MATILIJA DAM REMOVAL, SEDIMENT TRANSPORT, AND ROBLES DIVERSION MITIGATION PROJECT

WATER SUPPLY MITIGATION OPTIONS EVALUATION REPORT

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Prepared for:
Ventura County Watershed Protection District

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Attachments

EXECUTIVE SUMMARY

ES-1 Background and Purpose

Since its construction in 1947, the 168-foot-high, arched concrete Matilija Dam has blocked the transport of an estimated 8 million cubic yards (mcy) of sediment from naturally moving downstream to the ocean. This has resulted in loss of almost all reservoir storage, downstream sand and gravel-sized materials necessary to promoting downstream wildlife habitat, and sediment needed to maintain beaches at Surfer's Point. The dam also prevents southern steelhead from reaching upper Matilija Creek.

In coordination with the project Management Team, the Technical Advisory Committee (TAC), and the Design Oversight Group (DOG), three concepts were selected from six dam removal concepts previously evaluated by the Consultant Team (URS and Stillwater Sciences, 2014a). Each of the three preferred dam removal concepts (DRC-1, DRC-2, and DRC-3) involves the flushing of some amount of accumulated fine sediment, which has the potential to impact downstream water supply within the Ventura River watershed (AECOM and Stillwater Sciences 2015). The purpose of this report is to consider a range of possible impacts associated with the flushed sediment on each of the major water providers in the Ventura River watershed, and identify and evaluate potential options to offset any lost water supply related to those impacts.

ES-2 Surface and Groundwater Providers

The two largest surface water providers in the region are the Casitas Municipal Water District (CMWD) and Ventura Water. While Casitas diverts water directly from the Ventura River to their reservoir, Ventura Water meets their demand through a combination of supply from Lake Casitas, surface and subsurface intakes at Foster Park, transfers from several groundwater basins, and recycled water from Ventura's reclamation facility.

Major urban groundwater providers in the region include Golden State Water of Ojai, the Ventura River Water District and the Meiners Oaks Water District (MOWD).

ES-3 Potential Water Supply Impacts

Potential water supply impacts associated with dam removal are primarily related to elevated concentrations of suspended sediments and organic material that will likely occur during accumulated fine sediment flushing from the reservoir.

Study results indicate that for certain dam removal concepts, elevated suspended sediment concentrations (up to 10^6 mg/L) and organics could persist for up to a day (Phase I erosion), followed by more modest concentrations of suspended sediment (above 10^4 mg/L) that could persist for up to a week (Phase II erosion), after which those concentrations would rapidly decline (AECOM and Stillwater Sciences, 2016).

CMWD has stated that they will likely suspend diversions from the Ventura River during the initial Phase I flush of accumulated fine sediment and organic material from Matilija Dam, due to concerns about reservoir water quality. URS and Stillwater Sciences (2014b) estimated that during a relatively dry hydrologic cycle, lost diversions associated with accumulated fine sediment flushing over one to three storm events could amount to 4-15% of the total reservoir storage capacity.

Ventura Water may also decide to cease withdrawals at Foster Park during initial accumulated sediment flushing, and could require more water from CMWD to offset the lost withdrawals.

Elevated suspended sediment concentrations in the Ventura River are not expected to affect efficiency of adjacent wells, particularly shallow wells, due to perforations plugging with silt. Research by Cui et al (2008) suggests that fine sediment infiltrates to a very limited depth, rather than settling to the bottom of the alluvial aquifer.

ES-4 Water Supply Mitigation Options

Twenty-three water supply mitigation options, grouped into four main categories, were considered to manage potential impacts of the Matilija Dam removal project. The categories are summarized below.

- Diversion Replacements would divert water from above the Matilija Dam project area directly to Robles diversion or Robles-Casitas Canal to bypass the reservoir and any flushing activities associated with dam removal. Diversion would be accomplished through construction of a temporary diversion dam and pipeline. The three options considered are diversion from Matilija Creek to Robles-Casitas Canal, from North Fork Matilija Creek to Robles-Casitas Canal, and from Matilija Creek and North Fork Matilija Creek to Robles-Casitas Canal.

- Replacement Supplies would seek new sources of water to offset both water quality and supply impacts. Many of these options would supplement CMWD's water supply, while others would enhance supplies to any one of CMWD's water users, thereby reducing demand on CMWD and increasing overall system flexibility. Options considered include infiltration galleries, water transfers between surface providers, desalination, construction of new wells and well heads, and expansion of existing diversion facilities.

- Re-use and Conservation options are, in effect, a type of replacement supply, but they create more available water in the system, are highly adaptable, and environment-friendly. Options considered include the use of recycled wastewater effluent and scalping plants for water supply, water conservation policies, and crop idling transfers.

- Treatment Technologies focus on reducing potential water quality impacts associated with potential increases in sediment loading. Options considered include treatments such as chemical flocculation, oxygenation enhancement, well back-flushing, and treatment plant and diversion facility improvements.

ES-5 Recommended Options

Water supply mitigation options were evaluated based on cost, environmental impacts, feasibility, and adaptability to provide future benefits beyond the dam removal project. The following is a brief description and evaluation summary of seven options that are being recommended for further study:

CMWD Transfers to MOWD (Replacement Supplies): MOWD owns and operates five wells located near the Ventura River and currently receives water from CMWD on an as-needed basis. Increase in fine sediments and organics in the river associated with dam removal could potentially impact MOWD's well production. This loss could be offset through additional transfers from CMWD. Since CMWD currently transfers water to MOWD, there are no environmental concerns and no additional infrastructure required for the temporary transfers.

New Well Heads at Foster Park (Replacement Supplies): Groundwater is extracted from the Upper Ventura River Groundwater Basin via a series of wells at Foster Park. To offset potential water supply loss associated with dam removal, two new wells have been drilled and there are 90% design plans for the construction of the wellheads and the regulatory permits. It is likely that the installation of well heads could be completed before implementation of the dam removal project and the wells could be operational beyond the needs of the project.

Urban and Agricultural Conservation (Re-use and Conservation): Implementing water conservation policies could reduce demand for water supply and could potentially be extended (beyond the drought) to help offset water supply losses associated with dam removal. The City of Ventura's Water Wise Incentive Program offers monetary incentives for water-saving landscaping and measures. CMWD has also implemented similar measures and policies for agricultural efficiency. Conservation programs would represent an environmental benefit and would allow for greater operational flexibility, especially in times of drought.

Crop Idling (Re-use and Conservation): Crop idling allows water previously allocated to agricultural irrigation to be used for other purposes. The loss of crops during the idling period represents the cost of this option. Crops near the end of their productive life would be the best choice for crop idling. Given that the dam removal options are dependent on the occurrence of a large storm event, a primary concern with this option is a scenario where crops are idled, but a large storm does not occur and dam removal does not take place. There are no environmental concerns with this option. Due to the high associated costs, this option would not be continued after the completion of dam removal.

Casitas Reservoir Oxygenation Enhancement (Treatment Technologies): The potential additional influx of organics due to dam removal could cause low dissolved oxygen (DO) and iron levels in Casitas Reservoir, which may hamper the ability to maintain water quality standards and create taste and odor issues. A 2013 feasibility study (Water Quality Solutions 2013) concluded that a diffused oxygenation system with up to four in-lake diffusers, a liquid oxygen delivery system, and associated storage facility is the most cost-effective solution to address these concerns. The oxygenation system, with three in-lake diffusers, is under construction. There are no environmental concerns with this option, and increasing DO levels is generally considered a benefit for the local ecosystem. Use of the oxygenation system would be continued after the dam removal project and may allow the lake to maintain more consistent DO levels throughout the year.

Back-flushing of Meiners Oaks Wells 1 and 2 (Treatment Technologies): MOWD has expressed concern that the potential for temporary increases in fine sediment and organic loads associated with dam removal could negatively impact the efficiency of its Wells 1 and 2, due to fine sediment entering and causing bacterial presence and scale buildup on well casing perforations. A back-flushing operation would be effective in treating this issue. Back-flushing is currently a part of standard operations, so no new infrastructure would be needed for this option. The additional back-flushing can be performed as needed, depending on the level of impact.

CMWD Water Treatment Plant System Modifications (Treatment Technologies): The CMWD Marion Walker Water Pressure Filtration Plant treats water from the Casitas Reservoir for potable use. To accommodate higher sediment and organic loads, the plant could be converted to a double pass from the current single pass, which would include additional instrumentation. Higher turbidity may require additional flocculation chemicals and backwash cycles and/or generate additional sludge volumes. There are no environmental impacts with this option as it only modifies existing operations.

ES-6 Evaluation Summary

Table ES-1 summarizes the volume of water supply per year, as well as the cost, for each of the recommended options. To calculate the percent of lost supply volume (associated with dam removal), it was assumed that CMWD would suspend diversions at Robles for one large storm during the Phase I flushing event. This would equal a lost diversion volume of approximately 10,000 AF (4% of total reservoir capacity).

Table ES-1. Water Supply Management Options Recommended for Further Analysis

Option Type	Description	Volume[1.] (AFY)	Volume[2.] (% of lost supply volume)	Cost ($)
Replacement Supplies	CMWD Transfers to MOWD	N/A	N/A	$20K
	New Wellheads at Foster Park	750	8%	$1.5M
Re-Use & Conservation	Urban and Agricultural Conservation	250	3%	$191K
	Crop Idling Transfers	800	8%	$5.95M
Treatment Technologies	Casitas Reservoir Oxygenation Enhancement	N/A	N/A	$5K
	Back-flushing of Meiners Oaks Wells 1 and 2	83	1%	$20K
	CMWD Water Treatment Plant System Modifications	Varies[3.]	Varies[3.]	$250K + $10K/year

1. Potential additional or saved volume of water
2. Potential percentage of lost water volume offset
3. Amount of volume offset depends on level of additional treatment implemented

The potential impacts considered in this report are not necessarily all likely and not all potential impacts can be foreseen. It is recommended that each option be developed further in future studies to arrive at a combination of options that would work most effectively with the selected dam removal concept. Before implementation of any of these options, a more detailed consideration of factors such as environmental impacts, legal issues, input from regional stakeholders, constructability and cost, return on investment, and adaptive management measures would be required.

1.0 Introduction

1.1 Project Background and Purpose

Since its construction in 1947, the 168-foot-high, arched concrete Matilija Dam in Ventura County, California had blocked the transport of nearly 8 million cubic yards (mcy) of fine and coarse sediment from naturally moving downstream to the ocean. This has resulted in loss of the reservoir's original function of water storage, loss of downstream sand- and gravel- sized materials necessary for promoting habitat for a variety of wildlife species, loss of sediment needed to maintain beaches at Surfer's Point, and increased erosion of the Ventura River streambed. The dam, with its non-functioning fish ladder, also prevents Southern California steelhead from reaching upper Matilija Creek.

Ventura County Watershed Protection District (VCWPD) has contracted AECOM (formerly URS) and Stillwater Sciences (the Consultant Team) to evaluate a range of concepts for dam removal. Six initial options for dam removal were identified and screened, based on selected key criteria (URS and Stillwater Sciences 2014a), to shortlist three dam removal concepts. Each of the three concepts involves the flushing of some amount of sediment, which has the potential to impact downstream water supply within the Ventura River watershed (Figure 1.1-1).

The objective of this report is to consider a range of possible impacts of the dam removal concepts on each of the major water providers in the Ventura River watershed, and identify and evaluate potential mitigation options at a preliminary level. For purposes of this study, the term "mitigation" is not meant to suggest any regulatory compliance implications, but rather is associated with reducing the severity of any potential impact (in this case potential lost water supply).

Before implementation of any mitigation measures, a more detailed consideration of factors such as feasibility of the option with the selected dam removal concept, environmental impacts, constructability and cost, return on investment, adaptive management measures, etc. would be required.

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WATER SUPPLY MITIGATION OPTIONS EVALUATION

FIGURE 1.1-1

Location Map

1.2 Organization of this Report

This options evaluation report is organized as follows:

- **Section 1.0 Introduction:** summarizes the report purpose, project background and report organization.
- **Section 2.0 Other Studies:** summarizes previous and ongoing work related to this report.
- **Section 3.0 Water Providers:** provides a detailed description of surface and groundwater providers within the watershed.
- **Section 4.0 Potential Impacts to Providers**: describes several types of potential impacts to water supply that may be associated with the shortlisted dam removal concepts.
- **Section 5.0 Mitigation Options:** describes a variety of water supply mitigation options that have been investigated to potentially offset impacts to water supply associated with the removal of Matilija Dam.
- **Section 6.0 Recommendations:** summarizes the evaluation of options from Section 5.0, and provides recommendations for further study.
- **Section 7.0 Statement of Limitations:** describes the limitations associated with the assessments and evaluation provided in the report.
- **Section 8.0 References**: provides a reference list for the sources cited through this report.

