

MATILIJA DAM
ECOSYSTEM RESTORATION PROJECT
VENTURA COUNTY, CALIFORNIA

PHASE I PIPELINE AND MULTI-USE RECREATION TRAIL
ALIGNMENT STUDY



Prepared for
*U.S. Army Corps of Engineers
Los Angeles District*

In coordination with
Ventura County Watershed Protection District

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September 2008

Contract No. W912PL-04-D-0027
(Task Order 0011)

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Introduction

Background

The Ventura County Watershed Protection District (VCWPD), formerly called the Ventura County Flood Control District, constructed Matilija Dam in 1947 to provide water storage for agricultural needs and limited flood control. Modification to the dam structure and sedimentation behind the dam has reduced the water storage capacity to less than seven percent of the original capacity. The Matilija Dam Ecosystem Restoration Project, a U.S. Army Corps of Engineers (Corps) and VCWPD joint venture, includes the removal of Matilija Dam and redistribution of six million cubic yards of accumulated sediment, with about one-third of the material being slurried to a downstream site. The remaining sediment will be stockpiled and configured to improve the Matilija Creek flow regime and ultimately restore Ventura River to a more natural, pre-dam condition.

The *Matilija Dam Ecosystem Restoration Feasibility Study*¹ was completed in 2004. Among many elements of the broad and complicated plan, the study recommends that the 2.1 million cubic yards of sediment impounded at the dam be slurried to a location downstream of Robles Diversion Dam, and proposes that the temporary slurry pipeline be converted into a hiking trail at completion of the project. This trail would link existing downstream trails to a new trail system to be constructed in the dam's reservoir area.

Purpose of the Study

This Phase I Pipeline and Multi-use Recreational Trail Alignment Study explores the potential slurry and water supply pipeline alignments between Matilija Dam and the Meiners Oaks Levee and recreation trail alignments from the Los Padres National Forest trails in Matilija Canyon to the Highway 150 Bridge on the Ventura River in Ventura County, California. The purpose of the study is to: (1) identify a range of conceptual alignments for the slurry and water supply pipeline and recreational trails, as well as a combination of the two alignments where practicable, and (2) examine the constraints associated with these conceptual alignments. To do so, this study explores additional options of pipeline and trail as separate alignments, expanding upon the proposed shared alignment considered in the feasibility study for the Matilija Dam Ecosystem Restoration Project. The study outlines screening criteria, design parameters and constraints, including land use, right-of-way, and other factors.

Project Description

The Matilija Dam Ecosystem Restoration Project includes slurry pipeline alignments extending from the Matilija Dam area (approximately River Mile (RM) 17) to the Meiners Oaks Levee (RM 13.5). The slurry system consists of a slurry pipeline and a water supply line, which provides the water necessary to generate slurry. The removal of Matilija Dam would allow for natural transport of approximately 4 million cubic yards of sands, gravels and more coarse-grained sediment to Ventura River reaches downstream of the dam, and to the nearby coastline. The slurry removal of sediment is one of the requirements associated with dam removal, whereby 2.1 million cubic yards of fine sediments would be transported by pipeline to

¹ U.S. Army Corps of Engineers. *Matilija Dam Ecosystem Restoration Feasibility Study*, Ventura County, California (PWI #013667). September 2004.

downstream storage locations to address turbidity impacts to sensitive species and water diversion activities associated with the removal of the dam. Proposed alignments for the water supply and slurry pipelines downstream of Meiners Oaks Levee are not included in this study since the final location of slurry disposal sites were under review at the time of this study.

Recreation trails currently exist both upstream and downstream of the Matilija Dam area, but not in the vicinity of the dam. The upper trails are located in the Los Padres National Forest approximately ten miles upstream from the dam, while downstream trails, primarily maintained by the Ojai Valley Land Conservancy (OVLC), are located within one mile of the Highway 150 Bridge (Baldwin Road). There is also a multi-use walking, biking and equestrian trail, the Ojai Valley Trail that follows the Highway 33 alignment and roughly parallel to the Ventura River, from the mouth of the river to the City of Ojai. Opportunities exist to link the trail systems, particularly in combination with dam removal (See Figures 1 and 2).

This study explores options for new trails and linkages of multi-use trail (i.e. hiking, equestrian and mountain biking) along the existing unimproved access road that parallels the eastern edge of the Matilija Reservoir Area to the road entrance below the dam site. The multi-use trail would continue downstream along the Ventura River and would extend from Matilija Road to the Highway 150 Bridge (Baldwin Road) crossing. The new trail system would provide a link to the County of Ventura Ojai Valley Trail along Highway 33.

Figure 1: Trails North of Matilija Dam

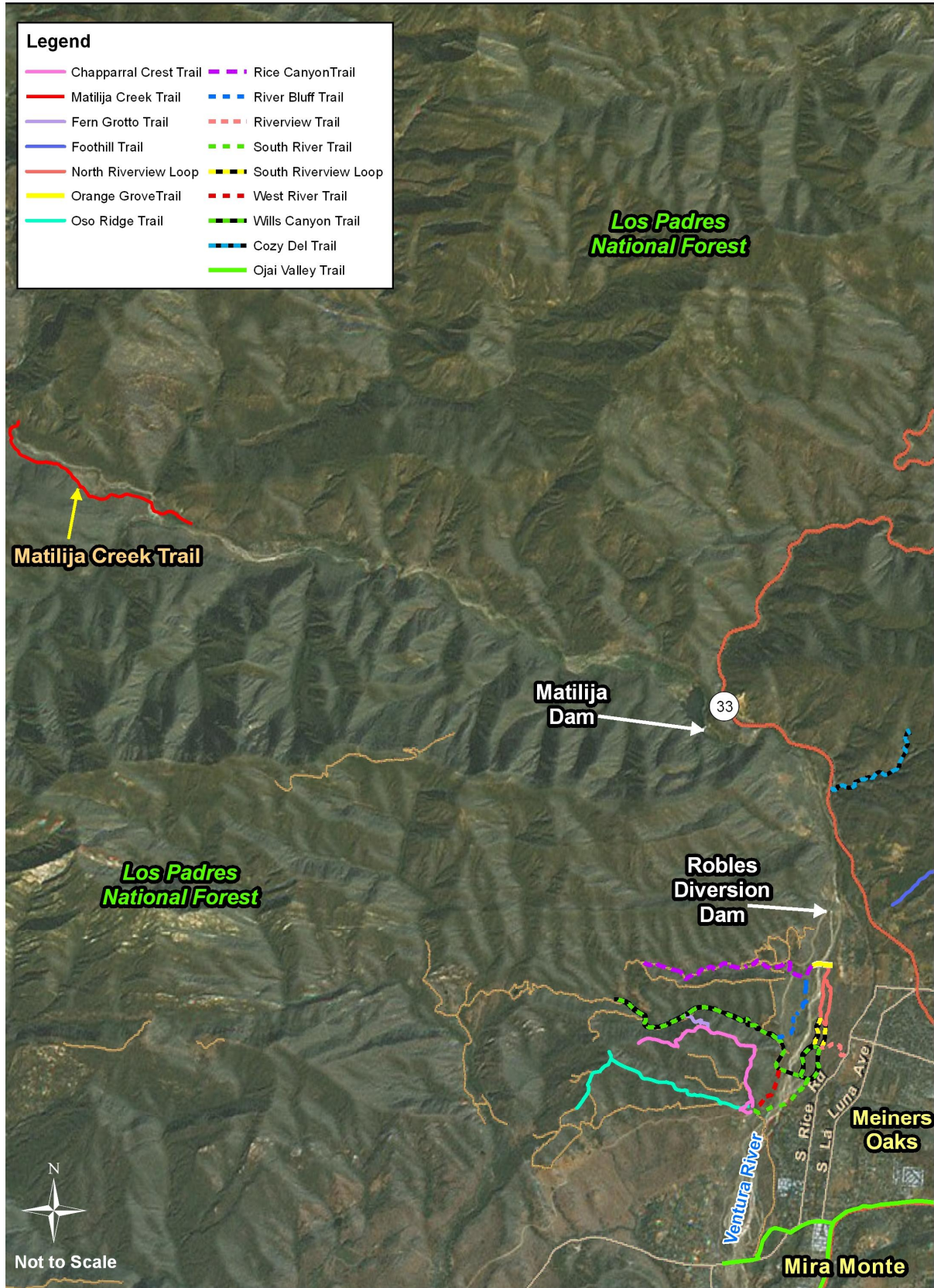
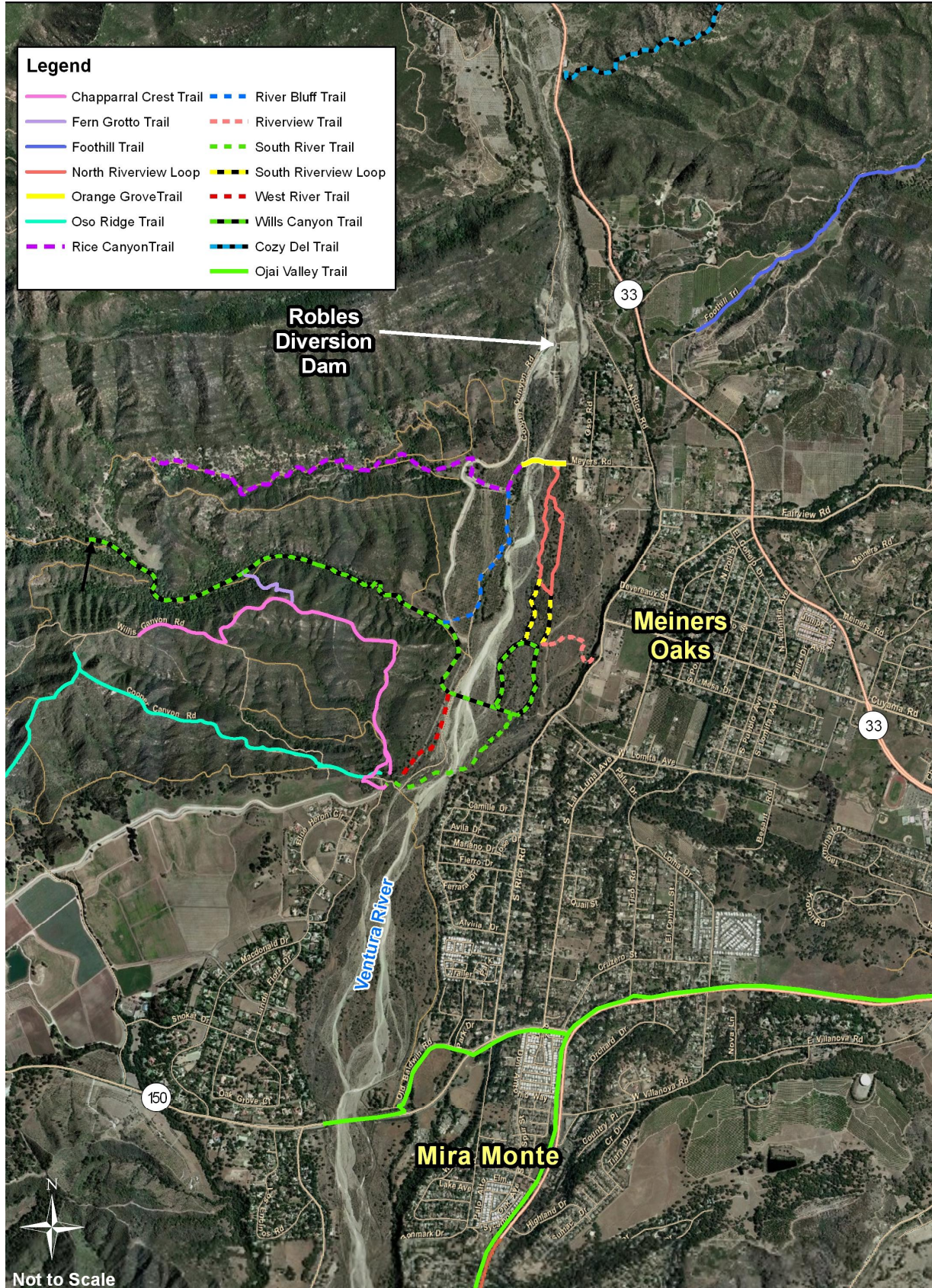


Figure 2: Trails South of Matilija Dam



Study Area

The alignment study area includes conceptual slurry and water supply pipeline alignments extending from the Matilija Dam to the Meiners Oaks Levee and recreational trail alignments between the Matilija Reservoir Area and Highway 150 (see Figure 3: Study Area)

Matilija Creek

The Lower North Fork of Matilija Creek and Matilija Creek mainstem form the headwaters for the Ventura River. Matilija Creek drains from steep foothills and mountains of the Santa Ynez Mountains as it flows to the Matilija Reservoir. Matilija Creek exits the Los Padres National Forest about seven miles north of Matilija Dam and then flows through a small portion of private land, surrounded on all sides by the Los Padres National Forest, until it reaches Matilija Dam. The north fork generally follows the alignment of Highway 33 as it winds into the Los Padres National Forest. The two come together at the confluence point approximately ½ mile downstream of Matilija Dam. The steep slopes along the creek are characterized by dense vegetation on the north-facing slopes and sparse vegetation on the south-facing slopes.

Ventura River

South of the confluence of the Lower North Fork of Matilija Creek and Matilija Creek mainstem, the Ventura River flows south past the western edge of the City of Ojai, through the unincorporated areas of Oak View and Casitas Springs. Beginning at the confluence, the river flows through the community of Camino Cielo. The Ventura River exits a steep canyon as it enters a wide depositional plain about a mile upstream from Robles Dam. The Robles Diversion Dam is located approximately 1.5 miles downstream of the headwaters of the Ventura River. This dam diverts water from the Ventura River to Lake Casitas via the 4.5 mile-long Robles-Casitas Diversion Conduit.

The Ventura River flows in a southerly direction through several constricting canyons and wider floodplain areas for a total of about 16 miles until it reaches the Ventura River Estuary and ultimately, the Pacific Ocean. The floodplain is seldom wider than 0.5 mile. In its lower reaches, the Ventura River flows through the City of San Buenaventura until it reaches its estuary. The estuary is approximately 1.25-mile wide. Presently, there are eight major bridge crossings between Matilija Dam and the ocean.

Figure 3: Project Study Area



Land Use Characteristics

Ventura County supports slow growth and has therefore protected large areas from future development. Other jurisdictions in the watershed include the Los Padres National Forest, Casitas Municipal Water District (CMWD), Teague Memorial Area, Ojai Area Plan (74,000 acres of unincorporated portions of Ojai and Ventura River Valleys), and the Ventura County Fire Protection Department. The river and floodplain at the mouth are owned by the State and the City of Ventura. The Ventura County Watershed Protection District holds flowage easements along portions of the Ventura River. Most of the land in the Ventura River Valley is privately owned.

