Malibu Creek Ecosystem Restoration Study

Los Angeles and Ventura Counties, California

Appendix F

Cost Engineering

U.S. Army Corps of Engineers
Los Angeles District

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1.0 INTRODUCTION AND ALTERNATIVES DESCRIPTIONS

This Appendix presents all relevant assumptions and construction methodologies used on all alternatives for the Malibu Creek Ecosystem Restoration Feasibility Study.

The study area is located about 30 miles (mi) west of the city of Los Angeles. Approximately 2/3 of the 109 sq. mi watershed is located in the northwest portion of the Los Angeles County area and the remaining 1/3 is in Ventura County. Malibu Creek Watershed is within the Santa Monica Mountains, in a mix of urban development and open space. Malibu Creek drains into Malibu Lagoon and Santa Monica Bay.

Malibu Creek drains 109 sq. mi of the Santa Monica Mountains, where the reach from Malibu Lagoon to Malibu Dam is 10 mi Rindge Dam, built in the 1920's, is located about 2 mi upstream from the confluence with the Pacific Ocean. The dam is a concrete arch structure 108 feet (ft) in height with an arc length of 140 ft at its crest (excluding spillway & rock outcrop) and 80 ft at its base. The dam is 2 ft thick at the crest and 12 ft thick at the base. 60-lb steel railroad ties run horizontally and vertically throughout the dam and serve as reinforcement for the structure. The height from the top of the arch structure to bedrock is approximately 117 ft. The top of dam elevation is approximately 298 ft.

A gated spillway was built in a rock outcrop on the western side adjacent to the arch dam abutment. 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). The spillway crest elevation is approximately 285 ft.

Rindge Dam is the largest disruption to stream flow and aquatic and terrestrial habitat connectivity on Malibu Creek between Malibu Dam and the Pacific Ocean. The dam creates a barrier to the endangered steelhead trout's spawning ground upstream of Malibu Creek. Currently, the geotechnical assessment estimates that 780,000 cubic yards (cy) of sediment is impounded behind the dam. The impounded sediment is defined as three distinct layers. The extent of the impounded sediment area is presented in **Figure 1.1-1**. 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, and 5% gravel and rock. Unit 2 sediment is likely source of beach nourishment. Unit 2 is underlain by a silt-clay dominant layer (Unit 3).

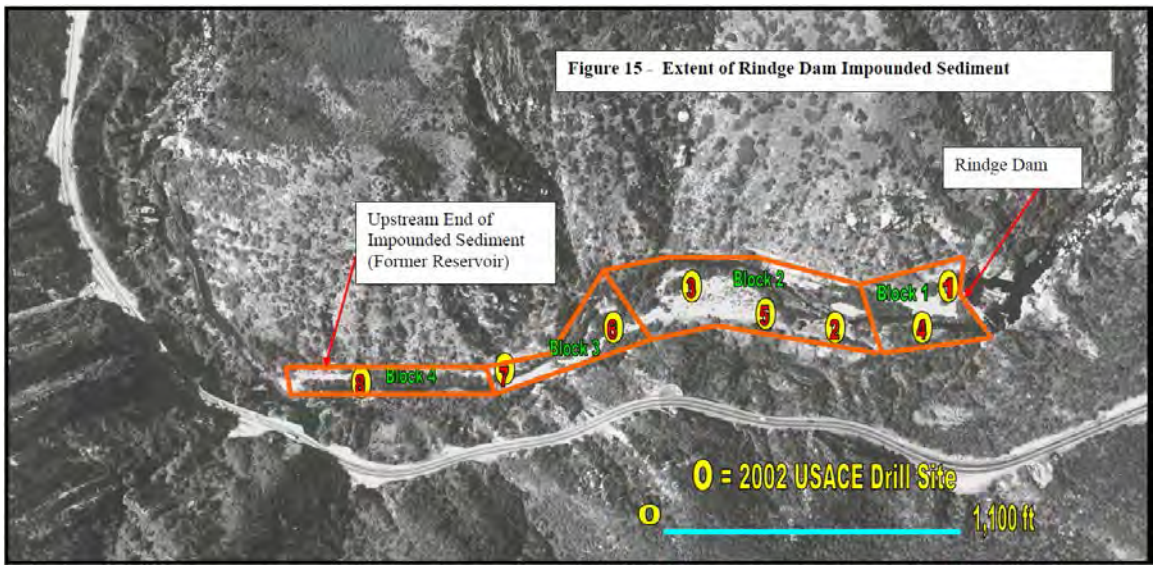

Figure 1.1-1 Extent of Rindge Dam Impounded Sediment

The study objectives are listed in the main report; please refer to the main report for information regarding study objectives.

The sediment behind the dam could be used to nourish downstream beaches in the City of Malibu and elsewhere in the Los Angeles (LA) County.

Most storms in the Southern California coastal area are of the general winter type, with hours of light to moderate steady precipitation, but with occasionally heavy showers or thunderstorms embedded. Local thunderstorms can occur in southern California at any time of the year, but are least common and least intense during the late spring. These local thunderstorms can at times result in very heavy rain for short periods of time over small areas, causing very rapid runoff from small drainages. Some of the smaller tributaries within the Malibu Creek watershed can be especially vulnerable to this type of storm. General summer storms in southern California are quite rare; but on occasion a tropical storm from off the west coast of Mexico can drift far enough northward to bring rain, occasionally heavy, to southern California, sometimes with very heavy thunderstorms embedded. Most of the major flood events in the history of Southern California have been the result of general winter storms, but several local thunderstorms have produced significant flows on various LA County streams.

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.

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, and 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.

Aside from dams along Malibu Creek and tributaries, little of the rest of the tributary reaches have channel structures that affect runoff. There are some short reaches of Malibu Creek tributaries that have been armored, primarily near road and bridge crossings.

Malibu Creek flows were once seasonal, but are now predominantly perennial due to other water sources resulting from storm runoff, local runoff, imported water, and permitted reclaimed water discharge.

The following base alternatives compare different methods for the demolition, removal, and disposal of the Rindge Dam and spillway as well as methods of removal for the sediment currently impounded by the Rindge Dam. Additionally, Alternatives 2, 3, and 4 have sub-alternatives that consider the enhancement of seven existing upstream barriers to allow passage of fish and other wildlife.

Once constructed, any of these alternatives requires minimal operation and maintenance (O&M) during dry seasons. Monitoring of structures to ensure their proper functioning and endurance is needed. Monitoring frequency varies, depending on frequency and severity of storm events. O&M was considered over a 50-year project life.

Maintenance on Alternatives 2a, 3a, and 4a involves repair of the south access road every other year and removal of trash each year. Sediment removal maintenance is unnecessary and it is, therefore, eliminated from further O&M consideration. It is anticipated that an annual inspection involving a team consisting of a biologist, an H&H engineer, and a civil design engineer are needed.

For Alternatives 2b(s), 3b(s), and 4b(s), sediment control for the upstream barriers (CC2, CC3, LV2, and LV3) is done twice a year to allow for low flow conveyance for the purpose of providing suitable passage of aquatic species. An annual inspection involving a team consisting of a biologist, an H&H engineer, and a civil design engineer are needed every year.

The costs related to maintenance and inspections were developed in coordination with the Project Delivery Team (PDT) and were factored into the annual O&M costs.

1.1 Alternative 1: No Action

Existing Rindge Dam and spillway remain in place. Sediment impounding will continue behind the Dam until equilibrium is reached between sediment impoundment and sediment flow downstream through the spillway. The downstream creek elevations are be expected to rise as the sediment trapping characteristics of the Dam diminish. This alternative limits migratory species to areas below the Dam.

1.2 Alternatives 2(s): Dam Removal with Mechanical Transport (trucking / barge transport)

This plan contributes to the primary study ecological restoration objective to restore the Malibu Creek ecosystem, (with some additional benefits to Las Virgenes Creek and Cold Creek), while maintaining downstream ecosystem and riparian management activities. This plan is expected to result in significant benefits to the ecosystem. The plan is to lower the dam height at the same rate as the impounded sediment is removed from behind the dam using mechanical means (excavators, bulldozers etc.) over a course of seven to eight years, from April to October. During the remainder of the year, work on the project ceases due to city and environmental limitations.

The first year of the project is dedicated to site prep: clearing, dewatering and ramp construction. The dam and the sediment from behind the dam will be removed over a 6 to 7 year time span. Construction will be limited to outside the rainy season and the sediment removed from behind the dam will either go to down-coast of Malibu Pier or the Calabasas Landfill. Calabasas Landfill is open from 8 am – 5 pm Monday through Saturday and closed Sundays. All sediment will be removed with loaders and highway trucks. The last year the creek invert is stabilized and trimmed. Work will consist of rock placement and grading to create a series of pools and riffles to enhance the natural characteristic of the project area.

As part of a project partnering effort, the sandy material, which comprises a large volume of the sediment to be removed, will used as beach nourishment material. Identified beach site is located down-coast of Malibu Pier.

The Southern California Dredged Materials Management Team (SC-DMMT), which is the regulatory body that reviews and approves placement of dredged materials in ocean or on beaches, on February 27, 2013, agreed in concept to consider allowing both on-beach placement and near-shore placement of the impounds sand-rich layer, while recognizing that its 22% fines content is at the upper end of the maximum percentage of fines accepted for on-beach placement.

As per standard procedures, prior to any placement, transect sampling is required to verify gradation compatibility with both near-shore and on-shore placements; if sediment is shown to be compatible, regular, confirmatory gradation sampling of the material at the dam site also have to be done as the excavation proceeds, to assure the gradation remains within the tolerable range. In addition, any approved placement scenario will be subject to continued testing for unsuitable materials as excavation of the impound proceeds

Gravel and clay-silt layers have no interested end-users to date, and is modeled to be wasted in a landfill. It should be usable as a landfill daily cover but there are no interested landfill managers within a reasonable hauling range.

1.3 Alternatives 3(s): Dam Removal with Natural Transport (natural erosion)

This alternative consists on removing the Rindge Dam in phases, in 5-ft increments, over the life of the project (50 yrs) and allowing the impounded sediment to be transported downstream naturally into the Pacific.

Rather than trucking away the impounded sediment, construction activities consist of removing the dam and spillway, only. After each 5-ft increment is removed, construction ceases until the natural creek flows during the winter storm season had transported the sediment downstream. Since no impounded material is being excavated and hauled off-site, this alternative does not provide any beach nourishment materials to the local beaches. In the final year of construction, grading of the creek will occur along the entire project length. Due to the reliance on natural weather patterns.

To mitigate the potential of flooding created by increased downstream sedimentation, this alternative requires that floodwalls be created on each side of the channel between Cross Creek Bridge and the Pacific Coast Highway. **Figure 1.3-1** shows the expected layout of the floodwalls. Both floodwalls are 3,100 ft long, 14-in thick, and 10 ft tall. The floodwalls are anchored using drilled-hole-cast-in-place (DHCP) piles placed to a depth of 25 ft. Bedrock depth is potentially as high as 50 ft, and is, therefore, not being considered as a potential issue.

As part of the natural removal process of the sedimentation, significant environmental impacts to migratory fish habitat and the Malibu Lagoon are expected as well as significant (4 ft +) sediment deposition downstream of the project. Potential benefits for Alternatives 3(s) are a largely reduced volume of trucking, affecting both the impact on air quality and local traffic, as well as a reduction in the cost of material disposal.

Figure 1.3-1 Downstream Floodwalls. Downstream Mitigation Layout

1.4 Alternatives 4(s): Dam Removal with Hybrid Mechanical (trucking) and Natural Transport (natural erosion)

This alternative is a combination of Alternatives 2(s) and 3(s). Construction activities are similar to Alternative 2; the dam height is lowered at the same rate as the impounded sediment using mechanical means, with the removed sediment being trucked off-site. The difference with Alternatives 4(s) is that at the end of each construction season, from season 2 through season 4, a five foot increment of the dam is removed below the local sediment grade, to allow a controlled volume of sediment to erode naturally downstream during the winter storm season.

The first year of the project is dedicated to site preparation, clearing, dewatering and ramp construction. The dam and the sediment from behind the dam are removed over a 6 to 7 year time span. At the end of each construction period an additional 5 ft of the dam is removed so sediment could be washed away during the rainy season. Construction is limited to outside the rainy season and the sediment mechanically removed from behind the dam is hauled to local beaches or the Calabasas Landfill.

As part of a project partnering effort, the sandy material, which comprises a large volume of the sediment to be removed, will used as beach nourishment material. Identified beach site is located down-coast of Malibu Pier.

In the final year of construction, grading of the creek will occur along the entire project length. Work consists of rock placement and grading to create a series of pools and riffles to enhance the natural characteristic of the project area. To mitigate the potential of flooding created by increased downstream sedimentation, this alternative requires floodwalls construction on each side of the channel between Cross Creek Bridge and the Pacific Coast Highway. Both floodwalls are 3,100 ft long and 5 ft in height. The floodwalls are anchored using drilled-hole-cast-in-place piles. Bedrock depth is potentially at 50 ft depth, and is, therefore, not being considered as a potential issue. The potential benefit of alternatives 4(s) is a reduction in the amount of sediment to be removed, resulting in a lessening of impact on air quality, local traffic and lowered material disposal costs. **Figure 1.4-1** shows an aerial view of the project area.

Figure 1.4-1 Project Area

USACE coordinated with the Cost Engineering Planning Center of Expertise (Walla Walla District) on 2013 for the development of contingencies. Based on those coordination meetings, it was decided to not have separate abbreviated risk analyses for Alternative 2(s); 3 (s); and 4(s). On 2016, all costs were refined/updated, the risks analyses were revisited and cost products submitted for ATR.

2.0 COST ESTIMATE BASIS

2.1 Unit Cost Basis

2.1.1 Direct Cost

Components of construction include the following five cost elements: labor, permanent materials, construction equipment, subcontracts, and contractor's expendable supplies. The key factors in determining the cost of each of these elements is the productivity of the work force and the construction equipment used to perform the various work activities. Productivity rates for the sediment excavation work were selected to reflect local weather, site conditions, work week hours, estimated volume, appropriate construction techniques, schedule sequencing, and experience gained on previous construction projects of similar nature.

Most costs were determined using databases for the individual components of labor, materials, and equipment. In some cases, costs from the bid tabulations of construction projects were selected to represent the actual cost of similar portions of this project. Where used, these historic values were escalated to dollar values and adjusted for economies of scale and other factors to provide an accurate reflection of the cost to do the work over the lifetime of the project. A third source of prices included commercially available construction cost data guides. Generally, costs were grouped for the most significant impact items, such as excavation, transportation of sediment, and concrete removal.

Labor rates used to develop the estimate were obtained from the latest Davis-Bacon Wage Rates for Los Angeles County, Heavy Construction.

Equipment rates are based on the Department of the Army EP 1110-1-8 “Construction Equipment Ownership and Expense Schedule”, Region 7.

Crews were developed for project specific applications and are listed in the crew database.

2.1.2 Quantity and Material Analysis

For the alternatives involving removal of impounded sediment, the sediment is assumed to be alluvial. The sediment is generally distributed in three layers. The upper layer predominantly consists of gravel, cobbles, and other rocks. The middle layer is predominantly sand. The bottom layer is mostly a combination of silt, sand and clay. The sediment distribution was simplified in the following breakdown show in **Table 2.1-1**.

Table 2.1-1 Sediment Distribution

Material Classification	Sediment Quantities
Rock/Gravel	200,000 CY
Sand	340,000 CY
Clay/Silt	230,000 CY
TOTAL	**770,000 CY**

Actual sediment volume available amounts to 780,000 CY. However, upstream 10,000 CY impounded material is narrow and thin; and it has no appreciable sand. This 10,000 CY is left in-place and eroded to grade naturally by the creek as recommended by the 2003 Geotechnical Impound investigation report. Therefore, the net sediment removal volume is 770,000 CY.

Based on consultation with USACE Geology, the impounded sediment will not swell upon excavation due extremely low relative density of the fine material, and the loose nature of the granular material. Geotechnical investigations and several Soil Penetration Tests (SPT) performed upon the impounded sediment indicated deposit are very loose even at the deepest layers. All material is in Loose Cubic Yards (LCY).

2.1.3 Equipment Selection

Equipment selection and sizing were developed through cost engineer experience.

2.2 Real Estate

Lands as well as temporary storage fees for the storage of re-useable materials at the Calabasas Landfill were identified and provided by USACE.

According to information provided by the Design Planning Report, the Calabasas Landfill could provide temporary storage for up to approximately 565,000 CY of roughly separated sand/cobble/gravel/boulder material for a ten-year period. The estimated time period is 2017-2027. Between 2017 and 2027, approximately 12 acres in stockpile area could be made available at the Calabasas Landfill for temporary storage. The site incurs costs associated with receiving this material, including dozer work associated with receiving the dirt, additional street sweeping and dust control.

2.3 Relocations

Relocations associated with the upstream barriers were estimated in detail by Cost Engineering.

2.4 Assumptions

2.4.1 Site Access/Preparation and Mobilization

The dam can be accessed through an existing, unpaved road off Malibu Canyon. Site access improvements are required for approximately 800 linear feet of temporary road for widening, as necessary, to accommodate construction traffic and for normal maintenance

of the roadway surface and drainage culverts during the contract period. No other improvements are anticipated.