2.0 Other Studies

2.1 Summary of Dam Removal Concepts

Under Task 1.3, the Consultant Team has evaluated a range of potential dam removal concepts, which are briefly described below. Full descriptions and a multi-criteria evaluation are detailed in the *Dam Removal Concepts Evaluation Report* produced by the Consultant Team (AECOM and Stillwater Sciences 2016). The three dam removal concepts (DRCs) under consideration and their anticipated sediment release characteristics are as follows:

- DRC-1 Containment Berm with High Flow Bypass
    - Description: This concept would involve removing the dam and building a bypass tunnel to divert upstream creek flow away from the reservoir sediments to North Fork Matilija Creek, until a high flow event occurs. During the high flow event, the flow would be allowed to return to Matilija Creek to erode a large portion of reservoir fine sediments.
    - Sediment Release: With this concept, sediment is released in high concentrations during one high flow events as a channel is downcut through the fine sediment behind the reservoir (Phase I), with subsequent flows removing additional fine sediments at a declining rate through local mass failures on the bank (Phase II).
- DRC-2 Uncontrolled Orifices with Optional Gates
    - Description: This concept would involve boring tunnels at the base of the dam and then blasting open the tunnels when a high flow event occurs to erode a large portion of reservoir fine sediments. This concept would include the option of installing gates on the upstream end of the tunnel orifices if it was found the large storm did not remove an adequate amount of the accumulated fine sediment from the reservoir. The gates would be closed to allow the reservoir to refill to minimize additional water quality impacts until the next high flow event occurs. The dam would be removed when a sufficient amount of the accumulated fine sediment has been eroded from the reservoir.
    - Sediment Release: Similar to DRC-1, sediment is released in high concentrations in one high flow event where a channel is cut through the fine sediments (Phase I) and at a declining rate thereafter (Phase II).
- DRC-3 Temporary Upstream Storage of Fine Sediment
    - Description: This option would involve mechanical removal of fine sediment behind the reservoir and temporary upstream storage of both fine and coarse sediment to create a channel through the lower third of the reservoir approximately along the pre-dam creek alignment at the pre-dam creek elevations. The dam would be removed when earthwork is complete.
    - Sediment Release: DRC-3 would result in significantly reduced peak sediment loading during the first post-removal high flow event. While Phase I erosion is completely avoided due to the prior mechanical removal of much of the fine reservoir sediment, Phase II erosion would be similar to DRCs-1 and 2.

2.2 Summary of Hydrologic Evaluation

A preliminary evaluation of watershed hydrology was completed by the Consultant Team under Task 3.2 entitled *Hydrologic Assessment for Water Supply* (URS and Stillwater Sciences 2014b). This memorandum focused on developing an understanding of surface water supply and demand associated with Casitas Municipal Water District (CMWD), which is one of the largest regional water suppliers. The analyses were based on historical diversion and stream gage data, and evaluated supply scenarios in an attempt to clarify the relative significance of the Robles diversion (compared to other sources to Casitas Reservoir). A schematic and summary of the system is presented in Section 3.1 of this report.

The findings of the hydrologic analysis included the following key points:

- During the period of record available for this analysis, the Robles diversion provided approximately 31% of the inflow into Casitas Reservoir. This percentage could potentially have been lower if diversions had been managed in some instances to prevent reservoir spilling.
- There is a typical pattern of oscillation between wet and dry periods in the Ventura River watershed that has been on the order of a 10- to 15-year cycle for the past 50 years, with at least one 20-year drought cycle over the past 100 years.
- Implementation of a dam removal concept that restricts diversions (allows diversion of a portion of storm or allows diversion between storms) or prevents diversions (no diversions throughout the period) during a typical wet cycle period and when the reservoir is full or nearly full, would have little to no effect on water levels in Casitas Reservoir.
- Implementation of a dam removal project during one of the typical dry cycles that suspends Robles diversions would significantly reduce water levels in Casitas Reservoir. However, if the impact could be limited to a few storms, it is probable that loss in storage would be limited to between 4-15% of the total reservoir capacity of 254,000 acre-feet (AF) (~10,000 to 38,000 AF). The lost volume would persist until the next wet cycle, when it would be restored.

2.3 Summary of Sediment Characterization and Transport

In order to characterize and quantify the sediment stored behind Matilija Dam, existing data and topography from 1947 and 2005 were reviewed and analyzed under Task 2.2 (Stillwater Sciences 2014). Based on these analyses, there were approximately 6.9 mcy of sediment stored behind the Matilija Dam as of 2005, comprising approximately 3.0 mcy of silt and clay, 2.2 mcy of sand, and 1.7 mcy of gravel, cobble, and boulders.

AECOM and Stillwater Sciences (2015) found that fine sediment transport immediately after the dam removal for DRCs- 1 and 2 would result in initially much higher fine sediment concentrations than under background conditions, but that these concentrations would drop immediately and rapidly in the following days. Within two weeks following initial sediment flushing, the fine sediment concentrations would be indistinguishable from that arising from the natural contribution from the watershed.

3.0 Water Providers

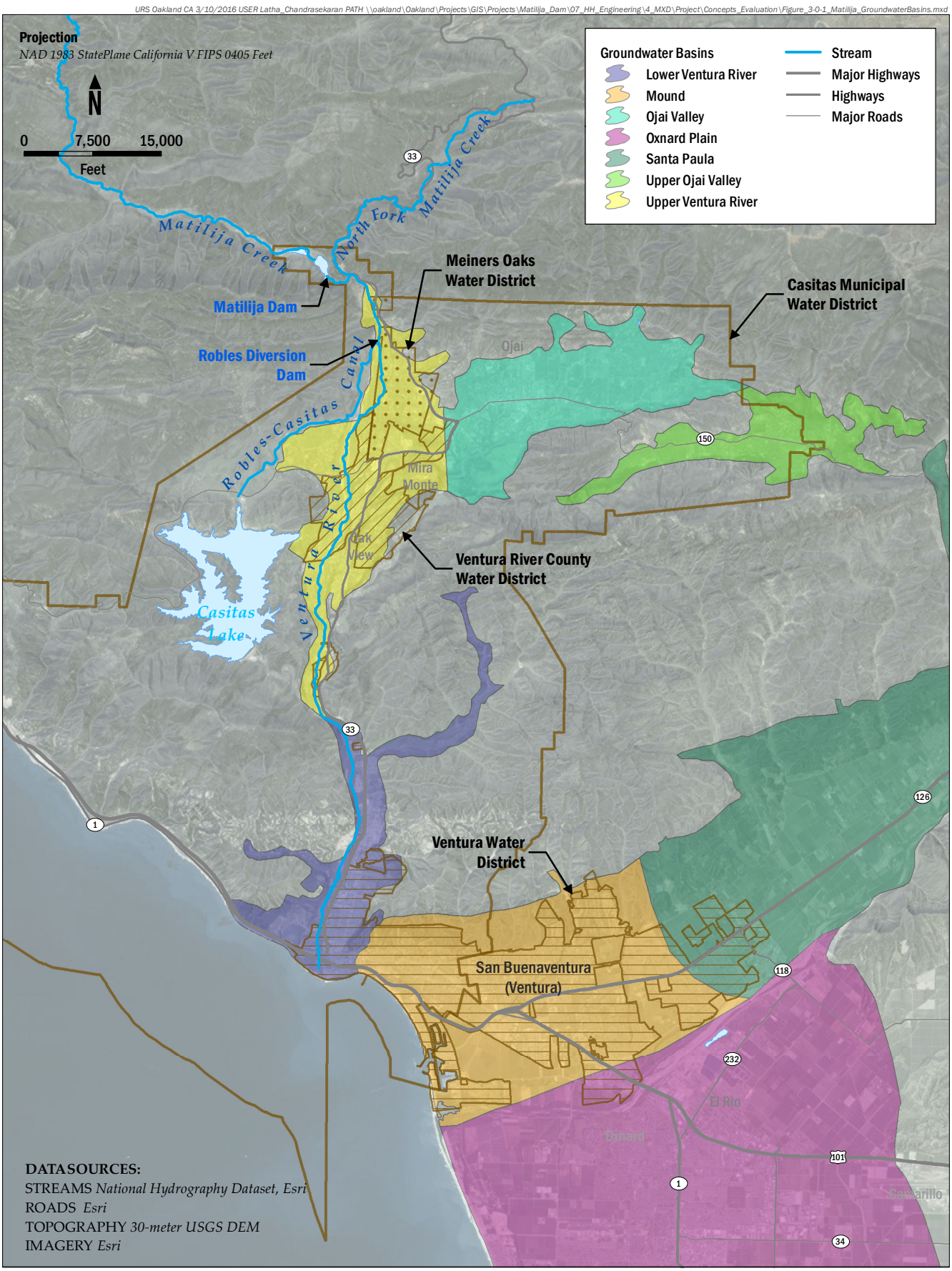
There are many interconnected water providers within Ventura County. The principal surface water providers discussed in this conceptual evaluation of mitigation options are:

- CMWD, which diverts water from the Ventura River at the Robles Diversion facility. CMWD's water demand in 2009 was 17,610 AF.
- The City of Ventura, who draws subsurface water from the Ventura River in the vicinity of Foster Park. The City's current reliable was supply from the Ventura River/Foster Park is approximately 4,200 AF per year (RBF 2015).

Major urban suppliers of groundwater include:

- Golden State Water of Ojai, which pumps from the Ojai Valley Groundwater Basin and supplement with surface water from CMWD. Golden State Water's water demand in 2009 was 1,778 AF.
- Ventura River Water District, which pumps from the Upper Ventura River Groundwater Basin and supplements with surface water from CMWD. Ventura River Water District's average annual demand is 1,324 AF.
- Meiners Oaks Water District (MOWD), which pumps from the Upper Ventura River Groundwater Basin and supplement with surface water from CMWD. MOWD's average annual water demand is approximately 1,100 AF.
- CMWD also operates one well in the Mira Monte area in the Upper Ventura River Groundwater Basin.

A map of selected regional groundwater basins and surface water providers is provided in Figure 3.0-1.



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WATER SUPPLY MITIGATION OPTIONS EVALUATION

FIGURE 3.0-1

Selected Local Groundwater Basins and Water Providers in the Project Vicinity

3.1 Surface Water Providers

3.1.1 Casitas Municipal Water District

The CMWD supplies water to approximately 70,000 customers in western Ventura County, including hundreds of agricultural customers and a number of other water utilities. The CMWD boundaries encompass the city of Ojai, Upper Ojai, the Ventura River Valley area, the City of Ventura to Mills Road, and the Rincon and beach area to the ocean and the Santa Barbara County line (the Casitas Service District).

The CMWD was formed in 1952 and Congress authorized the Ventura River project in 1956. The project included the Robles Diversion facility on the Ventura River, the Robles Canal, and Casitas Dam. Construction of Casitas Dam was completed in November 1958 and the reservoir spilled for the first time in 1978. Casitas Reservoir has a capacity of approximately 254,000 AF.

Robles Diversion Dam is located on the Ventura River near the City of Ojai, California at approximately river mile (RM) 14.16, and supplies water to Casitas Reservoir by canal (Figure 3.1-1). The normal maximum diversion is approximately 500 cubic feet per second (cfs) during the rainy season (December through February); however, CMWD has not been able to divert the full 500 cfs since the completion of the fish passage project and implementation of the Biological Opinion. The existing diversion dam is a low rock weir with a gated spillway, canal diversion headworks, and a fish passage facility located on the right abutment. The diversion weir has a hydraulic height of 13 feet. The fish screen features a chevron-configuration, vertical plate design with traveling brush mechanisms and adjustable velocity distribution baffles.

The canal, including the boxed inverted siphon, is approximately 27,500 feet long with a maximum capacity of 600 cfs. For the majority of its length, an access road parallels the canal and several small bridges provide locations for vehicles to cross over the canal.

Stored water in Casitas Reservoir is piped via the intake structure and tunnel through the dam directly into the water treatment facility located just downstream of Casitas Dam. All of CMWD's water supply is from this treatment plant. The outlet works at the end of the tunnel allow for emergency drawdown of the reservoir, with a capacity of 570 cfs (Wickstrum and Merckling 2011).

