction with other known projects, due to floodwall construction.

6.8 Recreation Resources

The cumulative analysis area for recreation resources includes the Cities of Malibu, Ventura, and Calabasas, and unincorporated areas within northwest Los Angeles County. The project alternatives would not result in the temporary or permanent removal of recreational facilities. Additionally, the project alternatives would not create recreational facility demands during construction or in the long-term as described in **Section 5.8**. Multiple projects listed above would create additional demands on recreational facilities but the project alternatives would not result in or create recreational facility demands. Therefore, the project alternatives, including the NER and LPP, would not incrementally contribute towards any additional demands on recreation resources or result in cumulative long-term impacts to recreation resources.

6.9 Transportation

Background traffic under Analysis Year conditions were developed using county-level vehicle miles traveled (VMT) projections obtained from the Southern California Association of Governments (SCAG) Model, a regional transportation demand model developed by SCAG. These VMT projections are reported for Existing and 2035 Conditions in the 2012-2035 Regional Transportation Plan (RTP)[2] developed by SCAG. Since the SCAG Model is a regional travel demand model, it includes all the planned and approved land use modifications within the SCAG region and as such serves as the cumulative analysis area. Hence, background traffic forecasts obtained from the SCAG Model projections reflect cumulative conditions for the region.

The No Action Alternative would not result in transportation or traffic impacts, and therefore, would not contribute towards creating a cumulative impact in conjunction with cumulative projects listed above.

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[2] 2012-2035 Regional Transportation Plan, Southern California Association of Governments, December 2011 (Tables A12 and A16).

Construction any of the project alternatives in conjunction with the projects identified above have the potential to result in significant traffic impacts due to the potential need for the installation of a traffic signal at the construction entrance on Malibu Canyon Road. Any alternatives that include shoreline placement of sediments may also require a traffic light along PCH, further contributing to cumulative effects. Therefore, all alternatives are expected to contribute to significant impacts to transportation, when considered in conjunction with other known projects.

While mitigation measures described in **Section 5.9** will reduce potential impacts associated with the project alternatives, until the Transportation Management Plan and associated traffic analyses are completed, it is assumed that potentially significant impacts to traffic exist associated with all alternatives, including the NER and LPP, will occur during construction.

6.10 Noise

Cumulative noise impacts typically occur when multiple projects affect the same geographic areas simultaneously or when sequential projects extend the duration of noise impacts on a given area over a longer period. Noise impacts are primarily localized because sound levels decrease relatively quickly with increasing distance from the source; therefore, the cumulative noise setting would be limited to the area subject to audible increase in noise levels with construction and development of cumulative projects. The cumulative analysis area for noise includes the areas in close proximity to the construction areas of Rindge Dam, Sheriff's Overlook, Calabasas Landfill, beach replenishment sites, Ventura Harbor, upland site F, and upstream barrier removal sites under each alternative.

The No Action Alternative would not result in noise impacts, and therefore, would not contribute towards creating a cumulative impact in conjunction with cumulative projects listed above. Noise impacts associated with the project action alternatives would occur during the construction phase. These impacts are temporary, construction related impacts as described in detail in **Section 5.11**. These impacts are associated with the construction activities during upstream barrier removal, and therefore are only associated with b and d designated alternatives. Projects listed in **Table 5.14-1** are not in the immediate vicinity of any of the proposed construction activity areas, except for a restoration project along Cold Creek. Cumulative noise impacts would potentially occur if the projects were in close proximity to sensitive receptors and the projects' activities and construction was occurring simultaneously.

Noise impacts associated with removal of the upstream barriers and the other restoration project would be due to construction activities and would be temporary. Both projects would include implementation of mitigation measures and adherence to local noise ordinance provisions from Los Angeles County, City of Malibu, and City of Calabasas. However, potentially significant short-term noise impacts still exist even after mitigation as a result of the removal of upstream barriers. Therefore all b and d variations of Alternatives 2, 3, and 4, which includes the NER and LPP, will contribute to significant cumulative effects in conjunction with other known projects. However, a and c variations of Alternatives 2, 3, and 4 are not expected to contribute to significant cumulative effects.

6.11 Air Quality and Global Climate Change

The population in Los Angeles County is expected to increase in the future. Increases in population and housing could increase traffic, utility demands, and construction projects, which would all result in increased air pollution. Additionally, air pollutant emissions associated with past and present development and activities have contributed to local and regional air pollution. The cumulative analysis area for air quality and global climate change includes the area within the Northwest Coastal Los Angeles County Source-Receptor Area (SRA) as defined by the SCAQMD, under CEQA. In addition, nearshore placement options occur partially in Ventura County, which is covered by the VCAPCD. Several projects, as identified above, could occur during the same period as the project action alternatives and would contribute to cumulative effects. The No Action Alternative would not result in air quality or global climate change impacts, and therefore, would not contribute to cumulative significant effects.

The significance thresholds developed by the SCAQMD, under CEQA, serve to evaluate if a proposed project could either 1) cause or contribute to a new violation of a CAAQS or NAAQS in the study area or 2) increase the frequency or severity of any existing violation of any standard in the area. Therefore, if an alternative would produce air quality impacts that are individually significant, then the alternative would also be cumulatively considerable, under CEQA.

As described in Section 5.12, construction activities associated all variations of Alternative 2 and 4 would result in individually significant air quality impacts for NOx under CEQA, and therefore would contribute to significant cumulative effects when considered in conjunction with other know projects. Therefore, both the NER and LPP would contribute to significant cumulative effects under CEQA. Variations of Alternative 3 have less than significant air quality impacts and do not contribute to significant cumulative effects when considered in conjunction with other projects. All action alternatives are under de minimis thresholds for NEPA-related impacts.

The construction GHG emissions for the NER, LPP, and other project alternatives are summarized in **Table 5.12-22**. These results are compared to the CEQA-related GHG threshold developed by SCAQMD. This comparison indicates that the project GHG emissions would be less than significant under CEQA. Projects identified above would also be subject to local air quality standards, including GHG emissions. There would be no significant cumulative impacts from any of the action alternatives, when considered in conjunction with other projects, from GHG emissions.

6.12 Safety and Hazards

The cumulative analysis area for safety and hazards includes the areas within and in the vicinity of Rindge Dam, upstream barrier sites, Calabasas Landfill, beach replenishment sites, proposed roads for hauling construction debris as well as the areas proposed for development of cumulative projects identified above. Under the No Action Alternative, Rindge Dam may degrade over time and may require removal or structural stability at some future date. Additionally, Rindge Dam also poses as a safety concern with regard to human injuries and deaths. Under the No Action Alternative, CDPR would likely perform park ranger patrols of the Rindge Dam area, post signage, and implement a closure order to deter illegal access and address safety concerns.

Impacts on safety and hazards associated with the project action alternatives would occur during the construction phase. Impacts to safety and hazards are temporary, construction related impacts as described in detail in **Section 5.13**. These impacts would be localized to the individual construction areas. However, with the mitigation measures identified in **Section 5.13** the project alternatives do not result in significant safety related impacts. Therefore, action alternatives, including the NER and LPP, are not expected to combine with any projects identified above that are within the cumulative analysis area to incrementally contribute towards creating a cumulative impact during construction.

No structures of facilities would be constructed as part of the project alternatives. After construction and in the long-term the project would not result in any safety and hazards issues. Therefore, the project alternatives will not incrementally contribute towards creating a significant cumulative impact in conjunction with the projects identified above.

6.13 Utilities

The cumulative analysis area for the landfill portion of utilities includes areas served by the Calabasas Landfill and projects in the Cities of Calabasas, Malibu, and County of Los Angeles identified above. The No Action Alternative would not result in impacts to utilities, and therefore would not contribute towards cumulative effects. The project action alternatives would not result in the construction of structures or buildings requiring the use of utilities. During construction, it is anticipated that the action alternatives would require the disposal of up to 504,000 cy of non-beach compatible materials at the Calabasas Landfill. The landfill has capacity available to handle waste volumes generated by the project alternatives. It is not anticipated that solid waste volumes generated during construction by those other listed projects and the project action alternatives would contribute towards exceeding the capacity of the Calabasas Landfill. The landfill can currently accept 3,400 tons per day, but is receiving approximately 1,700 tons per day, approximately 50 percent of its capacity. Therefore, the project action alternatives would not incrementally contribute towards creating a significant cumulative impact, during construction or in the long-term, in conjunction with the projects identified above.

7.0 EFFECTS FOUND NOT TO BE SIGNIFICANT

This section provides information regarding impacts that were determined to be insignificant during the scoping process, pursuant to Section 15128 of the CEQA Guidelines, as amended. As stated in the CEQA Guidelines: “An EIR shall contain a statement briefly indicating the reason that various possible significant effects of a project were determined to not be significant and were therefore not discussed in detail in the EIR.”

The following presents a brief summary of the effects found not to be significant. Reasons are provided why they would not be significant.

7.1 Agricultural and Forestry Resources

No significant impacts were identified with respect to conversion of prime farmland, unique farmland or farmland of statewide importance to non-agricultural use or conflict with existing agricultural zoning or a Williamson Act contract. No impacts were identified that would conflict with existing zoning or cause rezoning of forest land, result in the loss of forest-land, or conversion of forest land to non-forest use. No impacts were identified that would involve other changes in the existing environment which, due to their location or nature, could result in the conversion of farmland to non-agricultural use or conversion of forest land to non-forest use.

The NER/LPP project sites are within areas labeled as urban and built up land and other land on the State Important Farmland Maps prepared by the state of California Department of Conservation. For the most part the NER and LPP project sites are within the existing parkland owned by the CDPR. The NER and LPP project sites are not located in forest land areas and not under a Williamson Act contract. Neither the NER nor LPP will involve the construction of buildings and is a restoration project and therefore will not have a direct or indirect impact on farmland or forest-land.

7.2 Land Use and Planning

No significant impacts were identified that would physically divide an established community; conflict with an applicable land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect; or conflict with an applicable habitat conservation plan or natural community conservation plan. The NER and LPP are restoration projects and will not result in any changes to the underlying land uses. Neither the NER nor LPP will conflict with an applicable habitat conservation plan or natural community conservation plan and therefore will not have a direct or indirect impact on land use and planning.

7.3 Mineral Resources

No significant impacts were identified that would result in the loss of availability of a known mineral resource or the loss of a locally important mineral resource recovery site. The NER and LPP are restoration projects and do not involve urbanization or other uses that would potentially restrict access to mineral resources. Therefore, no impacts associated with mineral resources would occur.

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8.0 UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The environmental impacts of the project alternatives are described in **Section 4**. All impacts resulting from the project alternatives were reduced to less than significant levels through implementation of the mitigation measures except for the impacts, summarized in **Table 8-1** below, which are significant and unavoidable.

Table 7.3-1 Unavoidable Adverse Effects

Resource	Alternative 2	Alternative 3	Alternative 4
Earth Resources		Stream morphology and erosion impacts related to sediment deposition are significant for all variations of Alternative 3.	Stream morphology and erosion impacts related to sediment deposition are significant for all variations of Alternative 4.
Water Resources and Water Quality		Long-term turbidity increases are due to natural sediment transport and are significant for all variations of Alternative 3.	Long-term turbidity increases are due to natural sediment transport and are significant for all variations of Alternative 4.
Biological Resources		Impacts could occur due to increased turbidity and sedimentation over a long period of time from natural transport of impounded sediment for all variations of Alternative 3.	Impacts could occur due to increased turbidity and sedimentation over a long period of time from natural transport of impounded sediment for all variations of Alternative 4.
Cultural Resources	Demolition of Rindge Dam constitutes a significant effect for all variations of Alternative 2. Demolition of White Oak Dam constitutes a significant effect for all variations that include removal of upstream barriers.	Demolition of Rindge Dam constitutes a significant effect and floodwall construction may further impact cultural resources for all variations of Alternative 3. Demolition of White Oak Dam constitutes a significant effect for all variations that include removal of upstream barriers.	Demolition of Rindge Dam constitutes a significant effect and floodwall construction may further impact cultural resources for all variations of Alternative 4. Demolition of White Oak Dam constitutes a significant effect for all variations that include removal of upstream barriers.
Aesthetics		Long-term aesthetic impacts associated with the flood walls for all variations of Alternative 3.	Long-term aesthetic impacts associated with the flood walls for all variations of Alternative 4.