Temporary haul roads will be required to be established for excavation of the sediment material. Maximum grades should generally not exceed 15%. Mobilization and demobilization encompass the cost of transporting and setting up heavy pieces of equipment.

The current estimate considers constraints on construction activities for protection of threatened and endangered species.

Vegetation is cleared along the pioneer road, access maintenance road, and sediment removal area. Ground trees, trash, and areas difficult to access encompass 25% of the total area and they are manually cleared with brush-saws, track-hoes, and chippers. 75% of the total area is cleared with dozers and mulched.

The Sheriff's Overlook is a small overlook area off the Malibu Canyon Road just south of the project site. During construction, Sheriff's Overlook will be used as a staging and an oversight area for construction teams. A trailer for construction crews can be placed to provide optimal views of the dam deconstruction and truck and equipment routes to and from the construction site. Upon completion of construction activities, the trailer will be removed and any debris or equipment located at Sheriff's Overlook will be cleared from the area.

The cost estimate includes installation of guard rail fencing around the outlook and installing gravel for vehicles parking/roads.

Aesthetic and educational components are included as measures, particularly at Sheriff's Overlook above Rindge Dam and adjacent to Malibu Canyon Road. Post construction, Sheriff's Overlook will remain a dirt turnout for vehicles driving along Malibu Canyon Road. Interruptive signs will be placed displaying images and facts about the history of the Rindge Dam.

The disposal site is located 7.5 mi north of the project area. The LA County beach potentially receiving sand material from the project is approximately 5 miles from the dam.

Due to a lack of turnaround space available on the access road leading to the dam, two (2) ramps are constructed for truck traffic. One ramp will allow vehicles to travel northbound, towards the landfill, and the other allowing vehicles to travel southbound, towards the beach.

There is already an existing 12-ft wide ramp in the southbound direction, but it is in a state of disrepair. Repair of the existing ramp involves rebuilding the bottom area of the ramp (approximately 15,700 cy of fill) to a length of 1,000 ft. Additional work on the southbound ramp is required to allow for loaded truck traffic. The ramp is widened to 15 ft and reduced to a grade of 15%. Widening and re-grading the southbound ramp requires 55,000 cy of fill material.

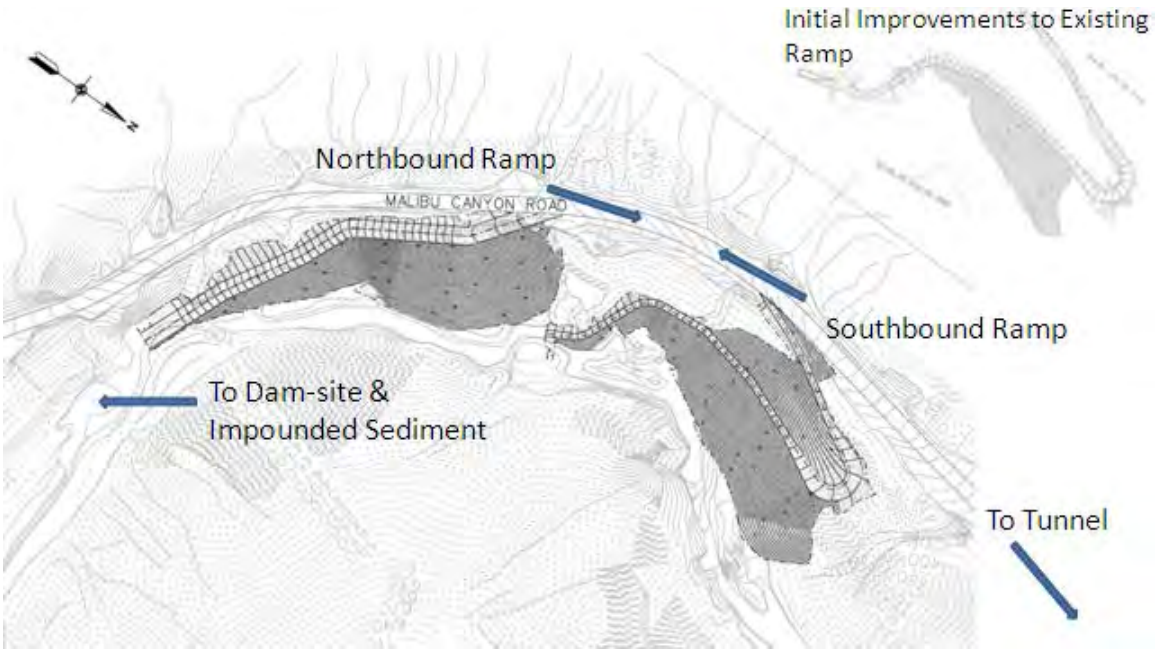

Figure 2.4-1 Northbound and Southbound Access Ramp Plans

2.4.2 Diversion and Control of Water

A cofferdam shall be used, upstream of the sediment removal area, for temporary control of water. The cofferdam permits construction and modification of the diversion channel as construction proceeds. The cofferdam will be constructed of compacted earthen fill material harnessed at the project site. The cofferdam will be approximately 30 ft long, 6 ft wide at the top (with 1:2 side slopes), and 6 ft high. Low flow water will travel from the cofferdam to the existing spillway via a 36-in diameter corrugated metal pipe (CMP) approximately 4,100 ft in length. It was decided to keep the pipeline above ground to allow for maximum flexibility during the removal of sediment material, concrete arc section, and spillway. The CMP will be anchored using 4 ft long metal stakes placed every 50 ft along both sides of the pipe. During the second year of construction, the CMP line is aligned such that all bypassed water is discharged from the Spillway.

At the end of each construction season, the CMP will be removed and transported to the contractor's yard for storage (i.e. to prevent damage during winter flows). The pipeline will then be reinstalled at the beginning of the next construction season. The cofferdam will also be demolished at the end of each construction season and re-constructed at the beginning of the next.

A total of 11 wells will be used to provide de-watering for the project site. These wells will be installed in the first year of the project and extend to the final project depth. The wells will be trimmed down to current invert level periodically throughout construction.

Since turbidity is a major environmental consideration during construction, the USACE validated the assumptions above relating to dewatering with a local dewatering contractor on February 1, 2013. The dewatering contractor suggested the use of de-silting tanks to treat the water before it's discharged into the CMP line, combined with other bypassed waters, and ultimately released downstream via the existing spillway. The dewatering

contractor also reviewed sieve data collected out in the field by the USACE Geologist and provided a recommendation with regards to the design of the well screens which has proven effective with fine material 200 and smaller.

2.4.3 Rindge Dam Structural Demolition

For estimating purposes, the removal of the arch dam section is assumed to be performed using conventional high-impact breakers, blasting, and diamond-wire saw-cutting methods.

The diamond-wire system consists of a diamond-impregnated wire made to length for each cut and a hydraulically-powered drive system. Diamond wire is routed to envelope the area to be cut (requiring drilled holes), then guided into a drive wheel on the power unit. The drive wheel rotates and pulls the wire through the concrete. The diamond wire is best suited for cutting or notching composites of dissimilar materials. Since the Rindge Dam arch is a composite of concrete, rebar and railroad ties, the cutting action of the diamond wire conforms to the work. The gentle cutting action of the diamond wire does not smear one material into another and does not snag at the border between two materials. Diamond wire saw-cutting will provide smooth surfaces, facilitate excavation of notch portions of the arch dam section, 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).

This demolition method allows for compliance with environmental requirements relating to turbidity and discharging waste material into Waters of the United States.

Vertical and angled drill holes will be required for production blasting of the base of the dam to the final excavation level. Two inch diameter drill holes were assumed to be located on a 4 ft pattern for production blasting of the concrete, with blasting mats used to confine the concrete rubble for removal using a crane and a loader.

Spillway removal shall consist of pre-splitting the concrete from the rock substratum, drilling and micro-blasting the surface to fracture the concrete, and manually breaking the concrete. The spillway will be removed in stages for all of the action alternatives and effectively occur in parallel with the demolition of the dam.

All the debris from the dam and spillway will be taken to the Calabasas Landfill for disposal.

2.4.4 Construction Logic and duration

Activity durations were based on engineering judgment and experience. Key assumptions for establishing activity durations include an average diamond-wire saw-cutting rate of 84 ft^2 (surface area) per day for concrete in the arch at Rindge Dam, and an average excavation rate of 1,300 cy per day for the sediment removal.

2.4.5 Waste Disposal

The Calabasas Landfill is located off of Lost Hills Road in Agoura, CA at the upper end of the watershed. The landfill is approximately 7.5 mi from Rindge Dam, mostly along Malibu

Canyon Road, named Las Virgenes Road after crossing Mulholland Drive. All waste materials will be removed from the site and transported to the Calabasas landfill.

The cost estimate assumes that all waste concrete will be dumped at the Calabasas Landfill. An estimated 3,460 cy of concrete will be in large blocks, weighing approximately 19 tons each. An estimated 540 cy of concrete from the foundation demolition will be fractured and broken into manageable pieces before hauling and disposal. 2,000 cy of concrete from the spillway demolition, micro-blasted and demolished into small pieces, will also be hauled to the landfill. Additional costs required to crush all waste concrete for disposal (with any reinforcing steel removed) is assumed to take place at the disposal site and is included in the disposal cost.

Additional waste disposal will result from de-vegetation activity. The green waste associated with vegetation removal will also be sent to the Calabasas Landfill.

2.4.6 Hauling

Typical construction equipment used for hauling includes flatbed trucks, low boys, and dump trucks. Hauling is performed 6 days per week during daylight hours along Malibu Canyon.

Removal of the concrete arch requires approximately 163 truck trips; each truck hauls two blocks at a time. The blocks are loaded onto the trucks with a crane.

The arc foundation concrete requires removal of approximately 15 ft of concrete from the surface (base) of the dam to the bedrock. The arc foundation amounts to approximately 540 CY of concrete to be removed and hauled away.

The spillway requires a total of approximately 100 trips to transport 2,000 CY.
Flatbed trucks and dump body trucks will be used for hauling the foundation and spillway concrete.

Truck traffic for sediment removal at Rindge Dam varies greatly based on the chosen alternative. Haul loads cannot exceed 80,000 pounds. The contractor will be required to make appropriate repairs to the Malibu Canyon Road to allow for normal use after construction.

2.4.7 Site Clean-up

Final channel cleanup, including removal of any concrete rubble and boulders, must be performed during the low-flow period (April through October).

2.4.8 Site Restoration

A site restoration plan will be developed to provide natural-looking contours following removal of the sediment and dam. The river channel contains large boulders, which will be push aside as necessary for fish passage and potential recreational use of the river, if possible.

2.4.9 Monitoring & Adaptive Management

An environmental mitigation cost were developed with input from the environmental coordinator and biologist. Cost includes: seeding, weeding, maintenance for five years, and biological monitoring for five years.

2.4.10 Road Improvement Plan

Heavy construction traffic associated with hauling materials from the dam site to designated disposal areas may cause damage to some of the existing roadways in the area. Malibu Canyon Road is designed and constructed to accept standard truck traffic. Two types of roadway repairs were considered; spot patching with resurfacing, or total replacement. The alternative for spot patching, as needed, is difficult to evaluate due to the inability to identify with any confidence the extent of potential damage and the amount of patching that may be required. It is anticipated that dips and ruts will be typical repair requirements, which could involve long sections of the road. The spot patching alternative includes resurfacing of the entire roadway with two layers of bituminous surface treatment. On March 20, 2013, the PDT assumed that the total replacement alternative (i.e. 0.5 mi) ensures that all potential deficiencies are addressed.

2.4.11 Beneficial use of Sediment Material

The SC-DMMT agreed in concept to consider allowing on-beach placement and near-shore placement of the sand-rich layer. The existing condition of the sand-rich material is 22% fines and 5% gravel with the remaining content being sand. Although this level of fines (silty material) is at the upper end of what is generally be accepted for on-beach placement, no amount of screening has been assumed at this time. The sand is trucked from the project site to the beach down-coast of Malibu Pier or trucked to Ventura Harbor and then barged to near-shore Malibu Beach.

2.5 Indirect Costs (Contractor Markups)

The contractors and subcontractors' field office overhead, home office overhead, and profit were established using historical rates for similarly sized jobs and represent the contractor's cost of doing business and assuming the risks associated with construction work. A dewatering subcontractor, fencing subcontractor, drilling/blasting subcontractor, paving subcontractor, landscape subcontractor, demolition subcontractor, trucking subcontractor, and environmental restoration subcontractor were included in the estimate.

For all the alternatives, disposal fees do not carry contractor’s markups. Disposal fees represent approximately 70% of the total sediment removal cost. Typically, disposal fees carry markups, but since the disposal fees represent such a large percentage of the estimate adding contractor’s markups would artificially inflate the estimate. In a bidding or negotiated contract disposal fees of this magnitude, loading and hauling carry normal dis should not carry field office overhead, home office overhead, profit and bond.

2.6 Owner Cost

The following Owner Costs are applied to the CWE.

2.6.1 Planning Engineering and Design (PE&D)

Planning Engineering and Design (PE&D), including Engineering During Construction (EDC) was estimated at 15% of the Construction cost with contingency.

2.6.2 Construction Management or Supervision & Administration (S&A)

Construction Management was estimated at 6.7% of the construction cost with contingency.

2.7 Schedule of Work

Due to the traffic conditions on Malibu Canyon/Las Virgenes Road, truck use for hauling on this road will be restricted to the hours of 9 AM to 3 PM daily. On school days, hauling is disallowed from 2:00 PM to 3:30 PM. Therefore, assume road use from 9 AM to 2 PM (5 work hours per day) while school is in session for any material hauled to the Calabasas landfill. On non-school days, the work day is 9 AM to 3 PM (6 hours).

During the summer time frame, sediment is not allowed to be hauled to the beach. Therefore, sediment is temporarily held a Site F. Site F is located outside the sediment impounded area near the dam. During the winter time frame, sand sediment is hauled from Site F to the beach.

After the addition of daily operational restrictions, the job requires one year of set up and site preparation, and 6 or 7 years of sediment hauling to complete the job, for a 7-year to 8-year total project length.

Truck hauling to the Calabasas Landfill will occur 6 days a week. No hauling to the landfill will occur on Sundays or federal holidays. Estimated construction duration is approximately 7 to 8 years followed with rehabilitation of the highway and the environmental mitigation work. The construction season is defined as 1-April to 15-October. During the winter period, no work will be done and no equipment will be on-site. During construction, the contractor will be responsible for checking the weather conditions every day and evacuating all personnel and equipment in the event inclement weather is forecasted. The existing cost estimate has accounted for contractor mobilization and de-mobilization during each year of construction.

3.0 UPSTREAM BARRIERS ASSESSMENT

A list has been compiled of 7 high-priority man-made barriers upstream of the Rindge Dam that have been identified as additional blockages to the migration of local fish species. Each one will be prioritized to see if its removal, modification or replacement can add migratory fish access to a large amount of additional habitat upstream of the dam for a relatively small incremental expense. An Indicator Species for the Malibu Creek Ecosystem Restoration is southern steelhead trout (*Oncoryhnchus mykiss*), a federally-listed endangered species. Prioritization of fish barriers should begin with a mention of the keystone barrier, which is the Rindge Dam. It is important to note that natural barriers to

the trout were identified in previous studies, but are not included in the prioritization. Generally speaking, the natural barriers are fish-passable under at least some flow conditions. This section discusses only the upstream barriers and makes no further mention of Rindge Dam.

Man-made barriers are considered a limiting factor and are, therefore, the only barriers included in this assessment. Recommendations were developed by Camp Dresser & McKee Inc. based on field assessment, barrier removal practices generally accepted by NOAA, NMFS, and CDFG, and the 2005 Abramson and Grimmer report. The actions "Remove invasives and monitor" is considered a part of every recommendation and should be included in all barrier renovation/removal plans, but are omitted here for brevity. Additionally, during construction, it is necessary to demolish and rebuild only one lane at a time where there is a County road running above (if applicable). The contractor is required to block only one-half of the barrier/bridge at a time, and allow for staggered two-way passage on the other lane using flag-men or automated signals at night. Fire department access to any construction site and passage across the road above must be maintained at all times during construction; wildfires being a major issue in Malibu.

CC5 (Cold Canyon Road Culvert) may have more than 6-inches of concrete on the invert, but from project photographs, the invert has eroded away with time. If more of the concrete is removed, there is a risk in exposing the corrugated metal pipe (CMP). Over time, the corrugated metal pipe will corrode and break down, and when this happens along the invert of a culvert it jeopardizes the structural integrity of the entire culvert. The concrete inverts of LV3 and LV4 also cannot be chipped away for similar reasons. From researching other projects plan sets, concrete inverts generally have about 4-inches of concrete placed over the reinforcing rebar, which is insufficient for a passage channel to be made. In addition, when concrete is removed from a box culvert, the structural characteristics of the culvert are changed and there is a risk of reducing the overall structural capacity.