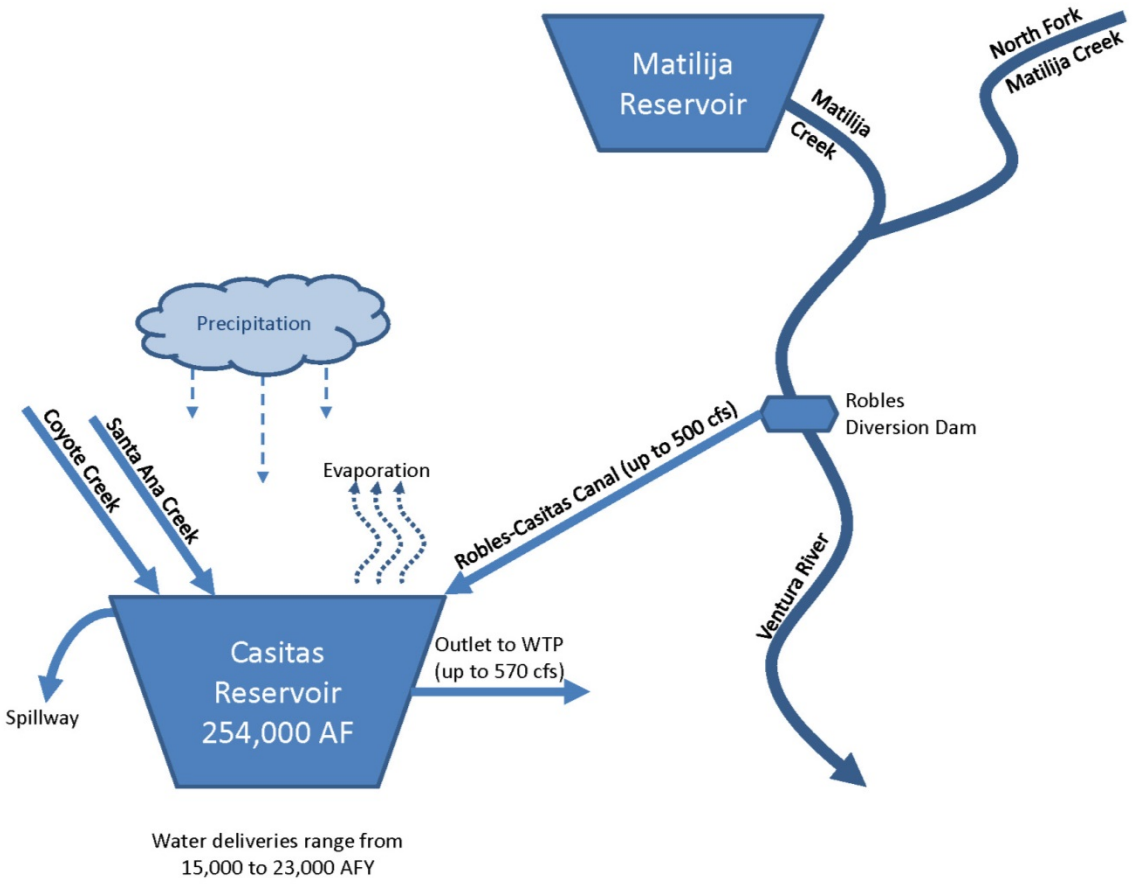

Figure 3.1-1. Casitas Reservoir and the Robles Diversion (Location Map and Schematic)

3.1.2 Ventura Water

The City's potable water supply is derived from local groundwater basins, Lake Casitas and sub-surface water from the Ventura River. The City also has a 10, 000 acre-foot per year allocation from the California State Water Project. To date the City has not received any of this water because there are no facilities to get the water to the City. There are presently five local water sources that provide water to the City water system (RBF 2015):

- Casitas Municipal Water District (Casitas)
- Ventura River Foster Park Area (Foster Park)
    - Surface Water Intake (no longer functional per 2016 Capital Improvement Project (City of Buenavntura 2016))
    - Upper Ventura River Groundwater Basin/Subsurface Intake and Wells
- Mound Groundwater Basin (Mound Basin)
- Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)
- Santa Paula Groundwater Basin (Santa Paula Basin)

The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF). The City's current reliable water supply is 19,600 AFY, although it could drop as low as 18,000 AFY at any time.

The Oxnard Plain Groundwater Basin is regulated by the Fox Canyon Groundwater Management Agency. Due to the current drought, the Management Agency issued Emergency Ordinance E in April 2014, reducing the amount of withdrawal from the basin.

From the Santa Paula Basin, the City is allowed to produce up to a total of 21,000 AF over a 7-year period, with a maximum of 3,000 AFY. The City currently has three wells within this basin, with two currently in operation. The total maximum allowed production from all three wells is 3,000 AFY.

3.2 Groundwater Providers by Basin

There are four groundwater basins in the Ventura River Watershed: Upper Ojai, Ojai Valley, Upper Ventura River and Lower Ventura River. These are tapped by 11 mutual water companies in the watershed, serving from less than 10 to hundreds of customers each. Some providers within the watershed also import water from basins outside the watershed. The Santa Paula and Oxnard Plain groundwater basins are also discussed in this section for this reason. The groundwater basins discussed in this conceptual evaluation are shown in Figure 3.0-1.

3.2.1 Upper Ojai Valley Groundwater Basin

The Upper Ojai Valley Groundwater Basin is the highest basin in the watershed, located above San Antonio Creek, a tributary to the Ventura River. The basin does not supply water to any of the major urban water suppliers discussed in this report, although it does provide local supply within the watershed and connects to the Ojai Valley Groundwater Basin. The California Department of Water Resources (DWR) has described the Upper Ojai Valley Groundwater Basin as follows:

> "The Upper Ojai Valley Groundwater basin is bounded by the Ojai Valley Groundwater Basin on the north, the Topatopa Mountains on the east, Sulfur Mountain on the south, and near impermeable rocks of the Santa Ynez Mountains elsewhere. The valley is drained westward by Lion Canyon into San Antonio Creek and eastward by Sisar Creek to Santa Paula Creek. Average annual precipitation ranges from 24 to 28 inches. Natural recharge into the basin is estimated to be 400 AFY. Recharge into the basin is estimated to be 320 AFY from return irrigation flow and about 600 AFY underflow." (DWR 2004)

3.2.2 Ojai Valley Groundwater Basin

The Ojai Valley Groundwater Basin is the source of water for Golden State Water Company and a number of mutual water companies. DWR has described the Ojai Valley Groundwater Basin as follows:

> "The Ojai Valley Groundwater Basin is bounded on the west and east by non-water-bearing Tertiary age rocks, on the south by the Santa Ana fault and the Sulphur Mountain Range, and on the north by Black Mountain and the Topatopa Mountains. The basin is drained by Thacher and San Antonio Creeks to the Ventura River. Average annual precipitation ranges from 20 to 24 inches." (DWR 2004)

3.2.3 Upper Ventura River Groundwater Basin

The Upper Ventura River groundwater Basin is an unconfined aquifer and, although it recharges fairly quickly after a series of winter storms, when the Ventura River dries up, basin levels drop significantly after only 2 or 3 years of drought conditions. It is the source of water for CMWD's well near Mira Monte, the City of Ventura's Foster Park Wells, MOWD's local supply, and numerous mutual water companies. The basin has been described by DWR as follows:

> "The Upper Ventura River Subbasin is bounded on the south by the Lower Ventura River Subbasin, on the east by the Ojai Valley Groundwater Basin, and elsewhere by impermeable rocks of the Santa Ynez Mountains….The surface is drained by the Coyote, Matilija, and San Antonio Creeks and the Ventura River. Average annual precipitation ranges from 14 to 24 inches." (DWR 2004)

3.2.4 Lower Ventura River Groundwater Basin

DWR has described the Lower Ventura River Groundwater Basin as shown below:

> "The Lower Ventura River Subbasin is bounded on the north by the Upper Ventura River Subbasin, on the south by the Pacific Ocean and Mound Subbasin of the Santa Clara River Valley Groundwater Basin, and elsewhere by near impervious rocks of the Santa Ynez Mountains. The valley is drained by Canada Larga and the Ventura River. Average annual precipitation ranges from 14 to 16 inches." (DWR 2004)

This groundwater basin is directly connected to the Pacific Ocean. The basin is minimally used and most of the wells are agricultural. No public water suppliers use the basin.

3.2.5 Santa Paula Groundwater Basin

The Santa Paula Groundwater Basin is a basin along the Santa Clara River located southeast from the Ventura River Watershed. DWR describes the basin as follows:

> "The northern boundary of the Santa Paula Subbasin is the contact between Pleistocene and younger alluvium and impervious rocks of the Topatopa Mountains. The southern boundary is formed by impervious rocks of Oak Ridge and South Mountain, the Oak Ridge fault, and the Saticoy fault... The eastern edge of the subbasin is marked by a bedrock constriction, with the boundary placed at the position of maximum rising water ... The western boundary of the subbasin separates it from the Mound and Oxnard subbasins, with the western boundary placed where there is a distinct change in the slope of the water table... The Santa Clara River and Santa Paula Creek drain the valley westward toward the Pacific Ocean. Average annual precipitation ranges from 14 to 18 inches." (DWR 2004)

3.2.6 Oxnard Plain Groundwater Basin

Wells near the Buenaventura Golf Course have drawn from the Oxnard Plain Groundwater Basin since 1961 (RBF 2015). Oxnard Plain Groundwater Basin is regulated by the Fox Canyon Groundwater Management Agency (GMA). A major goal of the GMA is to regulate and reduce future extractions of groundwater from the Oxnard Plain aquifers, in order to operate and restore the basin to a safe yield. The City's current reliable water supply from the Oxnard Plain Basin is 4,100 AFY (RBF 2015). In April of 2014, the GMA approved Emergency Ordinance E, which restricts the City to 3,862 AF after January 1, 2016.

DWR describes the basin as follows:

> "Oxnard Subbasin is a subbasin of the Santa Clara River Valley Basin, located in southern Ventura County. The northern boundary of the subbasin is the Oak Ridge fault. The southern boundary is formed by contact of permeable alluvium with the semi-permeable rocks of the Santa Monica Mountains…. The eastern edge of the subbasin lies against the Pleasant Valley and Las Posas Valley Basins…. The western edge of the subbasin is the Pacific Ocean…. Calleguas Creek and other tributary creeks drain the surface waters of the area westward into the Pacific Ocean and the Santa Clara River provides recharge along the northern border of the subbasin…. Average precipitation ranges from 14 to 16 inches per year." (DWR 2004)

3.2.7 Mound Groundwater Basin

The Mound Groundwater Basin is a basin located along the Santa Clara River. The majority of recharge is from percolation of surface flow from the Santa Clara River and other minor tributaries. DWR describes the basin as follows:

> "Mound Subbasin underlies the northern part of the Ventura coastal plain in the western part of the Santa Clara River Valley Groundwater Basin. The subbasin is bounded on the north by the Santa Ynez and Topatopa Mountains and on the south by the Oak Ridge and Saticoy faults (CSWRB 1956). The subbasin is bounded on the northeast by the Santa Paula Subbasin (CDPW 1933; CSWRB 1956). The subbasin is bounded on the west by the Pacific Ocean. Ground surface elevations range from sea level in the west to about 400 feet above sea level in the east (CSWRB 1956). The Santa Clara River and tributary creeks drain surface water westward into the Pacific Ocean. Average annual precipitation ranges from 12 to 16 inches." (DWR 2004)

4.0 Potential Impacts to Providers

This section describes several types of potential impacts to supply that may be associated with the shortlisted dam removal concepts summarized in Section 2.1. Each type of potential impact could result in a temporary lost opportunity to obtain water from the intended source, or additional treatment costs to ensure water quality standards are met. As discussed in Section 1.1, these potential impacts are not necessarily likely and not all potential impacts can be foreseen. However, at the conceptual level, they represent the focus of potential mitigation measures discussed in Section 5.0.

4.1 Increased Suspended Sediment

Assessments in AECOM and Stillwater Sciences (2016) indicate that for DRCs-1 and 2, elevated (above baseline) suspended sediment concentrations (up to 10^6 mg/L) and organics will persist for up to one day for Phase I erosion followed by slightly elevated suspended sediment concentrations (above 10^4 mg/L), associated with Phase II erosion, that could persist for up to a week and would then rapidly decline. For DRC-3, Phase I impacts would not occur, but Phase II impacts would be broadly equivalent to those of the other two concepts.

4.1.1 Surface Water

CMWD has maintained records on the timing and volume of water diversions from the Ventura River for many years, but the data do not include information on turbidity or TSS concentrations. However, sufficient information exists to infer this information. Based on historic diversion and creek/river gage records, and using established relationships between TSS and flow, AECOM and Stillwater Sciences (2016) estimated that CMWD has historically diverted at Robles when TSS concentrations were upward of 10,000 mg/L.

It is assumed at this time that CMWD will not divert water from the Ventura River for a certain period associated with the initial flush of fine sediment from the reservoir behind Matilija Dam (i.e., during Phase I, for DRCs-1 and 2).

In the event that elevated suspended sediment concentrations persist after this period, it is possible that subsequent diversions at the Robles diversion could lead to some level of suspended sediment deposition in the Robles-Casitas Canal and associated increased maintenance. However, high diversion flows are likely to be associated with a velocity that will transport the bulk of additional fine sediment through the canal to Casitas Reservoir.

The additional quantity of sediment is likely to have a negligible impact on the overall life of Casitas Reservoir and other surface water facilities, due to the short duration of anticipated elevated suspended sediment concentrations and providers' prior experience with high TSS concentrations during which diversions have historically occurred (AECOM and Stillwater Sciences 2016).

4.1.2 Groundwater

There is a concern that elevated suspended sediment concentrations in the Ventura River could lead to a reduction in adjacent well efficiency, particularly for shallower wells, due to perforations plugging with silt. Current research (Cui, et al. 2008), however, does not support the concern about physical migration of finer sediments, particularly to shallower wells. The research suggests that fine sediment infiltrates to a very limited depth, usually to within a few diameters of the largest bed material particles, rather than settle to the bottom of the alluvial aquifer.

Recharge within the watershed could be impacted if fine sediments blanketed the river bottom and remained for an extended period of time. Due to the steepness of the channel, however, the *Matilija Dam Ecosystem Restoration Feasibility Study - Final Report* by the US Army Corps of Engineers (USACE, 2004) does not anticipate fines being deposited in the active channel. The recharge capacities are, therefore, not expected to be impacted.

4.2 Increased Organics

AECOM and Stillwater Sciences (2015) concluded that very high oxygen demand (associated with increased organic material concentrations) during Phase I transport under DRCs-1 and 2 is likely to create severely anoxic conditions in Matilija Creek and much, if not all, of the Ventura River during those hours immediately following dam removal, for which suspended sediment concentrations will also be extraordinarily high. In the following week of (exponentially declining) Phase II transport, however, oxygen demand will fall rapidly to single-digit values, given the rapid, orders-of-magnitude reduction in suspended sediment concentrations that is anticipated to occur. At these levels, the water should be rapidly re-oxygenated by downstream transport.