Traffic	Potentially significant impacts on Malibu Canyon Road due to possible installation of a traffic light for all variations of Alternative 2. Additional impacts possible under beach placement options due to a possible light installation along PCH.	Potentially significant impacts on Malibu Canyon Road due to possible installation of a traffic light for all variations of Alternative 3.	Potentially significant impacts on Malibu Canyon Road due to possible installation of a traffic light for all variations of Alternative 3. Additional impacts possible under beach placement options due to a possible light installation along PCH.
Noise	Upstream barrier removal construction activities are anticipated to result in a significant short-term noise impacts for some receptors. These apply to B and D variations of Alternative 2.	Upstream barrier removal construction activities are anticipated to result in a significant short-term noise impacts for some receptors. These apply to B and D variations of Alternative 3.	Upstream barrier removal construction activities are anticipated to result in a significant short-term noise impacts for some receptors. These apply to B and D variations of Alternative 4.
Air Quality	The construction phase is expected to exceed the NOx threshold under CEQA.		The construction phase is expected to exceed the NOx threshold under CEQA.

9.0 ENVIRONMENTAL COMPLIANCE AND COMMITMENTS

9.1 Environmental Compliance

The NER, LPP, and the other alternatives have been designed and evaluated in accordance with the requirements of applicable federal, State, and regional standards and regulations. This section presents how the project is either compliant with applicable regulations or will achieve compliance before the project is implemented.

National Environmental Policy Act of 1969, Public Law 91-190, and California Environmental Quality Act. This EIS/EIR has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190, and the CEQA. The report was developed consistent with Article 9 Section 15120 to 15132 of the CEQA Guidelines and in accordance with the following NEPA requirements:

- Section 102 of the NEPA requires that all federal agencies use a systematic, interdisciplinary approach to protection of the human environment; this approach will ensure the integrated use of the natural and social sciences in any planning and decision making that may have an impact upon the environment. The NEPA also requires the preparation of a detailed EIS on any major federal action that may have a significant impact on the environment. This EIS must address any adverse environmental effects that cannot be avoided or mitigated, alternatives to the proposed action, the relationship between short-term uses and long-term productivity of the environment, and any irreversible and irretrievable commitments of resources involved in the project.
- Council of Environmental Quality (CEQ) Regulations on Implementing NEPA Procedures (40 CFR 1500 et seq.). These regulations provide for the use of the NEPA process to identify and assess the reasonable alternatives to proposed actions that avoid or minimize adverse effects of these actions upon the quality of the human environment. “Scoping” is used to identify the scope and significance of important environmental issues associated with a proposed federal action through coordination with federal, State, and local agencies; the public; and any interested individual or organization prior to the development of an impact statement. The process is also intended to identify and eliminate, from further detailed study, issues that are not significant or that have been covered by prior environmental review.
- U.S. Army Corps of Engineers (USACE) Environmental Quality Procedures for Implementing NEPA (33 CFR Part 230) provides guidance for implementation of the procedural provisions of NEPA for the Civil Works Program of the USACE. It supplements Council on Environmental Quality (CEQ) Regulations 40 C.F.R. 1500-1508, November 29, 1978, in accordance with 40 C.F.R. 1507.3, and is intended to be used in conjunction with the CEQ regulations. This regulation is applicable to all USACE personnel responsible for preparing and processing environmental documents in support of civil works programs.

As specified in NEPA and CEQA, reasonable alternatives were identified and evaluated, as presented in Sections 3 and 4. Potential environmental effects were identified and mitigation measures were proposed to reduce any potentially significant impacts to a less-than-significant level where feasible. The Draft EIS/EIR will be circulated for a 45-day period for public and resource agency review and comment. After the 45-day public review period, a Final EIS/EIR will be prepared in accordance with both NEPA and CEQA requirements.

Clean Water Act of 1977 (33 U.S.C. §1251 et seq.), as Amended. Impacts affecting water resources of the United States, as defined under the Clean Water Act (CWA), have been considered in this Draft EIS/EIR in **Section 5.3**. The Federal Water Pollution Control Act Amendment of 1972, as amended by the Clean Water Act of 1977 requires an assessment of impacts associated with the discharge of dredged or fill materials into the Waters of the United States. Appendix H provides an evaluation of these impacts. Section 230.10 (a)(2) of the 404(b)(1) guidelines state that "an alternative is practicable if it is available and capable of being done after taking into consideration costs, existing technology, and logistics in light of overall project purposes." A Draft 404(b)(1) evaluation has been prepared in compliance with the Clean Water Act (see Appendix H).

The USACE will ensure that this project as proposed is consistent or otherwise in compliance with the Section 404(b)(1) guidelines of the Clean Water Act. Unless exempted under Section 404(r), the 404(b)(1) guidelines prohibit the USACE from undertaking a project unless it is the LEDPA. If exempted under 404(r) specifically during project authorization, the USACE can implement a plan that is not the LEDPA, and would also be exempt from Section 401 compliance. In absence of a 404(r) exemption, to comply with Section 401 of the Act, the USACE will provide the draft IFR and appropriate technical documentation to the Regional Water Quality Control Board. Upon review of the submittal, the RWQCB will evaluate if issuance of a Section 401 Water Quality Certification is appropriate. USACE will continue to coordinate with the RWQCB throughout the remaining study, design, and construction phases of the project. Project construction will not commence until after Section 401 State Water Quality certification is obtained. The IFR contains sufficient information regarding water quality effects, including consideration of Section 404(b)(1) guidelines, to meet EIS content requirements of Section 404(r), should that exemption be invoked.

To comply with Section 402 of the CWA, coverage under the National Pollution Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Use Disturbance Activities (Order No. 2010-0014-DWQ, as amended) would be obtained prior to construction. A Stormwater Pollution Protection Plan (SWPPP), which would establish best management practices for storm water and non-storm water source control and pollutant control, would be prepared and implemented by the construction contractor.

Clean Air Act of 1970, as Amended. Potential air quality impacts have been assessed in **Section 5.12**. The section discusses the issues relative to the project's compliance with the USEPA's adopted de minimis thresholds in its general conformity rule. The general conformity applicability analysis in Section 5.12 determined that project-related emissions under both the NER and likely LPP are under the de minimis threshold for all pollutants. Therefore, a general conformity determination is not required.

Fish and Wildlife Coordination Act (16 U.S.C. Section 661 et seq.). This statute requires federal agencies to coordinate with the U.S. Fish & Wildlife Service (USFWS), applicable state agencies, and the National Marine Fisheries Service (NMFS), as appropriate, when a stream or body of water is proposed to be modified. The intent is to give fish and wildlife conservation equal consideration with other purposes of water resources development projects. Coordination with the USFWS, the NMFS, and the California Department of Fish and Wildlife has been ongoing throughout the planning process. Representatives of these agencies were members of the Technical Advisory Committee (TAC) that was established to assist in the planning activates relative to this feasibility study.

Numerous coordination meetings were held with the TAC throughout the planning process. The TAC participated in the planning decisions that determined the scope of biological surveys performed, the scope of the vegetation surveys performed, and all aspects of the habitat valuation performed for this project.

USFWS prepared a Planning Aid Report on June 20, 2005 and a Draft Coordination Act Report (CAR) on May 17, 2013. The Draft CAR is in **Appendix O** of this Integrated Report. The Final CAR will accompany the Final IFR, along with USACE's responses to its recommendations.

The USACE is continuing coordination with the USFWS, NMFS, and CDFW as part of the public review of the Draft EIS/EIR and will continue coordination throughout the feasibility phase.

Magnuson-Stevens Fishery Management and Conservation Act, as amended. The Project is located within an area designated as EFH for two Fishery Management Plans (FMPs): Coastal Pelagic Species Fishery Management Plan and Pacific Coast Ground fish Fishery Management Plan. The USACE has determined that the proposed project may adversely affect EFH, but the project is not expected to have a substantial adverse effect to EFH. The USACE will consult with NMFS on EFH using the information contained in this IFR.

Endangered Species Act (ESA) of 1973, as Amended (Public Law 93-205). The USACE received a list of threatened and endangered species that potentially could occur in the study area on May 17, 2013 from the U.S. Fish & Wildlife Service (USFWS). The southern California steelhead is the only species identified by the NMFS. The USFWS identified the following species in their species list letter: least Bell's vireo, yellow-billed cuckoo, California least tern, and tidewater goby.

Section 7 (c) of the Endangered Species Act requires consultation with the USFWS to determine if a Federal action may affect threatened or endangered species, and to ensure that any action does not jeopardize the continued existence or result in the destruction or adverse modification of designated critical habitat of any threatened or endangered species.

The USACE has concluded that the NER and LPP will have an overall beneficial effect on steelhead. The steelhead may experience short-term adverse effects from high sediment concentrations (turbidity) associated with the erosion of sediment from behind the dam. Significant, long-term beneficial effects are expected to steelhead from the removal of an impassible barrier (Rindge Dam and upstream barriers) to allow steelhead to reoccupy 13.5 mi of high quality steelhead habitat, the restoring of a more natural sediment regime to the ecosystem. (See details in Appendix C1 or the summary in Section VII of Appendix C1.) The USACE will initiate formal consultation with NMFS for the steelhead.

The USACE has assessed that the NER plan and the LPP would have no effect on [insert species [but may affect but is not likely to adversely affect [insert species] if they are present. The USACE will conduct surveys prior to construction for these species. The USACE plans to conduct informal consultation with the FWS for these species.

National Historic Preservation Act of 1966, as Amended. The Proposed Action has the potential to impact archeological resources. To address potential resources, CDPR has conducted surveys for archaeological resources within the proposed project area and USACE would implement mitigation measures to adverse effects prior to proceeding with the project.

USACE is consulting with the California SHPO regarding determinations of eligibility and effect. All documentation will also be provided to interested Native American groups. If the USACE determines that the project and its alternatives will have an adverse effect on National Register eligible properties, and the SHPO concurs, the Advisory Council will be notified per 36 CFR 800.6.

Coastal Zone Management Act (16 U.S.C. Sections 1451 et seq.) and California Coastal Act (California Public Resources Code, Division 20, Section 30000 et seq.). The Coastal Zone Management Act preserves, protects, develops where possible, and restores and enhances the Nation's coastal zone resources. It additionally encourages and assists states in their responsibilities in the coastal zone through development and implementation of management programs. The California Coastal Act of 1976, as amended, protects and enhances coastal resources within the California Coastal Zone, including, but not limited to public coastal access, recreation, the marine environment, land resources and development. A Coastal Consistency Determination will be submitted for review to the CCC in order to comply with the requirements of these acts.

Migratory Bird Treaty Act (16 USC Section 703-712). The Migratory Bird Treaty Act (MBTA) decrees that all migratory birds and their parts (including eggs, nests and feathers) are fully protected. Under the MBTA, taking, killing, or possessing migratory birds is unlawful. Projects that are likely to result in the taking of birds protected under the MBTA will require the issuance of take permits from the USFWS. Activities that would require such a permit would include, but not be limited to, the destruction of migratory bird nesting habitat during the nesting season when eggs or young are likely to be present. To comply with the MBTA, vegetation clearing would be completed outside of the nesting season for migratory birds (February 1 through August 15).

Estuary Protection Act (16 U.S.C Section 1221 et Seq.). The Estuary Protection Act requires federal agencies, in planning for the use or development of water and related land resources, to give consideration to estuaries and their natural resources. Although the southern- most end of the project is located in the Malibu Lagoon, the biological resources impact analysis in the Draft IFR concludes that the both the NER and likely LPP would not impact, and may ultimately enhance conditions, in this lagoon. Consequently, both the NER and likely LPP would be in compliance with this act.

Executive Order 11988, Floodplain Management. Executive Order 11988, dated May 24, 1977 requires federal agencies to avoid, to the extent possible, the short- and long-term adverse impacts associated with the occupancy and modification of floodplains. If there is no practicable alternative to undertaking an action in a floodplain, any potential adverse impacts must be mitigated. The Water Resources Council Floodplain Management Guidelines for implementation of EO 11988, as referenced in USACE ER 1165-2-26, require an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. The eight step process and project-specific responses are summarized below.