A few areas situated in the immediate vicinity of Matilija Creek and the Ventura River are planned for residential and/or commercial uses. Currently, the area north of the Matilija Dam is mainly open space with sparse residential areas. The area south of the dam up to the Camino Cielo Bridge is open space with a few concentrated areas of residential uses along Rice Road. The area south of the Camino Cielo Bridge to the Robles Diversion Dam is mainly groves with scattered residential uses on the west side of the Ventura River. The area south of the Robles Diversion Dam to Meiners Oaks Levee, is residential on the east side of the river and open space towards the west. Some areas of open space also remain on either side of the river from Meiners Oaks Levee to West Lomita Ave. There are residential uses on both sides of the river from West Lomita Avenue to Highway 150.

Existing Recreational Trails

Recreation access to Matilija Creek in the upper portions of the watershed several miles above Matilija Dam is located within the Los Padres National Forest, managed by the U.S. Forest Service. The access point for trails in the Matilija watershed leads to the Matilija Wilderness area and into the larger Los Padres National Forest. Other trails and recreation areas managed by the U.S. Forest Service include Matilija Creek Trail, Matilija Campsites, Middle Matilija Campsite and Murietta Camp.

The majority of the trails downstream of Matilija Dam, are owned and operated by the Ojai Valley Land Conservancy or the County of Ventura. The project area is located within the Ventura River Preserve-Rancho El Nido Unit of the OVLC Protected Open Space and Area of Influence. Trails within the Ventura River Preserve-Rancho El Nido unit include Rice Canyon Trail, River Bluff Trail, Orange Grove Trail, North and South Riverview Loop, West River Trail and South River Trail. The Ojai Valley Trail, maintained by the County of Ventura, runs the length of the Ventura River Valley and follows the abandoned Southern Pacific right-of-way along the west side of Highway 33 from Ojai to the northern end of Foster Park. Within the watershed, the trail serves bicyclists, equestrians and pedestrians. The equestrian trail terminates at Foster Park, but a bicycle and pedestrian trail continues downstream along the estuary to the mouth of the Ventura River and south along the shoreline.

Methodology

Conceptual Alignment Development

In order to consider a range of options, this alignment study explores the pipeline and the recreational trail as separate alignments. With these separate alignments, the design constraints of the recreational trail would not constrain the options for the pipeline and vice versa.

The information about right of way, land use, floodplains, and water resources used in the study of the conceptual alignments is based on field surveys, the Corps Geographic Information Source, and the 2004 Matilija Ecosystem Restoration Feasibility Study

Pipeline

The pipeline includes one water supply pipeline and one slurry pipeline. The alignment study assumed that the water supply pipe and slurry pipelines would not exceed a three-foot diameter for each pipe and the right-of-way (ROW) widths would accommodate the pipeline placement and associated vehicular access (roughly fifteen feet (ft)) for operation and maintenance during slurring. Conceptual pipeline alignments were developed with consideration to topography, constructability, and access for maintenance and operation. To avoid the need for pumps, the adverse gradients for the pipeline (in excess of 10%) were limited to less than 200 ft in length. (see Table 1).

The Robles Diversion Dam is located approximately 1.5 miles downstream of the Matilija Creek. This dam diverts water from Ventura River to Lake Casitas. The alignments of the slurry pipeline were designed to avoid disturbances to the Robles Diversion Dam.

Recreational Trail

The multi-use recreational trail alignments extend from Matilija Canyon to Highway 150 (Baldwin Road). The primary goal of the recreational trail alignments is to link upstream and downstream existing trails, including the Cozy Dell Trail and the OVLC trails, along the Ventura River wherever possible. The study aimed to provide recreational trails of medium hiking difficulty. At least one option proposal links the downstream portion of the recreation trail from the Highway 150 Bridge to the Ojai Valley Trail along Highway 33. The development of the recreational trail alignments considered long-term maintenance associated with the trail and minimized river crossing and areas within the 20-year floodplain.

The trail alignments were broken down into segments called nodes. Each node represents a connection between an existing trail and the new conceptual trail. The trail alignments may be implemented in whole or in part. Each segment between nodes may be constructed separately to provide the desired connectivity between existing trails.

The recreational trails hiking difficulty levels were based on the Forest Service Trail Accessibility Guidelines (FSTAG) and California State Parks Guidelines. FSTAG outlines design requirements for new or altered trails that are designed for hiker and pedestrian use and that connect either directly to a trailhead or to an accessible trail within National Forest System boundaries. FSTAG Section 7.3.1.1 requires that trails comply with one or more of four separate provisions for trail grade: up to 1:20 (5%), up to 1:12 (8.33%), up to 1:10 (10%), and up to 1:8

(12%). Resting intervals or specified distances between rest areas are required when trail grades exceed 1:20 (5%). No more than 30% of the total trail length may exceed a trail grade of 1:12 (8.33%).

The California State Parks Guidelines call for rest areas on easier, moderate, and difficult trails at maximum intervals of 200 ft, 400 ft, and 600 ft, respectively. Most agencies and private organizations that provide recommendations for rest areas concur with the 1994 Recreation Access Advisory Committee, which recommends that easier, moderate, and difficult trails should have rest areas at maximum intervals of 400 ft, 900 ft, and 1200 ft, respectively. Switchbacks may be employed to meet rest areas interval requirements.

Table 1: Design Criteria of the Pipelines and Recreational Trail

Pipelines	Recreational Trail
Extends from Matilija Dam (RM 16.5) to Meiners Oaks Levee (RM 14)*	Trail extends from Matilija Canyon (RM 18) to Highway 150/Baldwin Road
Gradient (<10%)	Multi-use trail
No adverse gradient for a length of greater than 200 ft	Medium hiking difficulty
Avoid impacts to Robles Diversion Dam	Avoid Robles Diversion Dam, upstream sediment basin, fish ladder and diversion canal
(2) 36" pipelines (one for water supply, one for slurry)	Provide connection to Ojai Valley Trail and other existing trails where possible
Located above 20 year floodplain	Located above 20 year floodplain
Potential maintenance access adjacent to pipeline (roughly 15 feet)	Limited river crossings

Screening Criteria

The screening criteria are used as guidelines for the comparison of the conceptual pipeline and recreational trail alignments. The screening criteria employed for the pipeline and the recreational trail alignments are shown in Table 2 and described below.

Table 2: Pipeline and Recreational Trail Alignment Screening Criteria

Pipeline	Recreational Trail
Right of way requirements	Right of way requirements
Relative cost of construction	Ease of maintenance
Adverse gradient (percent) and associated distance (feet)	Connections to existing trails
Adverse gradient (percent) and associated distance (feet)	Level of difficulty
Coincides with recreational trail (miles)	Rest and parking areas
Maricopa Highway (Highway 33)	Overlook areas provided
Number of new river crossings	Coincides with slurry pipeline (miles)
----	Number of new river crossings

Pipeline Screening Criteria

Right of way requirements

The pipeline alignments would cross both publicly and privately owned lands. To provide a measure for comparison of potential impact to private property, the numbers of privately owned and public owned parcels were identified for each conceptual alignment. Based on aerial photos, structures were mapped, and the number of residences within 100 feet of the alignment, the distance to the nearest residential building, and number of private roadway and driveways crossings were estimated, providing a measure for proximity impacts of the alignment.

Relative cost of construction

The relative cost of construction is a qualitative comparison of construction cost, taking into consideration the cut, fill, material and structures that would be required for the construction of the alignment.

Adverse gradient (percent) and associated distance (feet)

To maintain optimal flow conditions in the pipeline, it is critical to minimize adverse grades. To this end, the Corps required slurry alignments that have no adverse gradient greater than 10 percent and no adverse grade for a length of greater than 200 feet.

Coincides with recreational trail (miles)

To expand upon the alignments outlined in the feasibility study, this alignment study explores the pipeline alignments and the recreational trail alignments separately. The length of the pipeline that coincides with the recreational trail is included as a screening criterion. However, the coinciding alignments screening criterion is not a pure measure of benefit. The overlapping slurry pipeline and recreational trail alignments have both advantages and disadvantages to be taken in consideration. As compared to separate alignments, constructing the slurry pipeline and the recreational trail at the same location may potentially reduce construction cost, construction footprint, the number of parcels affected and operation and maintenance costs. However, while the parallel pipeline and recreational trail alignments may cross fewer parcels, the parallel alignments would have a broader footprint on an affected parcel versus a single alignment crossing the parcel.

Length of pipe parallel to Matilija Road and Highway 33

The screening criteria for length of the pipeline paralleling Matilija Road and Highway 33 encompass a qualitative measure for constructability, construction cost, environmental impact, and ease of maintenance. Highway 33 provides the main access to the Matilija Dam and would be the main access for construction and maintenance vehicles. The length of pipeline adjacent to the roadway provides a measure of relative aesthetic impact. For any alignment in close proximity to roadways, the pipeline would be viewable from the roadway and would introduce a man-made element to the natural landscape. However, construction of a pipeline adjacent to an existing roadway would likely require less cut and fill and therefore, cost less for both construction and maintenance and have a lesser environmental impact compared to an alignment along the slopes.

New river crossings

The number of new river crossings required by the alignment was aimed at capturing the potential impacts for hydrology (river flows and high flow events), maintenance, construction cost, and environmental impact.

Recreational Trail Screening Criteria

A brief explanation of each screening criterion for the conceptual recreational trail is given below:

Right-of-way requirements

The trail alignments would cross both public and privately owned lands. To provide a measure for comparison of potential impacts to private property, the numbers of privately owned and publicly owned parcels were identified for each conceptual alignment. Based on aerial photos, structures were mapped, and the number of residences within a 100 feet of the alignment and the distance to the nearest residential building were estimated, providing a measure for proximity impacts of the alignment.

Ease of Maintenance

Ease of maintenance criteria addresses the cost and difficulty of maintaining the trail after the completion of the project.

Connections to existing trails

The main goal of the recreational trail alignment is to provide linkages to existing trails. Therefore trail connections were included as part of the screening criteria.

Level of Difficulty

The level of difficulty is a measure of hiking difficulty, based on the U.S. Forest Service Trail Accessibility Guidelines. An easy hiking trail with low level of difficulty corresponds to trail grades up to 5% and would require a maximum rest interval of 200 ft. An easy to medium level has trail grades up to 8.33% with rest areas at intervals up to 400 ft. A medium level difficulty trail has up to a 10% grade and rest areas intervals up to 600 ft. High levels of hiking difficulty include trails of greater than 12% grade and rest areas intervals up to 1200 ft.

Rest and Parking Areas

The conceptual alignments do not include parking and rest area design features. For the purposes of screening, access to existing parking and rest areas as well as the opportunity for new rest areas and parking were examined.

Potential for overlook areas

Enjoyment and use of recreational trails are often associated with the scenic vistas provided by along the trails. This study does not identify exact locations for overlook areas, as siting of overlooks would be conducted as part of the design process. This study examines the potential for overlooks based on the elevation and opportunity for a scenic viewpoint.

Coincides with pipeline (miles)

The coinciding alignments screening criteria are not a pure measure of benefit. The overlapping slurry pipeline and recreational trail alignments have advantages and disadvantages to be taken in consideration. As compared to separate alignments, constructing the slurry pipeline and the recreational trail at the same location may potentially reduce construction cost, footprint, number of parcels affected, and operation and maintenance costs. Although the parallel pipeline and recreational trail alignments may cross fewer parcels, the parallel alignments would have a broader footprint on an affected parcel versus a single alignment crossing the parcel.

New river crossings

The number of new river crossings required by the alignment was aimed at reducing the potential impacts for hydrology (river flows and high flow events), maintenance, construction cost, and environmental impact.

Conceptual Alignments

Pipeline alignments

Seven pipeline alignments are explored in this study. An overview of these conceptual alignments is shown in Figure 4 and comparison of screening criteria for Alignments 1, 2B, 4 and 5 is outlined in Table 3. Exhibits for each alignment include station numbers that start at zero at Matilija Dam and are marked at 500 foot intervals. The profiles for the pipeline alignments are included in Appendix A.

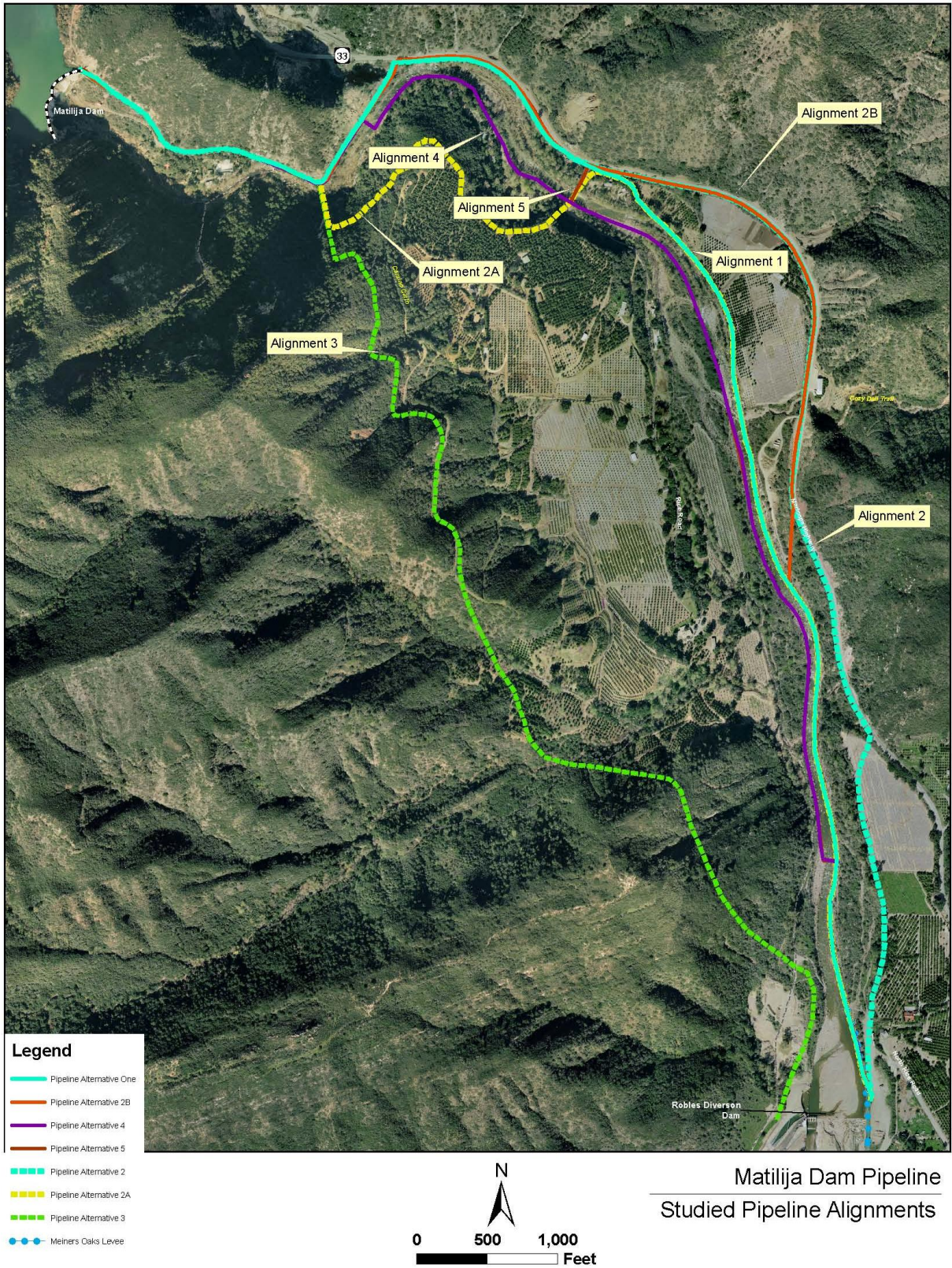
All seven alignments follow the same initial alignment along the eastside of the Ventura River and end at Meiners Oaks Levee. For all the pipeline alignments adjacent to roads upstream of the north fork bridge, the road at the bridge would be part of the trail right-of-way, and therefore it would be closed to the public during construction.