DRC-3 would avoid the brief period of intense anoxia immediately following dam removal and similar to DRCs-1 and 2, likely have a reduced level of background oxygen demand contribution during the weeks following Phase I transport.

4.2.1 Surface Water

4.2.1.1 CMWD

It is assumed at this time that CMWD will not divert water from the Ventura River for a certain period associated with the initial flush of fine sediment and organic material from the reservoir behind Matilija Dam (for DRCs-1 and 2). In the unlikely event that elevated organic material concentrations persist after this period, it is possible that subsequent diversions at the Robles diversion could lead to water quality deterioration in Casitas Reservoir.

Existing Issues

Excess organic material is an existing problem in Casitas Reservoir, as it nourishes algae, causes algal blooms, and creates an undesirable taste, even after treatment. When the algae die, they settle to the bottom of the lake. During the summer months, the surface water temperature of the lake rises, while the deeper portions of the lake remain cool. This results in the development of a thermocline that prevents

oxygen from migrating to the lower depths. Within the oxygen-poor hypolimnion, a series of chemical reactions can result in the release of additional phosphorous, and the generation of ammonium, iron, methyl mercury, manganese and hydrogen sulfide, which result in fish mortality and water treatment challenges at CMWD's water treatment plant. In addition, some recreational impacts occur from poor water quality, as algae create color and odor issues. Chemical treatment of the algae can cause secondary impacts from the treatment by-products. Figure 4.2-1 shows a section of a typical reservoir with temperature stratification and algae problems.

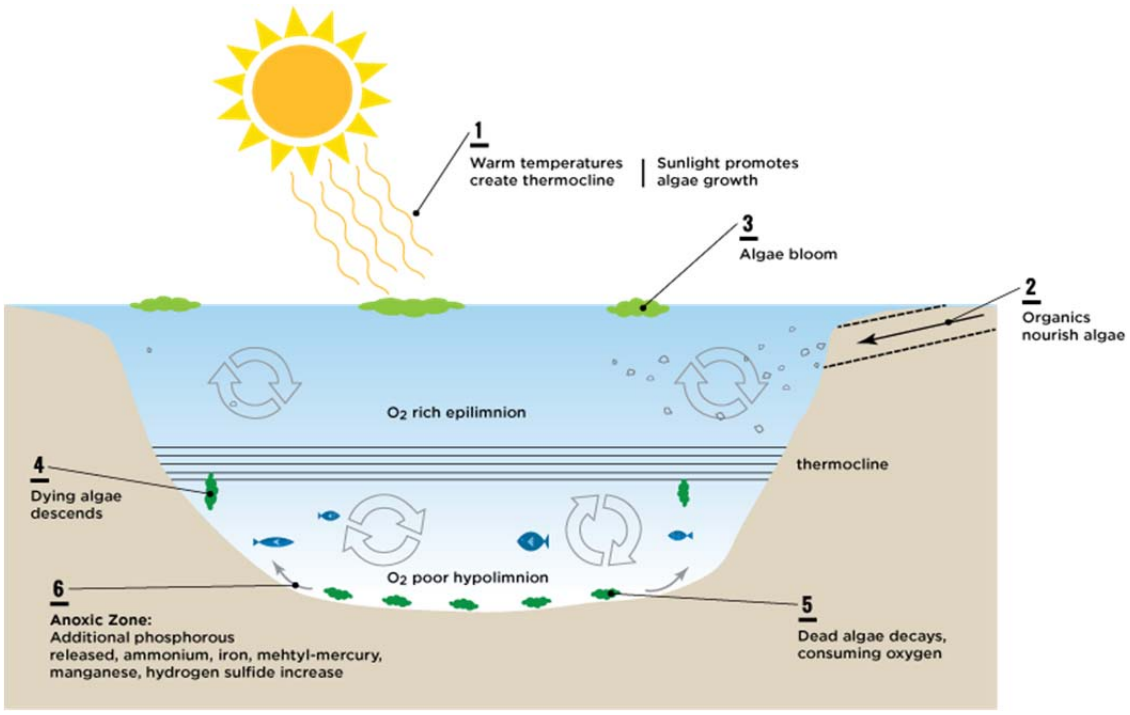

Figure 4.2-1. Water Quality Issues Associated with Organic Loading and Temperature Stratification in a Typical Reservoir

When a thermocline is present, CMWD mitigates the existing issues with water quality through careful monitoring and selection of the withdrawal depth at the inclined intake at Casitas Dam. CMWD also employs a bubbler system for lake aeration to increase the range of depths over which withdrawals can be made and treats the lake with algae killers. CMWD is considering expanding the aeration system.

Potential Dam Removal Impacts

The potential incremental impacts to Casitas Reservoir from organics released at Matilija Dam are unclear, given the short duration of expected peak loading of organics following dam removal, the large total volume of the reservoir, and the existing issues with organic loading. It is assumed that CMWD will not divert water from the Ventura River during the Phase I flushing of sediment and thus that the incremental increase of organics present in Phase II diversion would represent the impact to water quality. There would also be an impact to Casitas Reservoir due to the amount of water not diverted during Phase I, as summarized in Section 2.2.

4.2.1.2 Ventura Water

The City of Ventura has subsurface intakes along the Ventura River at Foster Park. It is possible that excess organic loading during the high flow flush could result in a slightly higher intake of organics at this location. The incremental amount of loading above the background levels the City currently treats during high flows is unknown. However, it is possible that Ventura Water will make a determination to cease withdrawals at this location during Phase I sediment flushing and will thus be required to take more water from CMWD during this period. As they already have an agreement with CMWD to meet their demands, there is unlikely to be an impact to Ventura Water's supply from downtime at Foster Park.

The water extracted from Mound Basin requires it to be blended with water from Ventura River or CMWD, prior to being delivered to customers. It should be noted that a reduction in water from CMWD and from Foster Park may also effectively reduce the supply available from Mound Basin, resulting in a compounding impact to the City's water supply.

4.2.2 Groundwater

Some providers have expressed concern about potential groundwater quality impacts from contaminants such as metals and organics in solution that could migrate into the aquifer. There is currently insufficient information to characterize the sediments behind Matilija Dam to rule out the possibility of metals, but these are not expected due to the relatively undisturbed nature of the upper watershed. As stated in USACE 2004, "in no instance do the concentrations of any analyte exceed Screening Level or Maximum Level concentrations developed under PSSDA… In that regard, based on potential contaminants only, any of the sampled material in Matilija Dam would be suitable for use on a beach or for natural release that would eventually transport it to a beach."

A higher load of organics is anticipated during the flushing immediately following dam removal. However, over a period of no more than two weeks the magnitude of oxygen demand associated with organics is expected to return to pre-project levels, with no long term impacts. Any unanticipated reduction in well efficiency of shallow wells near the Ventura River, due to modified bacteriological presence and scale buildup, could be mitigated by flushing.

5.0 Mitigation Options

5.1 Types of Mitigations

There are four basic types of mitigation that were considered to manage potential impacts of the Matilija Dam removal project, additional sediment loading in the Ventura River and Casitas Reservoir, and the possible incremental loss of supply to impacted providers. These four types of mitigations are:

1. *Diversion Replacement options* would divert water from above the Matilija Dam project area directly to Robles diversion or Robles-Casitas Canal to bypass the reservoir and any flushing activities associated with dam removal, thus eliminating the potential for additional sediment loading at CMWD facilities. Providers other than CMWD would not realize direct benefits from this type of mitigation;
2. *Replacement Supplies* would seek new sources of water to mitigate both water quality and supply impacts. Although many of these options would supplement CMWD's water supply, which provides regional benefits, other replacements were also considered. The understanding behind replacement supplies is that supplies to any one of CMWD's water users frees up additional supply for other users and thus increases overall system flexibility;
3. *Re-use and Conservation options* are, in effect, a type of replacement supply, but they are unique in their ability to create more available water in the system. Re-use and conservation are among the most highly adaptable options, and they rate highly in terms of environmental stewardship as well; and
4. *Treatment Technology options* focus on reducing water quality impacts associated with potential increases in sediment loading. These options would screen, filter, or even chemically remove fines and organics to prevent a variety of potential impacts.

The mitigation options considered in this conceptual report are summarized in Table 5.1-1 below.

Table 5.1-1. Summary of Mitigation Options

Type of Mitigation	No.	Description
Diversion Replacements	1	Diversion from Matilija Creek to Canal
	2	Diversion from NF Matilija Creek to Canal
	3	Diversion from Matilija Creek to NF Matilija Creek to Canal
Replacement Supplies	4	Infiltration Galleries
	5	Water Transfer from SWP to CMWD via Castaic
	6	Water Transfer from SWP to CMWD via Carpinteria
	7	CMWD Transfers to MOWD
	8	Groundwater Transfers
	9	Desalination
	10	New Wells in Santa Paula Basin
	11	New Wellheads at Foster Park
	12	San Antonio Creek Diversion Dam Expansion

Table 5.1-1. Summary of Mitigation Options

Type of Mitigation	No.	Description
Re-Use & Conservation	13	Recycled Water - Ojai Valley Wastewater Treatment Plant
	14	Recycled Water - Ventura Water Reclamation
	15	Recycled Water - Scalping Plants in Ojai Valley
	16	Urban and Agricultural Conservation
	17	Crop Idling Transfers
Treatment Technologies	18	Robles Diversion Dam Improvements
	19	Robles-Casitas Canal Temporary Treatments
	20	Casitas Reservoir Oxygenation Enhancement
	21	Back-flushing of MOWD Wells 1 and 2
	22	CMWD Water Treatment Plant System Modifications
	23	CMWD Water Treatment Plant Roughing Filters

5.2 Evaluation Criteria

Each of the twenty-three proposed mitigation options were evaluated using the following criteria:

- *Cost* – The estimated lifecycle costs of the options were evaluated relative to each other as well as their potential for return on investment when compared with other options.
- *Environmental* – This criterion considers the potential environmental impacts for each option as well as possible environmental permitting requirements.
- *Feasibility* – The feasibility evaluation represents the general effectiveness of each option with regards to mitigating potential water volume losses as well as the constructability and scheduling. Additionally, it considers comments and feedback received from local agencies and stakeholders.
- *Adaptability* – The adaptability criteria considers whether the proposed option has any future benefits beyond the mitigation needs of the dam removal project.

The twenty-three mitigation options were evaluated based on the preceding criteria in order to allow recommendations to be made for further development and possible implementation. Primarily, options must be deemed feasible to be recommended for further evaluation. However, a number of options were screened out based on excessive costs alone. Often, the options with higher estimated costs of implementation were those where large investments in infrastructure were a requirement, regardless of the scale of the option. As an example, a desalination plant, regardless of location or design flow, will always be very expensive and time-consuming to implement.

5.3 Description and Evaluation of Mitigation Options

The mitigation options investigated as part of this analysis (from Table 5.1-1) are also presented in Figure 5.3-1, and discussed in more detail in the following sections.

Groundwater Basins
- Lower Ventura River
- Mound
- Ojai Valley
- Oxnard Plain
- Santa Paula
- Upper Ojai Valley
- Upper Ventura River

- Stream
- Major Highway
- Highway
- Major Road

Not shown on map:
7 - REPLACEMENT: CMWD Transfers to MOWD
8 - REPLACEMENT: Groundwater Transfers (infeasible)
16 - RE-USE & CONSERVATION: Urban and Agricultural Conservation

Projection
NAD 1983 StatePlane California V FIPS 0405 Feet

N

0 4,500 9,000
Feet

DATASOURCES:
STREAMS *National Hydrography Dataset, Esri*
ROADS *Esri*
TOPOGRAPHY *30-meter USGS DEM*
IMAGERY *USBR*

3- DIVERSION: Matilija to N.F Matilija Creek to Robles Canal
1- DIVERSION: Matilija Creek to Robles Canal
Matilija Dam
2 - DIVERSION: N.F Matilija Creek to Robles Canal
4- REPLACEMENT: Infiltration Galleries
Robles Diversion Dam
18 - TREATMENT:Robles Diversion Dam Improvements
21 - TREATMENT: Back-flushing of Meiners Oaks Wells 1 & 2
19 - TREATMENT: Robles-Casitas Canal Temporary Treatments
6 - REPLACEMENT: Water Transfers via Carpinteria
20 - TREATMENT: Casitas Reservoir Oxygenation Enhancement
CMWD Marion Walker WTP
22- TREATMENT: CMWD WTP System Modifications
23 - TREATMENT: CMWD WTP Roughing Filters
11 - REPLACEMENT: New Well Heads at Foster Park
14 - RE-USE & CONSERVATION: Recycled Water via Ventura Water Reclamation
13 - RE-USE & CONSERVATION: Recycled Water via OVSD Treatment Plant
Ojai Valley WWTP
Ventura Water Reclamation Facility
9 - REPLACEMENT:Desalination
12 - REPLACEMENT: San Antonio Creek Diversion Dam Expansion
15 - RE-USE & CONSERVATION: Recyled Water via Scaling Plants
17 - RE-USE & CONSERVATION: Crop Idling Transfers
10 - REPLACEMENT: New Wells in Santa Paula Groundwater Basin
5 - REPLACEMENT: SWP Transfers via Castaic Lake

Matilija Creek
North Fork Matilija Creek
Robles-Casitas Canal
Ventura River
Lake Casitas
Ojai
Meiners Oaks
Mira Monte
Oak View
San Buenaventura (Ventura)
El Rio

33 150 1 101 126 118 232

AECOM
Ventura County Watershed Protection District
Matilija Dam Removal, Sediment Transport, and Robles Mitigation Diversion
WATER SUPPLY MITIGATION OPTIONS EVALUATION

FIGURE 5.3-1
Water Supply Mitigation Options

5.3.1 Diversion Replacements (Full or Partial)

The Diversion Replacement options consist of diverting flows upstream of Matilija Dam to the Robles-Casitas Canal, or to North Fork Matilija Creek and down to the Robles-Casitas Canal, protecting all, or part of the total in-stream flows that would be available at Robles from the potential impacts associated with sediment flushing.