1. Determine if the proposed action would be in the base floodplain.

The project is an aquatic ecosystem restoration, and is therefore within the floodplain. The aquatic ecosystem in Malibu Creek cannot be restored by actions taken outside of the floodplain.

2. If the proposed action would be in the base floodplain, identify and evaluate practicable alternatives to the action or locating the action in the base floodplain.

The aquatic ecosystem of Malibu Creek cannot be restored by actions outside of the floodplain. Therefore, there are no practicable alternatives to meet the project objectives outside of the floodplain.

3. If the action must be in the floodplain, advise the general public in the affected area and obtain their views and comments.

The proposed project has been fully coordinated with the general public, governmental agencies, organizations, and interested stakeholders. Public and agency involvement is described in detail in Section 11 below.

4. Identify beneficial and adverse impacts due to the action and any expected losses of natural and beneficial floodplain values. Where actions proposed to be located outside the base floodplain will affect the base floodplain, impacts resulting from these actions should also be identified.

The anticipated impacts of both the NER and likely LPP are discussed in detail in Chapters 5 and 6 of this report. During construction, project features would result in temporary adverse impacts to the natural environment, including the floodplain. However, the proposed restoration efforts under both the NER and likely LPP would result in long term significant benefits to the floodplain, including an increase in quantity and quality of riparian and aquatic habitat and connectivity.

5. If the action is likely to induce development in the base floodplain, determine if a practicable non-floodplain alternative for the development exists.

The project vicinity along Malibu Creek in many areas consists of steep sloping canyon walls that cannot be developed. In addition, the majority of the floodplain within the project area are owned by CDPR and maintained as state parks. Upper portions of the project area watershed are already developed with housing developments and neighborhoods. Neither the NER nor likely LPP are going to increase floodplain protection or reduce flood risk in any portions of the project area, nor will they open new lands for development. Given existing land use, urbanization, and topography, there are very limited or no opportunities for additional development within or downstream of the project footprint. Therefore, neither the NER nor likely LPP will induce any development of the floodplain.

6. As part of the planning process under the Principles and Guidelines, determine viable methods to minimize any adverse impacts of the action including any likely induced development for which there is no practicable alternative and methods to restore and preserve natural and beneficial floodplain values. This should include re-evaluation of the no action alternative.

Impacts as a result of implementing both the NER and likely LPP were evaluated in Chapter 5 on a resource by resource basis. Wherever there is a potential for adverse impacts, appropriate best management practices have been identified and listed. As there is a net benefit to the biological resources resulting from implementing either the NER or likely LPP, no biological mitigation would be required under either of these plans. The project would not induce development in the floodplain and would restore more natural processes to the floodplain by removing Rindge Dam and allowing natural sediment transport and flow regimes to occur. Neither the NER nor likely

LPP would result in an increased flood risk downstream of the project. Chapter 4 summarizes the process by which alternatives were identified, evaluated, screened, and selected, which includes analysis and comparison of the no action alternative.

7. If the final determination is made that no practicable alternative exists to locating the action in the floodplain, advise the general public in the affected area of the findings.

No practicable alternatives outside of the floodplain exist which could meet project objectives of restoring the aquatic ecosystem within Malibu Creek. The Draft IFR will be released for public and agency review, including posting in the Federal Register. Public meetings will also be held during the public review period.

8. Recommend the plan most responsive to the planning objectives established by the study and consistent with the requirements of this Executive Order.

Both the NER and likely LPP are equally responsive to the study objectives, and have identical work proposed within the floodplain. Both are equally consistent with the requirements of this EO.

Executive Order 11990, Protection of Wetlands. Executive Order 11990, dated May 24, 1977 is intended to support NEPA by directing federal agencies and programs to avoid to the extent possible the long and short-term adverse impacts associated with the destruction or modification of wetlands, and to avoid direct or indirect support of new construction in wetlands whenever a practicable alternative exists. New construction is defined as including dredging and filling activities. The Act directs federal agencies to avoid unnecessary alteration or destruction of wetlands and requires federal agencies to prepare wetland assessments for proposed projects which are located in, or which affect wetlands. Implementation of the NER or likely LPP would restore natural stream process and would provide beneficial impacts to Malibu Creek, Las Virgenes Creek, and Cold Creek. In addition, removing Rindge Dam would result in beneficial impacts to sensitive wildlife known to occur in Malibu Creek. As the removal of the Dam has been deemed necessary, and all practical measures to reduce impacts to wetlands would be implemented, the project would be in compliance with this Executive Order.

Executive Order 13122, Invasive Species. Executive Order 13112, dated February 3, 1999, requires that a proposed project include measures to prevent the introduction of invasive species and provide for their control to minimize the economic, ecological, and human health impacts that invasive species cause. With implementation of mitigation measures, including the restoration of disturbed sites with native vegetation, the project would be in compliance with this Executive Order.

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority
Populations and Low-Income Populations. This EO states that Federal agencies are responsible for conducting their programs, policies, and activities that substantially affect human health of the environment in a manner that ensures such programs, policies, and activities do not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin. The objectives of this executive order include identifying and addressing disproportionately high and/or adverse impacts of federal programs, policies, or activities on minority and/or low-income populations. The required analysis has been conducted, and no disproportionately high and/or adverse impacts to minority and/or low-income populations have been identified if either the NER or likely LPP are

implemented. Both the NER and likely LPP are therefore in compliance with the directives and objectives of this executive order.

Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. On April 21, 1997, President Clinton signed Executive Order 13045 that requires federal agencies to identify and assess environmental health risk and safety risks, which may disproportionately affect children. The NER would not disproportionately impact children. The NER would restore habitat for spawning steelhead. Potential impacts were identified with regard to biology, air quality, aesthetics, noise, transportation, and recreational uses. Mitigation measures were identified to reduce these potential impacts to less-than-significant levels. While there was no specific study conducted to assess impacts to children, there is no indication that any impacts would disproportionately affect children.

California Endangered Species Act. Provides for the protection of rare, threatened, and endangered plants and animals, as recognized by the CDFW, and prohibits the unauthorized taking of such species. As a responsible agency, the CDFW has regulatory authority over state-listed endangered and threatened species. State agencies are required to consult with the CDFW on actions that may affect listed or candidate species. The CDPR will coordinate with the CDFW to ensure compliance with this Act. With implementation of mitigation measures and Conservation Measures for special-status species, both the NER and likely LPP would be in compliance with state law.

California Fish and Game Code Sections 3503, 3503.5, 3511: Fully protected birds, Section 4700: Fully protected mammals, Section 5050: Fully protected reptiles and amphibians, Section 5515: Fully protected fishes. These Sections of the California Fish and Game Code regulate the taking of fully protected wildlife species in the state. With implementation of proposed mitigation measures under either the NER or LPP, including removal of vegetation outside the nesting season, the project would be in compliance with state law.

California Fish and Game Codes 1600-1607. Section 1600 et seq. of the California Fish and Game Code, as administered by CDFW, mandates that "it is unlawful for any person to substantively divert or obstruct the natural flow or substantially change the bed, channel, or bank of any river, stream, or lake designated by the department, or use any material from the streambeds, without first notifying the department of such activity." Streambed alteration must be permitted by CDFW through a Streambed Alteration Agreement. CDFW defines streambeds as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life" and lakes as "natural lakes and man-made reservoirs." CDFW jurisdiction includes ephemeral, intermittent, and perennial watercourses, and can extend to habitats adjacent to watercourses. Wetlands near watercourses would also be considered “habitats adjacent to watercourses”. Under Section 1602, prior to construction, the CDPR will enter into a Streambed Alteration Agreement with the CDFW that will include conditions to ensure impacts on fish and wildlife or habitat are avoided or minimized. Since this project is an ecosystem restoration project, it is anticipated that no mitigation will be required.

Native Plant Protection Act, California Fish and Game Code Section 1900-1913. The Native Plant Protection Act (NPPA) was enacted in 1977 and allows the California Fish and Game Commission to designate plants as rare or endangered. There are 64 species, subspecies, and varieties of plants that are protected as rare under the NPPA. The NPPA prohibits take of endangered or rare native plants, but includes some exceptions for agricultural and nursery operations; emergencies; and after properly notifying CDFW for vegetation removal from canals, roads, and other sites, changes in land use, and in certain other situations. With implementation of mitigation measures and Conservation Measures for special-status species, the project would be in compliance with state law.

Porter-Cologne Water Quality Control Act, California Water Code Section 13000 et seq. The 1969 Porter-Cologne Water Quality Control Act authorizes RWQCB to regulate discharges of waste and fill material to waters of the State, including “isolated” waters and wetlands, through the issuance of waste discharge requirements (WDRs). Potential effects of the NER and LPP on water quality have been evaluated and are discussed in **Section 5.3**. This project expects to achieve full compliance with this Act by achieving compliance with RWQCB certification mandates for Section 401 of the CWA.

Appendix F of CEQA Guidelines: EIRs are required to discuss potential energy impacts of proposed actions, with emphasis on avoiding or reducing inefficient, wasteful, or unnecessary energy consumption. NEPA directs that an EIS should include energy requirements and potential mitigation measures (40 CFR 1502.16(e)). Energy requirements of the project primary includes fuel for transport and construction vehicles. In order to reduce inefficient, wasteful, or unnecessary energy consumption, the use of low emissions vehicles as described in mitigation measures AQ-1 is required.

9.2 Mitigation Measures

The environmental commitments described in the Environmental Consequences Section to reduce or avoid significant impacts of the Proposed Action are summarized or listed in this section by resource.

9.2.1 *Earth Resources*

- **ER-1. Stabilization of Slopes**. Stabilization measures to the extent practical will be implemented to protect Malibu Canyon Road, and other areas as determined necessary and as recommended in **Appendix D** from landslide and soil destabilization effects that may be produced by the project as determined by a slope stability exploration and geotechnical evaluation to be conducted prior to project construction.
- **ER-2. Implement Best Management Practices (BMPs).** An erosion-control and spill response plan will be prepared and implemented to include erosion-control best-management practices during construction and implementation of geotechnical recommendations described in the **Appendix D**, including re-vegetation of disturbed areas, sloping the final impound surface at the end of each construction year, cutting the dam simultaneously with reducing impound elevations, construction of a cofferdam for control of flows, removal of the cofferdam during the winter season, dewatering sediments, diverting water around construction through pumping and/or piping, development of slope stability measures for groundwater saturation, construction ramp stability measures, and erosion-control measures at disposal sites.
- **ER-3 Sediment Analysis**. Additional sediment grain size analysis would be performed prior to excavation of the sand layer to confirm the material grain size for beach nourishment. Additionally, quality control and quality assurance measures would be identified during the PED phase and implemented during construction to ensure the material that is identified as beach quality sand is the material that is taken to the beach sites.

9.2.2 *Water Resources and Water Quality*

- **WR-1. Best Management Practices During Construction.** Prior to construction a stormwater pollution prevention plan (SWPPP) will be prepared to address potential impacts to stormwater from construction equipment, construction crews, and construction practices. The SWPPP shall include best management practices to prevent accidental spills and other contamination of Malibu Creek, and shall include provisions for in-the-dry construction at the barrier sites, and regular monitoring of water quality, including turbidity, during construction and in the winter runoff season. The SWPPP will include a provision for adaptive measures to be taken in the event of excess contamination or turbidity.
- **WR-2. Water Quality Monitoring During Nearshore Placement**. If material is placed off shore utilizing a barge (2a2, 2b2, 2c2, and 2d2), appropriate water quality monitoring would occur during sediment placement to ensure no significant impacts to water quality occurred.