Three alignments (Alignment 2, 2A, and 3) were withdrawn from further study due to substantial adverse gradient, grading, and/or potential environmental impact. Alignment 2, which paralleled Highway 33 and traveled south, was withdrawn due to its proximity to private properties and the transection of agricultural parcels. Alignment 2 was modified as Alignment 2A and 2B and shifted to the west, closer to the Ventura River, to avoid cutting across multiple parcels and agricultural areas. Alignment 2A was withdrawn from further consideration due to adverse gradient, proximity to private properties, and the crossing of multiple parcels owned by a single property owner. Although Alignment 3 is at a distance from private structures and skirts agricultural areas, it was withdrawn due to substantial adverse gradient. The costs of grading and construction, as well as maintenance of the access roads, for Alignment 3 would be very high.

Table 3: Screening Criteria Comparison of Pipeline Alignments

Criterion	Alignment 1	Alignment 2B	Alignment 4	Alignment 5
Number of parcels	9	8	12	9
Publicly owned parcels	4	5	6	4
Privately owned parcels	5	3	6	5
Residence within 100 ft	4	1	7	2
Nearest residential building	61 ft	74 ft	69 ft	45 ft
Driveway/private road crossings	2	4	3	2
Length of pipe parallel to Matilija Road	2250 ft	2250 ft	1730 ft	2250 ft
Length of pipe parallel to Maricopa Highway (Hwy 33)	1760ft	5220ft	-	1670ft
Relative cost of construction	\$\$	\$\$\$	\$\$\$	\$\$\$
Adverse gradient and associated distance (ft)	0	-3% (2150-2350)	0	0
Number of new river crossings	0	0	2	1

Figure 4: Pipeline Conceptual Alignments Studied



Matilija Dam Pipeline
Studied Pipeline Alignments

Alignment 1

Alignment 1 is a refinement of the alternative presented in the 2004 feasibility study. Illustrated in Figure 5, the 12,455 ft long pipeline runs adjacent to the south Matilija Road, starting from the south east corner of the dam, joining the Maricopa Highway 33 at the intersection. The pipeline continues southerly along the shoulder of Highway 33 until Camino Cielo where it would cross privately-owned land until reaching Robles Diversion Dam. From that point, the pipeline proceeds along Meiners Oaks Levee.

Alignment 1 does not have any adverse gradient throughout the length of the pipeline and does not require any modification of the existing Camino Cielo Bridge. However, it requires crossing five private parcels potentially owned by five individual landowners. The alignment's 4,500 ft is in close proximity to the roadway, with 2,000 ft of the pipeline length along the Maricopa Highway 33. During construction, traffic delays may occur along those stretches of roadway adjacent to the alignment.

While approximately 6,500ft of the pipeline alignment will be within the 20-year floodplain of the Ventura River, it is not expected to adversely affect the area's ability to accommodate flood flows. The pipeline would need be anchored to resist flotation, collapse and lateral movement due to the effects of wind and water loads in case of a 20-year or greater flood event.

Alignment 2B

As shown in Figure 6, Alignment 2B follows the same initial path of Alignment 1. However this alignment continues along the Maricopa Highway south to station 8000, where it crosses over to the east bank of the river for approximately eight miles until it reaches the west bank of Robles Diversion Dam. At that point, the pipeline would proceed along Meiners Oaks Levee.

Adverse gradient on this alignment will occur for lengths of 1,100 ft at 4.5% and 250 ft at 2%. Thus, alignment 2B does not meet the adverse gradient design criteria of no adverse gradient greater than 10 percent and no adverse grade for a length of greater than 200 feet. This alignment was included in the study because it attempts to minimize impacts to privately-owned parcels. Compared to other alignments, Alignment 2B would require crossing the least number of private parcels (three parcels), while traversing five publicly-owned parcels. Only one residence is located within 100 ft of the alignment, and the nearest residential building is located roughly 75 ft away from this alignment. However, this alignment crosses near more private driveways and/or private roads (three private driveways/roads) than do other alignments.

The alignment would be adjacent to 1,730 ft of Matilija Road and 5,520 ft of Highway 33, which is a considerably greater length when compared to other alignments. Therefore, Alignment 2B would result in most traffic delays during construction due to the long stretches of roadway adjacent to it.

Figure 5: Conceptual Pipeline Alignment 1

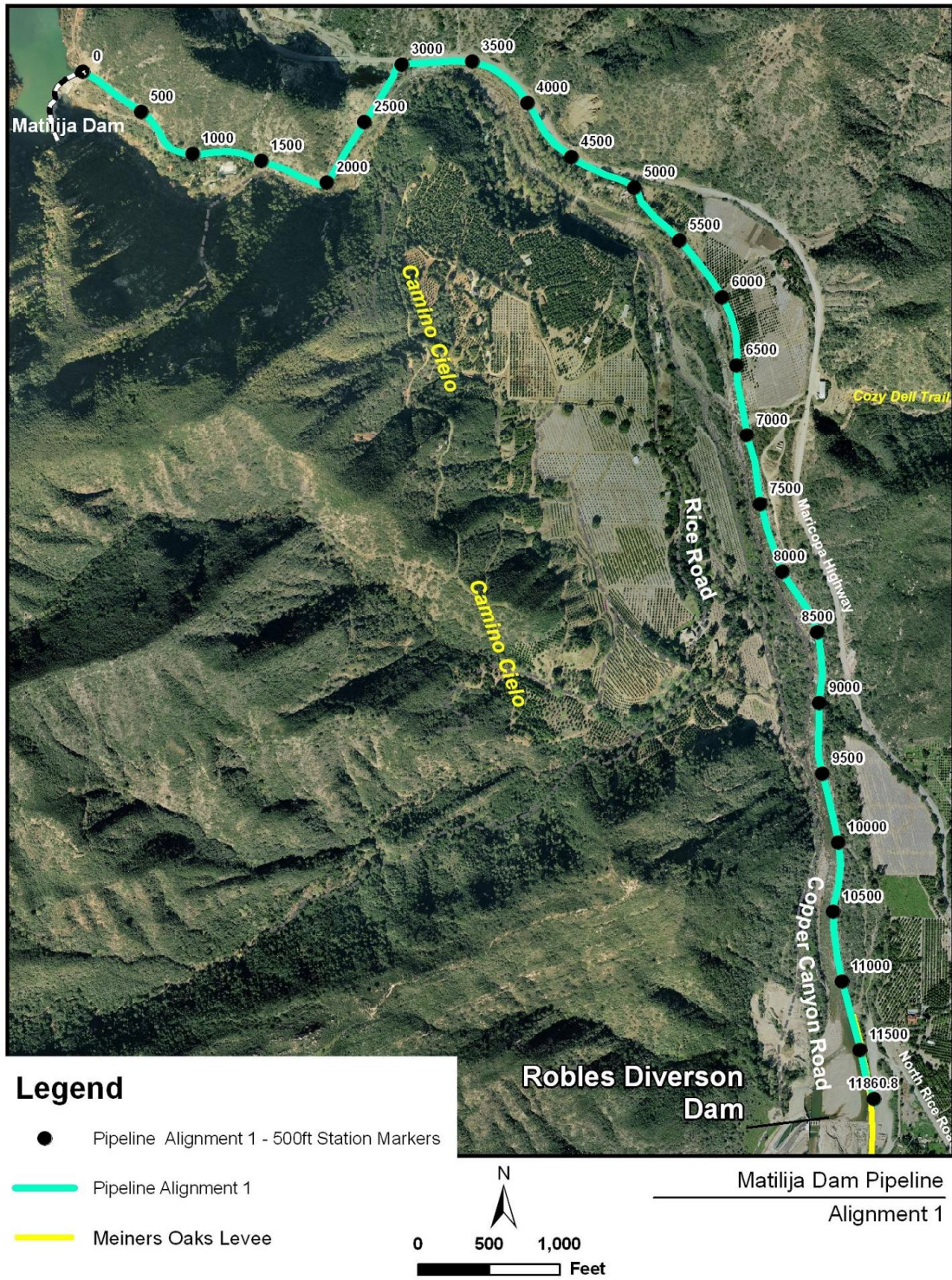
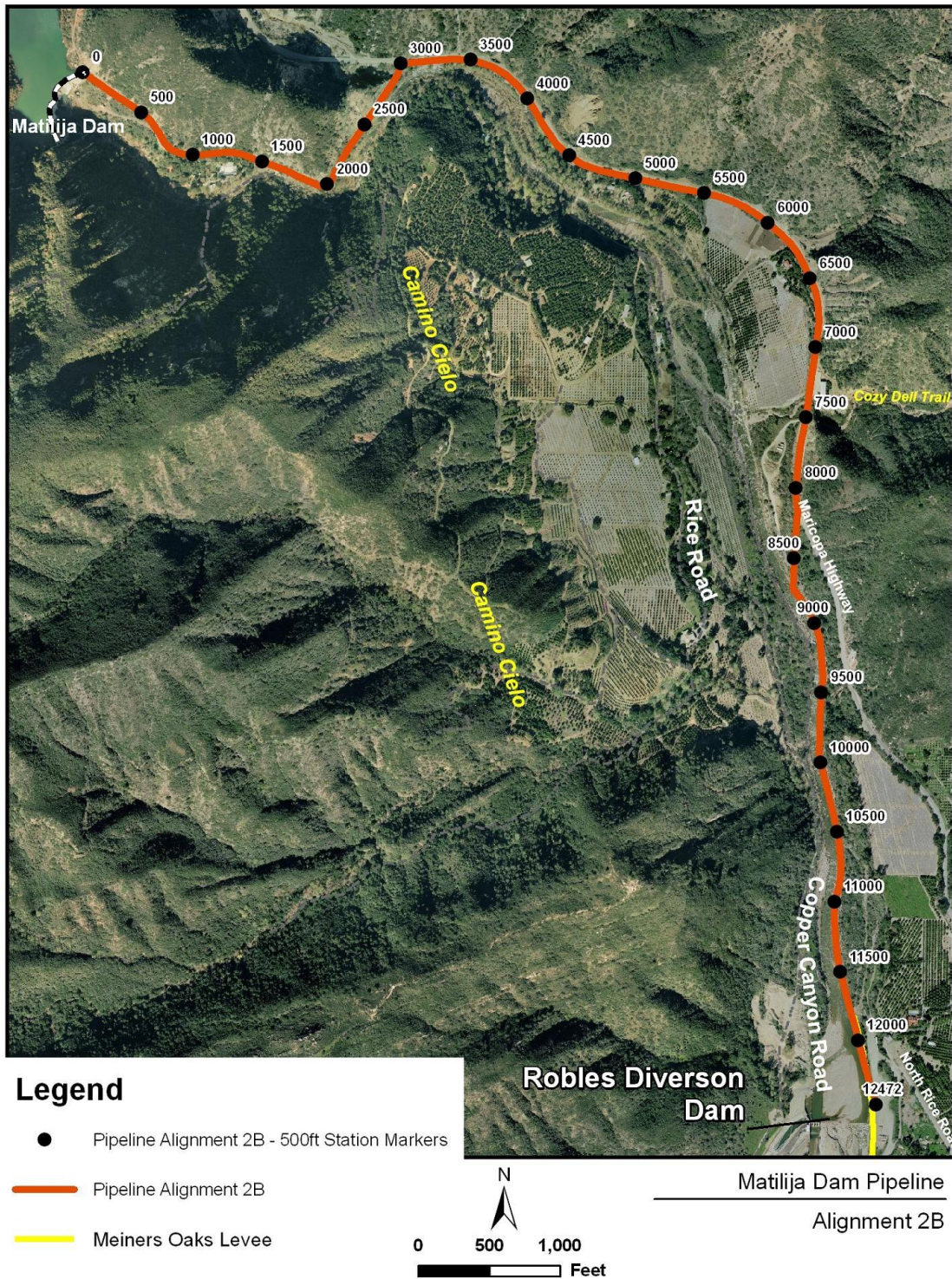


Figure 6: Conceptual Pipeline Alignment 2B



Alignment 4

This alignment follows the same initial alignment as Alignment 1 and then crosses over to the west (right) bank of the river approximately at station 2500. Then it travels south through private property near Rice Road. The pipeline transverses back over to the west bank of the river at station 10,000 and ends along Meiners Oaks Levee (see Figure 7). The total length of the pipeline is 11,700 ft. About 1,730 ft of the pipeline will be adjacent to Matilija Road.

This alignment crosses six private parcels with six individual land owners and travels near three private roadways or driveways. Six buildings are located within 100 feet of this alignment with the closest building located roughly 69 feet away.

The profile of the alignment shows no adverse gradient. The pipeline would cross the river via bridges in two locations, station 2500 and station 10,000. The bridges would add to the construction cost for this particular alternative.

Alignment 5

Alignment 5, shown in Figure 6, is similar to Alignment 4. This alignment follows the same initial alignment as Alignment 1 and splits away at station 4700. However, instead of the pipeline crossing over the Ventura River at station 2500 like Alignment 4 does, Alignment 5 is carried over the river via the existing Camino Cielo Bridge at station 5000. After this point, Alignment 5 follows Alignment 4. The pipeline transverses back over to the west bank of the river at station 10,000 and ends along Meiners Oaks Levee (see Figure 8).

Alignment 5 parallels 2,250 ft of Matilija Road and 1,670 ft of Maricopa Highway. By staying closer to the roadways, this alignment crosses fewer parcels than Alignment 4, but the construction of the pipeline along the roadways creates more traffic delays when compared to Alignment 4. Alignment 5 requires crossing five private parcels and four public parcels, whereas Alignment 4 transects twelve parcels. Only two residential buildings are within 100 ft of this alignment. However, of all the alignments, this alignment comes closest to residential buildings; of the two residential buildings within 100 feet, one building is located approximately 45 feet of the alignment.