Three variations of the diversion replacement were considered:

- Matilija Creek Diversion to Robles-Casitas Canal;
- North Fork Matilija Creek Diversion to Robles-Casitas Canal; and
- Matilija Creek Diversion to North Fork Matilija Creek Diversion to Robles-Casitas Canal.

The design criteria for the three diversion replacement options were based on the maximum flow capacity of the existing Robles-Casitas Canal, estimated at 500 cfs. By sizing the diversion pipelines for this design flow, the diversion pipelines could convey flows equivalent to the existing diversion flow in the Robles-Casitas Canal, resulting in no loss in water volume to Casitas Reservoir during dam removal. The required pipe diameter to meet the design flow criteria for all three options is 8 feet.

The design would need to consider and limit impacts to fish passage and other biological resources (e.g. riparian vegetation at inlet).

The three diversion options have no utility beyond the project construction period. Once sediment and organic concentrations in the river return to background levels, the Robles Diversion would be back online and the new facilities would be no longer required.

The three variations of the diversion replacement are discussed in more detail below.

5.3.1.1 Matilija Creek Diversion to Robles-Casitas Canal

This mitigation option would divert water from Matilija Creek directly to Robles-Casitas Canal. This option would require the construction of a 2.5-mile long diversion pipeline and a temporary diversion dam located upstream of Matilija Dam.

The pipeline would be constructed primarily by tunneling south from upstream of Matilija Dam to the Robles-Casitas Canal.

Evaluation

Cost – The estimated construction cost of the pipeline and diversion dam is $52.8 million (M). Due to the high estimated cost, a smaller diameter pipeline of 4 feet was also considered. This diameter represents a capacity of 125 cfs which, based on historic diversion records, would be equivalent to approximately 50% of the flow volume diverted through the Robles-Casitas Canal. The smaller pipeline reduced construction costs to approximately $40M.

Environmental – The pipeline alignment is primarily within undeveloped, rural lands and requires a large tunnel. An extensive environmental review, considering impacts to fish passage and riparian habitat, would be required.

Feasibility – Due to the length of environmental review required, this option would be difficult to implement in a timely manner. In addition, this option would not be effective with DRC-1, which includes construction of a bypass tunnel from upstream of Matilija Dam to North Fork Matilija Creek.

Adaptability – Once the sediment and organic levels in the Ventura River return to background levels, the pipeline facilities would no longer be needed.

5.3.1.2 North Fork Matilija Creek Diversion to Robles-Casitas Canal

This mitigation option would divert water from North Fork Matilija Creek, where a temporary diversion dam would allow all of North Fork Matilija Creek's flows to be diverted to the Robles-Casitas Canal. The temporary diversion dam would be located on the North Fork Matilija Creek, north of the convergence with Matilija Creek. The diversion pipeline would travel south to the Robles-Casitas Canal, approximately following Highway 33.

The pipeline would be approximately 2.7 miles in length and be constructed through open trenching.

Evaluation

Cost – The estimated construction cost of the pipeline is $14.3M. Due to the high estimated cost, a smaller diameter pipeline of 4 feet was also considered. This diameter represents a capacity of 125 cfs which, based on historic diversion records, would be equivalent to approximately 50% of the flow volume diverted through the Robles-Casitas Canal. The smaller pipeline reduced construction costs to around $8.5M

Environmental – The pipeline alignment crosses through both developed and undeveloped lands. An extensive environmental review, considering impacts to fish passage and riparian habitat, would be required.

Feasibility – Due to the length of environmental review required, this option would be difficult to implement in a timely manner. The alignment traverses through public and private lands and would require approvals and easements from multiple entities, which is complex and time consuming.

Adaptability – Once sediment and organic levels in the Ventura River return to background levels, the pipeline facilities would no longer be needed.

5.3.1.3 Matilija Creek Diversion to North Fork Matilija Creek Diversion to Robles-Casitas Canal

This mitigation option would divert water from Matilija Creek to North Fork Matilija Creek with a temporary diversion dam upstream of Matilija Dam and a tunnel connecting Matilija Creek to North Fork Matilija Creek, where a second temporary diversion dam would allow all of the flows from Matilija Creek and North Fork Matilija Creek to be diverted to Robles-Casitas Canal.

The pipeline would be approximately 3.1 miles in length and constructed through a combination of tunneling and open trenching. The tunnel is required due to a high point between Matilija Dam and North Fork Matilija Creek. The tunnel length is approximately 1,000 feet.

The diversion pipeline would travel east along the southern edge of Matilija Dam. As previously stated, a small tunneling segment will be required between Matilija Creek and North Fork Matilija Creek due to a high-elevation point. From North Fork Matilija Creek, the pipeline would travel south to the Robles-Casitas Canal, following Highway 33.

Evaluation

Cost – The estimated construction cost of the pipeline is $19.4M. Due to the high estimated cost, a smaller diameter pipeline of 4 feet was also considered. This diameter represents a capacity of 125 cfs which, based on historic diversion records, would be equivalent to approximately 50% of the flow volume diverted through the Robles-Casitas Canal. The smaller pipeline reduced construction costs to $13M. However, with DRC-1, the costs would be effectively reduced, as a pipeline would already be required to North Fork Matilija Creek to implement the dam removal.

Environmental – The pipeline alignment crosses through both developed and undeveloped lands. An extensive environmental review, considering impacts to fish passage and riparian habitat, would be required, along with botanical and biological surveys along the pipeline alignment.

Feasibility – Due to the length of environmental review required, this option would be difficult to implement in a timely manner. The alignment traverses through public and private lands and would require approval and easements from multiple entities.

Adaptability – Once sediment and organic levels in the Ventura River return to background levels, the pipeline facilities would no longer be needed.

5.3.2 Replacement Supplies (Full or Partial)

Replacement supply options focus on new sources of water to offset any water supply losses associated with dam removal. Options considered include infiltration galleries, water transfers, groundwater transfers, desalination, new wells, and expanded diversions. Specific options are discussed in more detail in the following sections.

5.3.2.1 Infiltration Galleries

Infiltration galleries or radial collection wells could be constructed along the Ventura River to collect subsurface flows for conveyance to Casitas Reservoir. Fine sediments and organics would be filtered by percolation through the surrounding soils. The percolated water would be collected and then conveyed to the Robles-Casitas Canal through a new transmission pipeline. A pump station would also be required.

The infiltration gallery would consist of two, 36-inch diameter, stainless steel wire-wrap well screens. The initial design flow was 500 cfs, the maximum capacity of the Robles-Casitas Canal. At this flow rate, the infiltration gallery could function as a complete volume replacement. However, the size of the gallery required to meet this flow rate was infeasible (over six miles in length). A reduced design flow of

125 cfs was evaluated. A design flow of 125 cfs would allow the infiltration galleries to capture 50% of the average annual diversion volume. At 125 cfs, the infiltration gallery would be approximately 8,800 feet in length.

The infiltration galleries would be located between the confluence of Matilija Creek and North Fork Matilija and Robles Diversion Dam to maximize the use of gravity flow to the canal.

Evaluation

Cost – The estimated cost of an infiltration gallery with a design flow of 125 cfs is $20M. An additional transmission pipeline and possible pump station would be required in order to convey the captured water to the Robles-Casitas Canal, which is not reflected in the cost estimate presented above.

Environmental – The infiltration gallery would be installed parallel to the Ventura River streambed and would require a comprehensive environmental review, including consideration of impacts to fish passage and riparian habitat.

Feasibility – The environmental review, permitting, and construction period would be difficult to implement in a timely manner. Additionally, there is limited space available, making it difficult to acquire the required land area for this option.

Adaptability – Once the dam removal is complete and sediment and organic values return to typical levels, the infiltration gallery would no longer be required. However, the infiltration galleries could be used instead of the Robles Diversion facility for reduced environmental impacts to the river.

5.3.2.2 Water Transfers

State Water Project

Both the City of Ventura and CMWD have the potential to obtain water from the State Water Project (SWP). However, the lack of existing facilities and agreements, as well as the timing of water availability from SWP do not favor these options.

City of Ventura

The City of Ventura has a 10,000 AFY allocation from the State Water Project. At this time, the City does not have the facilities required to deliver this water into their distribution system. The City has estimated that the cost of wheeling water through Metropolitan Water District facilities would be over $1,300/AF, not including the wheeling charges assessed by local agencies (RBF Consulting 2013).

CMWD

CMWD is a member agency of the SWP, with a 5,000 AFY entitlement. The nearest SWP facility is Castaic Dam. In 1991, Ventura County agencies estimated that the infrastructure required to deliver water from Lake Castaic to the City of Ventura would cost approximately $120M.

There is also potential CMWD access at the City of Carpinteria, approximately 15 miles to the north of Casitas Dam, where a connection at the terminus of the South Coast Conduit (SCC), at Carpinteria Reservoir, would allow for connection to the State Water Project. However, the pipeline is the primary

source of water for the Goleta Water District, City of Santa Barbara, Montecito, Summerland, and Carpinteria Valley areas. The design and age of the system constrain the ability of the SCC to function at the original design capacity of the system. In addition, the system is already suffering demand deficits. In 2014, the available water from the State Water Project was 5%, and is not likely to change in the foreseeable future. This makes the State Water an unreliable source. Coupled with the timing of CMWD's water needs, it is unlikely that sufficient supply would be available during a dry period, even after a single large storm.

CMWD Transfers to MOWD

MOWD is a water provider in Ventura County. The District owns and operates five wells located near the Ventura River with an average annual water demand of approximately 1,100 AFY. MOWD currently receives water from CMWD on an as-needed basis. The volume of water transferred is relatively small, averaging less than 50 AFY.

MOWD Wells 1 and 2 are located along the Ventura River and represent 30% of the district's water production. In 2009, Daniel B. Stephens and Associates prepared an Assessment of Potential Impacts to MOWD Wells that indicated that the increase in fine sediments and organics due to the dam removal could cause deficiencies in the MOWD Wells 1 and 2 and potentially reduce the amount of water MOWD is able to extract, causing a deficit in water production and demand (Stephens and Associates 2009). While it is unlikely that significant quantities of fines will infiltrate below a few feet in depth (Cui, et al. 2008), fines could enter the wells through an improperly sealed wellhead during the high flow event. MOWD has indicated concern about wellhead seals. The potential loss in water production from the wells for MOWD could be mitigated through additional transfers from CMWD.

Evaluation

Cost – CMWD sells water to MOWD at a rate of $2.30/100 cubic feet (CF)) (MOWD 2014). The volume of additional water to be transferred was determined by assuming Wells 1 and 2 would be inoperable for up to three weeks out of the year, during and following accumulated sediment flushing. The deficit volume of water is estimated at 82.5 AFY. The cost of purchasing the deficit volume from CMWD is estimated at $20 thousand (K).

Environmental – There are no environmental concerns with MOWD purchasing additional water from CMWD.

Feasibility – No additional infrastructure or construction is needed as CMWD currently transfers water to MOWD. The volume of water to be transferred could be scaled, as needed, based on the operational status of Wells 1 and 2.

Adaptability – Once sediment and organic levels in the river return to normal, the volume of water transferred from CMWD to MOWD would revert to typical volumes.

5.3.2.3 Groundwater Transfers

According to the California Water Code, water transfer agreements between users are desirable when they alleviate temporary local shortages. However, the process for enacting temporary transfers is potentially

onerous and, particularly in a time of drought, is unlikely to be approved, as there is unlikely to be sufficient water available for a transfer to occur without impact to existing users. DWR has prepared a white paper (DWR 2014) explaining the basic requirements for implementation of water transfers, which indicates that:

> "…water can be transferred … if the State Water Resources Control Board can make the following findings: (1) the proposed transfer would not injure any legal use of the water, during any hydrologic condition and (2) the proposed temporary water transfer would not unreasonably affect fish, wildlife, or other in-stream beneficial uses. If the SWRCB cannot make the above findings within 60 days, it is to notice and subsequently hold a hearing. The 60-day time period can be extended if approved by the permittee or licensee. The time required to hold a hearing would delay most temporary transfers to the point that they could not take place in the year proposed."

Groundwater could be transferred out of one of the nearby groundwater basins, such as Ojai, only for a scenario where recent precipitation has allowed the groundwater to recharge, but reservoir levels have not yet recuperated from the drought. However, all local groundwater basins are sufficiently depleted at the time of this report to render this option infeasible. In the event that the project is implemented during a wet cycle instead, this option will not be needed, as there is likely to be sufficient water in Casitas Reservoir to meet needs.