In contrast to carving a channel in each invert, it was assumed that there would be a need to construct a channel along the inverts of CC5, LV3, and LV4. The construction at CC5 requires building a channel along the 130 ft-long invert of the culvert, and do limited work upstream and downstream of the culvert to ensure low flows still pass through the structure. For LV3 and LV4, it is necessary to modify the invert of the box culvert AND the entire concrete apron upstream and downstream of each structure. In addition to the concrete apron modification, there is a need to modify the stream bed enough to ensure low flows pass through LV3 and LV4 and modify the sill structures to ensure fish can overcome the vertical drop at each one.

3.1 Upstream Barriers Assumptions

USACE developed the following upstream barrier plans for the feasibility-level cost estimates. These plans are considered to be technically feasible, economical, and compatible with the project objectives.

3.1.1 Site Access/Preparation

The current estimate assumes no constraints on construction activities will be necessary for protection of threatened and endangered species.

Vegetation must be cleared in and around the project sites and access maintenance roads, as needed. For the majority of the upstream barrier sites, it is assumed that vegetation will have to be manually cleared with brush-saws, track-hoes, and chippers. Some barrier sites, where equipment access is not an issue, allow for clearing using small dozers. Disposal of materials using rental dumpsters was assumed.

3.1.2 Diversion and Control of Water

For most of the upstream barrier alternatives, it is assumed that a temporary cofferdam of varying heights per alternative is installed upstream of the construction area. Installation of a temporary 36-inch CMP allows for water conveyance through the construction site, enabling fish passage during construction.

For some of the upstream barrier alternatives, a lack of staging area and/or access issues requires that the temporary cofferdam be built using sandbags. These cofferdams require the construction of a trench/sump to pump the water downstream of the construction site using hosing.

3.1.3 Structural Demolition for all 9 Upstream Alternatives

The demolition for each of the upstream alternatives varies based upon existing conditions (see **Figure 3.4-1** for a location of each barrier).

The following descriptions highlight some of the differing site conditions at each site and identify what the planned method is for improving fish passage to meet the project objective:

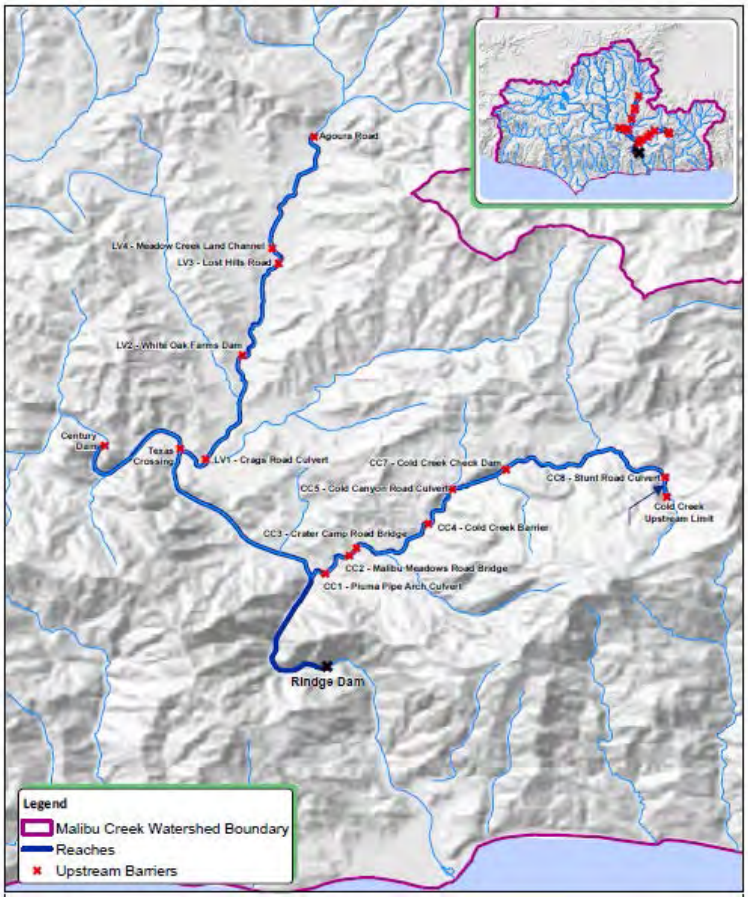

Figure 3.4-1 Locations of Upstream Barriers

LV1 - Crags Road Culvert Crossing

The existing concrete box culvert, the existing concrete abutments, and the existing concrete wing walls will be removed and replaced with a pre manufactured 75 ft long, 20 ft wide clear span bridge. This new bridge will span the entire creek and eliminate the current reduction in the creek cross section. The new bridge's deck elevation will match the top elevation of the existing structure.

The use of a pre-manufactured bridge will reduce construction time since the bridge will be delivered to the site and placed on the new abutments with a crane. Prior to installing the new bridge, the new wing walls and bridge abutments will have to be constructed on both banks of the creek. The creek bed will have to be re-graded to fill any voids left by the removal of the existing structures. Construction is estimated to take 15 days.

The creek flow will have to be diverted during removal of all the existing structures and construction of the new abutments and wing walls. Water diversion will also be necessary while any work is being performed within the creek. The creek will not need to be diverted while the pre manufactured bridge is being placed on the abutments. Dewatering will also be necessary during construction of the new bridge wing walls and the new bridge abutments.

De-vegetation will be required for the removal of the existing bridge wing walls and abutments along with construction of the new bridge wing walls and abutments. Additional clearing will be required at the designated staging area for the project. All areas that are cleared will be restored once construction is complete.

No traffic control measures will be required since this bridge is used for maintenance vehicle and fire truck access.

LV2 - White Oak Dam

The existing 6 ft dam will be removed in stages over 3 years to minimize any erosion and scour problems. The creek will have to be diverted each year to protect any crews and equipment being used to remove the dam. However, work in the creek will be kept at a minimum since the dam will be removed by a backhoe stationed on the creek bank. Dewatering will not be required. Demolition is estimated to take 15 days each year. Clearing will be limited to a 40 ft by 40 ft area on either side of the cofferdam, which will ensure the backhoe, has adequate space to work. These areas will have to be cleared every year of dam removal. All areas that are cleared will be restored once the dam removal is completed. Once the dam is removed, no further work will be done to restore the creek.

LV3 - Lost Hills Road Culvert & LV4 - Meadow Creek Lane Crossing

Both LV3 and LV4 will have to be treated as a single project because fish have to pass through both barriers to reach the habitat areas upstream of LV4. These structures will not be removed; rather, a low flow channel will 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. This channel will be 6 inches deep and start at the downstream end of the concrete apron, extend upstream through the culvert structure, and terminate at the end of the upstream concrete apron. This channel will be 3 ft wide and will ensure there is enough water traveling at low enough velocities for fish passage. The drop at the downstream end of the concrete invert will not be modified. The low flow channel for LV4 will be similar to the channel passing through LV3 and allow fish to travel upstream to the designated habitat areas. Construction is estimated to take 50 days.

The invert of the creek between LV3 and LV4 will have to be cleared and re-graded to provide a low flow channel that will connect the concrete channels along LV3 and LV4. This area will be restored once construction is complete.

The creek flow will have to be diverted during construction of both concrete low flow channels and while the creek invert between LV3 and LV4 is being re-graded. Limited dewatering will be necessary along the creek between LV3 and LV4 to ensure adequate working conditions for construction equipment.

Additional clearing will be required at the designated staging area for the project and along any invert access ramps. The staging area will be restored once construction is completed.

Some traffic control measures may be required during construction hours to facilitate the movement of equipment from the staging area to the construction site.

<u>CC1 - Piuma Culvert</u>

The existing CMP arch culvert, the concrete lining along the creek invert, and the stone head walls will be replaced by a 12 ft pre-cast arch culvert with new concrete footings and concrete head walls on both sides of the creek. The width and height of the new culvert will match the existing CMP culvert and the road elevations across the culvert will be the same as the existing roadway.

The existing metal arch culvert, stone wing walls, and concrete invert will be removed in two stages. The first stage will be from the upstream inlet to the centerline of the road, the second state will be from the centerline of the road to the downstream outlet. The culvert must be removed in two parts so the traffic along the road can be diverted into one lane across the bridge. Traffic control measures will be required during and after construction hours to ensure traffic can safely be reduced down to one lane across the creek.

The pre-cast culvert will reduce construction time since the culvert will be delivered to the site and placed on the footings with a crane. Prior to installing the new culvert sections, new headwalls and footings will have to be constructed. Construction is estimated to take 30 days.

The concrete invert of the creek will be replaced with a natural channel. The creek bed under the culvert will have to be re-graded to compensate for the small elevation drop at the end of the existing concrete invert.

Temporary shoring will be required to preserve the road while the existing metal culvert and stone wing walls are being removed. The temporary shoring will be placed

perpendicular to the centerline of the road and run parallel to the existing CMP culvert for 46 ft. The temporary shoring will be required on the north and south sides of the existing structure and will be removed once the new bridge abutments and wing walls are completed.

The creek flow will have to be diverted during removal of all the existing structures and construction of the new footings and headwalls. The creek will also have to be diverted while any work is being performed within the creek bed. Dewatering will be necessary during construction of the new culvert footings and headwalls.

Clearing will be required for the removal of the existing culvert wing walls and abutments, along with construction of the new culvert footings and headwalls. Additional clearing will be required at the designated staging area for the project. All areas that are cleared will be restored once construction has been completed.

CC2 - Malibu Meadows Road Crossing

The existing structure is a wood deck, steel beam bridge with the concrete invert and CMU abutments and wing walls. This structure will be removed and replaced with a 70 ft long and 25 ft wide pre-manufactured bridge with concrete abutments and wing walls on both sides of the creek. The new bridge will have a longer span than the existing structure to help eliminate the reduction of the creek cross section, and the bridge deck elevation will match the existing bridge deck elevation.

The pre-manufactured bridge will reduce construction time since the bridge will be delivered to the site and placed on the new abutments with a crane. Prior to installing the new bridge, new wing walls and bridge abutments will have to be constructed on both banks of the creek. Construction is estimated to take 30 days.

The existing concrete invert will be removed and replaced with a modified stream bed. The stream bed improvements will have to be designed to compensate for a 5 ft drop at the end of the existing concrete invert while still allowing fish to swim upstream. The stream bed improvements will have to prevent head cutting upstream of the new bridge.

The creek flow will have to be diverted during removal of all the existing structures and construction of the new abutments and wing walls. The creek flows will also have to be diverted while any work is being performed within the creek bed. The creek will not need to be diverted while the pre-manufactured bridge is being installed. Dewatering will also be necessary during construction of the wing walls and abutments.
Clearing will be required for the removal of the existing wing walls and abutments along with construction of the new abutments and wing walls. Additional clearing will be required at the designated staging area for the project. All areas that are cleared will be restored once construction has been completed.

Traffic control measures will only be in place to warn drivers of a closed bridge. All traffic will be redirected through neighboring streets.

CC3-Crater Camp Road Crossing

This site is assumed to be the same as CC2, except there is no gas line running along the bridge. This structure will be replaced in like manner to CC2, with minor changes to specific lengths and measurements.

CC4 - Cold Creek Barrier (Dam)

Cold Creek Barrier (Dam) is excluded from the project.

CC5 - Cold Canyon Road Culvert

The existing 25 ft diameter concrete culvert cannot be removed so a low flow channel will be built along the culvert's invert to allow fish passage upstream. The channel will be 6 inches deep and 3 ft wide and will ensure flows are slow enough and deep enough for fish passage during low flow conditions. The downstream portion of the culvert will not be modified, because fish can use existing ponds to make their way into the low flow channel. 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 will need to be diverted during construction but no dewatering will be necessary. Construction is estimated to take 15 days. No traffic control will be necessary.

Construction Logic and duration

Activity durations were based on engineering judgment and experience. Construction durations vary per alternative from 15 days to 5 months.

3.1.4 Waste Disposal

The Calabasas Landfill is located at Lost Hills Road in Agoura, CA at the upper end of the watershed. For the 7 upstream barriers, it was assumed that waste disposal is carried on via rented waste dumpsters per the suggestion of the local sponsor. The cost estimate assumes waste will be dumped at the Calabasas Landfill without further handling.

3.1.5 Hauling

Typical construction equipment used for hauling includes flatbed trucks, low boys, and dump trucks. Hauling is performed 6 days per week during daylight hours.

3.1.6 Site Clean-up

Final channel cleanup, including removal of any concrete rubble and boulders, must be performed during the low-flow period (April through October). All upstream barrier alternatives are assumed to have varying rock landscaping requirements based upon the project site to help enhance migratory fish passage.

3.1.7 Monitoring & Adaptive Management

Environmental monitoring and adaptive management scope and costs were provided by the USACE LA Planning Division Environmental Resources representative with assistance from Cost Engineering.

4.0 SYNOPSIS

Feasibility-level designs and estimates have been prepared for the sediment removal and demolition of Rindge Dam and Spillway as well as for the 7 upstream barrier alternatives. The current studies confirm that dam removal is technically feasible and can be safely performed in a manner compatible with sediment management requirements and project objectives. Dam removal activities will require a period of approximately 7 to 8 years to complete for removal Alternatives 2(s) and 4(s). Dam removal period for Alternatives 3(s) is dependent on seasonal storm levels to allow natural sediment erosion transport; it is estimated to take about 50 years for all the sediment to be naturally transported downstream.

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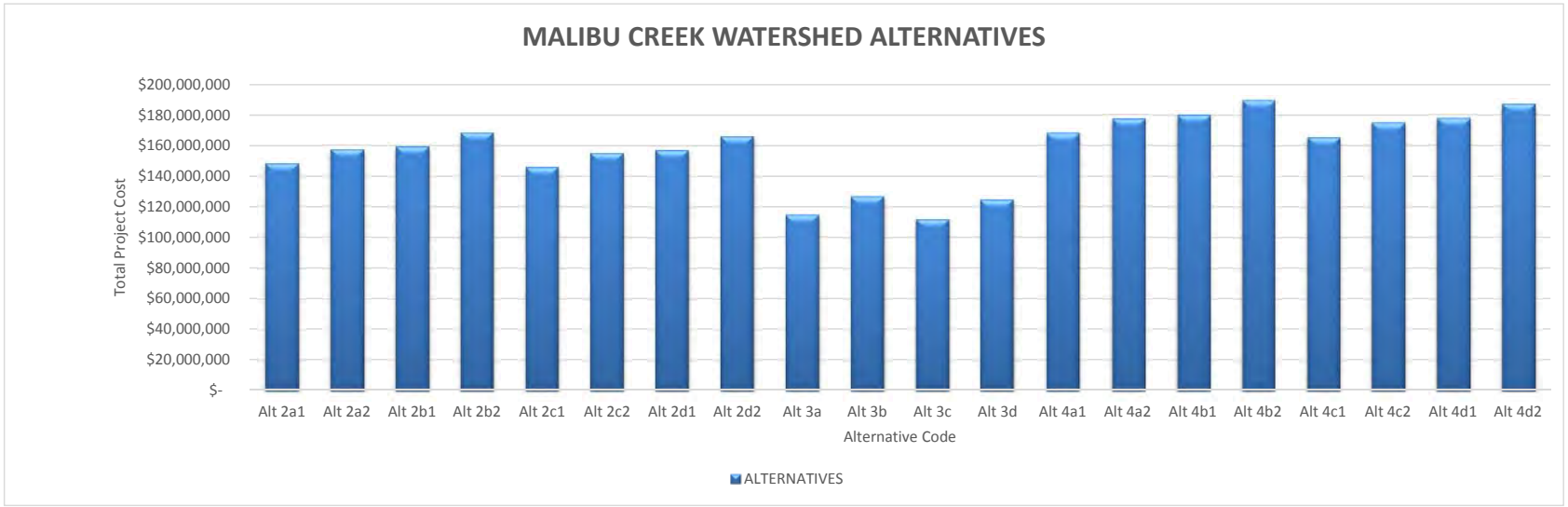
MALIBU CREEK WATERSHED ALTERNATIVES

	Alternatives	Total Project Cost	Demolition	Sediment Transportation	Including
Alts 2(s)	Alt 2a1	$ 148,480,000	Demo Arc and Spillway	Truck	
	Alt 2a2	$ 157,598,000	Demo Arc and Spillway	Truck and Barge	
	Alt 2b1	$ 159,670,000	Demo Arc and Spillway	Truck	U/S Barrier Removal
	Alt 2b2	$ 168,787,000	Demo Arc and Spillway	Truck and Barge	U/S Barrier Removal
	Alt 2c1	$ 146,153,000	Demo Arc	Truck	
	Alt 2c2	$ 155,272,000	Demo Arc	Truck and Barge	
	Alt 2d1	$ 157,344,000	Demo Arc	Truck	U/S Barrier Removal
	Alt 2d2	$ 166,460,000	Demo Arc	Truck and Barge	U/S Barrier Removal
Alts 3(s)	Alt 3a	$ 114,537,000	Demo Arc and Spillway	Truck	
	Alt 3b	$ 127,133,000	Demo Arc and Spillway		
	Alt 3c	$ 111,887,000	Demo Arc	Truck	U/S Barrier Removal
	Alt 3d	$ 124,484,000	Demo Arc		U/S Barrier Removal
Alts 4(s)	Alt 4a1	$ 168,274,000	Demo Arc and Spillway	Truck	
	Alt 4a2	$ 177,621,000	Demo Arc and Spillway	Truck and Barge	
	Alt 4b1	$ 180,603,000	Demo Arc and Spillway	Truck	U/S Barrier Removal
	Alt 4b2	$ 189,950,000	Demo Arc and Spillway	Truck and Barge	U/S Barrier Removal
	Alt 4c1	$ 165,686,000	Demo Arc	Truck	
	Alt 4c2	$ 175,033,000	Demo Arc	Truck and Barge	
	Alt 4d1	$ 178,014,000	Demo Arc	Truck	U/S Barrier Removal
	Alt 4d2	$ 187,362,000	Demo Arc	Truck and Barge	U/S Barrier Removal



MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE

5/8/2016, Rev. 8/10/16

PRICE LEVEL: 1 OCTOBER 2016

ENTIRE DAM REMOVAL (ARC AND SPILLWAY) -- 770,000 CY TRUCK AND/OR BARGE TRANSPORT

ALT 2a1 Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Trucking

Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment.
Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill.
Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
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	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	24%	369,957	1,911,445	
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	283,600	283,600	24%	68,064	351,664	
06	Biological Resources During Construction Monitoring	1	LS	4,218,200	4,218,200	24%	1,012,368	5,230,568	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,454,600	1,454,600	24%	349,104	1,803,704	
14	Cultural Resources	1	LS	1,464,000	1,464,000	24%	351,360	1,815,360	
	Total Estimated Construction				**97,593,972**		**23,422,553**	**121,016,525**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	14,639,096	14,639,096	24%	3,513,383	18,152,479	
31	Construction Management (S&A) - 6.7%	1	LS	6,538,796	6,538,796	24%	1,569,311	8,108,107	
	TOTAL COST				**119,734,000**		**28,746,000**	**148,480,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES 5/8/2016, Rev. 8/10/16
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

ALT 2a2 Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Truck and Barge

Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment.
Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill.
Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
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	242,800	242,800	24%	58,272	301,072	
06	Biological Resources During Construction Monitoring	1	LS	3,793,600	3,793,600	24%	910,464	4,704,064	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,341,600	1,341,600	24%	321,984	1,663,584	
14	Cultural Resources	1	LS	1,161,000	1,161,000	24%	278,640	1,439,640	
	Total Estimated Construction				**103,636,180**		**24,872,683**	**128,508,863**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,545,427	15,545,427	24%	3,730,902	19,276,329	
31	Construction Management (S&A) - 6.7%	1	LS	6,943,624	6,943,624	24%	1,666,470	8,610,094	
	TOTAL COST				**127,087,000**		**30,511,000**	**157,598,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES 5/8/2016, Rev. 8/10/16
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 2b1	**Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Trucking -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.									
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 2-7)	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	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	24%	369,957	1,911,445	
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	2,488,184	
14	Cultural Resources	1	LS	1,476,000	1,476,000	24%	354,240	1,830,240	
	Total Estimated Construction				**104,289,085**		**25,029,380**	**129,318,465**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,643,363	15,643,363	24%	3,754,407	19,397,770	
31	Construction Management (S&A) - 6.7%	1	LS	6,987,369	6,987,369	24%	1,676,968	8,664,337	
	TOTAL COST				**128,751,000**		**30,919,000**	**159,670,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES 5/8/2016, Rev. 8/10/16
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 2b2	**Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Truck and Barge -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.									
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 placeme	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	LS	16,549,544	16,549,544	24%	3,971,891	20,521,434	
31	Construction Management (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**	

DAM REMOVAL (ARC, ONLY) -- 770,000 CY TRUCK AND/OR BARGE TRANSPORT

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 2c1	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Trucking**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.									
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
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	283,600	283,600	24%	68,064	351,664	
06	Biological Resources During Construction Monitoring	1	LS	4,218,200	4,218,200	24%	1,012,368	5,230,568	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,454,600	1,454,600	24%	349,104	1,803,704	
14	Cultural Resources	1	LS	1,464,000	1,464,000	24%	351,360	1,815,360	
	Total Estimated Construction				**96,052,484**		**23,052,596**	**119,105,080**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	14,407,873	14,407,873	24%	3,457,889	17,865,762	
31	Construction Management (S&A) - 6.7%	1	LS	6,435,516	6,435,516	24%	1,544,524	7,980,040	
	TOTAL COST				**117,858,000**		**28,296,000**	**146,153,000**	

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 2c2	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Truck and barge**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.									
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
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	Sediment Removal (Truck/barge sand -- nearshore placeme	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	242,800	242,800	24%	58,272	301,072	
06	Biological Resources During Construction Monitoring	1	LS	3,793,600	3,793,600	24%	910,464	4,704,064	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,341,600	1,341,600	24%	321,984	1,663,584	
14	Cultural Resources	1	LS	1,161,000	1,161,000	24%	278,640	1,439,640	
	Total Estimated Construction				**102,094,692**		**24,502,726**	**126,597,418**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,314,204	15,314,204	24%	3,675,409	18,989,613	
31	Construction Management (S&A) - 6.7%	1	LS	6,840,344	6,840,344	24%	1,641,683	8,482,027	
	TOTAL COST				**125,211,000**		**30,060,000**	**155,272,000**	

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 2d1	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Trucking -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.									
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 2-7)	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	2,488,184	
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%	1	LS	15,412,140	15,412,140	24%	3,698,913	19,111,053	
31	Construction Management (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**	

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 2d2	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Truck and barge -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.									
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	Sediment Removal (Truck/barge sand -- nearshore placeme	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				**108,788,805**		**26,109,313**	**134,898,118**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	16,318,321	16,318,321	24%	3,916,397	20,234,718	
31	Construction Management (S&A) - 6.7%	1	LS	7,288,850	7,288,850	24%	1,749,324	9,038,174	
	TOTAL COST				**134,227,000**		**32,233,000**	**166,460,000**	

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ENTIRE DAM REMOVAL (ARC AND SPILLWAY) -- 770,000 CY SEDIMENT NATURALLY TRANSPORTED D/S

ALT 3a Rindge Dam Arc and Spillway Removal - Impounded sediment naturally transported downstream

Incrementally remove Rindge Dam arch and spillway. Impounded sediment is naturally transported downstream with winter storm flows.
Floodwalls required from Cross Creek Rd to PCH.
Upper Gravel layer trucked to Calabasas Landfill; included in the estimate as Sediment Removal.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
01	Lands and Damages - Floodwall	1	LS	366,000	366,000	25%	91,500	457,500	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	45%	2,627,565	8,466,598	
06	General Requirements (Years 2, 3 and 4)	3	yr	4,523,935	13,571,805	45%	6,107,312	19,679,117	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	45%	1,763,805	5,683,372	
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	45%	693,670	2,235,158	
06	Sediment Removal -- Truck Upper gravel layer and sediment cut back to allow dam demolition	1	LS	13,517,109	13,517,109	45%	6,082,699	19,599,808	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	45%	128,946	415,492	
06	Floodwalls (10 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	12,374,841	12,374,841	45%	5,568,678	17,943,519	
06	Biological Resources Pre-Construction Monitoring	1	LS	226,200	226,200	45%	101,790	327,990	
06	Biological Resources During Construction Monitoring	1	LS	11,618,800	11,618,800	45%	5,228,460	16,847,260	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,286,000	1,286,000	45%	578,700	1,864,700	
14	Cultural Resources	1	LS	1,480,000	1,480,000	45%	666,000	2,146,000	
	Total Estimated Construction				**65,661,389**		**29,547,625**	**95,209,014**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	9,849,208	9,849,208	24%	2,363,810	12,213,018	
31	Construction Management (S&A) - 6.7%	1	LS	4,399,313	4,399,313	24%	1,055,835	5,455,148	
	TOTAL COST				**81,238,000**		**33,299,000**	**114,537,000**	

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 3b	**Rindge Dam Arc and Spillway Removal - Impounded sediment naturally transported downstream -- U/S Barriers Modification/Removal**								
	Incrementally remove Rindge Dam arch and spillway. Impounded sediment is naturally transported downstream with winter storm flows. Floodwalls required from Cross Creek Rd to PCH. Upper Gravel layer trucked to Calabasas Landfill; included in the estimate as Sediment Removal.								
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
01	Lands and Damages - Floodwall	1	LS	366,000	366,000	25%	91,500	457,500	
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	45%	2,602,716	8,386,529	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	45%	2,627,565	8,466,598	
06	General Requirements (Years 2, 3 and 4)	3	yr	4,523,935	13,571,805	45%	6,107,312	19,679,117	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	45%	1,763,805	5,683,372	
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	45%	693,670	2,235,158	
06	Sediment Removal -- Truck Upper gravel layer and sediment cut back to allow dam demolition	1	LS	13,517,109	13,517,109	45%	6,082,699	19,599,808	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	45%	128,946	415,492	
06	Floowalls (10 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	12,374,841	12,374,841	45%	5,568,678	17,943,519	
06	Biological Resources Pre-Construction Monitoring	1	LS	290,300	290,300	45%	130,635	420,935	
06	Biological Resources During Construction Monitoring	1	LS	11,902,000	11,902,000	45%	5,355,900	17,257,900	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,838,000	1,838,000	45%	827,100	2,665,100	
14	Cultural Resources	1	LS	1,492,000	1,492,000	45%	671,400	2,163,400	
	Total Estimated Construction				**72,356,502**		**32,560,426**	**104,916,928**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	10,853,475	10,853,475	24%	2,604,834	13,458,309	
31	Construction Management (S&A) - 6.7%	1	LS	4,847,886	4,847,886	24%	1,163,493	6,011,378	
	TOTAL COST				**90,255,000**		**36,878,000**	**127,133,000**	

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ENTIRE DAM REMOVAL (ARC, ONLY) -- 770,000 CY SEDIMENT NATURALLY TRANSPORTED D/S

ALT 3c Rindge Dam Arc Removal - Impounded sediment naturally transported downstream

Incrementally remove Rindge Dam arch, only. Impounded sediment is naturally transported downstream with winter storm flows.
Floodwalls required from Cross Creek Rd to PCH.
Upper Gravel layer trucked to Calabasas Landfill; included in the estimate as Sediment Removal.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
01	Lands and Damages - Floodwall	1	LS	366,000	366,000	25%	91,500	457,500	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	45%	2,627,565	8,466,598	
06	General Requirements (Years 2, 3 and 4)	3	yr	4,523,935	13,571,805	45%	6,107,312	19,679,117	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	45%	1,763,805	5,683,372	
06	Sediment Removal -- Truck Upper gravel layer and sediment cut back to allow dam demolition	1	LS	13,517,109	13,517,109	45%	6,082,699	19,599,808	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	45%	128,946	415,492	
06	Floowalls (10 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	12,374,841	12,374,841	45%	5,568,678	17,943,519	
06	Biological Resources Pre-Construction Monitoring	1	LS	226,200	226,200	45%	101,790	327,990	
06	Biological Resources During Construction Monitoring	1	LS	11,618,800	11,618,800	45%	5,228,460	16,847,260	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,286,000	1,286,000	45%	578,700	1,864,700	
14	Cultural Resources	1	LS	1,480,000	1,480,000	45%	666,000	2,146,000	
	Total Estimated Construction				**64,119,901**		**28,853,955**	**92,973,856**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	9,617,985	9,617,985	24%	2,308,316	11,926,302	
31	Construction Management (S&A) - 6.7%	1	LS	4,296,033	4,296,033	24%	1,031,048	5,327,081	
	TOTAL COST				**79,362,000**		**32,525,000**	**111,887,000**	

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 3d	**Rindge Dam Arc Removal - Impounded sediment naturally transported downstream -- U/S Barriers Modification/Removal**								
Incrementally remove Rindge Dam arch, only. Impounded sediment is naturally transported downstream with winter storm flows. Floodwalls required from Cross Creek Rd to PCH. Upper Gravel layer trucked to Calabasas Landfill; included in the estimate as Sediment Removal.									
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
01	Lands and Damages - Floodwall	1	LS	366,000	366,000	25%	91,500	457,500	
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	45%	2,602,716	8,386,529	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	45%	2,627,565	8,466,598	
06	General Requirements (Years 2, 3 and 4)	3	yr	4,523,935	13,571,805	45%	6,107,312	19,679,117	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	45%	1,763,805	5,683,372	
06	Sediment Removal -- Truck Upper gravel layer and sediment cut back to allow dam demolition	1	LS	13,517,109	13,517,109	45%	6,082,699	19,599,808	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	45%	128,946	415,492	
06	Floowalls (10 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	12,374,841	12,374,841	45%	5,568,678	17,943,519	
06	Biological Resources Pre-Construction Monitoring	1	LS	290,300	290,300	45%	130,635	420,935	
06	Biological Resources During Construction Monitoring	1	LS	11,902,000	11,902,000	45%	5,355,900	17,257,900	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,838,000	1,838,000	45%	827,100	2,665,100	
14	Cultural Resources	1	LS	1,492,000	1,492,000	45%	671,400	2,163,400	
	Total Estimated Construction				**70,815,014**		**31,866,756**	**102,681,770**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	10,622,252	10,622,252	24%	2,549,341	13,171,593	
31	Construction Management (S&A) - 6.7%	1	LS	4,744,606	4,744,606	24%	1,138,705	5,883,311	
	TOTAL COST				**88,379,000**		**36,104,000**	**124,484,000**	

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ENTIRE DAM REMOVAL (ARC AND SPILLWAY) -- 650,000 CY TRUCK AND/OR BARGE TRANSPORT. REMAINING 120,000 CY NATURALLY TRANSPORTED DOWNSTREAM

ALT 4a1 Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Trucking

Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment.
Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill.
Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-7)	6	yr	4,523,935	27,143,610	41%	11,128,880	38,272,490	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	41%	632,010	2,173,498	
06	Sediment Removal (Truck sand -- beach placement)	1	LS	46,354,021	46,354,021	41%	19,005,149	65,359,170	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floodwalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	283,600	283,600	41%	116,276	399,876	
06	Biological Resources During Construction Monitoring	1	LS	4,741,800	4,741,800	41%	1,944,138	6,685,938	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,454,600	1,454,600	41%	596,386	2,050,986	
14	Cultural Resources	1	LS	1,553,000	1,553,000	41%	636,730	2,189,730	
	Total Estimated Construction				**99,501,882**		**40,795,772**	**140,297,654**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	14,925,282	14,925,282	24%	3,582,068	18,507,350	
31	Construction Management (S&A) - 6.7%	1	LS	6,666,626	6,666,626	24%	1,599,990	8,266,616	
	TOTAL COST				**122,056,000**		**46,218,000**	**168,274,000**	

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ALT 4a2 Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Truck and Barge

Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment.
Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill.
Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-8)	7	yr	4,523,935	31,667,545	41%	12,983,693	44,651,238	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	41%	632,010	2,173,498	
06	Sediment Removal (Truck/barge sand -- nearshore placeme	1	LS	47,696,409	47,696,409	41%	19,555,528	67,251,937	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	242,800	242,800	41%	99,548	342,348	
06	Biological Resources During Construction Monitoring	1	LS	4,317,200	4,317,200	41%	1,770,052	6,087,252	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,341,600	1,341,600	41%	550,056	1,891,656	
14	Cultural Resources	1	LS	1,832,000	1,832,000	41%	751,120	2,583,120	
	Total Estimated Construction				**105,068,805**		**43,078,210**	**148,147,015**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,760,321	15,760,321	24%	3,782,477	19,542,798	
31	Construction Management (S&A) - 6.7%	1	LS	7,039,610	7,039,610	24%	1,689,506	8,729,116	
	TOTAL COST				**128,831,000**		**48,791,000**	**177,621,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES 5/8/2016, Rev. 8/10/16
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 4b1	**Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Trucking -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.									
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	41%	2,371,363	8,155,176	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-7)	6	yr	4,523,935	27,143,610	41%	11,128,880	38,272,490	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	41%	632,010	2,173,498	
06	Sediment Removal (Truck sand -- beach placement)	1	LS	46,354,021	46,354,021	41%	19,005,149	65,359,170	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	347,700	347,700	41%	142,557	490,257	
06	Biological Resources During Construction Monitoring	1	LS	5,025,000	5,025,000	41%	2,060,250	7,085,250	
06	Biological Resources Monitoring and Adaptive Management	1	LS	2,006,600	2,006,600	41%	822,706	2,829,306	
14	Cultural Resources	1	LS	1,565,000	1,565,000	41%	641,650	2,206,650	
	Total Estimated Construction				**106,196,995**		**43,540,768**	**149,737,763**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,929,549	15,929,549	24%	3,823,092	19,752,641	
31	Construction Management (S&A) - 6.7%	1	LS	7,115,199	7,115,199	24%	1,707,648	8,822,846	
	TOTAL COST				**131,073,000**		**49,529,000**	**180,603,000**	

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CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 4b2	**Rindge Dam Arc and Spillway Removal - Impounded Sediment Mechanical Transport -- Truck and Barge -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch and spillway over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.									
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	41%	2,371,363	8,155,176	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-8)	7	yr	4,523,935	31,667,545	41%	12,983,693	44,651,238	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Rindge Dam - Spillway Demolition	1	LS	1,541,488	1,541,488	41%	632,010	2,173,498	
06	Sediment Removal (Truck/barge sand -- nearshore placeme	1	LS	47,696,409	47,696,409	41%	19,555,528	67,251,937	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	306,900	306,900	41%	125,829	432,729	
06	Biological Resources During Construction Monitoring	1	LS	4,600,400	4,600,400	41%	1,886,164	6,486,564	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,893,600	1,893,600	41%	776,376	2,669,976	
14	Cultural Resources	1	LS	1,844,000	1,844,000	41%	756,040	2,600,040	
	Total Estimated Construction				**111,763,918**		**45,823,206**	**157,587,124**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	16,764,588	16,764,588	24%	4,023,501	20,788,089	
31	Construction Management (S&A) - 6.7%	1	LS	7,488,183	7,488,183	24%	1,797,164	9,285,346	
	TOTAL COST				**137,848,000**		**52,102,000**	**189,950,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE

5/8/2016, Rev. 8/10/16

PRICE LEVEL: 1 OCTOBER 2016

ENTIRE DAM REMOVAL (ARC, ONLY) -- 650,000 CY TRUCK AND/OR BARGE TRANSPORT.