The profile of the alignment shows no sign of adverse gradient. Alignment 5 would carry over to the east bank of the Ventura River using the existing Camino Cielo Bridge, and would require one less structure than Alignment 4. Therefore, Alignment 5 would cost less than Alignment 4.

Figure 7: Conceptual Pipeline Alignment 4

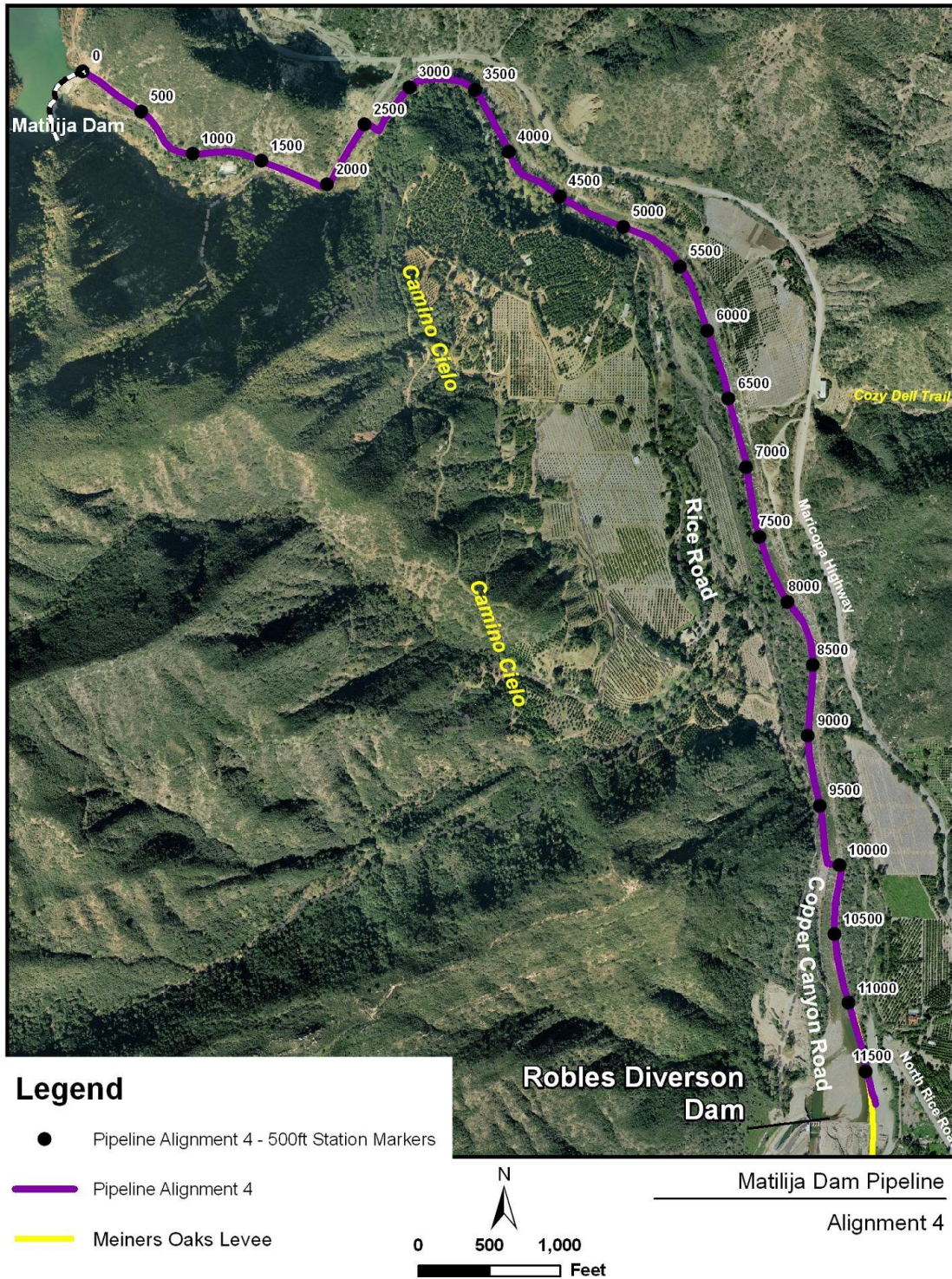
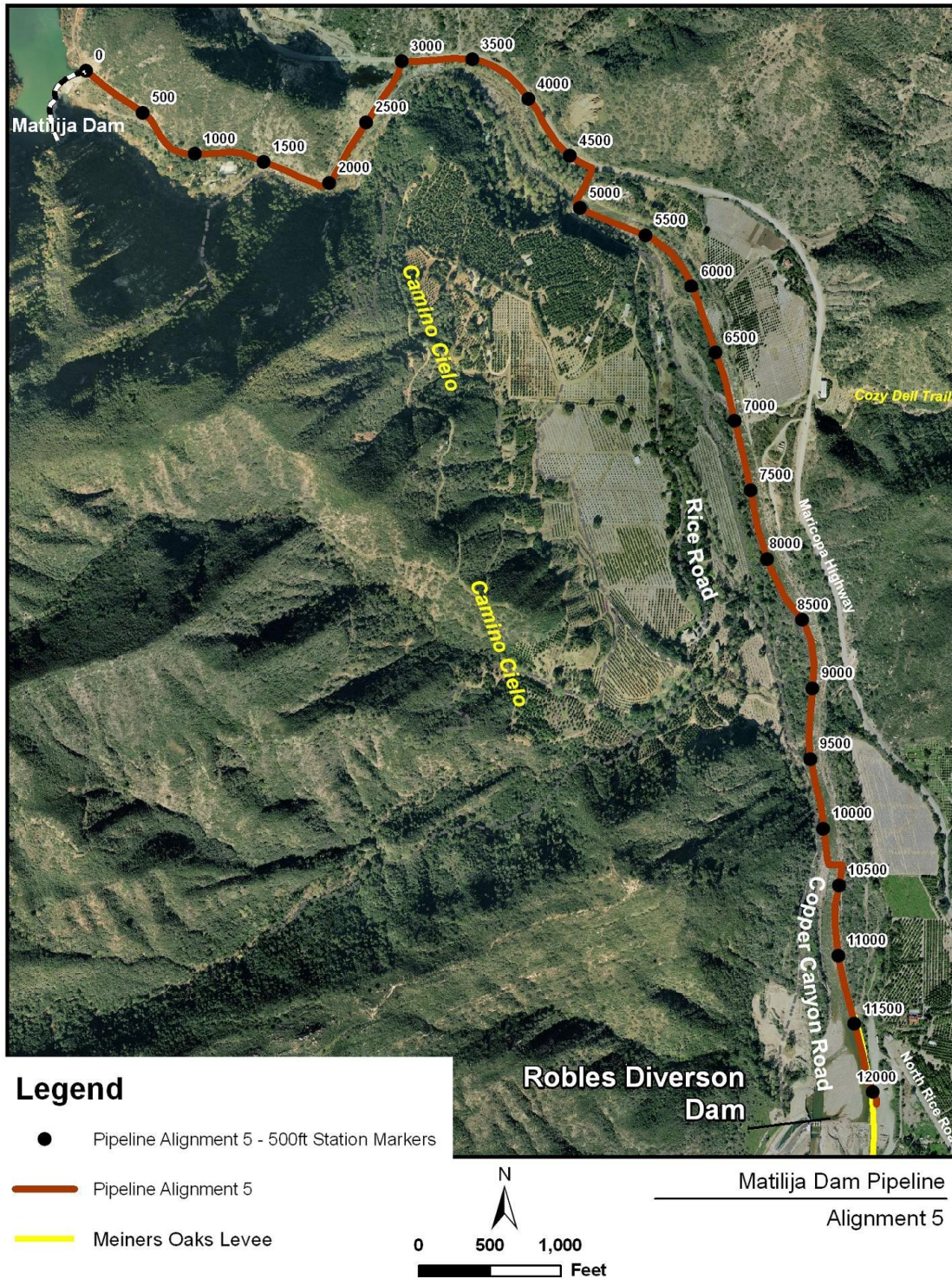


Figure 8: Conceptual Pipeline Alignment 5



Recreational Trail Options

The trail alignments were broken down into segments called nodes. The nodes are delineated with 4,000 foot station markers, with a zero marker at Node A. Each node represents a connection between an existing trail and the conceptual trail alignment option. The trail options may be implemented in whole or in part. Each segment between nodes may be constructed separately to achieve the desired connectivity between existing trails.

Trail Alignment Option 1 – Nodes A to D

This alignment option does not coincide with the slurry pipeline. As shown in Figure 9, the trail follows the Matilija Creek Road and connects to the existing Matilija Creek Trail at Node A. An opportunity for a loop trail in conjunction with Option 2 would be considered for this option. Nine residences are located within 100 ft of this trail option, with the closest residence at 50 ft away. Maintenance and road accessibility of the trail would be easy due to the location near the existing roadway. The trail would be on publicly-owned parcels; no additional right-of-way on privately-owned parcels would be required. The alignment runs along the bottom of the hillside and does not have the opportunity for overlook areas. This trail would have an easy to medium hiking difficulty level, and would not provide new parking or rest areas.

Trail Alignment Option 2 – Nodes A to D

Similar to Option 1, Option 2 trail alignment begins with a connection with Matilija Creek Trail at Node A, but between Nodes B and C it follows closer to Matilija Creek than Option 1 as shown in Figure 10. It follows the same path as Option 1 alignment between Nodes C and D.

Neither Option 1 nor Option 2 alignment coincides with the slurry pipeline in this area. Neither alignment option includes river crossings. Since Option 2 alignment travels closer to Matilija Creek and is located away from the roadway, the scenic quality of this alignment may be considered higher than that associated with Option 1 trail. Also, this option provides follows closer to Matilija Creek it provides better access and the associated recreational opportunities at the creek. The level of hiking difficulty is easy to medium difficulty, or slightly higher than that of Option 1 trail alignment. This trail option does not have existing parking or rest areas but new rest areas could be provided between Nodes B and C.

Additional right-of-way would be required within three parcels, including one privately-owned parcel. This trail option has considerably fewer residences within 100 ft of the alignment than Option 1 trail. Two residences are located within 100 ft of this trail alignment, with the closest residence located 51 ft from the trail alignment. This trail option is located within the 20 year flood plain, and thus, would be subject to erosion and inundation in the event of a 20-year flood event. For this reason, this alignment may require more maintenance with the associated higher maintenance cost than Option 1 alignment.

Figure 9: Recreational Trail Alignment Option 1 – Nodes A to D

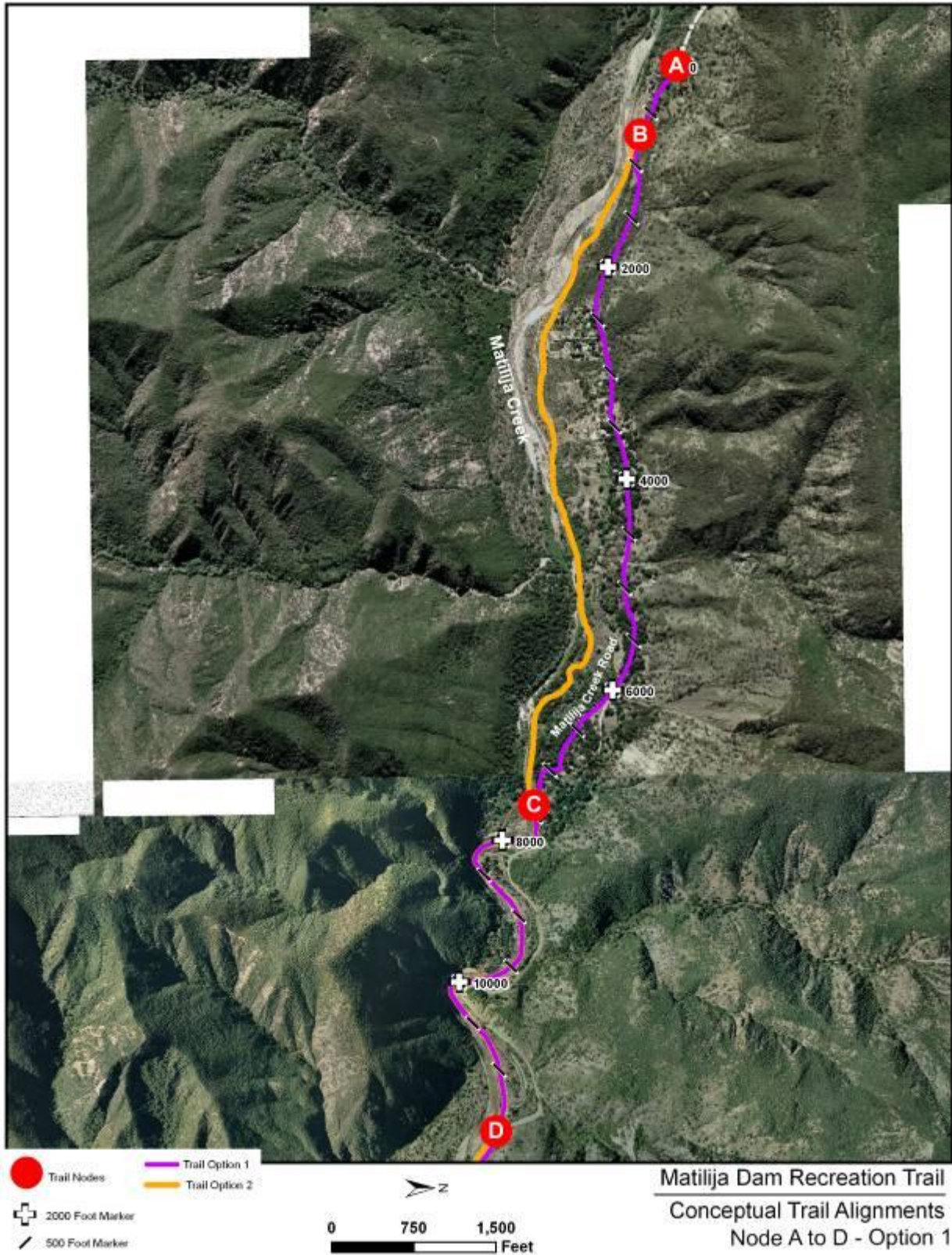
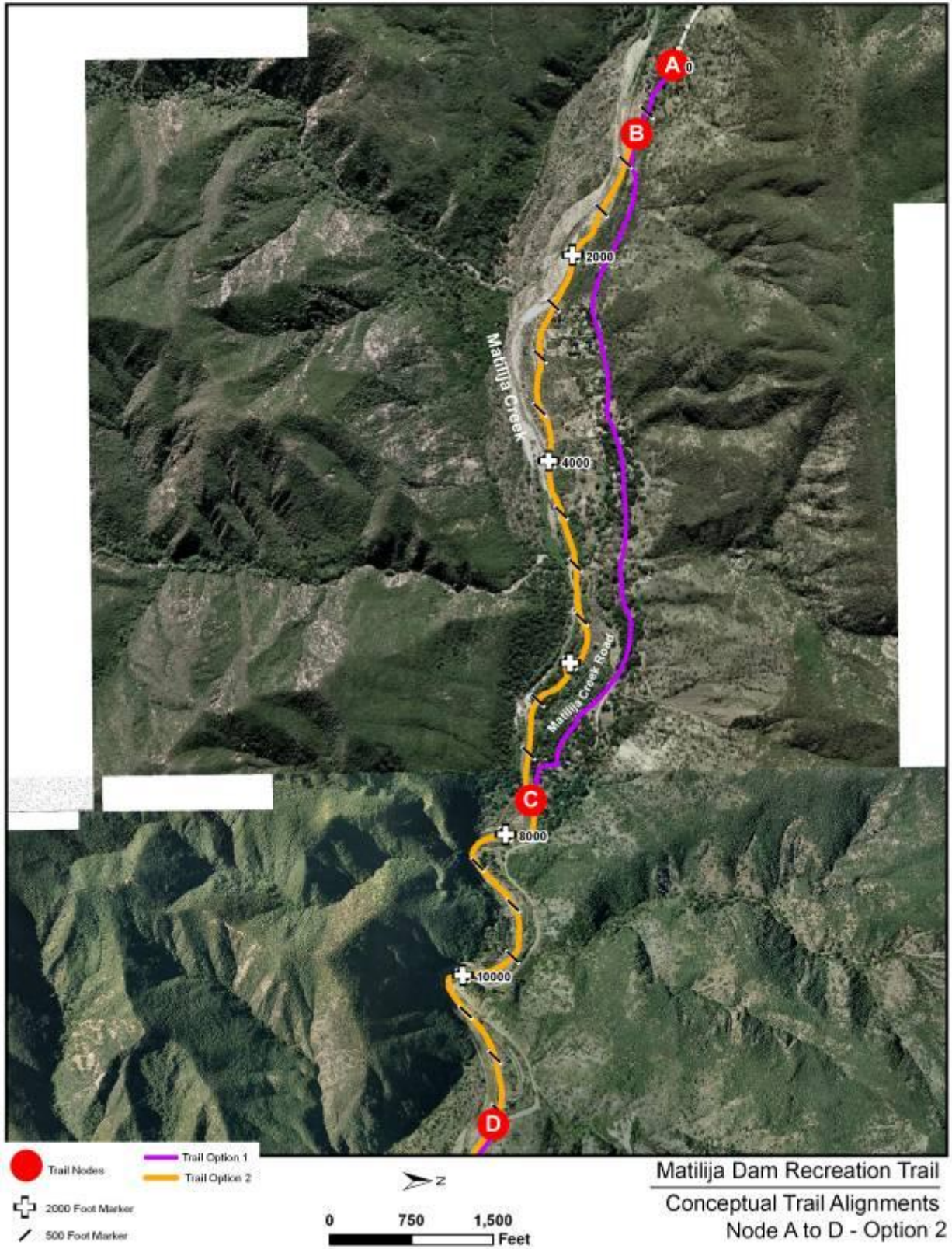