9.1.1 Biological Resources

- **BIO-1. Qualified biologist oversight.** A qualified biologist will be responsible for overseeing compliance with protective measures for the biological resources during clearing and construction activities within designated areas.
- **BIO-2 Oil Spill Control.** Oil-absorbing floating booms will be kept onsite and the contractor will respond to aquatic spills during construction.
- **BIO-3 Equipment Maintenance.** Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
- **BIO-5 Vegetation Removal Outside of Nesting Season.** Vegetation will be removed outside of the nesting season for migratory birds (February 1 through August 15) to the extent possible. If vegetation removal must be conducted during the nesting season, the area will be surveyed by a qualified biologist and appropriate buffers will be identified in consultation with the USFWS and CDFW to ensure impacts to nesting birds do not occur.
- **BIO-6 Construction Speed Limit.** Construction crews will be required to maintain a 15-m.p.h. speed limit on all unpaved roads to reduce the chance of wildlife being harmed if struck by construction equipment.
- **BIO-7 Vehicle Travel During Daylight Hours.** Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at night.
- **BIO-8 SWPPP.** A Storm Water Pollution Prevention Plan (SWPPP) will be required to prevent construction materials (fuels, oils, and lubricants) from spilling or otherwise entering the creek.
- **BIO-9 Employee Education Program.** An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the proposed project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the project area the following information:
    - A detailed description of all listed species including color photographs;

  - The protection listed species receive under the Endangered Species Act and possible legal action or that may be incurred for violation of the Act;
  - The protective measures being implemented to conserve all listed species during construction activities associated with the proposed project; and
  - A point of contact if listed species are observed.
  - Provisions of water quality Best Management Practices (BMP) and provisions of the SWPPP will be provided along with consequences for violations incurred by non-compliance with BMP and SWPPP provisions.
  - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting for the listed species that may be encountered during construction.
  - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- **BIO-10Fish Rescue and Relocation.** A fish rescue and relocation plan will be developed prior to commencing work in areas where impacts to special status fish species may occur. The fish rescue and relocation will be conducted under the supervision of a qualified biologist and will entail measures to reduce effects to steelhead and other fish associated with in-water construction activities.
- **BIO-11Special status plant species.** Pre-construction surveys at the appropriate time of year will determine of any are present in the construction areas. If present, conservation measures would planned and conducted in consultation with the USFWS and CDFW to mitigate impacts including relocation or collection of propagules of perennial species, collection of propagules of annual species, or waiting for seed set mitigation.

9.1.2 Cultural Resources

- **CR-1: Archaeological Monitoring of Earth Moving Activities at Rindge Reservoir.** Because the reservoir behind Rindge Dam is filled with 780,000 cy in sediments, it is unknown whether archaeological sites were buried during sedimentation. Therefore, a qualified archaeologist shall monitor earth removal activities as needed where the native stratigraphy (i.e. along the canyon walls and bottom) becomes exposed in order to locate, record and assess impacts to any buried archaeological resources. As the project intent is solely to remove sediments built up since the dam was constructed, no further excavation should be required once the originally topography is reached. Therefore, implementation of this archaeological monitoring requirement would reduce any potential impacts to unknown archaeological deposits to a less than significant level.
- **CR-2: Archaeological Monitoring of Beach Nourishment at Surfrider Beach.** Initial beach nourishment at Surfrider Beach shall be monitored by a qualified archaeologist and Native American observer in order to ensure that no impacts occur to the Adamson Saltwater Tank or archaeological site CA-LAN-264 as a result of the sand delivery and spreading activities. Since the project would involve the addition of sediments and could be re-directed as necessary in order to avoid potential impacts to archaeological resources, implementation of this archaeological monitoring requirement would reduce any potential impacts to historic resources or archaeological deposits to a less than significant level.
- **CR-3: Archaeological Monitoring of Construction Staging at the Sheriff’s Honor Camp Site (Sheriff’s Overlook).** A qualified archaeologist will monitor construction staging set-up at the Sheriff’s Honor Camp site, and perform periodic spot-checks of the staging area throughout the life of the project construction to ensure that no impacts occur

to the historic features associated with the Camp. Implementation of this archaeological monitoring requirement would reduce any potential impacts to the Sheriff's Honor Camp site to a less than significant level.

- **CR-4: Completion of Historic American Engineering Record (HAER) Documentation** of the Rindge Dam and the Associated Rindge Water Pipeline. Prior to removal, a complete record of the Rindge Dam and the associated Rindge Water Pipeline will be prepared according to HAER program guidelines, as administered under the National Park Service. Only those sections of the Pipeline shall be removed as necessary to allow for removal of the dam and restoration of the creek channel; all other intact sections of Pipeline shall remain in place.
- **CR-5: Incorporation of Interpretive Exhibits and Restoration of the Sheriff's Honor Camp site.** Following project completion, the Sheriff's Honor Camp site will be restored as an interpretive road turnout with overlooks of the Rindge Dam site and Malibu Canyon. Interpretive exhibits explaining the historical significance of Rindge Dam and the historic and prehistoric significance of the Malibu Canyon area, including the Honor Camp, will be developed and installed in consultation with CDPR interpretive and cultural resource staff. The design for the proposed interpretive features at this location shall preserve and incorporate the rock retaining walls and associated features to the extent possible in accordance with the *Secretary of the Interior Standards for the Treatment of Historic Properties,* and in consultation with the SHPO. A qualified archaeologist will monitor construction of the interpretive overlook in order to ensure that there are no impacts to historic features of the Honor Camp site.
- **CR-6: Completion of Historic American Engineering Record (HAER) and Historic American Building Survey (HABS).** Documentation of the White Oak Farm Historic District. During the project design phase, all feasible measures for minimizing the portion of the dam requiring removal in order to meet project objectives shall be explored. Prior to dam removal, in whole or in part, a complete record of the White Oak Dam and associated Powerhouse will be prepared according to HAER program guidelines, as administered under the National Park Service. Since the dam is a contributing element to the larger White Oak Farm Historic District, documentation of the remainder of the district's contributing historic resources, including the Colyear/Hope Ranch house and barn will be prepared according to HABS program guidelines. The information in the HABS/HAER documentation would be used to plan and undertake future structural stabilization of the historic features, and to prepare and implement an interpretive plan that portrays the story of the ranch's contribution to the agricultural heritage of the area.

9.1.3 Socioeconomics

No mitigation measures were identified to reduce project impacts to a level of less than significant.

9.1.4 Aesthetics

- **AES-1. Reduce visibility of construction activities and construction related equipment.** Construction activities and construction related equipment, including staging areas, laydown areas, stockpiles, conveyors, and equipment storage will be temporarily screened throughout construction when visible from roads, trails, scenic overlooks, residences to the extent practicable. Screening will consist of temporary screening fences with colors and materials to reflect the natural surroundings.
- **AES-2. Restoration of disturbed areas to blend with surrounding areas.** Slopes will be constructed to match existing slopes. A revegetation plan will be developed with a native plant palette. Areas visible from Malibu Canyon Road and/or residences will be planted with a combination of fast growing native plants and/or larger native plants to obscure scarring from construction activities. The re-vegetation plan should include a plant palette and proposed sizes, maintenance procedures during establishment period, including irrigation, if any, and replanting of dead vegetation. All areas disturbed by construction, including cleared areas, shall be restored to their original condition or an improved condition.
- **AES-3. Incorporate aesthetic considerations into road improvement plans.** The contractor will develop road improvement plans for required reconstruction or maintenance incorporating the use of aesthetic features. Plans will be submitted to the USACE for review and approval prior to implementation. Aesthetic features include, but are not limited to, drainage, slopes, retaining walls, and screenings to match surroundings.
- **AES-4. Incorporation of interpretive signs into restoration of the Sheriff's Overlook.** Interpretive signs featuring the historical significance of Rindge Dam will be installed as a component of the restoration efforts at the Sheriff's Overlook. Plans for the interpretative signs will be designed by the CDPR Department and USACE.
- **AES-5. Minimize stockpiling of sand on beach to prevent obstruction of coastal views.** Stockpile maximum heights will be kept to a minimum to avoid obstruction of coastal views.
- **AES-6. Minimize construction equipment storage areas at beach replenishment site.** Construction equipment storage areas will be minimized to reduce temporary disturbances to coastal views. If public parking areas are used for construction equipment storage, temporary removal of parking spaces will be minimized in order to maximize public access to coastal scenic areas.

9.1.5 Recreation Resources

No mitigation measures were identified to reduce project impacts to a level of less than significant.

9.1.6 Transportation

- **T-1. Transportation Management Plan.** During the design phase, a Transportation Management Plan (TMP) will be prepared to address any transportation related issues. This plan will be circulated to the City of Calabasas, City of Malibu, Los Angeles County, and Caltrans for review and approval to minimize temporary traffic impacts during construction. The TMP will cover all aspects of construction and will include haul routes, material hauling activities to the landfill and beaches, details of public parking closure at the beaches, all traffic control measures required including traffic signals, and all aspects of construction necessary during construction of the project. This plan would be developed by a registered Civil or Traffic Engineer who would be qualified to perform traffic studies and is familiar with the project area.
- **T-2. Road Repair.** The construction contractor will repair any damage or changes to neighboring roadways that occurred as a result of construction. The construction contractor will coordinate repairs with the appropriate public agencies to ensure that any damage is properly repaired.

9.1.7 Noise

- **NOISE-1. Noise Ordinances.** The construction contractor will obey all local noise ordinances. Title 12 Section 12.08.440 of the LAC code, restricts construction activities between the hours of 7:00 a.m. and 8:00 p.m. Construction is prohibited on Sundays and legal holidays. Construction and demolition activities that occur in Los Angeles County (LAC) are anticipated to occur only during the day.
- **NOISE-2. Heavy Equipment Operations.** The construction contractor will stagger heavy equipment operations. Noise reduction will be achieved by reducing the numbers and types of equipment that are operating at the same time. The use of equipment such as chainsaws and masonry saws would be scheduled so that they are not being used when other equipment is operating. In addition, standard masonry saw blades will be replaced with “damped” masonry saw blades. Noise from haul trucks will reduced by developing a schedule that prevents overlap of trucks entering and exiting the site and would be scheduled so that no more than two haul trucks are at the site at one time and for the sediment hauling option, trucks would be scheduled so that one truck is entering the site immediately after another truck has just left. Bull dozer work would be scheduled so that no more than two bull dozers are operating at a time.
- **NOISE-3. Electrically Powered Tools.** The construction contractor will use electrically powered tools when possible.
- **NOISE-4. Engine Covers and Mufflers.** Heavy equipment should be equipped with **manufacturer** recommended mufflers and adequate engine covers. Engine covers should be kept shut during operation.
- **NOISE-5. Terrain Maximization.** Maximization of surrounding terrain, such as a canyon, to reduce **noise** levels will occur.
- **NOISE-6. Additional Noise Attenuation Techniques.** The construction contractor will implement additional noise attenuation techniques such as sound blankets on noise generating equipment and the placement of temporary sound barriers between **construction** areas and sensitive receptors.

9.2.10 Air Quality and Global Climate Change

There are no air quality or global climate change related mitigation measures.

9.2.11 Safety and Hazards

- **HAZ-1. Reduce risk of wildfires.** The construction contractor will develop a fire prevention and response plan appropriate for the use of heavy equipment in a high fire hazard area, approved by the USACE, the CDPR Department, and the Los Angeles County Fire Department, prior to the initiation of construction.
- **HAZ-2. Hazardous Substances Control Plan.** The construction contractor will prepare a Hazardous Substance Control and Emergency Response Plan. The plan will develop an emergency response plan for the safe cleanup up accidental hazardous substance spills. To reduce the potential for spills during construction and equipment maintenance the plan will include hazardous materials handling procedures. Areas where refueling, equipment maintenance activities, and storage of hazardous materials, will be identified in the plan.
- **HAZ-3. Traffic Control Plan on Surface Streets.** The construction contractor will prepare a traffic control plan. The plan will address the safe exit and entry of trucks and construction equipment onto surface streets, including the use of flagging personnel where needed.
- **HAZ-4. Beach Safety Plans.** The construction contractor will prepare a beach safety plan. The plan will address fencing around stockpiles and construction equipment, closures of portions of parking lots during sand delivery, and closures of beach areas during spreading operations to ensure the safety of the public.
- **HAZ-5. Contingency Plan for Contaminated Soil.** Prior to the initiation of construction the contractor will develop a contingency plan for the detection and removal of contaminated soil that may be encountered during construction. This plan will be approved by the USACE prior to the initiation of construction.

9.2.12 Utilities

- **U-1.** Prior to construction during the PED phase, utility locations within the vicinity of each project feature shall be identified and verified, in coordination with each utility provider. If relocation of a utility line is determined to be required and cannot be avoided, the appropriate utility service provider would be consulted to sequence construction activities to avoid or minimize interruptions in service. Any relocation or modification to utilities shall comply with permit conditions and such conditions shall be included in the contract specifications.
- **U-2.** If utility service disruption is necessary, residents and businesses in the project area would be notified a minimum of two to four days prior to service disruption through local newspapers, and direct mailings to affected parties.