ALT 4c1 Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Trucking

Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment.
Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill.
Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-7)	6	yr	4,523,935	27,143,610	41%	11,128,880	38,272,490	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Sediment Removal (Truck sand -- beach placement)	1	LS	46,354,021	46,354,021	41%	19,005,149	65,359,170	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	283,600	283,600	41%	116,276	399,876	
06	Biological Resources During Construction Monitoring	1	LS	4,741,800	4,741,800	41%	1,944,138	6,685,938	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,454,600	1,454,600	41%	596,386	2,050,986	
14	Cultural Resources	1	LS	1,553,000	1,553,000	41%	636,730	2,189,730	
	Total Estimated Construction				**97,960,394**		**40,163,762**	**138,124,156**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	14,694,059	14,694,059	24%	3,526,574	18,220,633	
31	Construction Management (S&A) - 6.7%	1	LS	6,563,346	6,563,346	24%	1,575,203	8,138,550	
	TOTAL COST				**120,180,000**		**45,506,000**	**165,686,000**	

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MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 4c2	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Truck and barge**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.									
01	Lands and Damages - Dam Removal	1	LS	962,000	962,000	25%	240,500	1,202,500	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-8)	7	yr	4,523,935	31,667,545	41%	12,983,693	44,651,238	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Sediment Removal (Truck/barge sand -- nearshore placement)	1	LS	47,696,409	47,696,409	41%	19,555,528	67,251,937	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	242,800	242,800	41%	99,548	342,348	
06	Biological Resources During Construction Monitoring	1	LS	4,317,200	4,317,200	41%	1,770,052	6,087,252	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,341,600	1,341,600	41%	550,056	1,891,656	
14	Cultural Resources	1	LS	1,832,000	1,832,000	41%	751,120	2,583,120	
	Total Estimated Construction				**103,527,317**		**42,446,200**	**145,973,517**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,529,098	15,529,098	24%	3,726,983	19,256,081	
31	Construction Management (S&A) - 6.7%	1	LS	6,936,330	6,936,330	24%	1,664,719	8,601,049	
	TOTAL COST				**126,955,000**		**48,078,000**	**175,033,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES 5/8/2016, Rev. 8/10/16
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 4d1	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Trucking -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked for shoreline placement downcoast of Malibu pier includes use of temp upland Site F and Malibu pier parking area.									
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	41%	2,371,363	8,155,176	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-7)	6	yr	4,523,935	27,143,610	41%	11,128,880	38,272,490	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Sediment Removal (Truck sand -- beach placement)	1	LS	46,354,021	46,354,021	41%	19,005,149	65,359,170	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	347,700	347,700	41%	142,557	490,257	
06	Biological Resources During Construction Monitoring	1	LS	5,025,000	5,025,000	41%	2,060,250	7,085,250	
06	Biological Resources Monitoring and Adaptive Management	1	LS	2,006,600	2,006,600	41%	822,706	2,829,306	
14	Cultural Resources	1	LS	1,565,000	1,565,000	41%	641,650	2,206,650	
	Total Estimated Construction				**104,655,507**		**42,908,758**	**147,564,265**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	15,698,326	15,698,326	24%	3,767,598	19,465,924	
31	Construction Management (S&A) - 6.7%	1	LS	7,011,919	7,011,919	24%	1,682,861	8,694,780	
	TOTAL COST				**129,197,000**		**48,817,000**	**178,014,000**	

MALIBU CREEK WATERSHED - SUMMARY OF ALTERNATIVES 5/8/2016, Rev. 8/10/16
MALIBU CREEK ECOSYSTEM RESTORATION
ALTERNATIVE FORMULATION PHASE **PRICE LEVEL: 1 OCTOBER 2016**

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT COST	COST	CONTINGENCY %	CONTINGENCY $	TOTAL COST	NOTES
ALT 4d2	**Rindge Dam Arc Removal (Retain Spillway) - Impounded Sediment Mechanical Transport -- Truck and barge -- U/S Barriers Modification/Removal**								
Remove Rindge Dam concrete arch (not the spillway) over 5-8 years concurrent to removal of impounded sediment. Truck Sand layer to the shoreline downcoast of Malibu Pier. Truck Gravel and Clay/sil layers to Calabasas Landfill. Truck impounded sediment (sand) trucked to Ventura Harbor and barge to Malibu for near-shore placement.									
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	41%	2,371,363	8,155,176	
06	**Rindge Dam Removal**						-	-	
06	General Requirements (Initial, Year 1)	1	yr	5,839,033	5,839,033	41%	2,394,004	8,233,037	
06	General Requirements (Yearly, Years 2-8)	7	yr	4,523,935	31,667,545	41%	12,983,693	44,651,238	
06	Rindge Dam - Arc Demolition	1	LS	3,919,567	3,919,567	41%	1,607,022	5,526,589	
06	Sediment Removal (Truck/barge sand -- nearshore placeme	1	LS	47,696,409	47,696,409	41%	19,555,528	67,251,937	
06	Malibu Canyon Road Repair	1	LS	286,546	286,546	41%	117,484	404,030	
06	Floowalls (5 ft High) Downstream b/w Cross Creek Bridge and the Pacific Coast Hwy	1	LS	6,384,617	6,384,617	41%	2,617,693	9,002,310	
06	Biological Resources Pre-Construction Monitoring	1	LS	306,900	306,900	41%	125,829	432,729	
06	Biological Resources During Construction Monitoring	1	LS	4,600,400	4,600,400	41%	1,886,164	6,486,564	
06	Biological Resources Monitoring and Adaptive Management	1	LS	1,893,600	1,893,600	41%	776,376	2,669,976	
14	Cultural Resources	1	LS	1,844,000	1,844,000	41%	756,040	2,600,040	
	Total Estimated Construction				**110,222,430**		**45,191,196**	**155,413,626**	
30	Preconstruction Engineering and Design (PED) - 15%	1	LS	16,533,365	16,533,365	24%	3,968,007	20,501,372	
31	Construction Management (S&A) - 6.7%	1	LS	7,384,903	7,384,903	24%	1,772,377	9,157,279	
	TOTAL COST				**135,972,000**		**51,389,000**	**187,362,000**	

SUMMARY SHEET — **1 OCT 2016 PRICE LEVEL**

MALIBU CREEK -- UPSTREAM BARRIERS

FEASIBILITY COST ESTIMATES

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT PRICE	COST WITHOUT CONTING	CONTING	COST WITH CONTING	CONTING PERCENT
CC1 (Piuma Culvert)								
01.	**Real Estate**	1	LS	$70,000	$70,000	$17,500	$87,500	25%
02	**Relocations**	1	LS	$1,495,994	$1,495,994	$359,039	$1,855,033	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$10,044	$10,044	$2,411	$12,455	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$35,078	$35,078	$8,419	$43,496	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$240,367	$240,367	$57,688	$298,056	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$107,364	$107,364	$25,767	$133,132	24%
	TOTAL PROJECT COSTS:				**$2,020,181**	**$485,543**	**$2,505,725**	
CC2 (Malibu Meadows Road Crossing)								
01.	**Real Estate**	1	LS	$68,000	$68,000	$17,000	$85,000	25%
02	**Relocations**	1	LS	$1,180,680	$1,180,680	$283,363	$1,464,043	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$8,544	$8,544	$2,051	$10,595	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$28,978	$28,978	$6,955	$35,932	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$191,930	$191,930	$46,063	$237,994	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$85,729	$85,729	$20,575	$106,304	24%
	TOTAL PROJECT COSTS:				**$1,625,195**	**$390,727**	**$2,015,922**	
CC3 (Crater Camp Road Crossing)								
01.	**Real Estate**	1	LS	$68,000	$68,000	$17,000	$85,000	25%
02	**Relocations**	1	LS	$901,695	$901,695	$216,407	$1,118,102	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$8,544	$8,544	$2,051	$10,595	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$28,978	$28,978	$6,955	$35,932	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$150,083	$150,083	$36,020	$186,102	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$67,037	$67,037	$16,089	$83,126	24%
	TOTAL PROJECT COSTS:				**$1,285,670**	**$309,241**	**$1,594,911**	
CC5 (Cold Canyon Road Culvert)								
01.	**Real Estate**	1	LS	$53,500	$53,500	$13,375	$66,875	25%
02	**Relocations**	1	LS	$87,558	$87,558	$21,014	$108,572	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$8,544	$8,544	$2,051	$10,595	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$34,078	$34,078	$8,179	$42,256	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$28,727	$28,727	$6,894	$35,622	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$12,831	$12,831	$3,080	$15,911	24%
	TOTAL PROJECT COSTS:				**$286,572**	**$69,312**	**$355,884**	

SUMMARY SHEET **1 OCT 2016 PRICE LEVEL**

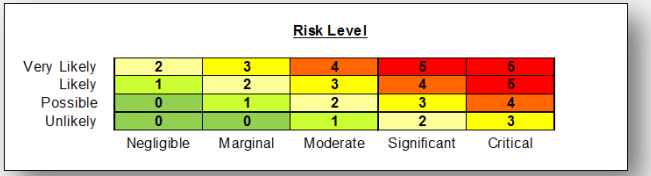
MALIBU CREEK -- UPSTREAM BARRIERS

FEASIBILITY COST ESTIMATES

CODE OF ACCTS	DESCRIPTION	QTY	UOM	UNIT PRICE	COST WITHOUT CONTING	CONTING	COST WITH CONTING	CONTING PERCENT
LV1 (Crags Road Culver Crossing)								
01.	**Real Estate**	1	LS	$54,000	$54,000	$13,500	$67,500	25%
02	**Relocations**	1	LS	$1,159,752	$1,159,752	$278,340	$1,438,092	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$10,044	$10,044	$2,411	$12,455	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$35,078	$35,078	$8,419	$43,496	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
14.	**Cultural Resources**	1	LS	$6,650	$6,650	$1,596	$8,246	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$190,929	$190,929	$45,823	$236,752	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$85,281	$85,281	$20,468	$105,749	24%
	TOTAL PROJECT COSTS:				**$1,603,068**	**$385,276**	**$1,988,344**	
LV2 (White Oak Farms Dam)								
01.	**Real Estate**	1	LS	$56,000	$56,000	$14,000	$70,000	25%
02	**Relocations**	1	LS	$598,259	$598,259	$143,582	$741,841	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$8,544	$8,544	$2,051	$10,595	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$34,078	$34,078	$8,179	$42,256	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
14.	**Cultural Resources**	1	LS	$4,770	$4,770	$1,145	$5,915	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$106,048	$106,048	$25,451	$131,499	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$47,368	$47,368	$11,368	$58,736	24%
	TOTAL PROJECT COSTS:				**$916,400**	**$220,496**	**$1,136,896**	
LV3 & LV4 (Lost Hills Rd Culvert and Meadow Creek Lane Crossing)								
01.	**Real Estate**	1	LS	$500,000	$500,000	$125,000	$625,000	25%
02	**Relocations**	1	LS	$359,875	$359,875	$86,370	$446,245	24%
06	**Biological Resources Pre-Construction Monitoring**	1	LS	$4,344	$4,344	$1,043	$5,387	24%
06	**Biological Resources During Construction Monitoring**	1	LS	$28,978	$28,978	$6,955	$35,932	24%
06	**Biological Resources Monitoring and Adaptive Management**	1	LS	$61,333	$61,333	$14,720	$76,053	24%
30.	**Preconstruction, Engineering & Design (PED) - 15%**	1	LS	$68,180	$68,180	$16,363	$84,543	24%
31.	**Construction Management (S&A) - 6.7%**	1	LS	$30,454	$30,454	$7,309	$37,762	24%
	TOTAL PROJECT COSTS:				**$1,053,164**	**$257,759**	**$1,310,923**	

Malibu Creek Ecosystem Restoration - Alternative Formulation Alternatives 2a(s)