5.3.2.4 Desalination

In this option, a new desalination plant would be constructed to replace the lost diversion volumes due to the increased sediment and organics load from the dam removal. The desalination plant was sized at 5 million gallons per day (MGD), which would be equivalent to 50% of the average annual diversions that Casitas Reservoir receives through the Robles-Casitas Canal.

The desalination plant would require an open ocean intake and new transmission infrastructure to convey water to the existing distribution system.

Evaluation

Cost – The estimated cost of the desalination plant is $65M. This cost does not include the transmission facilities that are required to connect the plant to the distribution system

Environmental – A new desalination plant would present significant environmental concerns and be subject to an extensive environmental review.

Feasibility – Due to the environmental permitting required, the construction of a new desalination plant would be difficult to implement in a timely manner.

Adaptability – The desalination plant would continue to operate after the dam removal project is complete and function as an additional water source. Water production from the plant is not subject to local hydrology and as such would provide a measure of drought protection.

5.3.2.5 New Wells in Santa Paula Basin

CMWD provides approximately 5,000 AFY of supply to the City of Ventura. Any additional supply for the City of Ventura would result in reduced demand for CMWD water and is, therefore, equivalent to an additional supply for CMWD.

The City of Ventura has an entitlement of 3,000 AFY from the Santa Paula Basin. However, the City's existing wells only have a capacity of 1,600 AFY, leaving a potential additional available supply of 1,400 AFY. In order to extract the additional 1,400 AFY entitled to the City of Ventura, a new well would need to be constructed.

Evaluation

Cost – The construction cost of a new well with an average capacity of 1,400 AFY is estimated at $250K. There will be an additional cost to connect the well to the existing transmission system. The cost for the connection will depend on the location of the well and nearby infrastructure and is not considered in the cost presented above.

Environmental – No significant environmental issues are anticipated with the well construction. The City of Ventura currently operates wells that extract water from the Santa Paula ground water basin. However, the Fox Canyon Groundwater Management Agency has rejected administrative and legal attempts by the City to increase its extraction from the basin. In addition, legal action is currently pending regarding overdraft of the Oxnard Plain Groundwater Basin.

Feasibility – This option involves drilling of new wells and construction of new wellheads, which could be completed prior to the dam removal. The option is equally beneficial for all dam removal concepts. In reviewing initial drafts of this report, the City of Ventura has commented that they doubt the feasibility of this option and do not recommend it being included as an option.

Adaptability – The new wells would function as additional water supply source for the City of Ventura and could be used beyond the dam removal project, as the City is not currently using their entire water entitlements. The increased production would allow for additional operational flexibility in the future.

5.3.2.6 New Wellheads at Foster Park

The Foster Park Facilities divert water from the Ventura River via a surface and subsurface water intake owned and operated by the City of Ventura. Surface water from the Ventura River is collected via surface diversion, subsurface collector, and shallow wells. Groundwater is extracted from the Upper Ventura River Groundwater Basin via a series of wells.

As part of the Matilija Dam Ecosystem Restoration Project, two additional wells, identified as Wells No. 12 and 13, were installed at Foster Park as part of the mitigation measures of the dam removal. The wells were constructed and funded through a grant received by the VCWPD for the City of Ventura in order to mitigate potential water lost as a result of increased turbidity. However, the wells were never completed. While the wells have been drilled, wellheads have not been constructed and therefore the wells are not currently operational. The wellhead design is reportedly 90% complete.

Evaluation

Cost – The estimated cost of the two new wellheads based on the current 90% design plans is $1.5M. However, there may be potential cost savings by eliminating certain proposed project features in the current design, such as a supervisory control and data acquisition system (SCADA) system, which may not be needed for temporary mitigation purposes.

Environmental –The wells have already been drilled and only require construction of the wellheads. It is possible that no additional environmental permitting would be required. However, the National Marine Fisheries Service (NMFS) has recently noted that increased pumping could potentially impact steelhead passage and critical steelhead habitat in the Ventura River, which would need to be addressed in future studies. In addition, the Santa Barbara Channel Keepers has recently filed a lawsuit against the State Water Resources Control Board over the City of Ventura's take of water at Foster Park. The lawsuit seeks to compel the State Water Resources Control Board to perform a Reasonable Use Analysis of the City of Ventura's extraction from the Ventura River.

Feasibility – The wells have already been drilled and there are 90% design plans for the construction of the wellheads and regulatory permits. It is likely the project could be completed and the wells brought online prior to the dam removal.

Adaptability – The original purpose of the wells was specifically for mitigation purposes for the removal of Matilija Dam. However, the wells could be converted to production wells for the City once the dam removal project is completed, with limitations on extraction dependent on the City's water rights. Re-purposing the wells for alternate production would require further environmental and regulatory review.

5.3.2.7 San Antonio Creek Diversion Dam Expansion

The San Antonio Creek Spreading Grounds Rehabilitation Project was intended to reduce reliance on imported water supplies from CMWD by increasing the groundwater storage and recharge in the Ojai Valley Groundwater Basin. This would be done by diverting surface water from the San Antonio Creek into the groundwater basin through a series of infiltration ponds and recharge wells. The project stakeholders are composed of the Ojai Basin Groundwater Management Agency, the Ojai Water Conservation District, the Golden State Water Company, the CMWD and the VCWPD. The project was completed in July 2014.

This option considers the expansion of existing facilities to divert additional water from San Antonio Creek and convey the water to Casitas Reservoir via the Robles-Casitas Canal. The option assumes the maximum diversion rate is 25 cfs, identical to the existing diversions to the recharge ponds. The pipe diameter required to meet the design flow rate is 24 inches. The pipeline would be approximately 6.5 miles long and travel along existing roadways following mainly Highway 150 and Highway 33.

There may be potential customers in the Ojai Valley Groundwater Basin that are closer to the diversion site. The existing infrastructure and connection points would need to be confirmed. If diversions can be delivered to nearby customers, there could be a reduction in costs as a result of a shorter pipeline. However, it is likely that diversions from the creek will only be available during the winter seasons when

demand is typically lower. In addition, there is minimal system storage available in the Ojai Basin region. As such, the actual reduction in water demand may be less than expected.

Evaluation

Cost – The cost of the transmission pipeline is estimated at $17M.

Environmental – The project would require a comprehensive environmental review as the San Antonio Creek is the main sub-watershed for steelhead refuge. Additionally, the 25 cfs diversion in the current design is only available during a 100-year storm. In order to be useful in offsetting the effects of dam removal, the diversion would need to be modified to capture higher storm flows, which would require new permits. The increased diversion may also reduce the supply available for downstream intake facilities, such as Foster Park.

Feasibility – The right of way acquisition and environmental permitting would be a lengthy process and difficult to implement in a timely manner. The 25 cfs in the current design is only available during a 100-year storm event, which would not produce a significant volume of water.

Adaptability – Diverting San Antonio Creek flows to Casitas Reservoir would provide an additional water source and provide CMWD with greater operational flexibility. The continued use and volume available for diversion would likely be contingent on the increased diversions not negatively affecting the recharge of the Ojai Valley Groundwater Basin and the requirements for the steelhead habitat.

5.3.3 Re-use and Conservation

Specific re-use and conservation options considered are discussed in more detail below.

5.3.3.1 Ojai Valley Wastewater Treatment Plant

The Ojai Valley Wastewater Treatment Plant (WWTP) is operated by the Ojai Valley Sanitation District (OVSD) and serves approximately 20,000 residents of the City of Ojai. The plant receives average flows of 1.55 MGD. There have been studies (Nautilus Environmental 2007) that investigated implementation of a recycled water program to supply customers with recycled water, reducing the demand of potable water. Currently, the treated effluent water is discharged to the Ventura River to enhance steelhead habitat and thus, may not be available to offset other supply losses, making this option infeasible.

While the plant does not currently serve any recycled water customers, and existing agreements prohibit this, the 2007 Feasibility Report (Nautilus Environmental 2007) identified potential customers currently supplied with domestic water from the City of Ventura that could be converted to recycled water. Potential users identified included agricultural, public/institutional and industrial users.

The City of Ventura currently leases the Ojai Valley WWTP land to OVSD. As part of the agreement with the City, OVSD would be expected to deliver any recycled water to the City, should the existing mandate for steelhead be altered.

This option involves modifying the project permits to divert some of the recycled water away from steelhead habitat enhancement and for use instead by City customers, including constructing distribution pipelines to those customers.

Evaluation

Cost – The costs associated with this option are based on the construction of treatment plan upgrades and new distribution pipelines to deliver recycled water to customers. It is assumed at this time that treatment plant upgrades could cost up to $500K. The cost per mile of pipe is estimated at $300 per linear foot (LF). The length and alignment of the pipelines depends on the location of the potential customers. A recycled water program may be eligible for State grants.

Environmental – There are no direct environmental concerns with supplying customers with recycled water. However, the OVSD discharge permit currently requires all effluent from the Ojai Valley WWTP to be discharged to the Ventura River for fish habitat. This is also a requirement of the Conditional Use Permit issued by Ventura County for reconstruction of the plant (Spina, personal communication 2015). An environmental review would be required to ensure that reducing the volume of effluent discharges to the river does not cause a detrimental effect to the local habitat.

Feasibility – The Ojai Valley WWTP currently treats water to tertiary levels, but does not provide title 22 water that meets State guidelines for reuse. Therefore, construction components would include plant improvements and transmission pipelines. A recycled water distribution system could likely be completed and functional to meet the dam removal schedule. In addition, a potential demand for recycled water has been previously identified.

Adaptability – Developing a recycled water demand would remain useful after the dam removal project is completed. Substituting recycled water for existing water supplies will reduce the City's reliance on surface and subsurface diversions and provide a measure of drought protection.

5.3.3.2 Ventura Water Reclamation Facility

The VWRF is a tertiary WWTP, which provides wastewater treatment services to 98% of City residences, in addition to wastewater services for McGrath State Beach Park and the North Coast Communities. The tertiary plant is located in the Ventura Harbor area, near the mouth of the Santa Clara River.

Average annual flows to the facility total approximately 9 MGD, with a total capacity of approximately 12 MGD. Currently, the City has a small recycled water demand of 700 AFY. The recycled water customers consist of two golf courses, a City park, and landscape irrigation areas along the existing distribution alignment. The remaining effluent is discharged to the Santa Clara Estuary.

Expanding the recycled water customer base could reduce the amount of water that CMWD supplies to the City possibly resulting in increased water supply for CMWD.

This option would consist of expanding the tertiary treatment plant and constructing distribution pipelines to new customers.

Evaluation

Cost – The City of Ventura has existing infrastructure for delivering recycled water to customers. Expanding the recycled water program consists of constructing water pipelines to new customers. The estimated cost of the pipeline is $4,300 per LF. Grants may be available for expanding the recycled water program.

Environmental – Environmental concerns are limited to the effects of lower volume of discharges to the Santa Clara River Estuary. A biological review will be required to determine if the lower volumes would harm the local wildlife.

Feasibility – The VWRF already serves several customers. Expansion of the system entails identifying new customers and construction of additional pipelines to convey the recycled water. If users could be identified near the treatment facility, deliveries could likely be initiated in a timely manner.

Adaptability – Expanding the City's recycled water customer base has benefits beyond the dam removal by reducing the City's reliance on surface/subsurface diversions, which provides a measure of drought protection.

5.3.3.3 Scalping Plants in Ojai Valley

Scalping plants are small-scale wastewater treatment systems that produce recycled water by intercepting a portion of the influent in sanitary sewer mains. The wastewater is treated locally and then delivered to customers. In scalping plants, only the liquid waste is treated. The solid waste is returned to the sewer main for treatment at the local WWTP. Because the wastewater is treated locally, there is potential to reduce infrastructure costs related to piping and pumping. However, in order to produce a useable volume of recycled water, the scalping plants are required to be located in areas that generate sizeable amounts of wastewater.

The 2013 Sustainable Water Use in the Ventura River Watershed Report (Bren School of Environmental Science & Management, 2013), identified two golf courses in Ojai that could potentially be served with recycled water from scalping plants. The recycled water demand from the two golf courses is estimated at 220 AFY.

This option considers construction of a new scalping plant to produce recycled water to meet irrigation water demands at two golf courses in Ojai.

Evaluation

Cost – The 2013 Bren report estimates construction costs of a 224 AFY capacity scalping plant at $2M. Annual operations and maintenance costs are estimated at $210K. This does not include any costs associated with permitting, land acquisition, or additional required infrastructure.

There may be also added costs at the Ojai Valley WWTP. As scalping plants only treat liquid waste, the concentration of the influent to the Ojai Valley WWTP may change and potentially require modifications to treatment and/or operations.

Environmental – Currently, all effluent from the Ojai Valley WWTP is discharged to the Ventura River for fish habitat. A scalping plant intercepts influent that would normally be delivered to the treatment plant. The resulting reduction in lower effluent discharge volumes to the Ventura River would require approval from regulatory agencies.

Feasibility – The location of the scalping plant requires specific site conditions in order to optimize operations. The site would need to be located near a sanitary sewer force main that meets the volume requirements of the scalping plant. Additionally, the site should ideally be located near the golf courses to minimize the amount of new infrastructure required to deliver the recycled water.