10.0 OTHER NEPA/CEQA REQUIRED ANALYSES

10.1 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

10.1.1 Introduction

NEPA (40 C.F.R. §1502.16) requires that an EIS consider the relationship between short-term uses of the environment and the impacts that such uses may have on the maintenance and enhancement of long-term productivity of the affected environment. This section considers the short- and long-term environmental effects of the NER. Typically projects result in short-term gains and long-term losses, however, the NER would result in short-term losses and long-term gains. Short-term uses of the environment that would occur with restoration include impacts on existing resources from construction-related activities. In the long term, the site is expected to be substantially more productive with respect to wildlife, habitat, hydrology, and other resources. While this section specifically addresses the NER, the potential LPP would have result in similar short and long term losses and gains. In places where the NER and LPP differ, both components are discussed. Therefore, this discussion applies to both the NER and LPP.

10.1.2 Short-Term Losses

As discussed in **Section** 4, short-term impacts would result from removal of the Rindge Dam and barriers, and transportation and disposal of sediments and construction debris at the Calabasas Landfill and the beach nourishment site, or at the nearshore site under the LPP. These NER and LPP components would result in temporary adverse impacts. Short-term turbidity increases would occur as residual silts and clays are washed downstream. Viewsheds would be disrupted throughout the construction period until revegetated areas mature. The Sheriff's Overlook area would not be available as a turnout for viewing the area. Temporary losses of vegetation and habitat would occur in the project vicinity. Disposal of sand at the beach site would impact recreation use of the Malibu Pier parking lot during delivery and spreading operations under the NER, but would be avoided in the LPP. Air quality, traffic, and noise would all be temporarily impacted during construction, and these impacts are generally comparable under the NER and LPP.

10.1.3 Long-Term Losses

Long-term impacts will occur with the NER, including changes in hydrology and water resources. Removal of Rindge Dam and White Oak Dam constitutes a long term loss of a cultural resource. Scouring that occurs in the area immediately downstream of the Rindge Dam would not occur after dam removal. Habitat areas upstream and immediately downstream of the dam may undergo changes in response to the new flow regime.

10.1.4 Long-Term Gains

As a result of the either the NER or LPP, multiple long-term beneficial impacts would occur. Malibu Creek would be restored and barriers removed returning the area to a more natural state similar prior to the period before Rindge Dam was constructed. Rindge Dam and barrier removal will facilitate upstream migration of steelhead by opening 18 mi of stream habitat that Rindge Dam and barriers current prohibit access to. Rindge Dam removal will also facilitate movement of other fish, amphibians, reptiles, small mammals, and invertebrates that cannot pass over the Rindge Dam. Large mammals would be able to pass through the area without having to move near Malibu

Canyon Road. Beach nourishment with beach compatible sand removed from the impoundment area would replace sand that would have previously been conveyed downstream to area beaches. Additionally, beach nourishment would replenish the beach adjacent to Malibu Pier, which has suffered wave-induced erosion, restoring this area for recreational purposes. Rindge Dam would be memorialized through interpretive signs at Sheriff's Overlook explaining its historical merits. These long-term gains provide greater benefits than the previously discussed short- and long-term losses.

10.2 Irreversible or Irretrievable Commitments of Resources Involved

10.2.1 *Introduction*

NEPA (40 C.F.R. §1502.16) and CEQA Guidelines (Section 15126.2[c]) require analysis of significant irreversible and irretrievable effects. Irreversible commitments include permanent damage to the environment that cannot be reversed. Irretrievable commitments include those that are temporarily lost but can be replaced either on site or off site after the NER or LPP have been undertaken. This section describes any resources that would be lost either temporarily or permanently as a result of the constructing either the NER or LPP

10.2.2 *Irreversible Commitments*

The NER and LPP would result in the irreversible commitment of fossil fuels and other energy sources to demolish the Dam and barriers, transport the impounded sediments, spread sand at the beach nourishment area or place sand offshore via barge, restore the study area, and replace/modify barriers. These resources cannot be replaced with more valuable resources once they are depleted. They represent a commitment of non-renewable resources. Restoration itself is not considered an irreversible commitment because the landscape could be converted to other land uses in the future.

Demolition of Rindge Dam is an irreversible commitment of a historic resource, as is the removal of White Oak Dam. Once Rindge Dam is removed, the historic resource cannot be replaced. Under the NER, the spillway would be left intact and therefore the entire structure of the dam would not be removed. Under the LPP, both the dam and spillway would be removed, as well as the White Oak Dam. However, under both the NER and LPP, Rindge Dam would be memorialized with interpretative signs at the Sheriff's Overlook following construction. Rindge Dam removal will allow the more valuable restoration of the Malibu Creek ecosystem to occur as the dam itself is obsolete for its original intended function as a reservoir.

10.2.3 *Irretrievable Commitments*

Sediment impounded behind Rindge Dam is considered an irretrievable resource since continued sediment transport would replenish excavated sediment. The sediment would be mechanically transported from behind Rindge Dam. Approximately 276,000 cy of beach compatible materials would be transported to either the beach for sand nourishment under the NER, or the nearshore environment under the LPP. Non-beach compatible materials would be transported to Calabasas Landfill for disposal. With implementation of either the NER or LPP, approximately 504,000 cy of sediment and construction materials would be transported to the landfill. Materials at the landfill that are not reused would be disposed after five years. Only a portion of this resource will be permanently lost if it cannot be reused and is permanently disposed at the landfill. The portion of the resource that is not permanently lost would be beneficially reused at the beaches and by others.

10.3 Growth Inducement and consistency with applicable general plans and policies

10.3.1 *Growth Inducement and Consistency with Applicable General Plan and Policies*

Growth inducement and consistency with applicable general plan and policies are addressed in this section.

NEPA (40 C.F.R. §1508.8) defines *indirect effects* as those that include growth-inducing effects or other effects related to induced changes in population density or growth rate. CEQA Guidelines Section 15126.2(d) requires a discussion of growth-inducing impacts of the NER. The NER would not result in direct growth inducing impacts, but could facilitate growth in the study area and indirectly induce growth through increased development of recreational resources.

Most of the development in the vicinity of the project site and beach/nearshore placement site has occurred in the cities of Malibu and Calabasas. Any potential growth inducement as a result of the NER or LPP would be consistent with the land use policies of the applicable general plans for this area. General plans and policies regarding land use are described in Section 7.2, Land Use and Planning.

While neither the NER nor LPP would directly induce growth, the removal of Rindge Dam and restoration of the Malibu Creek ecosystem would indirectly accommodate future development of recreational resources. Restoration of the Malibu Creek watershed to a more natural condition could increase the aesthetic value of the area, which may lead to increased development of recreational resources. Additional recreational resources may then lead to increased tourism or demand for housing in a highly valued area.

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11.0 PUBLIC INVOLVEMENT AND AGENCY COORDINATION

11.1 Agency Coordination

The USACE is the lead agency under NEPA, and the CDPR is the lead agency pursuant to CEQA. Implementation of the construction phase will be cost-shared between the federal government and non-federal sponsors and therefore this integrated report is prepared as a joint document to fulfill both NEPA and CEQA requirements.

This study was coordinated continuously with concerned resource agencies throughout the planning process and during development of the Integrated Feasibility Report. This coordination took place both as direct coordination with agencies and through the Malibu Technical Advisory Committee (TAC), described in detail in Appendix A. Since the process and participation of the TAC is discussed in detail in Appendix A, only direct agency coordination is discussed here.

11.1.1 *California Department of Parks and Recreation*

The Feasibility Study is a cooperative effort between the USACE and CDPR, which is the non-Federal sponsor of the study. The study was coordinated with Federal and State resource agencies including the U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), and National Marine Fisheries Service (NMFS).

Other agencies and institutions coordinated with during the Feasibility Study included the California Coastal Conservancy, the Santa Monica Bay Restoration Commission (SMBRC), Los Angeles Regional Water Quality Control Board (LA RWQCB) the Los Angeles County Department of Beaches and Harbors (LACDBH), California Department of Fish and Wildlife (CDFW) and Mountains Restoration Trust (MRT). The TAC is a diverse group of individuals and agency representatives that includes the USACE and CDPR, the Coastal Conservancy, SMBRC, the CDFW, California Coastal Commission (CCC), California Trout, the U.S. Fish and Wildlife Service, NOAA-National Marine Fisheries Service, the National Park Service SMMNRA, the Resources Conservation District of the Santa Monica Mountains (RCD), Santa Monica Baykeeper, Heal the Bay, the Los Angeles Regional Water Quality Control Board, the U.S. Geological Survey, CalTrans, the University of California Cooperative Extension, the Las Virgenes Municipal Water District, consultants, Serra Canyon Property Owners, Surfrider, Malibu Surfing Association and other public interests.

Feasibility studies require formal public meetings at the Public Workshop and Scoping Meeting and Draft Feasibility Report milestones, and formal internal or interagency meetings at the baseline studies, alternatives analysis and feasibility review conference milestones. Two initial Public Workshops were held on May 3, 2012 to solicit public input on the Feasibility Study scope. Numerous meetings have been held since with the agencies mentioned above during the feasibility phase. This coordination will continue through the remainder of the Feasibility phase.

Documentation relative to interagency coordination is attached as **Appendix A**.

11.1.2 *U.S. Fish and Wildlife Service (USFWS)*

Coordination with USFWS has been on-going throughout the study. Initial coordination between the USACE and USFWS began in July 2007, and continued through the present. This coordination included collaboration with USFWS during the development of the Draft Coordination Act Report (CAR), which was provided to the USACE in May of 2013. Informal Consultation was initiated with the USFWS and NMFS in 2016 under provisions of the Federal Endangered Species Act (ESA) through a series of telephone calls and email exchanges, and is ongoing. Coordination with USFWS will continue through development of the final CAR, as well as through the Malibu TAC and during informal consultation required under the ESA. The draft IFR will be provided to USFWS for comment during the review period, and the draft ESA determinations will be coordinated with USFWS pursuant to the ESA. USACE will consult with USFWS on its effects determinations and proposed conservation measures based on the final plan.

11.1.3 *U.S. Army Corps of Engineers, Regulatory Branch (USACE)*

The USACE is the agency that regulates Section 404 of the Clean Water Act. While the USACE does not issue itself 404 permits, the USACE must comply with provisions of the Clean Water Act. The USACE does this through the completion of a 404(b)(1) analysis and a determination of the Least Environmentally Damaging Practicable Alternative (LEDPA). The jurisdictional determination of waters of the U.S. for this project was performed by the USACE' Los Angeles District North Coast Regulatory Branch. A Draft 404(b)(1) analysis was coordinated through the North Coast Regulatory Branch to ensure consistency with 404(b)(1) guidelines. The Draft 404(b)(1) analysis is contained in Appendix H. The Final 404(b)(1) analysis will assess compliance with provisions of the Clean Water Act and will identify the LEDPA as required.

11.1.4 *U.S. Environmental Protection Agency (USEPA)*

The USACE has conducted initial coordination with USEPA with regard to suitability of the sand layer of the accumulated sediments for beach and near shore placement. This consultation occurred in conjunction with the Southern California Dredged Material Management Team (SC-DMMT), which includes the USEPA, California Coastal Commission (CCC), and the LA RWQCB, in February 2013 for material suitability determination for beach placement of the proposed excavated sand layer. The sand layer was determined to be within acceptable levels for direct beach placement. The USACE will continue to coordinate with the USEPA throughout the NEPA process and construction activities.

11.1.5 *National Marine Fisheries Services (NMFS)*

Coordination with NMFS has been ongoing throughout the study. Initial coordination began between the USACE and NMFS in July 2007 and has continued through present. A formal request was made to the NMFS in March 2014 for the NMFS to serve as a Cooperating Agency, as defined under NEPA. The NMFS declined due to a lack of resources. Coordination with NMFS to date has included discussions on potential benefits and impacts to ESA listed species and their designated critical habitat, primarily southern California steelhead, as well as discussion of potential impacts to protected habitats in the beach and nearshore environment. Informal Consultation was initiated with the USFWS and NMFS in 2016 under provisions of the Federal Endangered Species Act, and is ongoing. Coordination with NMFS will continue during the circulation of the draft IFR, concurrent EFH consultation, and a draft BA will be prepared and coordinated with NMFS during formal consultation pursuant to the ESA.