Feasibility (Recommended Plan)
Abbreviated Risk Analysis
Meeting Date: 4-Mar-16



Risk Register

24%

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
	Project Management & Scope Growth				Maximum Project Growth		75%	
Yes	PS-1	Access Roads	-Slope stability of access area. Possible partial loss of ramps due to erosion.	- This has already mitigated in the cost estimate by accounting for repair of access roads each year to account for any intermediate erosion. Additional slope stability testing will be conducted during design phase.	Significant	Possible	3	$10,789k
Yes	PS-2	Diversion Control of Water / Dewatering	Water care and diversion fully understood, planned?	- Design, repair, and appropriate costs are properly accounted for to provide proper diversion of water throughout the project duration.	Marginal	Unlikely	0	$10,789k
Yes	PS-3	Environmental Considerations	Potential of scope growth dues to added feattures	- Possible scope increase to account for turbidity issues in effluent. Design is confident in current mitigation measures. Estimate accounted for an onsite bioligist and ongoing testing and mitigation. Low risk of impact into sensitive species issues.	Marginal	Unlikely	0	$2,024k
Yes	PS-4	General Requirements	Traffic Control	- Road along site will have extensive traffic control due to travel volume by site.	Negligible	Possible	0	$13,618k
Yes	PS-5	Sediment Removal (Exc, Load, Haul)	Quantity variations. Load/haul logistics.	- Uncertainty in actual quantities of sediment posses a small potential for increase in volume. Insufficient investigation into canyon wall lines and horizontal limits of sediment pile. Team took a conservative stance on crew productivity. - Designed hauling roads to provide efficient productivity of hauling, costs of ramps accounted for in access roads. Hauling speeds and distances researched extensively and accounted for in cost estimate conservatively.	Marginal	Possible	1	$20,148k
Yes	PS-6	Sediment Removal (Disposal Fees)	Disposal Fees concerns	- Conservative estimates have been made on all costs associated with Tipping Fees. Amount of tipping fees is variable and is being negotiated.	Marginal	Possible	1	$31,295k
Yes	PS-7	Rindge Dam Demolition	Scope growth and additional features concerns.	- Insufficient as-builts for determining overall concrete quantities, but designers have been able to provide a conservative estimate with available information. Hauling costs have been accounted for in 'Hauling.' The team believes all items have been estimated conservatively.	Negligible	Unlikely	0	$5,461k
Yes	PS-8	Environmental Monitoring	Insufficient investigations to support design assumptions.	- Possible additional requirements for surveying and monitoring of species and water quality over a 5 year period beyond the project duration (will need to add to cost estimate to properly account for MAMP). Possible cultural mitigation due to past discoveries in the area. Preservation of existing historical monuments (ie Sheriffs Overlook).	Significant	Very LIKELY	5	$5,956k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	PS-9	0			Negligible	Unlikely	0	$k
Yes	PS-10	0			Negligible	Unlikely	0	$k
Yes	PS-11	0			Negligible	Unlikely	0	$k
Yes	PS-12	Remaining Construction Items	Additional asphalt road repairs leading to the dam	- Possibility of requiring additional road repair throughout the project duration. Possible interim repairs of pot holes and damages. Mob/Demob and clearing costs are included in this and have been conservatively accounted for. If awarded near a nesting period it could result in contractor delay.	Marginal	Possible	1	$1,751k
Yes	PS-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,639k
Yes	PS-14	Construction Management			Negligible	Unlikely	0	$6,539k
	Acquisition Strategy				**Maximum Project Growth**		**30%**	
Yes	AS-1	Access Roads	Possibility of contracting out to Small Business. Weather delays concerns.	-Project will not be 8a, but could be small business. Subcontracting should not be required for installation of access roads. Harsh weather may affect roads, but estimate has provisions allowed for repair to road at the start of every building season. All access roads will have rip rap support as part of the engineered design.	Marginal	Unlikely	0	$6,551k
Yes	AS-2	Diversion Control of Water / Dewatering	Contracting plan. Weather delays. Subcontracting	- Estimate accounts for use of a dewatering subcontractor for wells. All drainage and bypass pipe is standard and will likely be installed by the GC. Contract has strict regulations on building season and water quality that will limit risk.	Marginal	Unlikely	0	$10,789k
Yes	AS-3	Environmental Considerations	Contracting plan. Subcontracting	- Contract specs will require a subcontracted bioligist during construction window that will monitor environmental by contractor. This cost has been accounted for in estimate. Regular water quality testing and pre/post bird surveys have also been accounted for. All other BMP's are considered standard and will likely be installed by the GC.	Negligible	Unlikely	0	$2,024k
Yes	AS-4	General Requirements	Contracting plan. Subcontracting	- Contracting method is firmly set. Subcontractors for minor specialty features have been accounted for in the estimate.	Negligible	Unlikely	0	$13,618k
Yes	AS-5	Sediment Removal (Exc, Load, Haul)	Contracting plan. Weather delays. Subcontracting	- Contracting method established. Quantites for excavated material were conservatively established, but still could increase slightly. Construction window does start in April and there is the possibility of encountering inclimate weather.	Negligible	Possible	0	$20,148k
Yes	AS-6	Sediment Removal (Disposal Fees)	Contracting Plan	- These will likely be transferred to LEERD's and will be pre-negotiated and should reduce.	Negligible	Unlikely	0	$31,295k
Yes	AS-7	Rindge Dam Demolition	Subcontracting	- Demolition subcontractor accounted for in estimate.	Negligible	Unlikely	0	$5,461k
Yes	AS-8	Environmental Monitoring	Subcontracting	- Subcontractor accounted for in estimate for special environmental mitigation.	Negligible	Unlikely	0	$5,956k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	AS-9	0			Negligible	Unlikely	0	$k
Yes	AS-10	0			Negligible	Unlikely	0	$k
Yes	AS-11	0			Negligible	Unlikely	0	$k
Yes	AS-12	Remaining Construction Items	Subcontracting	- Possibility for needed subcontractor for soil stabilization of side slope following excavation of sediment.	Marginal	Possible	1	$1,751k
Yes	AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,639k
Yes	AS-14	Construction Management			Negligible	Unlikely	0	$6,539k
	Construction Elements				**Maximum Project Growth**		**25%**	
Yes	CON-1	Access Roads	Construction claims and construction methods concerns.	- Construction of the access roads is considered primarily standard. Reconstruction of an area of slope may pose difficulties and require special equipment. Some potential for mods based on soil stability.	Marginal	Possible	1	$6,551k
Yes	CE-2	Diversion Control of Water / Dewatering	Wate care and diversion plan.	- Specialty subcontractor has been accounted for to perform dewatering. A water care and diversion will be required. Site access is difficult. Construction window does overlap with times of inclimate weather.	Marginal	Possible	1	$10,789k
Yes	CE-3	Environmental Considerations	Subcontracting	- Use of a subcontractor has been accounted for in the estimate	Negligible	Unlikely	0	$2,024k
Yes	CE-4	General Requirements	Construction procedures	- All elements are considered standard and variabilities have been accounted for in other categories.	Negligible	Unlikely	0	$13,618k
Yes	CE-5	Sediment Removal (Exc, Load, Haul)	Site access, mob/demob, construction logistics	- Slope stability/roadway retaining wall undermining during or post construction. Difficult site access with larger excavation equipment. Work within an area that has been dewatered. Quantity of material to be excavated has been estimated conservatively, but types of material highly variable. Estimated that contractor remobilizes at the start of every construction window. - Access to site is steep and risk of high traffic. Increase in material quantities will affect amount of hauling. Risk of diversion of hauling based on quality of material excavated.	Significant	Possible	3	$20,148k
Yes	CE-6	Sediment Removal (Disposal Fees)			Negligible	Unlikely	0	$31,295k
Yes	CE-7	Rindge Dam Demolition	Arc stability during demolition. Potential for claims. Specialty equipment	- Stability of the remaining arch during demolition is a risk. Water care and diversion accounted for elsewhere. Current estimate requires specialty equipment to demo concrete due to noise. A large crane will be needed for moving of concrete blocks. Potential for claims due to unforseens.	Critical	Possible	4	$5,461k
Yes	CE-8	Environmental Monitoring	Subcontracting	- Subcontractor accounted for in estimate for special environmental mitigation.	Negligible	Unlikely	0	$5,956k
Yes	CE-9	0			Negligible	Unlikely	0	$k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	CE-10	0			Negligible	Unlikely	0	$k
Yes	CE-11	0			Negligible	Unlikely	0	$k
Yes	CE-12	Remaining Construction Items	Additional and severity of road repairs needed	- A special mobilization and use of subcontractor for road repair has been accounted for. It is likely that more road will be required to be repaired than what will be solicited.	Marginal	Possible	1	$1,751k
Yes	CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,639k
Yes	CE-14	Construction Management			Negligible	Unlikely	0	$6,539k
	Specialty Construction or Fabrication				**Maximum Project Growth**		**65%**	
Yes	SC-1	Access Roads			Negligible	Unlikely	0	$6,551k
Yes	SC-2	Diversion Control of Water / Dewatering			Negligible	Unlikely	0	$10,789k
Yes	SC-3	Environmental Considerations			Negligible	Unlikely	0	$2,024k
Yes	SC-4	General Requirements			Negligible	Unlikely	0	$13,618k
Yes	SC-5	Sediment Removal (Exc, Load, Haul)			Negligible	Unlikely	0	$20,148k
Yes	SC-6	Sediment Removal (Disposal Fees)			Negligible	Unlikely	0	$31,295k
Yes	SC-7	Rindge Dam Demolition			Negligible	Unlikely	0	$5,461k
Yes	SC-8	Environmental Monitoring			Negligible	Unlikely	0	$5,956k
Yes	SC-9	0			Negligible	Unlikely	0	$k
Yes	SC-10	0			Negligible	Unlikely	0	$k
Yes	SC-11	0			Negligible	Unlikely	0	$k
Yes	SC-12	Remaining Construction Items			Negligible	Unlikely	0	$1,751k
Yes	SC-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,639k
Yes	SC-14	Construction Management			Negligible	Unlikely	0	$6,539k
	Technical Design & Quantities				**Maximum Project Growth**		**30%**	

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	T-1	Access Roads	Quantity increase/loss/waste	- Estimated quantities for material needed to develop access roads was investigated by the geotechnical design and was estimated conservatively	Marginal	Unlikely	0	$6,551k
Yes	T-2	Diversion Control of Water / Dewatering	Sufficient investigations	- Estimates were developed by a dewatering contractor. All materials needed for water control by the General Contractor have been conservatively estimated.	Negligible	Unlikely	0	$10,789k
Yes	T-3	Environmental Considerations	Level of confidence	- Environmental design assisted in development of quantities and methods. Quantities were estimated conservatively.	Marginal	Unlikely	0	$2,024k
Yes	T-4	General Requirements	Level of confidence	- Civil design assisted in development of quantities and methods. Quantities were estimated conservatively.	Marginal	Unlikely	0	$13,618k
Yes	T-5	Sediment Removal (Exc, Load, Haul)	Level of cofidence based on design and assumptions.	- Civil and geotechnical design assisted in the development of quantites. Geotech believes accurate quantity estimates were developed. Geotechnical investigations and Soil Penetration Tests (SPT) were performed on the impounded sediment within the last few years. Blow count tests indicated soil properties with extremely low relative density. The PDT feels the impounded sediment is in its loose state and the baseline estimate was based on in-situ Loose Cubic Yards (LCY). But, there is a possibility for increased quantities based on potential swell factors. - PDT feels the quantities are accurate and material swelling will not be an issue (Unlikely to happen), but if the material does swell it will add large costs (Significant impact).	Significant	Unlikely	2	$20,148k
Yes	T-6	Sediment Removal (Disposal Fees)			Negligible	Unlikely	0	$31,295k
Yes	T-7	Rindge Dam Demolition	Appropriate methods used in the qtys calculations	- Civil and structural design assisted in the development of quantites. Civil design believes accurate quantity estimates were developed. There is a possibility for increased quantities based on material discovered.	Marginal	Possible	1	$5,461k
Yes	T-8	Environmental Monitoring	Appropriate methods used in the qtys calculations	- Environmental design assisted in development of quantities and methods. Quantities were estimated conservatively.	Negligible	Unlikely	0	$5,956k
Yes	T-9	0			Negligible	Unlikely	0	$k
Yes	T-10	0			Negligible	Unlikely	0	$k
Yes	T-11	0			Negligible	Unlikely	0	$k
Yes	T-12	Remaining Construction Items	Possibility of qty increases.	- Roadway repair is variable and has been considered at a minimum. Other work (ie flagging, dust control) considers all work is completed in estimated time frame. Interim patching work hasn't been considered. Civil design assisted with development of material quantities for designed repair portiion.	Negligible	Likely	1	$1,751k
Yes	T-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,639k
Yes	T-14	Construction Management			Negligible	Unlikely	0	$6,539k

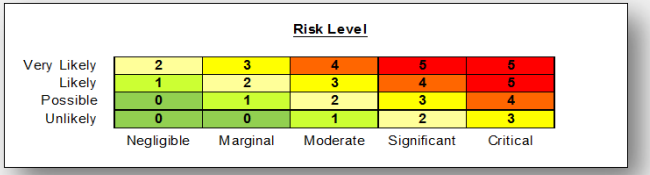
Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
	Cost Estimate Assumptions				Maximum Project Growth		35%	
Yes	EST-1	Access Roads	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$6,551k
Yes	EST-2	Diversion Control of Water / Dewatering	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subconstractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. A dewatering subcontractor assisted in development cost estimates. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$10,789k
Yes	EST-3	Environmental Considerations	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$2,024k
Yes	EST-4	General Requirements	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$13,618k
Yes	EST-5	Sediment Removal (Exc, Load, Haul)	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities. Possible rerouting based on material quality and outside agency acceptance.	Marginal	Likely	2	$20,148k
Yes	EST-6	Sediment Removal (Disposal Fees)	Disposal site identification	Assumed all gravel, caly and silt goes to a landfill. However, it is likely that an alternative site will be identified.	Negligible	Unlikely	0	$31,295k
Yes	EST-7	Rindge Dam Demolition	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$5,461k
Yes	EST-8	Environmental Monitoring	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$5,956k
Yes	EST-9	0			Negligible	Unlikely	0	$k
Yes	EST-10	0			Negligible	Unlikely	0	$k
Yes	EST-11	0			Negligible	Unlikely	0	$k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	EST-12	Remaining Construction Items	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$1,751k
Yes	EST-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,639k
Yes	EST-14	Construction Management			Negligible	Unlikely	0	$6,539k
	External Project Risks				**Maximum Project Growth**		**40%**	
Yes	EX-1	Access Roads	Public concerns	- Potential of public attempting to use for access to area below.	Negligible	Possible	0	$6,551k
Yes	EX-2	Diversion Control of Water / Dewatering	Weather concerns. Releases from U/S facility.	- Low risk of adverse weather during construction window, but high flows are likely during off season. Possibility for an uncontrolled release from an upstream treatment facility.	Marginal	Possible	1	$10,789k
Yes	EX-3	Environmental Considerations	Other agencies required testing	- Permitting and planning may require additional testing and consideration of local agency regulations.	Marginal	Possible	1	$2,024k
Yes	EX-4	General Requirements	Other agencies requiiring additional traffic control	- Outside agencies may require additional traffic control measures beyond what is currently accounted for. Public opinion on jobsite traffic impact to the area.	Significant	Likely	4	$13,618k
Yes	EX-5	Sediment Removal (Exc, Load, Haul)	Additional traffic control	- Hauling is highly dependent on traffic control and impact from external sources outside the Corps control.	Significant	Likely	4	$20,148k
Yes	EX-6	Sediment Removal (Disposal Fees)	Change in disposal fees	- No control of fees that will be charged by outside company. Could be variable, negatively or positively, to the project.	Marginal	Possible	1	$31,295k
Yes	EX-7	Rindge Dam Demolition	Other agencies imposing additional requirements	- Possible issues accounted for in other categories	Negligible	Unlikely	0	$5,461k
Yes	EX-8	Environmental Monitoring	Weather concerns.	- Extreme weather, or event, may cause the need for replanting.	Negligible	Possible	0	$5,956k
Yes	EX-9	0			Negligible	Unlikely	0	$k
Yes	EX-10	0			Negligible	Unlikely	0	$k
Yes	EX-11	0			Negligible	Unlikely	0	$k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	EX-12	Remaining Construction Items	Access road cocerns	- These features are affected inline with many others. Believe possible fluctuation has been accurately accounted for in those FOW.	Negligible	Possible	0	$1,751k
Yes	EX-13	Planning, Engineering, & Design	Funding can be delayed	Additional contracts might also be necessary if funding is delayed, possibly causing cost increases in PED, Contracting and Construction Management.	Critical	Possible	4	$14,639k
Yes	EX-14	Construction Management	Funding can be delayed	Additional contracts might also be necessary if funding is delayed, possibly causing cost increases in PED, Contracting and Construction Management.	Critical	Possible	4	$6,539k

Malibu Creek Ecosystem Restoration - Alternative Formulation Alternatives 3a(s)