Figure 10: Recreational Trail Alignment Option 2 – Nodes A to D



Trail Alignment Option 1 – Nodes D to E to G

This alignment option does not coincide with the slurry pipeline alignment. As shown in Figure 11, the alignment follows the Matilija Creek Road near the Mesa Property. Ten buildings are within 100 ft of this trail alignment, with the closest building located 25 ft from the trail. Maintenance of the trail and road accessibility to the trail would be easy due to its location on or adjacent to the existing Matilija Creek Road. No additional right-of-way on private property would be required since this trail would be adjacent to the existing roadway. This trail option would not provide new parking or rest areas. The alignment runs along the bottom of the hillside and does not have the opportunity for overlook areas. This trail would have an easy to medium hiking difficulty level.

Trail Alignment Option 2 – Nodes D to F to G

Option 2 trail alignment does not coincide with the slurry pipeline. It crosses over to the west side of Matilija Creek away from Matilija Creek Road (See Figure 12), and crosses back to the east side of Matilija Creek just north of Node F. At Node F, the south fork of this trail option provides a connection to the old, abandoned Camino Cielo trail. An opportunity for a loop trail exists if this trail alignment is implemented in conjunction with the Option 1 trail alignment between Nodes D to E to G.

Three buildings are within 100 ft of this trail, with the closest building at 90 ft away. Maintenance and road accessibility of the trail would be more difficult than that associated with Option 1 trail alignment due to the location away from the roadway. Additional right-of-way would be required on six parcels. The parcels are owned by three property owners (one federal, one private, and one County).

This trail would not provide any new parking or rest areas. The trail would have two river crossings and an easy to hard hiking difficulty level due to the 10:1 slopes between stations 6000 and 10,000.

This trail option would require switchbacks in steep areas. Thus, the construction and grading costs for this trail would also be higher than those associated with option 1 due to the steep slopes and the location along the hillside versus near the existing roadway. However, along the ridgeline of the steep climb between stations 6000 and 10,000, the trail elevation peaks at roughly 2,000 ft likely providing opportunities for outlook areas along this section of the trail.

Figure 11: Recreational Trail Alignment Option 1 – Nodes D to E to G

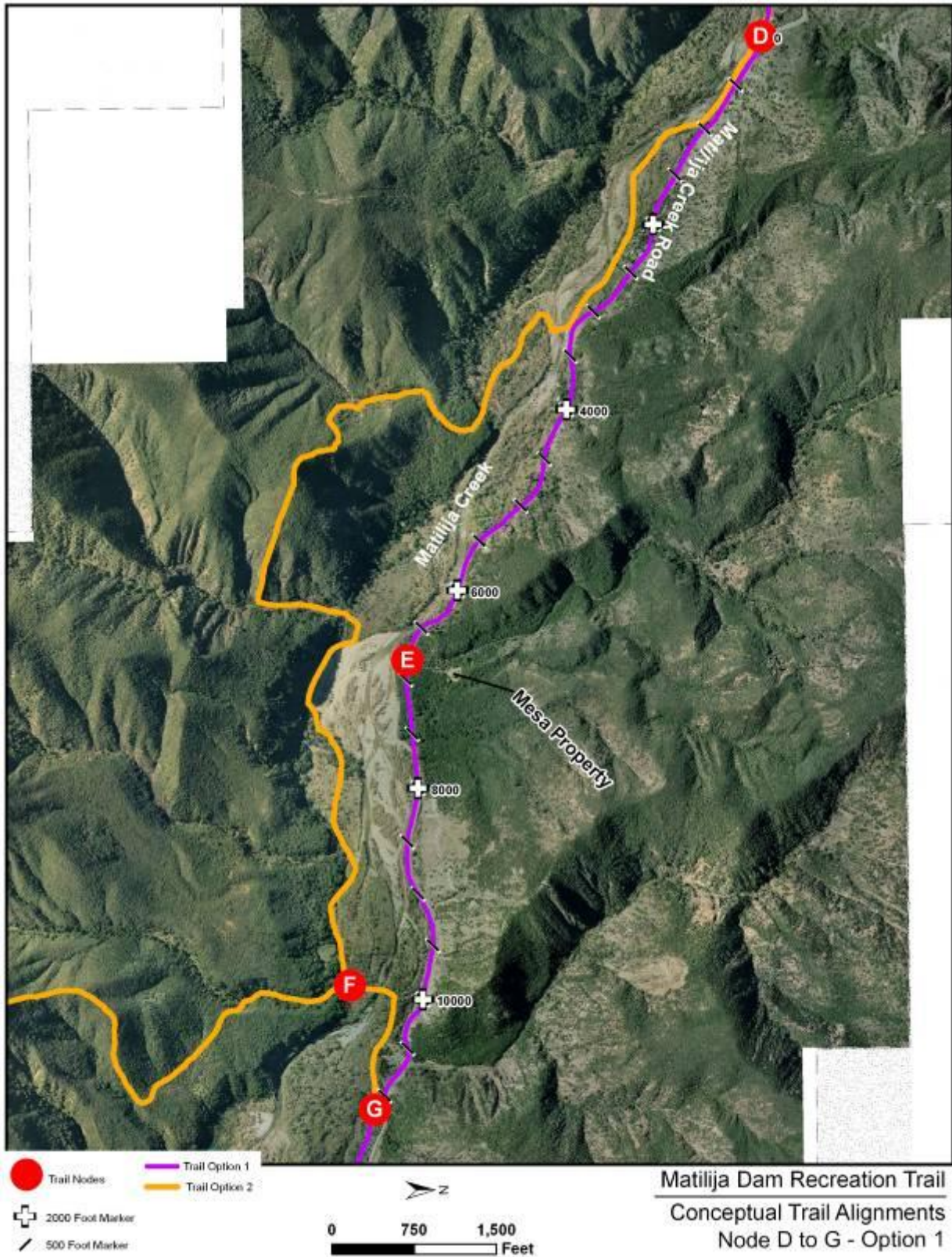
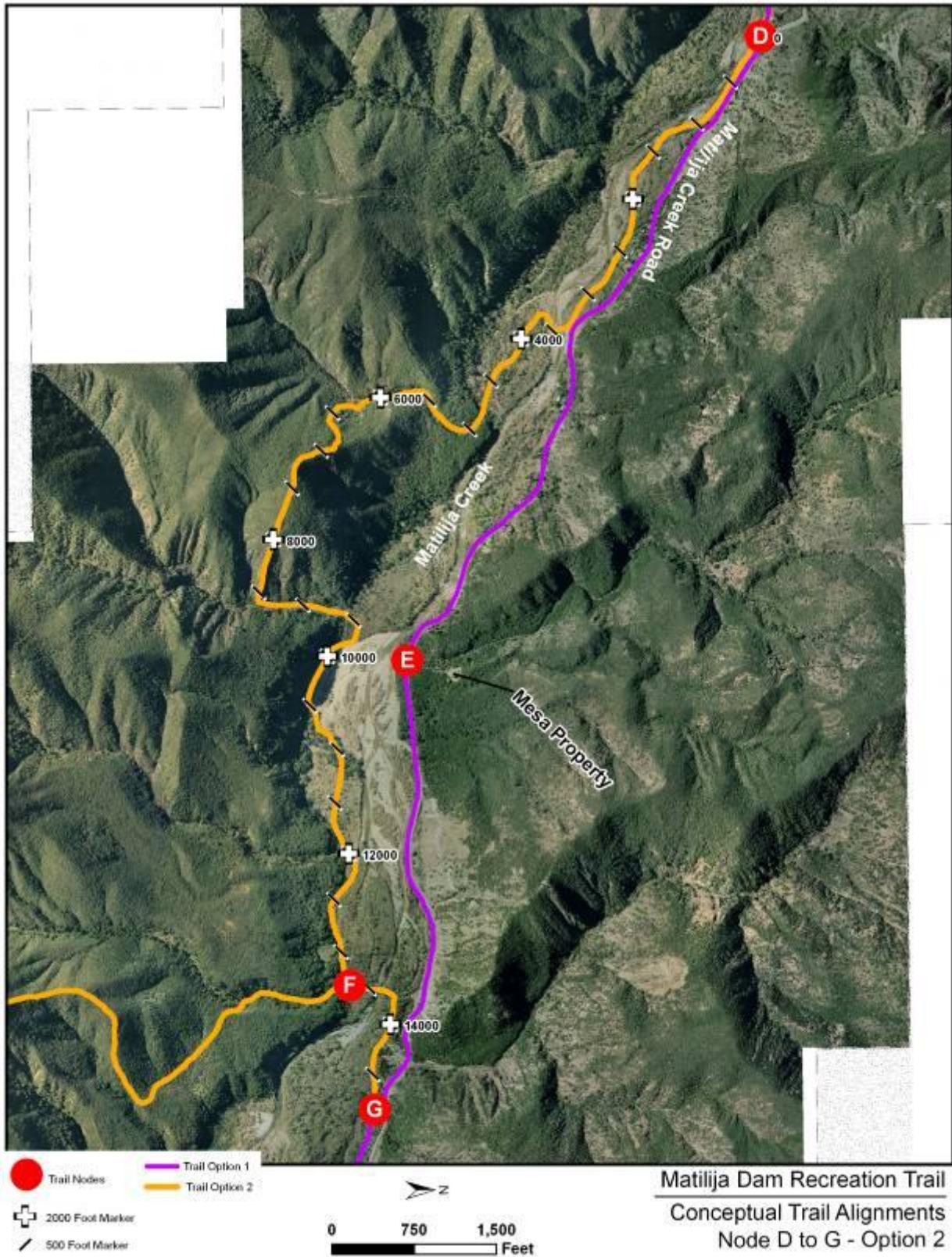


Figure 12: Recreational Trail Alignment Option 2 – Nodes D to F to G



Trail Alignment Option 1 – Nodes G to I

Trail Alignment Option 1 includes 0.31-mile segment that coincides with the slurry pipeline. Show in Figure 13, the trail follows the Matilija Creek Road and pulls away from the roadway to Node H. After Node H, the trail alignment forks into a side trail to a potential overlook area and a trail towards the Matilija Dam. This alignment is the same as option 2 trail alignment between Nodes I and J; however, this trail moves north, closer to Maricopa Highway after Node J. This trail option provides an opportunity for loop trails if implemented in conjunction with Option 2. It may also connect to future trails, leading to such features as Hanging Rock, within the reservoir area after the decommissioning of the dam. The trail will have an easy to medium hiking difficulty level.

Two buildings are located within 100 ft of this alignment, with the closest building at 80 ft from the trail. Maintenance and road accessibility of the trail would be easy due to the location on or near the existing roadway. No additional right-of-way on privately owned parcels would be required since this trail would be located on publicly-owned parcels. Existing parking for maintenance vehicles at the dam may be improved to provide public parking and rest areas serving the trail.

Trail Alignment Option 2 – Nodes F to I

This trail alignment option does not coincide with the slurry pipeline. The trail would be west of Matilija Creek and on the west side the Matilija Reservoir. It is the same as Option 1 alignment between Nodes I and J; however, Option 2 moves south, closer to Camino Cielo, after Node J. This alignment would have two river crossings, one between nodes F and G, and another crossing over the Ventura River west of Node I. (See Figure 14).

Unlike Option 1, this alignment would not connect to any future trails within the reservoir area because most of the alignment travels up the slope to the ridgeline overlooking the reservoir. The terrain between Nodes F and I is fairly steep and peaks at an elevation of just over 2,500 ft, which may provide overlook area opportunities along this segment. In comparison, the Option 1 trail elevation, not including the proposed overlook, reaches around 1,160 ft. Option 2 would have hard hiking difficulty level and would require switchbacks in steep areas. The grading and switchbacks would add to the cost of this trail alignment in comparison with Option 1 alignment. Option 1 may be less costly since it does not cross as much steep terrain, parallels a portion of the pipeline alignment, and is located closer to Maricopa Highway. Also, accessibility and maintenance of this trail will be more difficult, compared to Option 1 alignment which is located on or near existing roadways.