11.1.6 *California Coastal Commission (CCC)*

It is the responsibility of the USACE to determine if a proposed federal activity affects coastal resources in a manner that is consistent with the California Coastal Management Plan (CCMP). To do so, the USACE will prepare a Coastal Consistency Determination (CCD), which will be submitted to the CCC for their concurrence. Previous coordination with the CCC has occurred directly during discussion of the proposed project beginning in July 2007. In addition, the CCC has participated in the study as a member of the Malibu TAC. During the review period, the Draft IFR will be circulated to the CCC for review and comment. The CCD will be prepared and forwarded to the CCC for concurrence.

11.1.7 *California State Lands Commission (CSLC)*

The USACE will continue coordinating with the CSLC throughout the NEPA process and construction activities. Authorization will be requested for beach or nearshore placement of sand during PED.

11.1.8 *California Department of Fish and Wildlife (CDFW, formerly the California Department of Fish and Game)*

The USACE and CDPR will continue to coordinate with CDFW throughout the CEQA process and construction activities. Also, the USACE will coordinate with CDFG relative to California listed species and Species of Special Concern. The CDFW may participate in a Federal Section 7 consultation, if initiated, and has the option to adopt the Federal BO or to prepare its own BO. Depending on the results of the BO, a Section 2081 take permit may be required for the project. The non-federal sponsors would be responsible for applying for a Section 2081 take permit, as well as a 1601 Streambed Alternation Agreement, if required.

11.1.9 *California State Historic Preservation Officer (SHPO) / Advisory Council on Historic Preservation*

The USACE has initiated consultation with the California State Historic Preservation Officer (SHPO) via letter and telephone regarding project compliance with Section 106 of the National Historic Preservation Act (36 CFR 800). The SHPO will be provided with a draft of the EIS during the public review period and may provide comments.

11.1.10 *Los Angeles Regional Water Quality Control Board (LA RWQCB)*

The LA RWQCB has participated as a member of the Malibu TAC, and discussions were initiated in October of 2016 to begin coordination for the required CWA 401 Water Quality Certification (WQC). During PED, and prior to construction, the USACE will obtain the required 401 WQC and comply with the permit requirements. Coordination with the LA RWQCB will continue through the TAC and the LA RWQCB will also be provided a copy of the IFR during public review.

11.1.11 *Other Agencies/Public Interest Groups*

In addition to the agencies discussed above, the USACE has coordinated with numerous other federal and state agencies, much of which is described in Appendix A and has occurred through the Malibu TAC.

11.2 Public Involvement

The public involvement for this study began in the prior reconnaissance phase with a public workshop held on January 28, 1998 at the Malibu Bluffs Park with about 100 members of the community present. A public scoping meeting and workshop was held on May 29, 2002 for the feasibility phase of the study. These meetings and comments received afterwards are summarized in the public concerns, and have been used to identify problems and opportunities. **Appendix A1** includes a transcript of May 2002 public workshop and associated public comments. A notice of Intent to Prepare an EIS for the study was published in the Federal Register (vol. 67, no. 109) on Thursday, June 6, 2002.

Meetings have continued throughout the study through two forums: the Project Delivery Team (PDT), and the Malibu TAC. Details on the membership and participation of the Malibu TAC are detailed in Appendix A. A Public Outreach Group was established for the feasibility study, comprised of representatives from the CDPR, the USACE, Malibu Creek Watershed Council, and other interested parties. . This group worked closely together to develop a Public Involvement Plan for the feasibility study. Additional details of the past and future public involvement are also contained in Appendix A.

12.0 PLAN IMPLEMENTATION

This section presents the Federal and non-Federal responsibilities for implementation of the NER Plan and/or the likely LPP. This includes Federal and non-Federal project cost-sharing requirements and the division of responsibilities between the Federal government and the non-Federal sponsor, the CDPR. It also list steps toward project approval and a schedule of the major milestones for the design and construction of the NER plan and/or likely LPP.

12.1 Operation, Maintenance, Repair, Rehabilitation, and Replacement (OMRR&R)

OMRR&R activities required for either the NER Plan or likely LPP are limited. For the NER Plan, the OMRR&R activities around the dam and impounded sediment area and upstream barriers are estimated to cost $38.8k/yr and include:

- Removal of vegetative growth along top surface of access ramp/road. ($4k/yr)
- Annual minor repairs to the access ramp to allow small pick-ups and equipment to access area, as needed. ($10k/yr)
- Annual inspection of former dam and impounded sediment area to check for aquatic habitat barriers and impediments, such as boulders and debris that obstruct fish passage with no viable alternative routes around them. These impediments may require relocation or removal, particularly in first several decades after dam removal is complete. Residual sediment left behind is to be monitored annually until, at minimum, the pre-dam invert is exposed. Biological/fisheries annual inspections involve 2 biologists for 5 days/yr, and post-storm season biological inspections for 2 days/yr for the first 20 yrs to determine the need for aquatic habitat obstruction removal in the former dam area (Total average: $7.6k/yr for 50 yrs).
- Annual Rindge Dam spillway visual inspections assuming more significant inspections and repairs are required every 5 years to maintain the integrity of the aging structure. (Annual inspections: 2 engineers for 2days/yr and structural repairs to the spillway every 5 yrs at $25,000/per repair (Total average: $7k/yr)
- Upstream barriers LV3, LV4 and CC5 require annual inspections (1 biologist and 1 engineer) to ensure aquatic habitat connectivity is maintained and the low flow channel for fish passage is not obstructed. Annual removal of aquatic habitat impediments would occur each dry season and obstructions would be removed after storms when safe access is available for crews and equipment (assume once every 2 yrs, on average). (Total average: $10.2k/yr)

For the likely LPP, OMRR&R activities include the same first three bullets listed above for the NER Plan and the last bullet. The 4^{th} bullet does not apply since the spillway will be removed for this alternative. The total estimated annual OMRR&R cost for the likely LPP is $31.8k/yr.

12.2 Monitoring and Adaptive Management

Monitoring and adaptive management conforms with the requirements of Section 2039 of WRDA 2007 and USACE implementation guidance (CECW-PB Memo 31 August 2009). The USACE and the non-Federal sponsor are responsible for carrying out the monitoring and adaptive management plan after construction of each project phase/component until ecological success criteria are met, but for no more than ten years. It is anticipated that the restored habitats can reasonably be expected to achieve success within five years for most or all project components. Upon the determination of the District Engineer that ecological success criteria have been met, cost-shared monitoring will be concluded, and in no case shall cost-shared monitoring extend beyond ten years after construction of each component.

For the NER Plan and the likely LPP, the PDT and Sponsor developed a monitoring and adaptive management plan (MAMP) to ensure the success of the recommended restoration plan in meeting project objectives and to provide a process to identify when any adaptive management actions are warranted during the monitoring period. The MAMP identifies criteria upon which an adaptive management action may be implemented and provides:

- A systematic approach for identifying project success criteria in areas of habitat restoration;
- The process for future decision-making related to habitat management activities in the project area;
- Triggers, and implementation of remedial actions to meet success criteria;
- The framework for effective monitoring, assessment of monitoring data, and decision making for implementation of adaptive management activities in the project area;
- The process for identifying adaptive management actions in the project area; and
- Decision criteria for vegetation and wildlife evaluation and modification of adaptive management activities.

A qualified restoration biologist will coordinate the restoration monitoring. This monitoring program is intended to provide continued oversight of the restoration areas after dam removal and upstream barrier modifications are complete. The restoration areas will be monitored through a combination of horticultural monitoring, providing proactive direction and oversight of the maintenance program, and botanical monitoring measuring overall vegetation type development. This oversight will provide feedback for the maintenance contractor and information to evaluate progress so that recommendations can be made to help meet performance standards. Upon construction completion, cost-shared monitoring for ecological success and adaptive habitat management will be initiated and continue for five years or until ecological success is achieved as defined by the NER Plan or likely LPP's established success criteria, but for no longer than ten years.

Vegetation sampling will occur annually for the duration of the monitoring period beginning the spring at the peak of the growing season following implementation of restoration activities in order to allow time for the new vegetation within the restoration areas to become established. Sampling will consist of permanent field monitoring at certain locations and monitoring will measure percent cover of native and non-native plant species, structural diversity, and percent cover over water. Vegetation monitoring also includes quantitative measurements of the growth, establishment of plants and assessment of the invasion of non-native species. Plant health monitoring will review the project areas to assess germination, survival, and growth of seeded and planted material, levels of weed competition, erosion, and other detrimental actions. Documentation will indicate if restoration areas achieve the success criteria as defined by the performance standards.

To assess the overall creek health, habitat inventory mapping will be completed annually at permanent monitoring stations following the *California Salmonid Stream Habitat Restoration Manual Fourth Edition, Part III, Habitat Inventory Methods* (Flosi et al 2010). This stream mapping assesses the restoration of salmonid habitat and migratory corridor based on the physical characteristics of the site, including the stream gradient, substrate composition, organic material in the stream, and vegetative cover above the stream. A general inventory of all wildlife species observed and detected in the monitoring areas will be documented during vegetation monitoring.

Nesting sites, roosting sites, animal burrows, and other signs of wildlife use of the newly created habitat will be recorded.

Table 12.2-1 MAMP PERFORMANCE STANDARDS (As a Relative Percentage of Reference Site Values)

Year	Cover of Trees, Shrubs, and Herbs (analyzed separately)	Container Plant Survival	Non-native Coverage (giant reed & salt cedar)	Non-native Coverage (other non-native species)
1	No Quantitative Performance Goals	80%	20%	10%
2	50%	100%*	15%	10%
3	60%	-	10%	5%
4	80%	-	5%	5%
5	90 – 100%	-	0%	5%

*Relative percentage of Year 1.

Potential adaptive management measures include additional irrigation and/or supplemental water if vegetation cover objectives are not met. Replanting, plant protection, invasive species control and erosion control are additional adaptive management measures if vegetation cover objectives are not met. Re-grading of the creek invert may be needed if triggers for vegetative cover habitat are not met.

The total estimate monitoring and adaptive management cost for the NER Plan over 5 years is just over $2M ($2,006,600). The estimated monitoring and adaptive management cost for the likely LPP is about $1.9M ($1,893,600).

12.3 Project Costs

Table 12.3-1 and Table 12.3-2 provide a summary cost breakdown for the NER Plan and likely LPP.