Feasibility (Recommended Plan)
Abbreviated Risk Analysis
Meeting Date: 4-Mar-16



Risk Register

41%

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
	Project Management & Scope Growth				**Maximum Project Growth**		**75%**	
Yes	PS-1	Access Roads	-Slope stability of access area. Possible partial loss of ramps due to erosion.	- This has already mitigated in the cost estimate by accounting for repair of access roads each year to account for any intermediate erosion. Additional slope stability testing will be conducted during design phase.	Significant	Possible	3	$6,165k
Yes	PS-2	Diversion Control of Water / Dewatering	Water care and diversion fully understood, planned?	- Design, repair, and appropriate costs are properly accounted for to provide proper diversion of water throughout the project duration. Estimate accounts for installation and removal of dewatering equipment and material at every mob- and demobilization. Concern regarding drilling of well and exposure of well head from one mobilization to the next.	Marginal	Likely	2	$6,165k
Yes	PS-3	Environmental Considerations	Potential of scope growth dues to added feattures	- Scope increase to account for turbidity issues in effluent. Estimate accounted for an onsite bioligist and ongoing testing and mitigation. Current construction plan is to have excess sediment removed during off season in effluent, otehrwise impacts would be significant.	Significant	Very LIKELY	5	$1,181k
Yes	PS-4	General Requirements	Traffic Control	- Road along site will have extensive traffic control due to travel volume by site.	Marginal	Possible	1	$7,830k
Yes	PS-5	Sediment (Gravel) Removal (Exc, Load, Haul)	Quantity variations. Load/haul logistics.	- Uncertainty in actual quantities of sediment posses a small potential for increase in volume. Insufficient investigation into canyon wall lines and horizontal limits of sediment pile. Team took a conservative stance on crew productivity. - Designed hauling roads to provide efficient productivity of hauling, costs of ramps accounted for in access roads. Hauling speeds and distances researched extensively and accounted for in cost estimate conservatively.	Marginal	Possible	1	$2,894k
Yes	PS-6	Sediment (Gravel) Removal (Disposal Fees)	Disposal Fees concerns	- Conservative estimates have been made on all costs associated with Tipping Fees. Amount of tipping fees is variable and is being negotiated.	Marginal	Possible	1	$10,623k
Yes	PS-7	Rindge Dam Demolition	Scope growth and additional features concerns.	- Insufficient as-builts for determining overall concrete quantities, but designers have been able to provide a conservative estimate with available information. Hauling costs have been accounted for, as well as excavation for access to concrete. The team believes all items have been estimated conservatively.	Negligible	Unlikely	0	$5,461k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	PS-8	Floodwalls Downstream	Potential for scope growth	- Very limited conceptual design into this project aspect in regards to geotechnical exploration and structural design. Geotechnical findings could drive design requirements. Conceptual design has been reviewed by others and appear comfotable with design.	Significant	Likely	4	$12,375k
Yes	PS-9	Environmental Monitoring	Insufficient investigations to support design assumptions.	'- Possible additional requirements for surveying and monitoring of species and water quality over a 5 year period beyond the project duration (will need to add to cost estimate to properly account for MAMP). Possible cultural mitigation due to past discoveries in the area. Preservation of existing historical monuments (ie Sheriffs Overlook).	Significant	Very LIKELY	5	$13,131k
Yes	PS-10	0			Negligible	Unlikely	0	$k
Yes	PS-11	0			Negligible	Unlikely	0	$k
Yes	PS-12	Remaining Construction Items	Clearing and grubbing award and nesting periods concerns.	- Mob/Demob and clearing costs are included in this and have been accounted for, but process would require mob/demob and clear/grub at every episode. If awarded near a nesting period it could result in contractor delay. Limited road repair since minimal hauling in comparison to Alt 2.	Marginal	Possible	1	$1,767k
Yes	PS-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$9,849k
Yes	PS-14	Construction Management			Negligible	Unlikely	0	$4,399k
	Acquisition Strategy				**Maximum Project Growth**		**30%**	
Yes	AS-1	Access Roads	Possibility of contracting out to Small Business. Weather delays concerns.	-Project will not be 8a, but could be small business. Subcontracting should not be required for installation of access roads. Harsh weather may affect roads, but estimate has provisions allowed for repair to road at the start of every building season. All access roads will have rip rap support as part of the engineered design.	Negligible	Unlikely	0	$4,234k
Yes	AS-2	Diversion Control of Water / Dewatering	Contracting plan. Weather delays. Subcontracting	- Estimate accounts for use of a dewatering subcontractor for wells. All drainage and bypass pipe is standard and will likely be installed by the General Contractor. Contract has strict regulations on building season and water quality that will limit risk.	Negligible	Unlikely	0	$6,165k
Yes	AS-3	Environmental Considerations	Contracting plan. Subcontracting	- Contract specs will require a subcontracted bioligist during construction window that will monitor environmental by contractor. This cost has been accounted for in estimate. Regular water quality testing and pre/post bird surveys have also been accounted for. All other BMP's are considered standard and will likely be installed by the GC.	Marginal	Likely	2	$1,181k
Yes	AS-4	General Requirements	Contracting plan. Subcontracting	- Contracting method is firmly set. Subcontractors for minor specialty features have been accounted for in the estimate.	Negligible	Unlikely	0	$7,830k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	AS-5	Sediment (Gravel) Removal (Exc, Load, Haul)	Contracting plan. Weather delays. Subcontracting	- Contracting method established. Quantites for excavated material were conservatively established, but still could increase slightly. Construction window does start in April and there is the possibility of encountering inclimate weather.	Negligible	Possible	0	$2,894k
Yes	AS-6	Sediment (Gravel) Removal (Disposal Fees)	Contracting Plan	- These will likely be transferred to LEERD's and will be pre-negotiated and should reduce.	Negligible	Unlikely	0	$10,623k
Yes	AS-7	Rindge Dam Demolition	Subcontracting	- Demolition subcontractor accounted for in estimate.	Negligible	Unlikely	0	$5,461k
Yes	AS-8	Floodwalls Downstream	Shedule change due to weather delays	- Floodwall needs to be completed in the first work window to allow for extra sediment disposal. Work will likely be performed by a subcontractor. Needs to also be completed before bird nesting season. Both items have been accounted for in the current cost estimate.	Negligible	Likely	1	$12,375k
Yes	AS-9	Environmental Monitoring	Subcontracting	- Subcontractor accounted for in estimate for special environmental mitigation.	Negligible	Unlikely	0	$13,131k
Yes	AS-10	0			Negligible	Unlikely	0	$k
Yes	AS-11	0			Negligible	Unlikely	0	$k
Yes	AS-12	Remaining Construction Items	Subcontracting	- Possibility for needed subcontractor for soil stabilization of side slope following excavation of sediment.	Marginal	Possible	1	$1,767k
Yes	AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$9,849k
Yes	AS-14	Construction Management			Negligible	Unlikely	0	$4,399k
	Construction Elements				**Maximum Project Growth**		**25%**	
Yes	CON-1	Access Roads	Construction claims and construction methods concerns.	- Construction of the access roads is considered primarily standard. Reconstruction of an area of slope may pose difficulties and require special equipment. Some potential for mods based on soil stability.	Marginal	Possible	1	$4,234k
Yes	CE-2	Diversion Control of Water / Dewatering	Wate care and diversion plan.	- Specialty subcontractor has been accounted for to perform dewatering. A water care and diversion will be required. Site access is difficult. Construction window does overlap with times of inclimate weather.	Marginal	Possible	1	$6,165k
Yes	CE-3	Environmental Considerations	Subcontracting	- Use of a subcontractor has been accounted for in the estimate	Negligible	Unlikely	0	$1,181k
Yes	CE-4	General Requirements	Construction procedures	- All elements are considered standard and variabilities have been accounted for in other categories.	Negligible	Unlikely	0	$7,830k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	CE-5	Sediment (Gravel) Removal (Exc, Load, Haul)	Site access, mob/demob, construction logistics	- Slope stability/roadway retaining wall undermining during or post construction. Difficult site access with larger excavation equipment. Work within an area that has been dewatered. Quantity of material to be excavated has been estimated conservatively, but types of material highly variable. Estimated that contractor remobilizes at the start of every construction window. - Access to site is steep and risk of high traffic. Increase in material quantities will affect amount of hauling. Risk of diversion of hauling based on quality of material excavated.	Significant	Possible	3	$2,894k
Yes	CE-6	Sediment (Gravel) Removal (Disposal Fees)	N/A	N/A	Negligible	Unlikely	0	$10,623k
Yes	CE-7	Rindge Dam Demolition	Arc stability during demolition. Potential for claims. Specialty equipment	- Stability of the remaining arch during demolition is a risk. Water care and diversion accounted for elsewhere. Current estimate requires specialty equipment to demo concrete due to noise. A large crane will be needed for moving of concrete blocks. Potential for claims due to unforseens.	Critical	Possible	4	$5,461k
Yes	CE-8	Floodwalls Downstream	Schedule, modification, subcontracting concerns.	- Work needs to be completed in first work window and before the bird nesting season. Work likely performed by specialty subcontractor. Both these elements have been accounted for in estimate. High potential for modifications and delay claims. Will require special mobilizations to particular areas.	Significant	Possible	3	$12,375k
Yes	CE-9	Environmental Monitoring	N/A	N/A	Negligible	Unlikely	0	$13,131k
Yes	CE-10	0			Negligible	Unlikely	0	$k
Yes	CE-11	0			Negligible	Unlikely	0	$k
Yes	CE-12	Remaining Construction Items	Additional and severity of road repairs needed	- A special mobilization and use of subcontractor for road repair has been accounted for. It is likely that more road will be required to be repaired than what will be solicited.	Marginal	Possible	1	$1,767k
Yes	CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$9,849k
Yes	CE-14	Construction Management			Negligible	Unlikely	0	$4,399k
	Specialty Construction or Fabrication				**Maximum Project Growth**		**65%**	
Yes	SC-1	Access Roads			Negligible	Unlikely	0	$4,234k
Yes	SC-2	Diversion Control of Water / Dewatering			Negligible	Unlikely	0	$6,165k
Yes	SC-3	Environmental Considerations			Negligible	Unlikely	0	$1,181k
Yes	SC-4	General Requirements			Negligible	Unlikely	0	$7,830k
Yes	SC-5	Sediment (Gravel) Removal (Exc, Load, Haul)			Negligible	Unlikely	0	$2,894k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	SC-6	Sediment (Gravel) Removal (Disposal Fees)			Negligible	Unlikely	0	$10,623k
Yes	SC-7	Rindge Dam Demolition			Negligible	Unlikely	0	$5,461k
Yes	SC-8	Floodwalls Downstream	Construction complications.	- Once final design is selected, construction processes are standard but will have limitations due to access and work space constraints. Concerns have been accounted for adequately in the estimate.	Negligible	Possible	0	$12,375k
Yes	SC-9	Environmental Monitoring			Negligible	Unlikely	0	$13,131k
Yes	SC-10	0			Negligible	Unlikely	0	$0k
Yes	SC-11	0			Negligible	Unlikely	0	$0k
Yes	SC-12	Remaining Construction Items			Negligible	Unlikely	0	$1,767k
Yes	SC-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$9,849k
Yes	SC-14	Construction Management			Negligible	Unlikely	0	$4,399k
	Technical Design & Quantities				**Maximum Project Growth**		**30%**	
Yes	T-1	Access Roads	Quantity increase/loss/waste	- Estimated quantities for material needed to develop access roads was investigated by the geotechnical design and was estimated conservatively	Marginal	Unlikely	0	$4,234k
Yes	T-2	Diversion Control of Water / Dewatering	Sufficient investigations	- Estimates were developed by a dewatering contractor. All materials needed for water control by the General Contractor have been conservatively estimated.	Negligible	Unlikely	0	$6,165k
Yes	T-3	Environmental Considerations	Level of confidence	- Environmental design assisted in development of quantities and methods. Quantities were estimated conservatively.	Marginal	Unlikely	0	$1,181k
Yes	T-4	General Requirements	Level of confidence	- Civil design assisted in development of quantities and methods. Quantities were estimated conservatively.	Marginal	Unlikely	0	$7,830k
Yes	T-5	Sediment (Gravel) Removal (Exc, Load, Haul)	Level of cofidence based on design and assumptions.	- Civil and geotechnical design assisted in the development of quantites. Geotech believes accurate quantity estimates were developed. Geotechnical investigations and Soil Penetration Tests (SPT) were performed on the impounded sediment within the last few years. Blow count tests indicated soil properties with extremely low relative density. The PDT feels the impounded sediment is in its loose state and the baseline estimate was based on in-situ Loose Cubic Yards (LCY). But, there is a possibility for increased quantities based on potential swell factors. - PDT feels the quantities are accurate and material swelling will not be an issue (Unlikely to happen), but if the material does swell it will add large costs (Significant impact).	Significant	Unlikely	2	$2,894k
Yes	T-6	Sediment (Gravel) Removal (Disposal Fees)			Negligible	Unlikely	0	$10,623k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	T-7	Rindge Dam Demolition	Appropriate methods used in the qtys calculations	- Civil and structural design assisted in the development of quantites. Civil design believes accurate quantity estimates were developed. There is a possibility for increased quantities based on material discovered.	Marginal	Possible	1	$5,461k
Yes	T-8	Floodwalls Downstream	Design assumptions; possibility of increased quantities.	- Conceptual floodwall design has been vetted by by external review for added confidence with design. Geotechincal testing will determine final floodwall dimensions/quantities and could likely result in significant increases.	Significant	Likely	4	$12,375k
Yes	T-9	Environmental Monitoring	Level of confidence on quantities	- Environmental design assisted in development of quantities and methods. Quantities were estimated conservatively.	Negligible	Unlikely	0	$13,131k
Yes	T-10	0			Negligible	Unlikely	0	$k
Yes	T-11	0			Negligible	Unlikely	0	$k
Yes	T-12	Remaining Construction Items	Possibility of road way qty increases.	- Roadway repair is variable and has been considered at a minimum. Other work (ie flagging, dust control) considers all work is completed in estimated time frame. Interim patching work hasn't been considered. Civil design assisted with development of material quantities for designed repair portion.	Negligible	Likely	1	$1,767k
Yes	T-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$9,849k
Yes	T-14	Construction Management			Negligible	Unlikely	0	$4,399k
	Cost Estimate Assumptions				**Maximum Project Growth**		**35%**	
Yes	EST-1	Access Roads	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$4,234k
Yes	EST-2	Diversion Control of Water / Dewatering	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subconstractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. A dewatering subcontractor assisted in development cost estimates. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$6,165k
Yes	EST-3	Environmental Considerations	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$1,181k
Yes	EST-4	General Requirements	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$7,830k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	EST-5	Sediment (Gravel) Removal (Exc, Load, Haul)	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities. Possible rerouting based on material quality and outside agency acceptance.	Marginal	Likely	2	$2,894k
Yes	EST-6	Sediment (Gravel) Removal (Disposal Fees)	Disposal site identification	Assumed all gravel, caly and silt goes to a landfill. However, it is likely that an alternative site will be identified.	Negligible	Unlikely	0	$10,623k
Yes	EST-7	Rindge Dam Demolition	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$5,461k
Yes	EST-8	Floodwalls Downstream	Design is not defined. Traffic congestion concerns.	- Area does have succeptability to sporadic congestion. Design is not diffinitive which will result in changes to final cost estimate. Cost estimate will be adjusted as a more reliable design is established.	Marginal	Likely	2	$12,375k
Yes	EST-9	Environmental Monitoring	Traffic congestion concerns.	-All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$13,131k
Yes	EST-10	0			Negligible	Unlikely	0	$k
Yes	EST-11	0			Negligible	Unlikely	0	$k
Yes	EST-12	Remaining Construction Items	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$1,767k
Yes	EST-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$9,849k
Yes	EST-14	Construction Management			Negligible	Unlikely	0	$4,399k
	External Project Risks				**Maximum Project Growth**		**40%**	
Yes	EX-1	Access Roads	Public concerns	- Potential of public attempting to use for access to area below.	Negligible	Possible	0	$4,234k
Yes	EX-2	Diversion Control of Water / Dewatering	Weather concerns. Releases from U/S facility.	- Low risk of adverse weather during construction window, but high flows are likely during off season. Possibility for an uncontrolled release from an upstream treatment facility.	Marginal	Possible	1	$6,165k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	EX-3	Environmental Considerations	Other agencies required testing	- Permitting and planning may require additional testing and consideration of local agency regulations.	Marginal	Possible	1	$1,181k
Yes	EX-4	General Requirements	Other agencies requiiring additional traffic control	- Outside agencies may require additional traffic control measures beyond what is currently accounted for. Public opinion on jobsite traffic impact to the area.	Significant	Likely	4	$7,830k
Yes	EX-5	Sediment (Gravel) Removal (Exc, Load, Haul)	Additional traffic control	- Hauling is highly dependent on traffic control and impact from external sources outside the Corps control.	Significant	Likely	4	$2,894k
Yes	EX-6	Sediment (Gravel) Removal (Disposal Fees)	Change in disposal fees	- No control of fees that will be charged by outside company. Could be variable, negatively or positively, to the project.	Marginal	Possible	1	$10,623k
Yes	EX-7	Rindge Dam Demolition	Other agencies imposing additional requirements	- Possible issues accounted for in other categories	Negligible	Unlikely	0	$5,461k
Yes	EX-8	Floodwalls Downstream	Residents and resouce agencies opposition. Market competition.	- Residence in areas are likely to oppose having a floodwall in their backyard. Construction market is still very competitive in the area which is likely to result in tight margins of bidding. Resource agencies are very opposed to floodwalls as well.	Critical	Possible	4	$12,375k
Yes	EX-9	Environmental Monitoring	Weather concerns.	- Extreme weather, or event, may cause the need for replanting.	Negligible	Unlikely	0	$13,131k
Yes	EX-10	0			Negligible	Unlikely	0	$k
Yes	EX-11	0			Negligible	Unlikely	0	$k
Yes	EX-12	Remaining Construction Items	Access road cocerns	- These features are affected inline with many others. Believe possible fluctuation has been accurately accounted for in those FOW.	Negligible	Possible	0	$1,767k
Yes	EX-13	Planning, Engineering, & Design	Funding can be delayed	Additional contracts might also be necessary if funding is delayed, possibly causing cost increases in PED, Contracting and Construction Management.	Critical	Possible	4	$9,849k
Yes	EX-14	Construction Management	Funding can be delayed	Additional contracts might also be necessary if funding is delayed, possibly causing cost increases in PED, Contracting and Construction Management.	Critical	Possible	4	$4,399k

Malibu Creek Ecosystem Restoration - Alternative Formulation Alternatives 4a(s)

Feasibility (Recommended Plan)
Abbreviated Risk Analysis
Meeting Date: 4-Mar-16

Risk Level

	Negligible	Marginal	Moderate	Significant	Critical
Very Likely	2	3	4	5	5
Likely	1	2	3	4	5
Possible	0	1	2	3	4
Unlikely	0	0	1	2	3