Three residences are located within 100 ft of this trail, with the closest residence within 30 ft from the alignment. Maintenance and road accessibility of the trail would be difficult due to the terrain within the area. Additional right-of-way would be required on five parcels owned by three property owners (one federal, one private and one flood control district). This trail option has no existing parking and rest areas and does not offer opportunities for new parking and rest areas due to the steep terrain.

Figure 13: Recreational Trail Alignment Option 1 – Nodes G to I

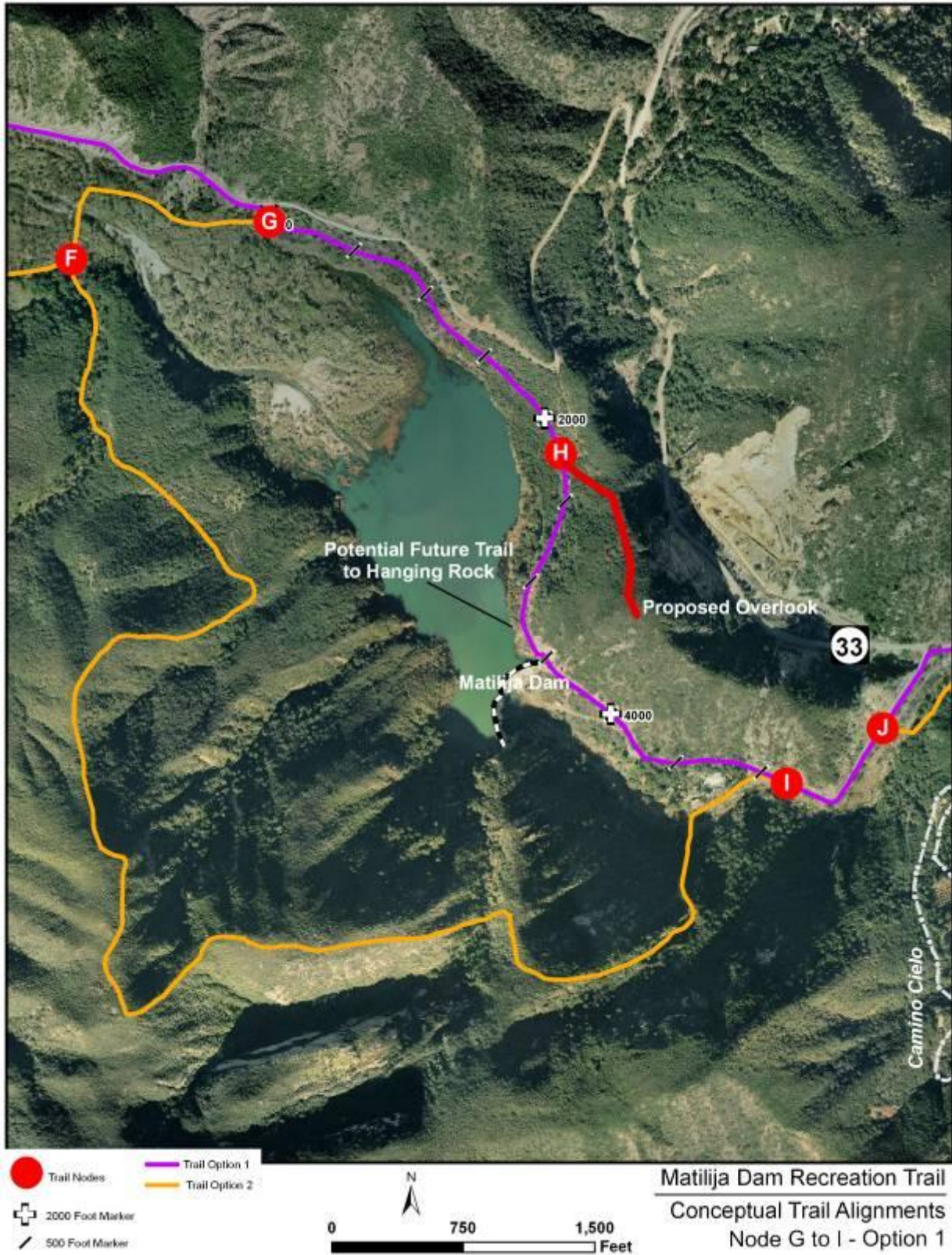
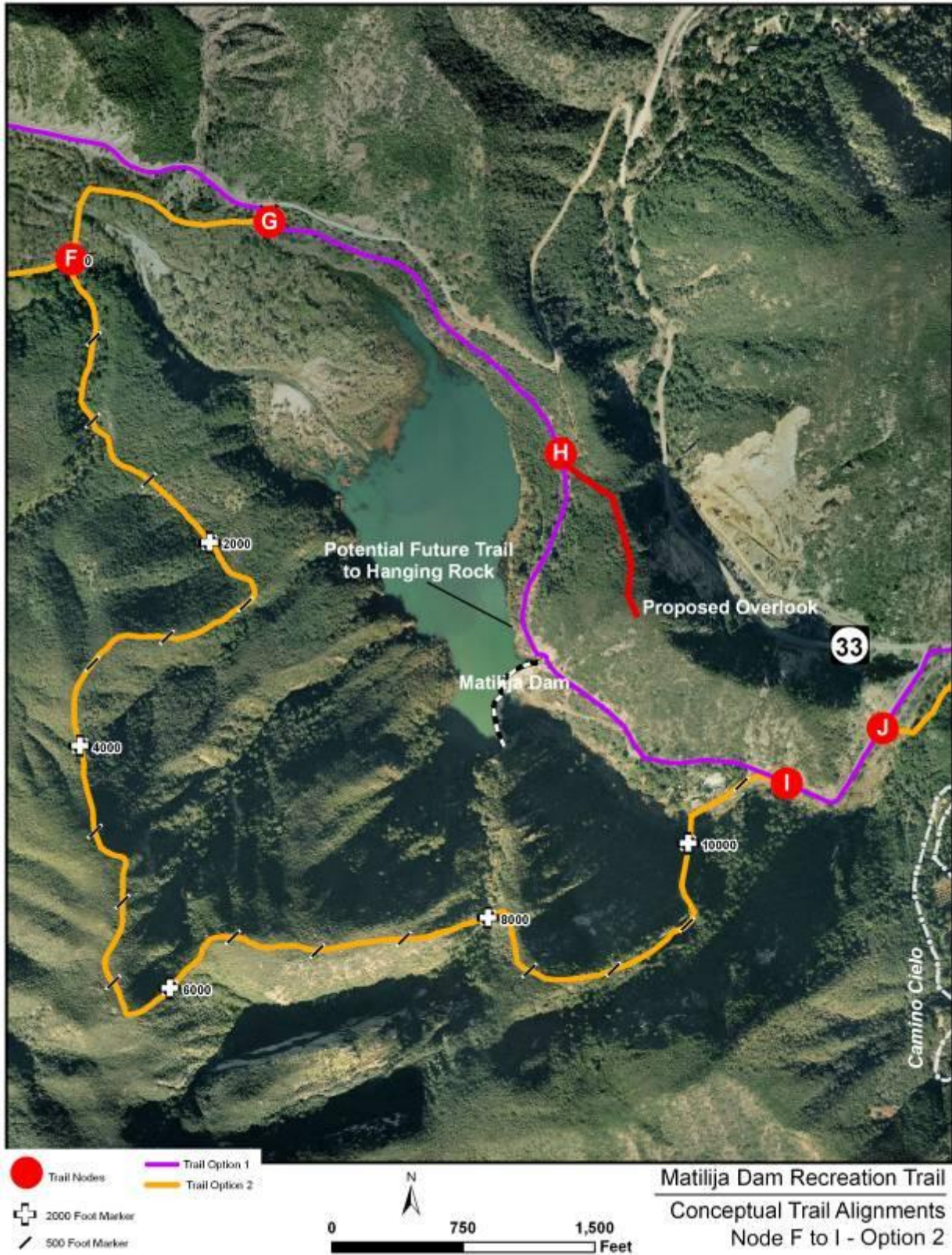


Figure 14: Recreational Trail Alignment Option 2 – Nodes F to I



Trail Alignment Option 1 – Nodes I to K to L

This trail alignment would coincide with all slurry pipeline alignments for a distance 0.61 mile. The trail follows Matilija Road between Nodes I and J, and travels up to Highway 33 between Nodes J and M. (See Figure 15).

One residential structure is located within 100 ft of this trail at a distance of approximately 40 ft from the alignment. Maintenance and road accessibility of the trail would be easy due to the location on or near the existing roadway. However, this trail may be considered having lower visual quality than the Option 2 alignment due to its proximity to the roadway. No additional right-of-way on privately owned parcels would be required since this trail would be within the existing roadway. Coordination with the California Department of Transportation (Caltrans) would be required because much of the trail in this section would be along Highway 33, a State facility.

This trail option has no existing parking and rest areas but has the opportunity for new parking and rest areas. The trail can be connected to the existing trails; one river crossing at Node K to L would be required to connect with the existing Camino Cielo Trail.

The trail will have an easy to medium hiking difficulty level. No overlook areas would be provided with this option

Trail Alignment Option 2 – Nodes I to L

This trail alignment option would coincide with 0.45 miles of the pipeline Alignment 4. Illustrated in Figure 16, the trail would follow the west side of Ventura River along the edge of private properties. This trail can be connected to Camino Cielo Trail. The trail includes a new river crossing to the east of Node J. A new bridge would be required for this crossing, which would add to the construction cost. The trail would have an easy to medium hiking difficulty level. No overlook areas would be provided with this alignment option.

As compared to one residential building located within 100 ft of the Option 1 trail alignment, seven residences are located within 100 ft of this alignment. The closest residence to this alignment is at 35 ft from the trail.

Additional right-of-way would be required on four parcels owned by two private property owners. Similar to Option 1, this trail option has no existing parking and rest areas but has the opportunity for new parking and rest areas near Nodes K and L.

Figure 15: Trail Alignment Option 1 – Nodes I to K to L

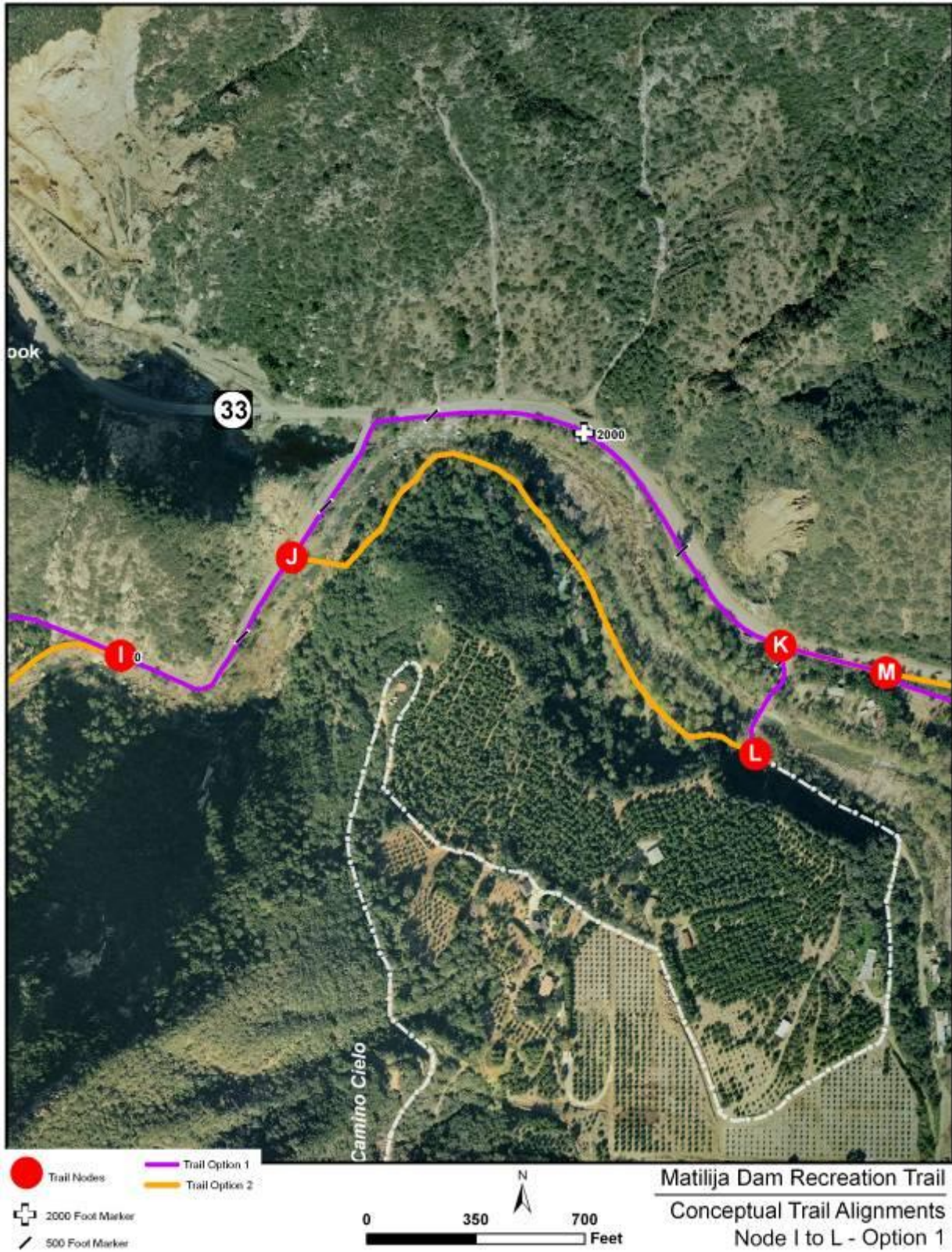
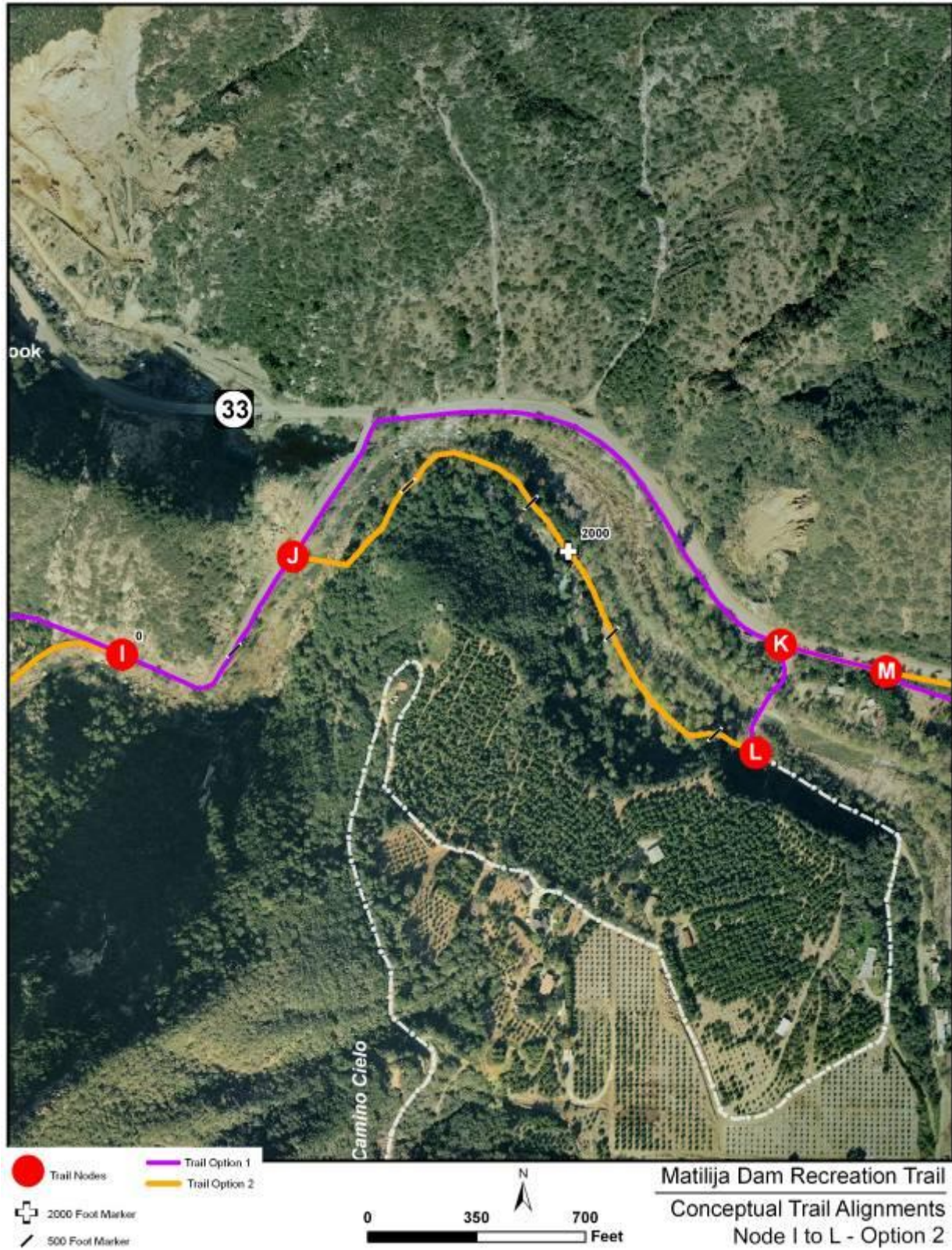