Table 12.3-1 NER Plan (Alternative 2d1) Costs (October 2016 Price Level)

Code of Accounts	Description	Quantity	Unit of Measure[1]	Unit Cost	Cost	Contingency %	Contingency $	Total Cost
01	Lands and Damages – Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500
01	Lands and Damages – Upstream Barriers	1	LS	869,500	869,500	25%	217,375	1,086,875
02	Relocations – U/S Barriers Mod/Removal	1	LS	5,783,813	5,783,813	24%	1,388,115	7,171,928
06	Rindge Dam Removal							
06	General Requirements (Initial, Year 1)	1	YR	5,839,033	5,839,033	24%	1,401,368	7,240,401
06	General Requirements (Yearly, Years 2-7)	6	YR	4,523,935	27,143,610	24%	6,514,466	33,658,076
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	24%	940,696	4,860,263
06	Sediment Removal (Truck sand -- beach placement)	1	LS	51,443,328	51,443,328	24%	12,346,399	63,789,727
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	24%	68,771	355,317
06	Biological Resources Pre-Construction Monitoring	1	LS	347,700	347,700	24%	83,448	431,148
06	Biological Resources During Construction Monitoring	1	LS	4,501,400	4,501,400	24%	1,080,336	5,581,736
06	Biological Resources Monitoring and Adaptive Management	1	LS	2,006,600	2,006,600	24%	481,584	2,448,184
14	Cultural Resources	1	LS	1,476,000	1,476,000	24%	354,240	1,830,240
	Total Estimated Construction				102,747,597		24,659,423	127,407,020
30	Preconstruction Engineering and Design (PED) - 15%[2]	1	LS	15,412,140	15,412,140	24%	3,698,913	19,111,053
31	Construction Management[2] (S&A) - 6.7%	1	LS	6,884,089	6,884,089	24%	1,652,181	8,536,270
TOTAL COST					126,875,000		30,468,000	157,344,000

[1] LS = Lump Sum
[2]PED and S&A amounts include PED and S&A for 02 account items

Table 12.3-2 Likely Locally Preferred Plan (Alternative 2b2) Costs (October 2016 Price Level)

Code of Accounts	Description	Quantity	Unit of Measure	Unit Cost	Cost	Contingency %	Contingency $	Total Cost
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500
01	Lands and Damages - Upstream Barriers	1	LS	869,500	869,500	25%	217,375	1,086,875
02	Relocations - Upstream Barriers Modification/Removal along Las Virgenes Creek and Cold Creek	1	LS	5,783,813	5,783,813	24%	1,388,115	7,171,928
06	Rindge Dam Removal						-	-
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	24%	1,401,368	7,240,401
06	General Requirements (Yearly, Years 2-8)	7	yr	4,523,935	31,667,545	24%	7,600,211	39,267,756
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	24%	940,696	4,860,263
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	24%	369,957	1,911,445
06	Sediment Removal (Truck/barge sand -- nearshore placement)	1	LS	53,843,001	53,843,001	24%	12,922,320	66,765,321
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	24%	68,771	355,317
06	Biological Resources Pre-Construction Monitoring	1	LS	306,900	306,900	24%	73,656	380,556
06	Biological Resources During Construction Monitoring	1	LS	4,076,800	4,076,800	24%	978,432	5,055,232
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,893,600	1,893,600	24%	454,464	2,348,064
14	Cultural Resources	1	LS	1,172,000	1,172,000	24%	281,280	1,453,280
	Total Estimated Construction				110,330,293		26,479,270	136,809,563
30	Preconstruction Engineering and Design (PED) - 15%[1]	1	LS	16,549,544	16,549,544	24%	3,971,891	20,521,434
31	Construction Management[1] (S&A) - 6.7%	1	LS	7,392,130	7,392,130	24%	1,774,111	9,166,241
TOTAL COST					136,103,000		32,683,000	168,787,000

[1]PED and S&A amounts include PED and S&A for 02 account items

12.3.1 *Cost Apportionment*

The following summarizes cost apportionment for the NER Plan and likely LPP. The following guidance (ER 1105-2-100) specially addresses cost-sharing for LPP's.

- Projects may deviate from the NER Plan if requested by the non-Federal sponsor and approved by the Assistant Secretary of the Army for Civil Works (ASA (CW)).
- Plans requested by the non-Federal sponsor that deviate from these plans shall be identified as the LPP.
- If the non-Federal sponsor prefers a plan more costly than the NER Plan, and the increased scope of the plan is not sufficient to warrant full Federal participation, ASA (CW) may grant an exception as long as the sponsor pays the difference in cost between those plans and the LPP.

Standard cost-sharing policy for ecosystem restoration projects is described in current guidance (ER 1105-2-100) as follows:

- The non-Federal sponsor (CDPR) will be 35% of the project or separable element implementation costs (preconstruction, engineering and design (PED) and construction), or total implementation costs of a multiple purpose project allocated to ecosystem restoration.
- The non-Federal sponsor (CDPR) is responsible for providing 100% of the LERRDs and OMRR&R.
- The value of LERRD shall be included in the non-Federal 35 percent share. Where the LERRD exceeds the non-Federal sponsor's 35 percent share, the sponsor will be reimbursed for the value of LERRD which exceeds its 35 percent share.
- **Table 12.3-3 and Table 12.3-4** also show line items for Federal Administrative Costs. These costs represent Federal administration and review activities relating to the non-Federal sponsor's provision of LERRD for the project, and are therefore a cost shared component of the project and are not part of LERRD.

Table 12.3-3 Federal and non-Federal Apportionment of Total Project First Cost of the NER Plan (October 2016 Price Level)

Item [1]	Federal Cost	%	Non-Federal Cost	%	Total Cost
Ecosystem Restoration					
Construction	$82,814,563	65%	$35,131,154	28%	$117,945,717
LERRDs (100% Non-Fed)[2]	$0	0%	$9,461,303	7%	$9,461,303
PED	$12,422,184	65%	$6,688,869	35%	$19,111,053
Construction Management	$5,548,576	65%	$2,987,695	35%	$8,536,270
Total Project Cost	$100,785,323	65%	$54,269,020	35%	$155,054,343
(1) Based on October 2016 price level, 3.125% interest rate, and a 50-year period of analysis. (2) Non-Federal Costs for Construction and LERRDS amount to a total 35% contribution.					

Table 12.3-4 Federal and non-Federal Apportionment of Total Project First Cost of the Likely Locally Preferred Plan (October 2016 Price Level)

Item [1]	Federal Cost	%	Non-Federal Cost	%	Total Cost
Ecosystem Restoration					
Construction	$85,749,641	65%	$36,711,580	28%	$122,461,221
LERRDs (100% Non-Fed)[2]	$0	0%	$9,461,303	7%	$9,461,303
PED	$13,338,932	65%	$7,182,502	35%	$20,521,434
Construction Management	$5,958,057	65%	$3,208,184	35%	$9,166,241
Sub-Total Project Cost Share Amount	$105,046,629	65%	$56,563,570	35%	$161,610,199
Additional Non-Fed Construction Costs					
Spillway Removal & Additional Barging Costs	$0	0%	$4,887,309	100%	$4,887,039
Total Project Cost	$105,046,629		$61,450,879		$166,497,238
(1) Based on October 2016 price level, 3.125% interest rate, and a 50-year period of analysis. (2) Non-Federal Costs for Construction and LERRDS amount to a total 35% contribution.					

12.4 Environmental Operating Principles

The USACE has reaffirmed its commitment to the environment by formalizing a set of "Environmental Operating Principles: applicable to all of its decision-making and programs. These principles foster unity of purpose on environmental issues, reflect a new tone and direction for dialog on environmental matters, and ensure that employees consider conservation, environmental preservation, and restoration in all USACE activities. The principles are described in Engineering Circular 1105-2-4040 "Planning Civil Work Projects under the Environmental Operating Principles," 1 May 2003.

The study addresses the USACE Environmental Operating Principles as below:

- Foster sustainability as a way of life throughout the organization.
    - Monitoring will be used to implement adaptive management measures to meet and sustain the targeted Malibu Creek watershed ecosystem restoration objectives.
- Proactively consider environmental consequences of all USACE activities and act accordingly.
    - Avoid and minimize impacts on environmental resources/habitats.
    - Avoid direct impacts to reefs/rocky bottom habitat, giant kelp, and surfgrass.
- Create mutually supporting economic and environmentally sustainable solutions.

  - NER and likely LPP plans restore connectivity to riverine aquatic habitat, provide for a more natural sediment transport regime within the watershed, and allow for placement of sands in the coastal environment while balancing environmental impacts against levels of residual risk.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by the USACE which may impact human and natural environments.
  - NEPA, Fish and Wildlife Coordination Act (FWCA), and Endangered Species Act (ESA) requirements will be met.
- Consider the environment in employing a risk management and systems approach throughout life cycles of projects and programs.
  - Minimize impacts on surrounding habitats through adaptive management.
  - Communicate impacts and residual risk to stakeholders and the public.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner.
  - Coordinate with the Ecosystem Planning Center of Expertise and extensively utilize the broad knowledge and experience of the CDPR and TAC members.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities.
  - Actively listen and respond to TAC members and the public, addressing and incorporating comments and concerns during the planning process and for future design and implementation.

12.5 USACE Campaign Plan and Strategic Plan

The USACE' Campaign Plan Goal 2 to Transform Civil Works and the Sustainable Solutions to America's Water Resources Needs: Civil Works Strategic Plan 2014-2018 guided this effort. The PDT worked with all segments of our partners and stakeholders following the USACE' 6-step plan formulation process, as well as the extensive review process. The USACE is delivering an enduring and essential solution that meets the Nation's needs under Goal 2 which seeks to "Deliver enduring and essential water resources solutions through collaboration with partners and stakeholders".

These Campaign Plan and Strategic Plan priorities are supported by the NER Plan and likely LPP through the following:

- The adaptive management plan incorporates measures to account for potential environmental/cultural changes.
- The OMRR&R plan will provide assurance of engineering, economic, and environmental sustainability of project over 50-year economic life.
- The NER Plan and likely LPP will be peer reviewed and are supported by the non-Federal sponsor.
- Employed an integrated, comprehensive systems – based approach by planning and designing project features as a system including up and downstream projects.
- Employed risk – based concepts in planning and conceptual design and will continue to do so in construction and OMRR&R.
- Employed a continuous assessment of study policy issues through coordination with the USACE vertical team, assessing and modifying organizational behavior, as needed.

- Used a dynamic independent review process.
- Employed adaptive planning and engineering systems developing a Monitoring and Adaptive Management Plan cost shared for 5 years after construction to allow for unexpected changes and respond to necessary modifications following construction.
- Used a rationale for restoration alternatives focused on sustainability and applied ecological and engineering principles.
- Applied ecological and engineering principles in design of alternatives to place project features where appropriate ecologically and restore creek functions.
- Considered the need for review and inspection of completed works by considering the future ecosystem restoration needs.
- Effectively communicated risk using public involvement vehicles and discussions with the non-Federal sponsor and with key stakeholders.
- Established public involvement early in the study process.
- Manage and enhanced technical expertise and professionalism with an interdisciplinary team from the USACE, Federal and local agencies, the non-Federal sponsor, University and contractor personnel. Shared and learned from multiple disciplines within and outside the USACE.

12.6 Division of Plan Responsibilities

The Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) and various administrative policies have established the basis for the division of Federal and non-Federal responsibilities in the construction, maintenance, and operation of Federal water resource development projects accomplished under the direction of the USACE. Anticipated Federal and non-Federal responsibilities are described in this section. The final division of specific responsibilities will be formalized in the project partnership agreement (PPA).

12.6.1 *Federal Responsibilities*

The estimated Federal share of the total first cost of the project is not more than 65 percent of the costs of the NER plan or likely LPP, limited to costs of construction. The Federal Government's responsibilities are anticipated to be:

- Sharing a percentage of the costs for Preconstruction, Engineering and Design (PED), including preparation of the Plans and Specifications, which is cost shared at the same percentage that applies to construction of the project.
- Sharing a percentage of the construction costs for the project.
- Administering contracts for construction and supervision of the project after authorization funding and receipt of non-Federal assurances.

12.6.2 *Non-Federal Responsibilities*

Federal implementation of the recommended project would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

a. For the NER plan, provide 35 percent of total project costs as further specified below:
   1. Provide 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;
   2. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;
   3. Provide, during construction, any additional funds necessary to make its total contribution equal to 35 percent of total project costs.

a. For an LPP, provide 35 percent of total project costs of the National Ecosystem Restoration plan and 100 percent of incremental costs of the Locally Preferred Plan as further specified below:
   1. Provide 35 percent of design costs in accordance with the terms of a design agreement entered into prior to commencement of design work for the project;
   2. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the project;
   3. Provide, during construction, any additional funds necessary to make its total contribution of ecosystem restoration NER plan costs equal to 35 percent;
   4. Provide, during construction, all incremental costs of the Locally Preferred Plan.

For both options:

b. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefor, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;

c. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the outputs produced by the ecosystem restoration features, hinder operation and maintenance of the project, or interfere with the project's proper function;

d. Shall not use the ecosystem restoration features or lands, easements, and rights-of-way required for such features as a wetlands bank or mitigation credit for any other project;

e. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

f. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

g. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

h. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

i. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

j. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);

k. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;

l. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary remediation and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;

m. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and

n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 10 U.S.C. 1962d-5b), and Section 103(j) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

12.7 Non-Federal Sponsor's Financial Capability

The non-Federal sponsor has committed to provide its share of total project costs, as well as all LERRD required for the project. The non-Federal sponsor has committed to performing all OMRRR required for the project. The non-Federal sponsor has also made a commitment to undertake all necessary response and remediation for CERCLA contaminants required for the Project, including providing lands free of soil contamination prior to construction of the Project features on those lands and handling groundwater contamination during construction activities. The non-Federal sponsor's self-certification of financial capability will be provided prior to the circulation of the Final EIS/EIR.