Risk Register

38%

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
	Project Management & Scope Growth				**Maximum Project Growth**		**75%**	
Yes	PS-1	Access Roads	-Slope stability of access area. Possible partial loss of ramps due to erosion.	- This has already mitigated in the cost estimate by accounting for repair of access roads each year to account for any intermediate erosion. Additional slope stability testing will be conducted during design phase.	Significant	Possible	3	$10,789k
Yes	PS-2	Diversion Control of Water / Dewatering	Water care and diversion fully understood, planned?	- Design, repair, and appropriate costs are properly accounted for to provide proper diversion of water throughout the project duration. Estimate accounts for installation and removal of dewatering equipment and material at every mob- and demobilization. Concern regarding drilling of well and exposure of well head from one mobilization to the next.	Marginal	Likely	2	$10,789k
Yes	PS-3	Environmental Considerations	Potential of scope growth dues to added feattures	- Scope increase to account for turbidity issues in effluent. Estimate accounted for an onsite bioligist and ongoing testing and mitigation. Low risk of impact into sensitive species issues. Current construction plan is to have excess sediment removed during off season in effluent. Additional mitigation needed for installation of floodwalls.	Significant	Likely	4	$2,024k
Yes	PS-4	General Requirements	Traffic Control	- Road along site will have extensive traffic control due to travel volume by site.	Marginal	Possible	1	$13,618k
Yes	PS-5	Sediment Removal (Exc, Load, Haul)	Design confidence. Natural transport (erosion) uncertainty.	- Signficant scope of work changes resulting from sediment volume not naturally eroded downstream (natural transport risk). Insufficient investigation into canyon wall lines and horizontal limits of sediment pile. - Designed hauling roads to provide efficient productivity of hauling, costs of ramps accounted in access roads. Hauling speeds and distances researched extensively and accounted in cost estimate.	Significant	Likely	4	$15,085k
Yes	PS-6	Sediment Removal (Disposal Fees)	Disposal Fees concerns	- Conservative estimates have been made on all costs associated with Tipping Fees. Amount of tipping fees is variable and is being negotiated.	Marginal	Possible	1	$31,269k
Yes	PS-7	Rindge Dam Demolition	Scope growth and additional features concerns.	- Insufficient as-builts for determining overall concrete quantities, but designers have been able to provide a conservative estimate with available information. Hauling costs have been accounted for in 'Hauling.' The team believes all items have been estimated conservatively.	Negligible	Unlikely	0	$5,461k
Yes	PS-8	Floodwalls Downstream	Potential for scope growth	- Very limited conceptual design into this project aspect in regards to geotechnical exploration and structural design. Geotechnical findings could drive design requirements. Conceptual design has been reviewed by others and appear comfotable with design.	Significant	Likely	4	$6,385k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	PS-9	Environmental Monitoring	Insufficient investigations to support design assumptions.	- Possible additional requirements for surveying and monitoring of species and water quality over a 5 year period beyond the project duration (will need to add to cost estimate to properly account for MAMP). Possible cultural mitigation due to past discoveries in the area. Preservation of existing historical monuments (ie Sheriffs Overlook).	Significant	Very LIKELY	5	$6,480k
Yes	PS-10	0			Negligible	Unlikely	0	$k
Yes	PS-11	0			Negligible	Unlikely	0	$k
Yes	PS-12	Remaining Construction Items	Additional asphalt road repairs leading to the dam	- Possibility of requiring additional road repair throughout the project duration. Possible interim repairs of pot holes and damages. Mob/Demob and clearing costs are included in this and have been conservatively accounted for. If awarded near a nesting period it could result in contractor delay.	Marginal	Possible	1	$1,840k
Yes	PS-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,925k
Yes	PS-14	Construction Management			Negligible	Unlikely	0	$6,667k
	Acquisition Strategy				**Maximum Project Growth**		**30%**	
Yes	AS-1	Access Roads	Possibility of contracting out to Small Business. Weather delays concerns.	-Project will not be 8a, but could be small business. Subcontracting should not be required for installation of access roads. Harsh weather may affect roads, but estimate has provisions allowed for repair to road at every building season. All ramps/access roads will have rip rap support as part of the engineered design.	Negligible	Unlikely	0	$6,551k
Yes	AS-2	Diversion Control of Water / Dewatering	Contracting plan. Weather delays. Subcontracting	- Estimate accounts for use of a dewatering subcontractor for wells. All drainage and bypass pipe is standard and will likely be installed by the General Contractor. Contract has strict regulations on building season and water quality that will limit risk.	Negligible	Unlikely	0	$10,789k
Yes	AS-3	Environmental Considerations	Contracting plan. Subcontracting	- Contract specs will require a subcontracted biologist during construction window that will monitor environmental by contractor. This cost has been accounted for in estimate. Regular water quality testing and pre/post bird surveys have also been accounted for. All other BMP's are considered standard and will likely be installed by the GC.	Marginal	Likely	2	$2,024k
Yes	AS-4	General Requirements	Contracting plan. Subcontracting	- Contracting method is firmly set. Subcontractors for minor specialty features have been accounted for in the estimate.	Negligible	Unlikely	0	$13,618k
Yes	AS-5	Sediment Removal (Exc, Load, Haul)	Contracting plan. Weather delays. Subcontracting	- Contracting method established. Quantites for excavated material were conservatively established, but still could increase slightly if natural erosion volume assumption does not occur. Construction window starts in April and there is the possibility of encountering inclimate weather.	Marginal	Possible	1	$15,085k
Yes	AS-6	Sediment Removal (Disposal Fees)	Contracting Plan	- These will likely be transferred to LEERD's and will be pre-negotiated and should reduce.	Negligible	Unlikely	0	$31,269k
Yes	AS-7	Rindge Dam Demolition	Subcontracting	- Demolition subcontractor accounted for in estimate.	Negligible	Unlikely	0	$5,461k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	AS-8	Floodwalls Downstream	Schedule and Subcontracting concerns	- Floodwall needs to be completed in the first work window to allow for extra sediment disposal. Work will likely be performed by a subcontractor. Needs to also be completed before bird nesting season. Both items have been accounted for in the current cost estimate.	Negligible	Unlikely	0	$6,385k
Yes	AS-9	Environmental Monitoring	Subcontracting	- Subcontractor accounted for in estimate for special environmental mitigation.	Negligible	Unlikely	0	$6,480k
Yes	AS-10	0			Negligible	Unlikely	0	$k
Yes	AS-11	0			Negligible	Unlikely	0	$k
Yes	AS-12	Remaining Construction Items	Subcontracting	- A special mobilization and use of subcontractor for road repair has been accounted for. It is likely that more road will be required to be repaired than what will be solicited.	Marginal	Possible	1	$1,840k
Yes	AS-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,925k
Yes	AS-14	Construction Management			Negligible	Unlikely	0	$6,667k
	Construction Elements				**Maximum Project Growth**		**25%**	
Yes	CON-1	Access Roads	Construction claims and construction methods concerns.	- Construction of the access roads is considered primarily standard. Reconstruction of an area of slope may pose difficulties and require special equipment. Some potential for mods based on soil stability.	Marginal	Possible	1	$6,551k
Yes	CE-2	Diversion Control of Water / Dewatering	Wate care and diversion plan.	- Specialty subcontractor has been accounted for to perform dewatering. A water care and diversion will be required. Site access is difficult. Construction window does overlap with times of inclimate weather.	Marginal	Possible	1	$10,789k
Yes	CE-3	Environmental Considerations	Subcontracting	- Use of a subcontractor has been accounted for in the estimate	Negligible	Unlikely	0	$2,024k
Yes	CE-4	General Requirements	Construction procedures	- All elements are considered standard and variabilities have been accounted for in other categories.	Negligible	Unlikely	0	$13,618k
Yes	CE-5	Sediment Removal (Exc, Load, Haul)	Site access, mob/demob, construction logistics	- Slope stability/roadway retaining wall undermining during or post construction. Difficult site access with larger excavation equipment. Work within an area that has been dewatered. Quantity of material to be excavated has been estimated conservatively, but types of material highly variable. Estimated that contractor remobilizes at the start of every construction window. - Access to site is steep and risk of high traffic. Increase in material quantities will affect amount of hauling. Risk of diversion of hauling based on quality of material excavated.	Significant	Possible	3	$15,085k
Yes	CE-6	Sediment Removal (Disposal Fees)			Negligible	Unlikely	0	$31,269k
Yes	CE-7	Rindge Dam Demolition	Arc stability during demolition. Potential for claims. Specialty equipment	- Stability of the remaining arch during demolition is a risk. Water care and diversion accounted for elsewhere. Current estimate requires specialty equipment to demo concrete due to noise. A large crane will be needed for moving of concrete blocks. Potential for claims due to unforseens.	Critical	Possible	4	$5,461k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	CE-8	Floodwalls Downstream	Potential for claims	'- Work needs to be completed in first work window and before the bird nesting season. Work likely performed by specialty subcontractor. Both these elements have been accounted for in estimate. High potential for modifications and delay claims. Will require special mobilizations to particular areas.	Significant	Possible	3	$6,385k
Yes	CE-9	Environmental Monitoring	Subcontracting	- Subcontractor accounted for in estimate for special environmental mitigation.	Negligible	Unlikely	0	$6,480k
Yes	CE-10	0			Negligible	Unlikely	0	$k
Yes	CE-11	0			Negligible	Unlikely	0	$k
Yes	CE-12	Remaining Construction Items	Additional and severity of road repairs needed	- A special mobilization and use of subcontractor for road repair has been accounted for. It is likely that more road will be required to be repaired than what will be solicited.	Marginal	Possible	1	$1,840k
Yes	CE-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,925k
Yes	CE-14	Construction Management			Negligible	Unlikely	0	$6,667k
	Specialty Construction or Fabrication				**Maximum Project Growth**		**65%**	
Yes	SC-1	Access Roads			Negligible	Unlikely	0	$6,551k
Yes	SC-2	Diversion Control of Water / Dewatering			Negligible	Unlikely	0	$10,789k
Yes	SC-3	Environmental Considerations			Negligible	Unlikely	0	$2,024k
Yes	SC-4	General Requirements			Negligible	Unlikely	0	$13,618k
Yes	SC-5	Sediment Removal (Exc, Load, Haul)			Negligible	Unlikely	0	$15,085k
Yes	SC-6	Sediment Removal (Disposal Fees)			Negligible	Unlikely	0	$31,269k
Yes	SC-7	Rindge Dam Demolition			Negligible	Unlikely	0	$5,461k
Yes	SC-8	Floodwalls Downstream	Access and space constraints	- Once final design is selected, construction processes are standard but will have limitations due to access and work space constraints. Concerns have been accounted for adequately in the estimate.	Negligible	Possible	0	$6,385k
Yes	SC-9	Environmental Monitoring			Negligible	Unlikely	0	$6,480k
Yes	SC-10	0			Negligible	Unlikely	0	$k
Yes	SC-11	0			Negligible	Unlikely	0	$k
Yes	SC-12	Remaining Construction Items			Negligible	Unlikely	0	$1,840k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	SC-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,925k
Yes	SC-14	Construction Management			Negligible	Unlikely	0	$6,667k
	Technical Design & Quantities				**Maximum Project Growth**		**30%**	
Yes	T-1	Access Roads	Quantity increase/loss/waste	- Estimated quantities for material needed to develop access roads was investigated by the geotechnical design and was estimated conservatively	Marginal	Unlikely	0	$6,551k
Yes	T-2	Diversion Control of Water / Dewatering	Sufficient investigations	- Estimates were developed by a dewatering contractor. All materials needed for water control by the General Contractor have been conservatively estimated.	Negligible	Unlikely	0	$10,789k
Yes	T-3	Environmental Considerations	Level of confidence	- Environmental design assisted in development of quantities and methods. Quantities were estimated conservatively.	Marginal	Unlikely	0	$2,024k
Yes	T-4	General Requirements	Level of confidence	- Civil design assisted in development of quantities and methods. Quantities were estimated conservatively.	Marginal	Unlikely	0	$13,618k
Yes	T-5	Sediment Removal (Exc, Load, Haul)	Level of cofidence based on design and assumptions on natural transport of sediment. Possibility of increased quantities	- Civil and geotechnical design assisted in the development of quantites. Geotech believes accurate quantity estimates were developed. Geotechnical investigations and Soil Penetration Tests (SPT) were performed on the impounded sediment within the last few years. Blow count tests indicated soil properties with extremely low relative density. The PDT feels the impounded sediment is in its loose state and the baseline estimate was based on in-situ Loose Cubic Yards (LCY). But, there is a possibility for increased quantities based on potential swell factors. - If rain events do not carry remaining 120,000 CY naturally downstream then costs will increase (Critical). California remains in a drought; it is likely that rains will not transport remaining sediment in its entirety.	Critical	Likely	5	$15,085k
Yes	T-6	Sediment Removal (Disposal Fees)	Possibility of increased quantities	- If rainy events do not carry or transport the sediment naturally, then risk of finding a disposal site for unaccounted volume increases; it is possbile that some sediment may be disposed at the landfill	Marginal	Possible	1	$31,269k
Yes	T-7	Rindge Dam Demolition	Appropriate methods used in the qtys calculations	- Civil and structural design assisted in the development of quantites. Civil design believes accurate quantity estimates were developed. There is a possibility for increased quantities based on material discovered.	Marginal	Possible	1	$5,461k
Yes	T-8	Floodwalls Downstream	Design confidence. Natural transport (erosion) uncertainty.	- Conceptual floodwall design has been vetted by by external review for added confidence with design. Geotechincal testing will determine final floodwall dimensions/quanities and could likely result in significant increases.	Significant	Likely	4	$6,385k
Yes	T-9	Environmental Monitoring	Appropriate methods used in the qtys calculations	- Environmental design assisted in development of quantities and methods. Quantities were estimated conservatively.	Negligible	Unlikely	0	$6,480k
Yes	T-10	0			Negligible	Unlikely	0	0k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	T-11	0			Negligible	Unlikely	0	$k
Yes	T-12	Remaining Construction Items	Possibility of qty increases.	- Roadway repair is variable and has been considered at a minimum. Other work (ie flagging, dust control) considers all work is completed in estimated time frame. Interim patching work hasn't been considered. Civil design assisted with development of material quantities for designed repair portiion.	Negligible	Likely	1	$1,840k
Yes	T-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,925k
Yes	T-14	Construction Management			Negligible	Unlikely	0	$6,667k
	Cost Estimate Assumptions				**Maximum Project Growth**		**35%**	
Yes	EST-1	Access Roads	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$6,551k
Yes	EST-2	Diversion Control of Water / Dewatering	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subconstractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. A dewatering subcontractor assisted in development cost estimates. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$10,789k
Yes	EST-3	Environmental Considerations	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$2,024k
Yes	EST-4	General Requirements	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$13,618k
Yes	EST-5	Sediment Removal (Exc, Load, Haul)	Estimate assumptions regarding production, crews, congestion, subcontracting; and additional hauling.	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities. Possible rerouting based on material quality and outside agency acceptance. - If additional material needs to be mechanically transported (hauled) then the estimate will increase significantly.	Significant	Likely	4	$15,085k
Yes	EST-6	Sediment Removal (Disposal Fees)	Disposal site identification	- Assumed all gravel, clay and silt goes to a landfill. Fees could change/ - Assumed additional hauling, if required, will be sandy material; not bound for landfill	Moderate	Unlikely	1	$31,269k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	EST-7	Rindge Dam Demolition	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$5,461k
Yes	EST-8	Floodwalls Downstream	Site access, transport delays, congestion	- Area does have succeptability to sporadic congestion. Design is not diffinitive which will result in changes to final cost estimate. Cost estimate will be adjusted as a more reliable design is established.	Marginal	Likely	2	$6,385k
Yes	EST-9	Environmental Monitoring	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$6,480k
Yes	EST-10	0			Negligible	Unlikely	0	$k
Yes	EST-11	0			Negligible	Unlikely	0	$k
Yes	EST-12	Remaining Construction Items	Estimate assumptions regarding production, crews, congestion, subcontracting	- All work estimated as performed by prime and subcontractor. Standard markups were used. Crews and productivity were taken from past data and estimated conservatively. Area can incur times of high traffic and congestion. Some traffic delays have been calculated into work productivities.	Negligible	Unlikely	0	$1,840k
Yes	EST-13	Planning, Engineering, & Design			Negligible	Unlikely	0	$14,925k
Yes	EST-14	Construction Management			Negligible	Unlikely	0	$6,667k
	External Project Risks				**Maximum Project Growth**		**40%**	
Yes	EX-1	Access Roads	Public concerns	- Potential of public attempting to use for access to area below.	Negligible	Possible	0	$6,551k
Yes	EX-2	Diversion Control of Water / Dewatering	Weather concerns. Releases from U/S facility.	- Low risk of adverse weather during construction window, but high flows are likely during off season. Possibility for an uncontrolled release from an upstream treatment facility.	Marginal	Possible	1	$10,789k
Yes	EX-3	Environmental Considerations	Other agencies required testing	- Permitting and planning may require additional testing and consideration of local agency regulations.	Marginal	Possible	1	$2,024k
Yes	EX-4	General Requirements	Other agencies requiring additional traffic control	- Outside agencies may require additional traffic control measures beyond what is currently accounted for. Public opinion on jobsite traffic impact to the area.	Significant	Likely	4	$13,618k
Yes	EX-5	Sediment Removal (Exc, Load, Haul)	Additional traffic control	- Hauling is highly dependent on traffic control and impact from external sources outside the Corps control.	Significant	Likely	4	$15,085k

Use/ View	Risk Element	Feature of Work	Concerns	PDT Discussions & Conclusions (Include logic & justification for choice of Likelihood & Impact)	Impact	Likelihood	Risk Level	Line Item Magnitude ($000)
Yes	EX-6	Sediment Removal (Disposal Fees)	Change in disposal fees	- No control of fees charged by landfill. Could be variable, negatively or positively, to the project.	Marginal	Possible	1	$31,269k
Yes	EX-7	Rindge Dam Demolition	Other agencies imposing additional requirements	- Possible issues accounted in other categories	Negligible	Unlikely	0	$5,461k
Yes	EX-8	Floodwalls Downstream	Residence in the area. Market competition. Resource agencies.	- Residence in areas are likely to oppose having a floodwall in their backyard. Construction market is still very competitive in the area which is likely to result in tight margins of bidding. Resource agencies are very opposed to floodwalls as well.	Critical	Possible	4	$6,385k
Yes	EX-9	Environmental Monitoring	Weather concerns.	- Extreme weather, or event, may cause the need for replanting.	Negligible	Possible	0	$6,480k
Yes	EX-10	0			Negligible	Unlikely	0	$k
Yes	EX-11	0			Negligible	Unlikely	0	$k
Yes	EX-12	Remaining Construction Items	Access road cocerns	- These features are affected inline with many others. Believe possible fluctuation has been accurately accounted in those FOW.	Negligible	Possible	0	$1,840k
Yes	EX-13	Planning, Engineering, & Design	Funding can be delayed	Additional contracts might also be necessary if funding is delayed, possibly causing cost increases in PED, Contracting and Construction Management.	Critical	Possible	4	$14,925k
Yes	EX-14	Construction Management	Funding can be delayed	Additional contracts might also be necessary if funding is delayed, possibly causing cost increases in PED, Contracting and Construction Management.	Critical	Possible	4	$6,667k

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