Figure 16: Trail Alignment Option 2 – Nodes I to L



Trail Alignment Option 1 – Nodes K to Q

The trail alignment, depicted in Figure 17, follows the east side of the Ventura River. It can be connected to the Orange Grove and Rancho El Nido Trails and would present easy hiking opportunities. No direct connections to the Cozy Dell Trail are included with this alignment. Since the area is relatively flat, no overlook areas would be provided with this trail option. This trail option would coincide with the Pipeline Alignment 1 for a distance of 0.64 miles.

Three residences are located within 100 ft of this trail, with the closest at 80 ft from the trail. Maintenance and road accessibility of the trail would be easy. Additional right-of-way would be required on eleven parcels which are owned by six private landowners and one federal landowner. Parking exists within the area. Opportunity for new parking and rest area facilities exist along Maricopa Highway between Nodes N and O.

Trail Alignment Option 2 – Nodes K to Q

This trail alignment option is similar to Option 1; however, it would follow Highway 33 from nodes K to N and provide a direct connection to Cozy Dell Trail (see Figure 18). The remaining portion of this trail would follow Option 1 alignment. This trail option also connects to the Orange Grove and Rancho El Nido Trails with an easy to moderate hiking difficulty level. Since the area is relatively flat, no overlook areas would be provided with this alignment option. Of all the trail alignment options between Nodes K to Q, this alignment parallels the pipeline alignment for the longest distance. It parallels the Pipeline Alignment 2B for 1.12 miles.

Four residences are located within 100 ft of this alignment, with the closest residence at a distance of 76 ft. Additional right-of-way would be required on nine parcels, owned by three private landowners and one federal landowner. Opportunity for new parking and rest area facilities exist along Maricopa Highway between Nodes N and O.

Trail Alignment Option 3 – Nodes L to Q

This option follows the west side of the Ventura River and passes to the west of the Robles Diversion Dam and Robles Casitas Canal. Coordination with the Casitas Water District would be needed for any trail development near these facilities (See Figure 19). The trail would connect to the Camino Cielo Trail, Orange Grove Trail, Rice Canyon Trail, and River Bluff Trail, but offers no connection to the Cozy Dell Trail. The area is relatively flat and would be an easy hike. Unlike Option 1 and Option 2 alignments, this trail alignment would not coincide with any of the pipeline alignments.

Two residences are located within 100 ft of this alignment option, with the closest residence at 40 ft from the trail. Maintenance and road access would be available via Rice Road and Copper Canyon Road. Additional right-of-way would be required on eleven parcels which are owned by eight property owners (six private, one federal, and a water district). Parking for maintenance vehicles exists in the vicinity of the Robles Diversion Dam. Opportunity for new parking and rest area facilities may be available along Rice Road and Copper Canyon Road. No overlook areas would be provided with this option.

Figure 17: Trail Alignment Option 1 – Nodes K to Q

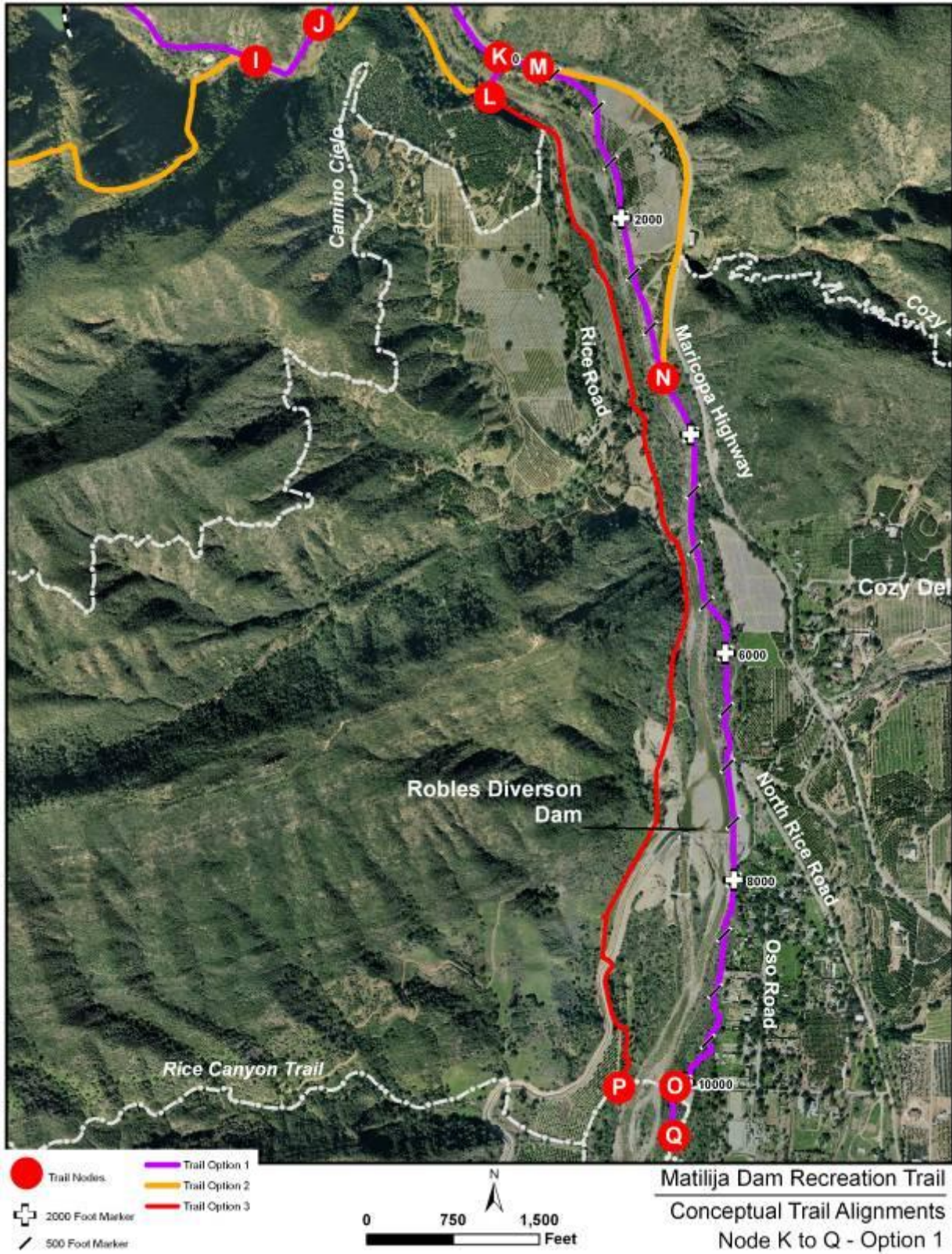


Figure 18: Recreational Trail Alignment Option 2 – Nodes K to Q

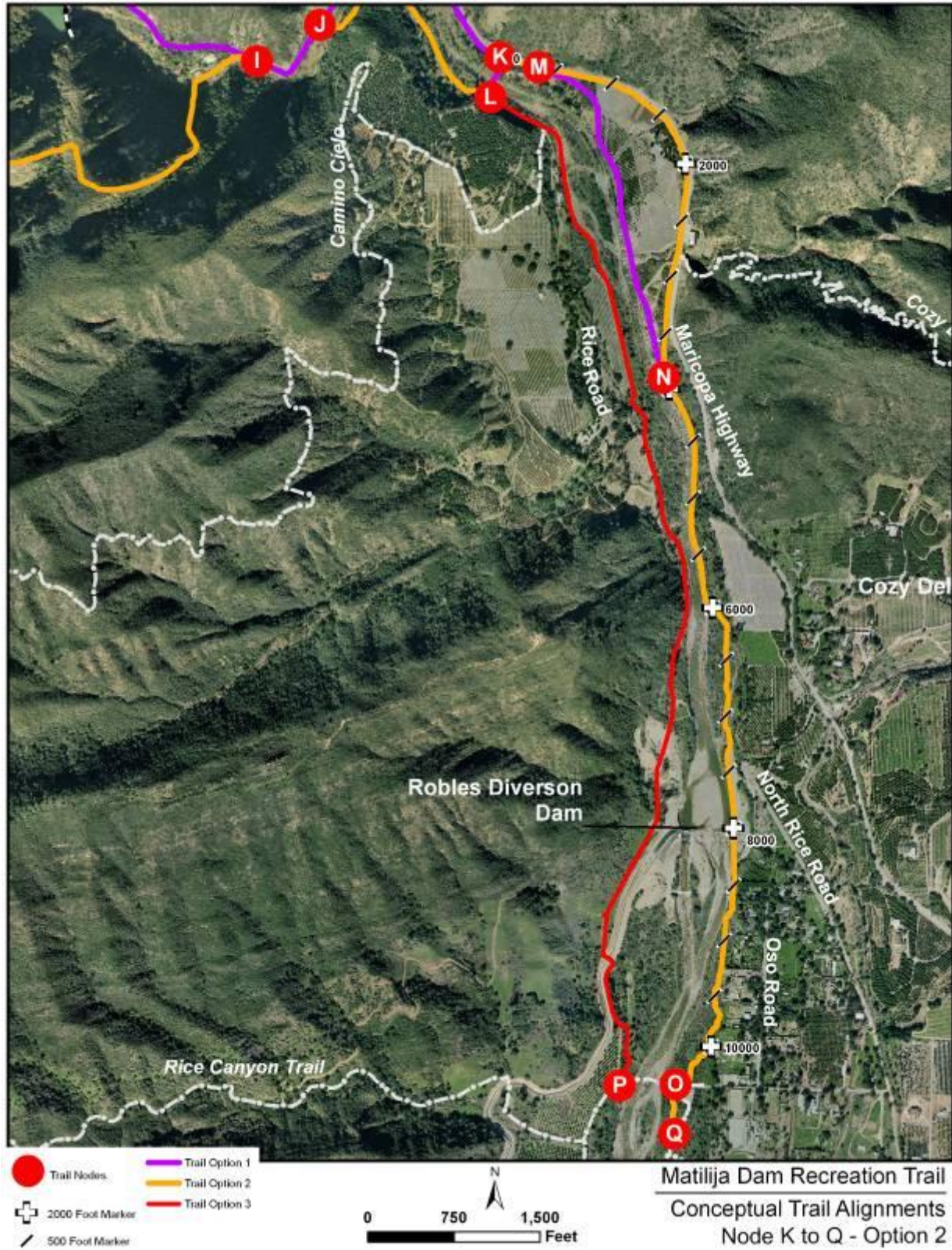
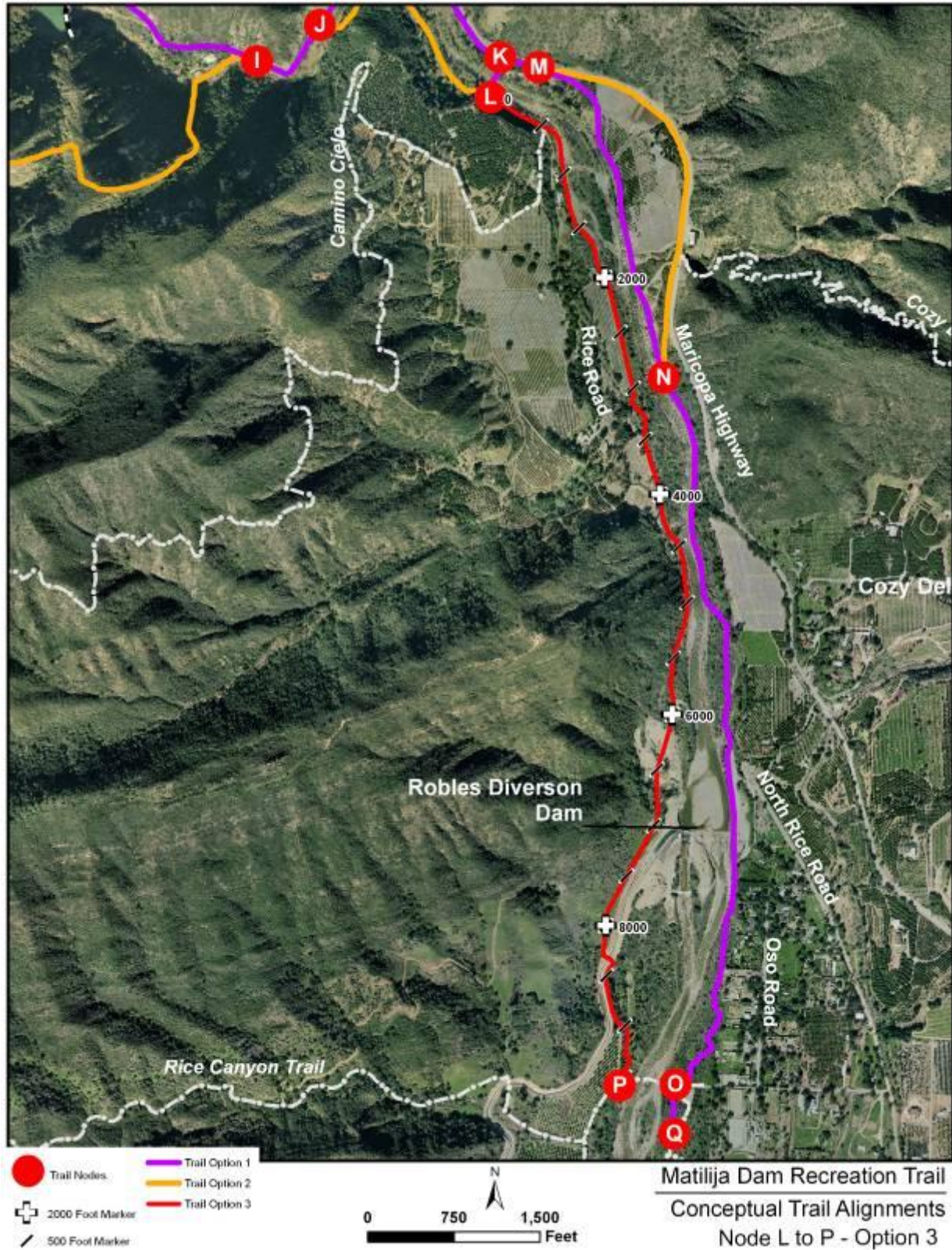