12.8 Project Partnership Agreement

Prior to advertisement for the first construction contract, a Project Partnership Agreement will be required to be signed by the Federal Government and the CDPR, requiring formal assurances of local cooperation from CDPR. This agreement will be prepared and negotiated during the Plans and Specifications Phase.

12.9 Approval and Implementation

The necessary reviews and activities leading to approval and implementation of the NER Plan or likely LPP are listed below:

a. Environmental Impact Statement Filing – after circulation of this Final IFR for state and agency review, as well as public review, the District will file Final IFR together with the proposed report of the Chief of Engineers with EPA.

b. Environmental Impact Report Certification – The Final IFR will be circulated for public and agency review and comment a minimum of 10 days before consideration by the CDPR. At a public hearing, the CDPR will decide whether to recommend approval of the EIR and forward the document to the CDPR for certification. If adopted, a Notice of Completion is filed with the CDPR.

c. Chief of Engineers Approval – Chief of Engineers signs the report signifying approval of the project recommendation and submits the following to ASA (CW): the Chief of Engineers Report, the Final IFR, and the unsigned ROD.

d. ASA (CW) Approval – The Assistant Secretary of the Army for Civil Works will review the documents to determine the level of administration support for the Chief of Engineers recommendation. The ASA (CW) will formally submit the report to the Office of Management and Budget (OMB). OMB will review the recommendation to determine its relationship to the program of the President. OMB may clear the release of the report to Congress.

e. Project requires congressional approval for construction.

f. Funds could be provided, when appropriated in the budget, for preconstruction, engineering and design (PED), upon issuance of the Division Commander's public notice announcing the completion of the final report and pending project authorization for construction. Surveys, model studies, and detailed engineering and design for PED studies will be accomplished first and then plans and specifications will be completed, upon receipt of funds.

g. Construction would be performed with Federal and non-Federal funds, once the construction project was advertised and awarded.

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13.0 RECOMMENDATION

At this phase of the study, prior to concurrent review of the draft document, the USACE has identified Alternative 2d1 as the National Ecosystem Restoration (NER) Plan, and the Tentatively Selected Plan (TSP) for future recommendation for authorization as a Federal project, with such modifications thereof as in the discretion of the Commander, Headquarters, U.S. Army Corps of Engineers, may be advisable. The USACE also recognizes that the Sponsor, the California Department of Parks and Recreation (CDPR) has identified it is likely to formally request Alternative 2b2 as a Locally Preferred Plan (LPP). CDPR supports moving forward with either the TSP or the LPP, with preference of the implementation of the LPP.

Concurrent review of this draft Integrated Feasibility Report (IFR) includes public, technical, legal, and policy reviews, and an Independent External Peer Review (IEPR). The Project Delivery Team (PDT), USACE Los Angeles District management, and USACE vertical team representatives throughout the agency will consider comments provided during the review period prior to providing feedback to a USACE Headquarters Senior Leaders Panel. This panel will consider the evaluation of the significant public, technical, legal, policy and IEPR comments on the TSP, likely LPP, and other alternatives to determine the corporate endorsement of a recommended plan and proposed way forward to complete feasibility-level design and the final feasibility report.

The final feasibility report will include recommendations from the USACE, Los Angeles District Commander, reflecting information available at that time and the current Departmental policies governing formulation of individual project. Recommendations will not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the non-Federal sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Kirk E. Gibbs
Colonel, US Army
Commander and District Engineer
Los Angeles District

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14.0 PREPARERS AND REVIEWERS

Lead agencies responsible for preparation of this Integrated Feasibility Report include the following:

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Many of USACE staff have contributed to the study since the early 2000's. Some of the prior USACE PDT members include: Marriah Abellera, Jodi Clifford, Kevin Wohlmut, Tiffany Bostwick, Ben Nakayama, John Killeen, Jason Shea, Kyle Dahl, Kathy Anderson, Kerry Casey, Chris Sands, Art Shak, Mike Vahabzadeh-Hagh, Santiago Munoz, Alex Hernandez, and Van Crisostomo.

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14.1.3 *Other Support to Report Preparation*

Consultants that contributed services to the preparation of this report include: CDM-Smith (environmental studies), RECON Environmental Inc. (Malibu coastal shoreline survey), Statistical Research Inc. (SRI, National Register of Historic Places Evaluation of Rindge Dam), Group Delta and Crux Subsurface (Rindge Dam impounded sediment investigations), CS Studios (Rindge Dam removal photo simulations).

Other contributors included members of the Technical Advisory Committee including: Rosi Daggett (Resource Conservation District of the Santa Monica Mountains), Mark Abramson (Santa Monica Baykeeper), and Jack Topel (Santa Monica Bay Restoration Commission).

14.2 <u>Reviewers</u>

Individuals responsible for review of this Integrated Feasibility Report include:

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14.2.4 Independent External Peer Review Team

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14.2.5 USACE Office of Water Project Review (Policy Review)

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Other HQ reviewers include: Tab Brown, Wes Coleman, and Jodi Creswell (Planning).

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15.0 LIST OF ACRONYMS AND ABBREVIATIONS

AAHUs	Average Annual Habitat Units
ac	acre(s)
af	acre/ft
a.m.	Ante meridiem, before noon
AMSL	Above Mean Sea Level
ANSI	American National Standards Institute
APE	Area of Potential Effects
AQMPs	Air Quality Management Plan
ARB	Air Resources Board
BA	Biological Assessment
BMPs	Best Management Practices
BOR	Bureau of Reclamation
BUR	Bob Hope International Airport, Burbank
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CAFÉ	Corporate Acreage Fuel Economy
Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCC	California Coastal Commission
CCD	Coastal Consistency Determination
CDFW	California Department of Fish and Wildlife
ºC	degrees Celsius
CE/ICA	Cost Effectiveness and Incremental Cost Analysis
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act of 1970
CFR	Code of Federal Regulations
cfs	cubic feet/second
CH_4	methane
CMP	Congestion Management Program
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CNRA	California National Resources Agency
CO	carbon monoxide
CO-CAT	Coastal & Ocean Climate Working Group of the California Climate Action Team
CO_2	carbon dioxide
CO_2e	CO_2-equivalency
CPUC	California Public Utilities Commission
CSC	California Species of Special Concern
CSLC	California State Lands Commission
cy	cubic yard(s)
dB	decibels (A-weighted)
DBH	Los Angeles County Department of Beaches and Harbors
DDT	dichlorodiphenyltrichloroethane
CDPR	State of California, Department of Parks and Recreation
DPS	District Population Segment
DSOD	Department of Water Ressources' Division of Safety of Dams
DWR	Department of Water Ressources

EFH	Essential Fish Habitat
EIR	Environnemental Impact Report
EIS	Environnemental Impact Statement
EOP	Environmental Operating Principle
EPA	U.S. Environmental Protection Agency
EQ	Environmental Quality
ER	Engineer Regulation
ESU	Evolutionarily Significant Units
ºF	degrees Fahrenheit
FCSA	Feasibility Cost Sharing Agreement
FE	Federal-listed, endangered species
FEMA	Federal Emergency Management Act
FHWA	Federal Highway Administration
FMPs	Fishery Management Plans
FPE	Federally proposed for listing as endangered species
FT	Federal-listed, threatened species
ft	ft/foot
ft/sec	ft/foot per second
ft^2	square ft
GHG	greenhouse gas
GIS	Geographic Information System
HAER	Historic American Engineering Record
HCM	Highway Capacity Manual
HDPE	high-density polyethylene
HE	Habitat Evaluation
HEC-FDA	Hydrologic Engineering Center Flood Damage Analysis
HEC-FFA	Hydrologic Engineering Center Flood Frequency Analysis
HEC-6T	Sedimentation in Stream Networks Software
HEC-RAS	Hydrologic Engineering Center River Analysis
hp	horsepower
HSI	Habitat Suitability Index
HTB	Heal the Bay
HTRW	hazardous, toxic, or radioactive waste
HU	habitat units
Hwy 101	Highway 101
in	inch(es)
in/yr	inch(es)/year
IPCC	Intergovernmental Panel on Climate Change
kg	kilograms
km	kilometer(s)
km^2	square kilometer(s)
km^3	cubic kilometer(s)
lbs	pounds
kHz	kilohertz
LACDPW	Los Angeles County Department of Public Works
LACSD	Los Angeles County, Solid Waste Department
LADOT	Los Angeles Department of Transportation
LADVR	Light-duty Vehicle Rule
LAX	Los Angeles International Airport
LCFS	Low Carbon Fuel Standard
LCP	Local Coastal Program

L_{dn}	Day-night average noise level
L_{eq}	Average equivalent noise level
LOS	Level of Service
LPP	Locally Preferred Plan
LSTs	Localized Significance Thresholds
LVMWD	Las Virgenes Municipal Water District
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
MBTA	Migratory Bird Treaty Act
MCW	Malibu Creek Watershed
MCWC	Malibu Creek Watershed Council
MCWNRP	Malibu Creek Watershed Natural Resource Plan
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MGD	million gallons per day
MHHW	mean higher high water
MHW	mean high water
mi	mile(s)
mi^2	square mile(s)
mL	milliliter(s)
MLLW	mean lower low water
mm	millimeter(s)
MMT	million metric tons
MPN	most probable number
MSL	Mean Sea Level
MTL	Mean Tide Level
MUTCD	Manual on Uniform Traffic Control Devices
NAAQS	National Ambient Air Quality Standards
NED	National Economic Development
NEPA	National Environmental Policy Act of 1969
NER	National Ecosystem Restoration
NRC	National Research Council
NHPA	National Historic Preservation Act
NHTSA	Department of Transportation’ National Highway Traffic Safety Administration
NMFS	National Marine Fisheries Service
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NOAA	National Oceanographic and Atmospheric Administration
NOI	Notice of Intent
NOP	Notice of Preparation
NOx	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Parks Service
NRCS	National Resources Conservation Service
NRHP	National Register of Historic Places
NTU	Nephelometric Turbidity Unit(s)
N_2O	nitrous oxide
OHP	Office of Historic Preservation
OPR	California Office of Planning and Research
OSE	Other Social Effects

O_3	Ozone
OWTS	Onsite Wastewater Treatment Systems
Pb	lead
PCBs	polychlorinated biphenyls
PCH	Pacific Coast Highway
PDT	Project Delivery Team
PED	Pre-Construction Engineering Design
PFEL	Pacific Fisheries Environmental Laboratory
P&G	Principles and Guidance
p.m.	Post meridiem, after noon
PM_{10}	particulate matter equal to or less than 10 microns in size
$PM_{2.5}$	fine particulate matter equal to or less than 2.5 microns in size
ppt	parts per thousand
PPV	Peak Particle Velocity
PRC	Public Resources Code
RBA	Risked-based Analysis
RED	Regional Economic Development
ROD	Record of Decision
ROG	reactive organic gases
RWQCB	California Regional Water Quality Control Board - Los Angeles Region
SCAQMD	South Coast Air Quality Management District
SCAB	South Coast Air Basin
SCAG	Southern California Association of Governments
SCC	California State Coastal Conservancy
SC-DMMT	Southern California Dredged Material Management Team
SE	State-listed, endangered species
SF_6	sulfur hexafluoride
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SLR	Sea Level Rise
SMBRC	Santa Monica Bay Restoration Commission
SMBRP	Santa Monica Bay Restoration Project
SMMNRA	Santa Monica Mountains National Recreation Area
SO_2	sulfur dioxide
SOx	oxides of sulfur
SQG	Sediment Quality Guidelines
SRA	Sediment Removal Area
SSA	Storage Site A
SSB	Storage Site B
ST	State-listed, threatened species
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
TAC	Technical Advisory Committee
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TMP	Transportation Management Plan
TOC	total organic carbon
TSP	total suspended particulates
TSP	Tentatively Selected Plan
TSS	total suspended solids
TWRF	Tapia Water Reclamation Facility

UBC	Uniform Building Codes
UPRR	Union Pacific Railroad
USACE	U.S. Army Corps of Engineers, Los Angeles District
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOCs	volatile organic compounds
VRAP	Visual Resources Assessment Procedure
WDRs	Waste Discharge Requirements
WOP	without project
yd	yard(s)
yd^2	square yard(s)
yd^3	cubic yard(s)
yd^3/ft	cubic yard(s) per foot
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
%	percent
%o	parts per thousand

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A

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