Adaptability – The scalping plants could remain in operation after the dam removal. The use of recycled water is a sustainable practice and provides a measure of drought protection.

5.3.3.4 Urban and Agricultural Conservation

A main concern of the dam removal project is a loss in water volume to Casitas Reservoir during fine sediment flushing. Implementing water conservation policies would reduce demand, which is equivalent to increasing water supplies. Recent emergency drought measures are striving to reach 15-30% demand reduction in Ventura County. If local water districts are successful in implementing a conservation strategy that reaches a portion of that goal, those same measures could potentially be extended to help mitigate the potential impacts associated with dam removal. This option evaluates potential water conservation methods and their effectiveness for the City of Ventura and CMWD.

City of Ventura

Based on the City of Ventura's 2010 Urban Water Management Plan (Kennedy/Jenks 2011), the City has employed several urban conservation incentives such as rebates for high efficiency appliances (Casitas service area only), tiered water rates, and educational programs. The City has seen a 7% decrease in water demand per year since the implementation of the conservation plan, and it estimated that further savings could occur with additional incentives.

The City has recently developed a new conservation program called The Water Wise Incentive Program. The program offers monetary incentives for replacing high water use landscaping with water saving landscapes and measures.

The City has no agricultural customers so demand reductions within the City's service area are not possible through agricultural conservation programs.

CMWD

CMWD has a small urban demand and has employed conservation methods similar to the City of Ventura. While both the City of Ventura and CMWD have already enacted water conservation plans, increasing the awareness of the conservations programs available may lead to additional water savings.

CMWD has also implemented policies for agricultural efficiencies such as rebates for smart irrigation controllers and educating agricultural customers on improving irrigation distribution uniformity and irrigation scheduling.

Evaluation

Cost – The estimated cost is $100K and represents a grant to the City and CMWD for costs related to promotion of the existing water conservation programs. In addition, new programs could be developed to augment existing programs; such as requiring new, water efficient appliances whenever a home is sold. The reduction in water usage due to conservation would cause a loss of revenue in water sales. The loss in water sales is estimated at $91,000[1]

Environmental – There are no environmental concerns with this option; it would represent an environmental benefit.

Feasibility – Conservation programs have already been enacted. This option proposes increasing awareness of the programs through marketing to increase participation.

Adaptability – Expanding the urban conservation plan has benefits beyond the dam removal project. Reducing the average annual demand of water will allow the City and CMWD to maintain a higher surplus of water and allow for greater operational flexibility, especially in times of drought.

5.3.3.5 Crop Idling Transfers

Crop idling, or crop fallowing, allows water previously allocated to irrigation to be used for other purposes. The loss of any crops, or potential crops during the fallowing period represent the cost of the mitigation, as no new infrastructure is needed to move water. The value of the mitigation would lie in the total amount of water that was not used for irrigation during the fallowing period.

Since idled crops and re-allocated usage related to this project would be contained entirely within Ventura County, and no State or Federal water would be involved in the transfer, Agency approval is unlikely to be required. Developing, reviewing and approving water transfers is often a lengthy process and it is uncertain whether there would be legal ramifications to crop fallowing, but it seems likely that this would be a feasible option.

Truck crops are crops that are typically replaced at the end of their productive season, at least annually. Fallowing such crops requires at most a one-year commitment of the land, as the crops could be re-seeded the following growing season. CMWD provides water service to approximately 5,700 acres of irrigated lands, which consists primarily of avocado and citrus orchards, and a limited amount of truck crops such as flowers, strawberries, apples, and walnuts. Orchards are a high-value, long-term investment crop, and thus, only orchards near the end of their productive life would be acceptable as a water supply mitigation option. If applied toward mitigation, the trees would be fallowed and the farmer reimbursed for the reasonable market value of the crop for that year and all subsequent years for the estimated remaining productive life of the trees. In addition, an annual lease of the land would be required to offset the lost opportunity for the farmer to replace the crop.

[1] This value is based on an estimated additional conservation of 250 AFY between City of Ventura and CMWD. The water rate was estimated at $0.831 per hundred cubic feet (HCF) as shown in the CMWD 2010 Urban Water Management Plan.

Without a current and detailed land use survey, it is difficult to determine what percentage of the estimated acreage of orchards could be considered near the end of their useful life. It was assumed that no more than 10% of the total land in orchards would likely be available to fallow. Likewise, cost estimation is also difficult as different crops have different values. For the purposes of this evaluation, a unit value for avocados, with a value of $1,850 per ton (Ventura County 2014) was selected, as this is the highest value crop grown in the area and thus provides a conservative cost estimate.

Evaluation

Cost – The estimated cost for crop idling orchards near their end of useful life is $5.95M. This cost is based on the assumption that 10% of the total irrigated land acreage in CMWD is available for idling and uses the unit value of $1,850 per ton, as discussed above. The cost assumes a sufficiently large storm occurs within one year of crop idling. A delay between when crop idling commences and when a large storm event occurs may increase the costs of this option.

Environmental – There are no environmental concerns regarding crop idling.

Feasibility – A primary concern of this option is scheduling of crop idling in relation to the dam removal. The dam removal concepts are dependent on specific storm events occurring. Due to difficulty in predicting the required storm event, a scenario may occur where crops are idled, but a sufficiently large storm event does not occur and the dam removal does not proceed.

Adaptability – Due to the high costs associated with this option, crop idling would not be continued as a water conservation method after the completion of the dam removal. No unused infrastructure remaining at the end of this option would be an advantage.

5.3.4 Treatment Technologies

Treatment technologies consist of options to mitigate any unanticipated long-term increases in fine sediments and organics through the use of chemicals and/or filters. Specific treatment technology options considered are discussed in more detail below.

5.3.4.1 Robles Diversion Dam Improvements

CMWD has begun investigating the placement of new screens at Robles Diversion Dam. The goal of screen improvements would be to provide decreased maintenance and more reliable removal of debris and organics from Ventura River diversions. The additional screening could aid in the reduction of organic loading to Casitas Reservoir.

The new screens being evaluated are an engineered polymer, traveling screen made by Hydrolox and have less porosity than the existing screens. The smaller total amount of opening (40 % open compared to the existing screens, which are 49% open) could reduce diversion flow capacity. The Biological Opinion provides for a screen opening of 1.75 mm, which would be more effective at screening larger objects such as fish and debris than suspended and fine organics.

Evaluation

Cost – The cost for this option consists of the purchase and installation of new screens. From the Robles Diversion Dam Fish Screen and Fishway Project Design Plans (Borcalli and Associates, 2004), the approximate area of the screens is 5,200 square feet. The cost estimate assumes that no modifications to the channel would be necessary and that the screens could simply be replaced in the current configuration. Structural modifications may be required to ensure a minimum of 621 cfs can pass through the screens during peak flow events. At an approximate cost of $31/square foot, it is estimated that this option would cost approximately $350K, including shipping and labor.

Environmental – There would not be any significant environmental concerns as this option replaces existing infrastructure. The Hydrolox screens may have some advantages for fish due to the smaller opening size, which is more effective at fish exclusion and a possible reduction in impingement mortality over standard screens. Modifications to the existing fish screen system would require the approval of the United States (US) Bureau of Reclamation (BOR), National Marine and Fisheries Service, and the California Department of Fish and Wildlife.

Feasibility – It is unclear what the rate of organics removal would be from the new screens, given that little is known about the nature of the organics that could be stored behind Matilija Dam. The new screens could be very effective at removing larger organic particles, and there is some evidence that the spray bar design could be effective at removing debris and organic sludge buildup. Future characterization studies of the sediment behind the dam would be needed to further evaluate the potential effectiveness of this option.

Adaptability – The use of screens is part of existing standard operations. The new screens would likely result in lowered maintenance costs, less fouling, and, therefore, a more consistent performance and supply.

5.3.4.2 Robles-Casitas Canal Temporary Treatments

Improvements to the Robles-Casitas Canal would consist of the construction of treatment facilities on Federal land along the canal to allow chemical flocculation and settlement of fine sediments and organics. The fines and organics would settle out during large storm events while traveling through a series of settling basins, thus reducing the amount of fines and organics entering Casitas Reservoir. In addition, access roads would be constructed to allow removal of settled material, as needed during the dry season.

CMWD has experience with the use of flocculants along the canal. In 1985, a local wildfire burned the land adjacent to the canal, producing winter storm runoff to the canal with a significant amount of organics. CMWD employed a temporary polymer floc station to treat the runoff at the canal. CMWD indicated that the success of the floc stations was difficult to quantify. In addition, the flocculants have a short shelf life, requiring them to be replaced annually, which would result in significant waste, since large storm events do not occur on an annual basis. The chemical flocculants would routinely expire without being used.

Evaluation

Cost – The cost of this option is estimated at $1M for initial capital improvements consisting of temporary settling basins, pumps, and road improvements and $100K annually for leasing Federal land, additional operations personnel, and chemical flocculants.

Environmental – No significant environmental issues are anticipated. CMWD has previously used flocculants along the canal.

Feasibility – Managing the inventory of chemical flocculants would be difficult; they need to be made readily available for use during a storm event. The short shelf life of the chemical flocculants and the difficulty in predicting storm events may result in large volumes of expiring before they can be used.

Adaptability – The addition of flocculants to the canal would be performed with temporary stations along the canal as CMWD had previously done. Once the sediment and organics levels in the river return to typical values, the floc stations, and settling basins could be removed.

5.3.4.3 Casitas Reservoir Oxygenation Enhancement

The additional influx of organics due to the removal of Matilija Dam causes concerns of low dissolved oxygen (DO) and iron levels in Casitas Reservoir. Low DO in the lake creates increased concentrations of manganese, hydrogen sulfide, and methyl-mercury, which may hamper the reservoir's ability to maintain water quality standards and create taste and odor issues

DO levels could be increased through a diffused oxygenation system that injects oxygen into the lake. In 2013, CMWD contracted with Water Quality Solutions to provide a feasibility study for hypolimnetic oxygen system enhancements (Water Quality Solutions 2013). The study concluded that a diffused oxygen system with up to four in-lake diffusers, a liquid oxygen delivery system, and associated storage facility presented the most cost effective solution. The hypolimnetic oxygenation system would target the anoxic water below a depth of 483 feet to operate in conjunction with the existing bubbler system.

The average age of water in Lake Casitas is estimated to be ten years. As such, the organic material will reside in the lake for some time before the treatment plant sees any impacts of the additional organic loading. Mitigation options involving treatment of the lake should take this into consideration.

The hypolimnetic aeration system is under construction with three in-lake diffusers. It is anticipated that additional liquid oxygen will be required because of the increased organic loading. This mitigation option proposes support of the operating costs of the expanded oxygenation system presented in the 2013 feasibility study to mitigate the additional losses in DO and target DO concentrations of no less than 3 mg/L. A fourth diffuser line may be needed.

Evaluation

Cost – There is a lack of available information on both background levels of organics and the transport of sediments and organics within Casitas Reservoir that would allow a detailed evaluation of the impacts of the incremental increase in TSS and organics due to the dam removal. This option assumed that low DO effects would last for up to two weeks after the Robles diversion is reopened, following the two-week

closure for Phase I flushing. The 2013 feasibility study estimated the annual costs of a dissolved oxygenation system at $112K. The cost estimate for this option is $5K, based on the scaling the annual cost of $112K over the assumed impact duration of two weeks. This cost estimate does not consider the construction of a fourth diffuser.

Environmental – There are no significant environmental concerns with this option. CMWD already owns the property on which the treatment system would be placed, adjacent to the dam. Low DO can result in a variety of environmental issues and, therefore, increasing the DO levels is generally considered a benefit for the local ecosystem.

Feasibility – The 2013 Feasibility Study concluded that the diffused oxygenation system could be effective in increasing lake DO levels. The latest version of the aeration de-stratification system was installed in 2005 and remains in operation.

Adaptability – CMWD has experienced low DO issues in the lake over recent years due to warm seasonal conditions that promote the development of a thermocline, as well as the existing issues with naturally occurring organics. The concerns are more prevalent during the late summer and fall seasons. Use of the expanded oxygenation system could be continued even after the dam removal project and may allow the lake to maintain more consistent DO levels throughout the year.

5.3.4.4 Back-flushing of Meiners Oaks Wells 1 and 2

MOWD has expressed concerns that the increased fine sediment and organic loads from the dam removal will have negative impacts on the efficiency of Wells 1 and 2 due to fine material becoming lodged in them through unsealed well casings and resulting bacteriological presence and scale buildup on well casing perforations.

Wells 1 and 2 represent 30% of the MOWD water supply. A reduction in the efficiency of these wells would represent a significant decrease in water supply for this provider.

Well efficiency could be maintained through a back-flushing operation to dislodge material buildup and organic growth on the well casings following the Phase I flushing event, should the wells be impacted. Back-flushing consists of sending highly pressurized water in the opposite direction of water extraction for approximately 30 minutes. No additional infrastructure is needed for this option; back-flushing is currently part of MOWD standard operations.

Evaluation

Cost – The estimated cost for one back-flush service for each well, plus swabbing to remove scale, is $20K, based on the additional hours for operations staff and volume of water used.

Environmental – There are no environmental concerns with well back-flushing, which is performed as part of standard operations.

Feasibility – There is no new infrastructure or operations adjustments required for this option. The back-flush could be performed on an as-needed basis, based on the amount material buildup on the well casings.