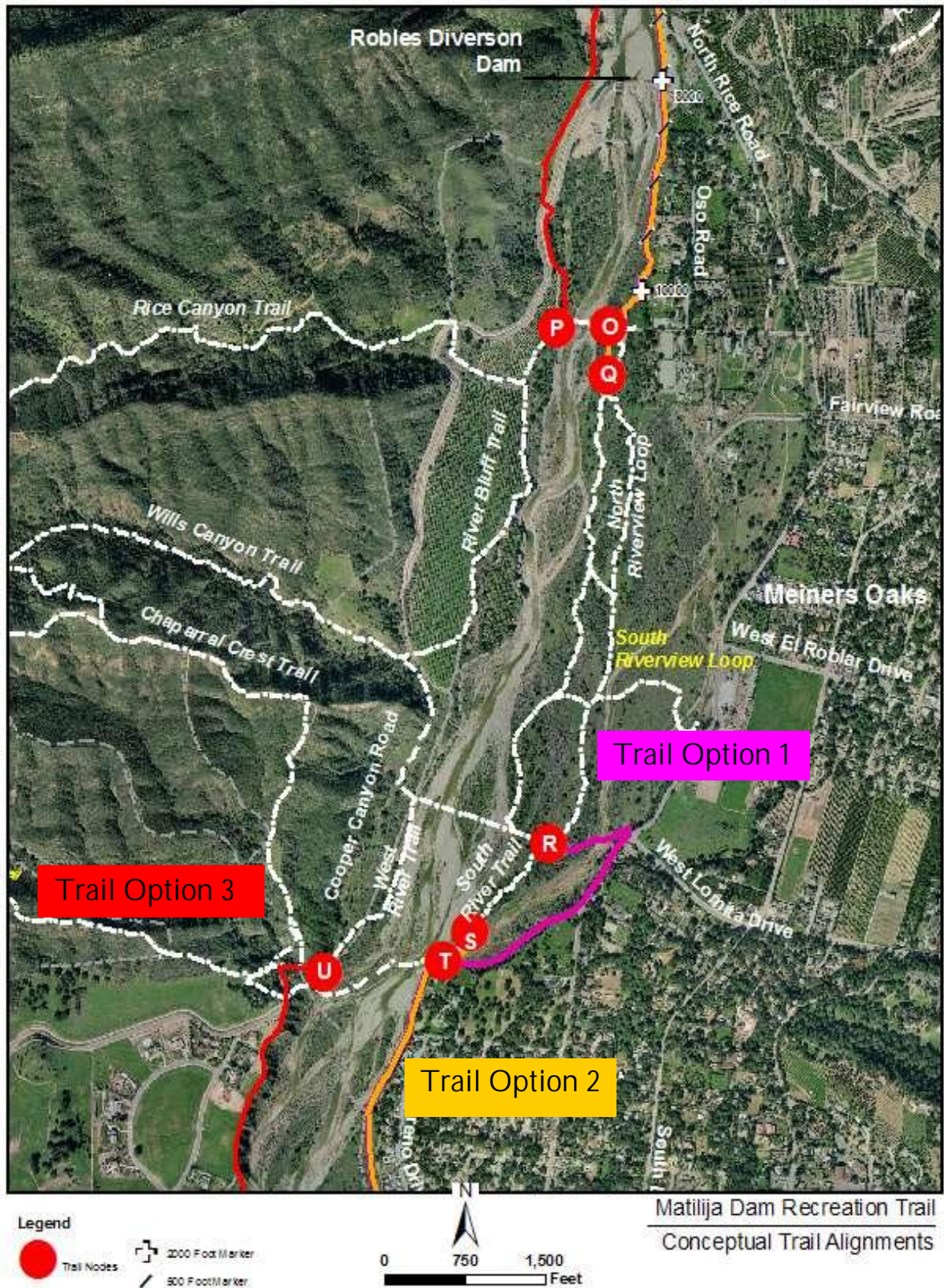
Figure 19: Recreational Trail Alignment Option 3 – Nodes L to Q



All Trails Options – West Lomita Drive

No additional trails are proposed between Nodes Q and R since several trails already exist in this section, including but not limited to the River Bluff Trail, North and South Riverview Loops, West River Trail, Willis Canyon Trail, and Chaparral Crest Trail (see Figure 20). Trail links are provided to the north of Node Q, and the new trail alignment options begin again to the south of Node R, near West Lomita Drive in Meiners Oaks. Since the pipeline alignments in this study end at Meiners Oaks Levee, none of the trail alignment options south of Node Q coincide with the pipeline alignments.

Figure 20: Recreational Trail Alignment – All Trails Option (West Lomita Drive)



Trail Alignment Option 1 – Nodes R to W

This trail alignment option follows the east side of the Ventura River, traveling to the west to West Lomita Drive (see Figure 21). The trail leads south along a bluff and borders the residential areas of Meiners Oaks. The trail ends at Node W near Baldwin Road. It offers a easy hike and provides connection to the South River Trail and access to the Ojai Valley Trail. It can also be connected to the Rancho El Nido Trails. This trail alignment would not coincide with the slurry pipeline.

Residential areas along Moreno Drive would be in close proximity to the trail. Twenty-two residences are located within 100 ft of this alignment option, with the closest residence at 50 ft away from the trail. Additional right-of-way would be required on two parcels which are owned by two property owners (one private and one water district). Parking and rest areas exist for the Ojai Valley Trail and near the South River Trail. Opportunity for new parking and rest area facilities can be considered between Node T and W. Since the area is relatively flat and low lying, no overlook areas would be provided with this option.

Trail Alignment Option 2 – Nodes S to W

This alignment is the same as Option 1 trail alignment except for the connection of nodes R to T (see Figure 22). The trail begins at the southern terminus of the South River Trail and follows the same alignment as Option 1 trail between Nodes T and W. One river crossing located north of Highway 150 would be required for this alignment.

Twenty residences are located within 100 ft of this alignment, with the closest residence located 50 ft from the alignment. Maintenance and road accessibility of the trail would be easy to medium. Additional right-of-way would be required on one parcel, owned by a single private property owner.

Trail Alignment Option 3 – Nodes U to X

This trail alignment option follows the west side of the Ventura River, starting at the West River Trail and crossing the Oso Ridge Trail, and it can directly connect to the Ojai Valley Trail at Baldwin Road (See Figure 23). This trail option would not coincide with the slurry pipeline

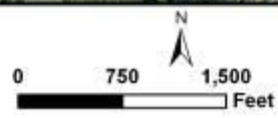
Parking and rest areas exist for the Ojai Valley Trail. Opportunity for new parking and rest area facilities may be considered between Node U and X. The trail can connect to the Rancho El Nido Trails with an easy to moderate hiking difficulty level. Given the flat terrain, no overlook areas would be provided with this option.

The primary advantage of this Option 3 is that it is located at a distance from private residences. There are two residences located within 100 ft of this trail alignment, with the closest residence located 80 ft from the trail. However, additional right-of-way would be required on ten parcels owned by nine property owners (seven private and one federal), whereas Option 1 and Option 2 trail alignments require less additional right-of-way affecting fewer parcels.

Figure 21: Recreational Trail Alignment Option 1 – Nodes R to W



- Trail Nodes
- Trail Option 1
- Trail Option 2
- Trail Option 3
- + 2000 Foot Marker
- / 500 Foot Marker



Matilija Dam Recreation Trail
 Conceptual Trail Alignments
 Node R to W - Option 1

Figure 22: Recreational Trail Alignment Option 2 – Nodes S to W



Figure 23: Recreational Trail Alignment Option 3 – Nodes U to X



Table 4: Screening Criteria Comparison of Trail Options by Nodes

Criterion	Nodes A to D		Nodes D to G		Nodes G, F to I		Nodes I to L		Nodes K, L to Q, P			Nodes: R, S, U to V, W, X		
	Option 1	Option 2	Option 1 – D to E to G	Option 2 – D to F to G	Option 1 – G to I	Option 2 – F to I	Option 1 – I to K to L	Option 2 – I to J to L	Option 1 – K to Q	Option 2 – K to Q	Option 3 – L to Q	Option 1 – R to W	Option 2 – S to W	Option 3 – U to X
Level of Difficulty	Easy to Medium	Easy to Medium	Easy to Medium	Easy to Hard (require switchback in steep areas)	Easy to Medium	Easy to Hard (requires switchback)	Easy to Medium	Easy to Medium	Easy to Medium	Easy to Medium	Easy to Medium	Easy to Medium	Easy to Medium	Easy to Medium
Closest private residences	50 ft	51 ft	25 ft	90 ft	80 ft	50 ft	40 ft	35 ft	80 Ft	76 Ft	40 Ft	50 Ft	50 Ft	80 Ft
Residences within 100 ft	9	2	10	3	2	3	1	7	3	4	2	22	20	2
Ease of Maintenance	Easy – On or near existing roadway	Easy to Medium – within 20 year Flood Plain	Easy	Hard (steep terrain)	Easy	Hard (steep terrain)	Easy	Easy to Medium (requires new river crossing)	Easy	Easy to Medium (along Highway 33)	Easy	Easy	Easy to Medium (along Highway 33)	Easy
Trail Connections	Yes – Matilija Creek Trail	Yes – Matilija Creek Trail	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Road Accessibility	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Right of way requirements	On Existing Roadway	Three Parcels – Two Land Owners (One Federal, One Private)	None (On Existing Roadway)	6 Parcels - 3 Property Owners (One Federal, One Flood Control & One Private)	None (On Existing Roadway)	5 Parcels - 3 Property Owners (One Federal, One Flood Control & One Private)	None (On Existing Roadway)	4 Parcels - 2 Property Owners (Two Private)	11 Parcels - 7 Property Owners (One Federal & Six Private)	9 Parcels - 5 Property Owners (One Federal & Three Private)	11 Parcels - 8 Property Owners (One Federal, One Water District & Six Private)	2 Parcels - 2 Property Owners (One Water District & One Private)	1 Parcels - 1 Property Owners (One Private)	10 Parcels - 9 Property Owners (One Federal & Seven Private)
Existing parking and rest areas	No	No	Yes	No	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Opportunity for new rest areas and parking	No	Rest Areas – No Parking	No	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Coincides with pipeline (Miles)	0	0	0	0	0.31 Miles	0	0.61 Miles (Entire length of trail parallels pipeline)	0.45	0.64 Miles	1.12 Miles	0 Miles	0 Miles	0 Miles	0 Miles
Overlook areas Provided	None	None	None	Yes	Optional Trail	Yes	No	No	No	No	No	No	No	No
River Crossings	None	None	0	2	0	2	Camino Cielo	New Bridge	0	0	0	0	1	0

Comments and Coordination

The conceptual slurry and recreational trail alignments were presented to the Design Oversight Group (DOG) on April 3, 2008 at the County of Ventura Atlantic Conference Room and made available on the Internet (<http://matilijadam.org>). The DOG is comprised of federal, state and local government agencies; environmental resource agencies; interest groups, local residents and stakeholders, including the Corps, Bureau of Land Management, U.S. Fish and Wildlife Service, California Department of Fish and Game, VCWPD, Ventura County Board of Supervisors, OVLC, Surfrider and others.

The Design Oversight Group identified the following concerns:

- *Right of Way* –A general concern was raised for the slurry pipeline and recreation trail alignments that crossed through private property. Subsequent meetings with residents downstream of the dam have indicated that most would be willing to allow the temporary impacts associated with a slurry pipeline passing through their property but would strongly oppose the long-term impacts associated with recreation trails. Vandalism, litter and liability were key issues for residents, as well as the maintenance of the trail. The Corps Real Estate Division has indicated that recreation trails would require that the land be purchased in fee. Coordination with local residents and private property owners and additional field surveys would be needed for the future development and refinement of the conceptual alignments. The VCWPD would only pursue new trails if certain conditions were met: If there were willing private property interests that would allow for a trail to be built through their property, and if the accumulated interests allowed for a link to upstream and downstream existing trails. In other words, a partial trail would not be constructed, nor would anyone be forced to have a trail run through their property.
- *Robles Diversion Dam* -vicinity of the Robles fish passage facility. The primary concerns include threats to water quality and interference with the steelhead restoration activities. Other concerns near the Robles fish passage facility were the possible increase in trespassing, vandalism, fence and gate maintenance. The conceptual alignments were developed to avoid the Robles Diversion Dam facility and operations.
- *Potential recreational trails and loops in the reservoir area* - This study does not outline any potential recreational trails or loops in the Matilija Reservoir Area since the area is currently underwater and the removal of the accumulated sediment after the decommissioning of the dam would change the topography of the area. Recreational trails in this area would need to be studied separately.
- *Maintenance of trails* – Several DOG members questioned who would operate and maintain the trails. No interests have been specifically identified at this time for all areas being considered, although the County of Ventura, the U.S. Forest Service and the Ojai Valley Land Conservancy have been involved in past discussions regarding operation and maintenance of portions of the trails.

Conclusion

The purpose of this study was to explore alignment options for the slurry pipeline and recreational trail, building upon the alternatives from the feasibility study. This study is conceptual in nature. Additional coordination with the Design Oversight Group and local stakeholders would be needed to refine the conceptual alignments.

Appendix A:
Profiles of the conceptual slurry pipeline alignments

Appendix B:
Maps and profiles of the conceptual recreational trail alignments