Adaptability – Back-flushing is already routinely performed and is an effective method for removing buildup. The additional back-flushing would likely only be necessary once, following accumulated sediment flushing. This mitigation option is completely flexible as there is no new infrastructure required and it would only need to be performed if the wells were impacted by the accumulated sediment flushing. If there were no impact to the wells, the additional back-flushing would not need to be performed.

5.3.4.5 CMWD Water Treatment Plant Improvements

The CMWD Marion Walker Water Pressure Filtration Plant treats water from the Casitas Reservoir for potable use. The plant has a maximum capacity of 100 cfs but averages 56 cfs. CMWD has expressed concerns that the increased fine sediment and organic loads will have a significant impact on water quality that could make the water more difficult to treat. While CMWD is not expected to divert water during the peak flows associated with sediment flushing, it is already diverting water at high sediment concentrations during certain storm events. The following options are intended to provide treatment plant improvements to accommodate and treat higher sediment and organic loads than it presently does.

5.3.4.5.1 System Modifications

Based on a review of the Plant Process Flow Diagram (Sverdrup Civil, Inc. 1995), operational improvements and system modifications could be made that would allow the water treatment plant to maintain the required water quality levels.

Because the filtration plant is capable of treating a maximum of 100 cfs but averages 56 cfs, the filtration plant could potentially remove additional turbidity and/or TSS concentration and maintain averages of approximately 56 cfs with similar water quality. Operations would be similar with the possible exception of additional flocculation chemicals, back-wash cycles, and/or sludge volumes from higher turbidity levels.

If a higher water quality was proved to be necessary due to higher turbidity and/or TSS concentration, system modifications could convert the filtration plant to a double pass from the current single pass. The system modifications would include additional instrumentation, piping, fittings, valving, and PLC or SCADA updates. High turbidity incidents would be registered by the filtration plant inlet inline turbidity meter and could automatically convert the plant to a double pass system. Figure 5.3-2 below presents a schematic of the new piping and automatic valves (in red) to convert the existing system to a double pass filtration plant. The filtration plant performance and capacity will depend on the influent turbidity and TSS concentration and have to be tested; however, it will be less than the current maximum capacity of 100 cfs. Additional study and performance tests would be required to determine whether the system modifications meet peak demands.

The filtration plant could convert back to single pass after high turbidity incidents. All other system operations would be similar. Additionally, higher turbidity may require additional flocculation chemicals and backwash cycles and/or generate additional sludge volumes. The current filtration media could be retained.

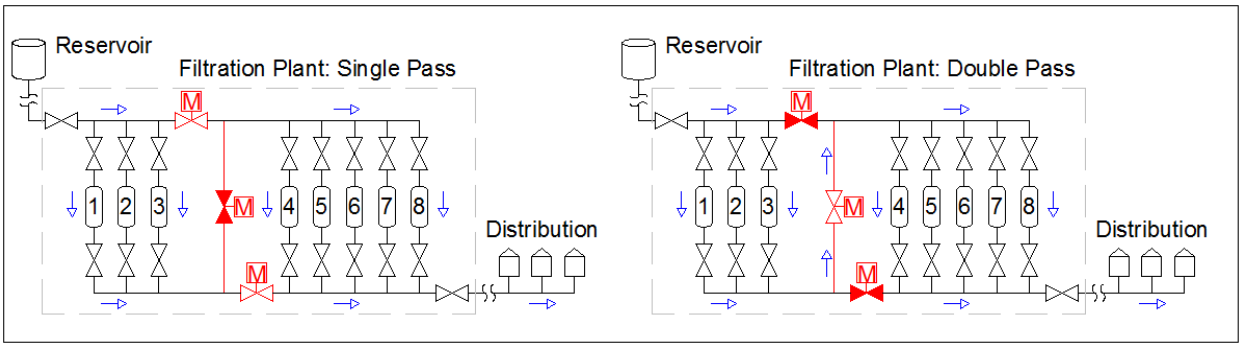

Figure 5.3-2. Schematic of Modified Filtration Plant with Double Pass

Evaluation

Cost – The estimated cost for improvements to the treatment plant is an initial expense of $250K for one-time plant improvements and $10K per year for additional chemicals and operations staff.

Environmental – There are no environmental impacts as the option only modifies existing operations.

Feasibility – Improvements to the water treatment plant would be effective for all three dam removal concepts. The required system modifications consists of instrumentation upgrades and do not require lengthy construction times.

Adaptability – The system improvements do not require any additional maintenance and would provide the plant additional flexibility in treating high turbidity flows.

5.3.4.5.2 Adding Roughing Filters

Roughing filters are a passive water pretreatment and/or treatment technology. They are effective in removing suspended solids, organics, and pathogens. This option involves adding roughing filters to the water treatment train at the plant.

Roughing filters are typically a series of open-top, connected rectangular structures containing different filtering materials. Water flows from one compartment to an adjacent compartment through progressively finer filtering materials. There are typically three compartments of filtering materials: coarse, medium, and fine. The compartments could be arranged in a vertical up or down flow, or a horizontal flow.

The filter performance and flow rates are determined by the filtration material sizes and cross-sectional area of the compartments. For a given system, decreasing the filtration material sizes will increase water quality but decrease flow rates. To offset the reduced flow rates, the compartment sizes could be increased to maintain flow rates with a higher water quality.

The influent hydraulic head is utilized to drive the water through the filter. The head loss across the filter is designed to be relatively low to prevent water from overtopping the open compartments. The filter and compartments will require periodic backwashing to maintain quality and performance.

Evaluation

Cost – A cost estimate was developed for two flow rates: 56 and 100 cfs representing the current average flow of the plant and the maximum capacity of the plant. The construction costs are estimated at $12.8M and $21.8M respectively. These costs represent a new pressure reducing station, roughing filter structure, filter material, pump station, miscellaneous piping, and electrical service upgrades.

Environmental – There are no environmental concerns with this option. The improvements will be within the existing water treatment plant facility.

Feasibility – New roughing filters would be effective in mitigating the increased fine sediments and organic loads. The facilities could be constructed to meet the dam removal schedule and are equally useful for all three dam removal concepts.

The water treatment plant currently utilizes the Casitas Reservoir head at approximately 120 psi to drive water across the existing filters and into the distribution system. Adding a new, pretreatment roughing filter would require the Casitas Reservoir head to be significantly reduced to near or slightly above atmospheric pressure at the inlet of the roughing filter. Due to the existing plant set up, a new pressure reducing facility would be needed. After pretreatment, the roughing filter effluent would require a new pump station to boost back the pressure of the effluent to the Casitas Reservoir head, for transporting it through the filtration plant and into the distribution system. While this setup is possible, it is rather costly and inefficient.

Adaptability – The new roughing filter facilities could remain operational after the dam removal project is complete. The additional pretreatment would provide CMWD additional flexibility in operations and maintaining water quality standards.

5.4 Evaluation matrix

Table 5.4-1 presents a summary matrix of the mitigation options evaluation and the options recommended for further analysis.

Table 5.4-1. Summary of Options Evaluation and Recommendations

Type of Mitigation	Description	Cost	Environmental	Feasibility	Adaptability	Develop Further
Diversion Replacements	Diversion from Matilija Creek to Canal	✗	✗	✗	✗	
	Diversion from NF Matilija Creek to Canal	✗	✗	✗	✗	
	Diversion from Matilija Creek to NF Matilija Creek to Canal	✗	✗	✗	✗	
Replacement Supplies	Infiltration Galleries	✗	✗	✗	✗	
	Water Transfer from SWP to CMWD via Castaic	✗	✓	✗	✓	
	Water Transfer from SWP to CMWD via Carpinteria	✓	✓	✗	✓	
	CMWD Transfers to MOWD	✓	✓	✓	✓	☑
	Groundwater Transfers	✓	✓	✗	✗	
	Desalination	✗	✗	✗	✓	
	New Wells in Santa Paula Basin	✓	✓	✗	✓	
	New Wellheads at Foster Park	✓	✓	✓	✓	☑
	San Antonio Creek Diversion Dam Expansion	✓	✓	✗	✗	
Re-Use & Conservation	Recycled Water – Ojai Valley Wastewater Treatment Plant	✓	✓	✗	✓	
	Recycled Water – Ventura Water Reclamation	✓	✓	✗	✓	
	Recycled Water – Scalping Plants in Ojai Valley	✓	✓	✗	✓	
	Urban and Agricultural Conservation	✓	✓	✓	✓	☑
	Crop Idling Transfers	✓	✓	✓	✗	☑
Treatment Technologies	Robles Diversion Dam Improvements	✓	✓	✗	✓	
	Robles-Casitas Canal Temporary Treatments	✓	✓	✗	✗	
	Casitas Reservoir Oxygenation Enhancement	✓	✓	✓	✓	☑
	Back-flushing of Meiners Oaks Wells 1 and 2	✓	✓	✓	✓	☑
	CMWD Water Treatment Plant System Modifications	✓	✓	✓	✓	☑
	CMWD Water Treatment Plant Roughing Filters	✗	✓	✗	✓	

6.0 Recommendations

Based on evaluation of the twenty-three waters supply mitigation options presented, seven are being recommended for further analysis and are summarized below in Table 6.0-1. None of these options individually is sufficient to mitigate the entire range of potential impacts associated with dam removal. It is recommended that each option be developed further in future studies to arrive at a combination of options that would work most effectively with the selected dam removal option.

Table 6.0-1summarizes the volume of water supply per year, as well as the cost, for each of the recommended options. To calculate the percent of lost supply volume (associated with dam removal), it was assumed that CMWD would suspend diversions at Robles for one large storm during the Phase I flushing event (implemented during a dry hydrologic cycle). This would equal a lost diversion volume of approximately 10,000 AF (4% of total reservoir capacity).

Table 6.0-1. Mitigation Options Recommended for Further Analysis

Type of Mitigation	Description	Volume[1.] (AFY)	Volume[2.] (% per year)	Cost ($)
Replacement Supplies	CMWD Transfers to MOWD	N/A	N/A	$20K
	New Wellheads at Foster Park	750	8%	$1.5M
Re-Use & Conservation	Urban and Agricultural Conservation	250	3%	$191K
	Crop Idling Transfers	800	8%	$5.95M
Treatment Technologies	Casitas Reservoir Oxygenation Enhancement	N/A	N/A	$5K
	Back-flushing of Meiners Oaks Wells 1 and 2	83	1%	$20K
	CMWD Water Treatment Plant System Modifications	Varies[3.]	Varies[3.]	$250K + $10K/year

4. Potential additional or saved volume of water.
5. Potential percentage of lost water volume (4% or 10,000 AF).
6. Amount of volume mitigated depends on level of additional treatment implemented.

Impacts to MOWD from dam removal could be mitigated by importing additional water from CMWD at surcharged rates, as well as by providing a one-time back-flushing of Wells 1 and 2, following the sediment flushing period associated with dam removal.

Conservation and crop idling would increase the overall flexibility of water supply and benefit all water users, while being relatively low-impact in terms of cost and the environment. While the quantity obtainable from crop idling would vary depending on the agreements that could be reached with local landowners, these options are likely to be feasible.

Finally, some water quality impacts are likely at Casitas Reservoir and MOWD, where treatment options could best address organics and fines in the water supply. These options will improve the ability to procure and deliver water that meets delivery water quality standards. However, additional characterization of the existing reservoir sediment would help to quantify the water quality impacts.

As discussed in Section 1.1, the evaluation of mitigation options presented in this report is preliminary in nature. Before implementation of any mitigation measures, input should be sought from regional

stakeholders, and legal, environmental and other considerations should be researched further. In addition, preliminary design and cost estimating will be required for each option to determine constructability, the lost volume of Robles diversion that could be offset, and the total return on investment.

7.0 Statement of Limitations

The services presented herein were conducted in a manner consistent with the standard of care ordinarily applied as the state of practice in the profession in developing the water supply mitigation options for dam removal and their associated construction costs, given the amount of existing site and design information available at the time of preparation of this report. No other warranties, expressed or implied, are included or intended in this document.

No field work was conducted for this study. This report is conceptual or preliminary in nature and is not to be used as the sole basis for final design or construction, or as a basis for major capital decisions. Further detailed design should be performed prior to such decisions.

Some background information, design bases, and other data used by AECOM in preparing this report have been furnished by the US BOR, CMWD, VCWPD, and/or third parties. AECOM has relied on this information as furnished, and is neither responsible for nor has confirmed the accuracy of this information.

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MATILIJA DAM REMOVAL, SEDIMENT TRANSPORT, AND ROBLES DIVERSION MITIGATION PROJECT

WATER SUPPLY MITIGATION OPTIONS EVALUATION REPORT

MARCH 2016

ATTACHMENT 1: DESIGN OVERSIGHT GROUP COMMENTS

Surfrider Foundation

Ventura County Chapter – Matilija Coalition
PO Box 1028, Ventura, CA 93002
(805) 205-4953 **www.matilija-coalition.org**

October 17, 2015

Peter A. Sheydayi, P.E., D.WRE
Deputy Director, Design and Construction Division
Ventura County Watershed Protection District
800 S. Victoria Avenue Ventura, CA 93009-1610

RE: Matilija Dam Removal, Sediment Transport, and Robles Diversion Mitigation Project

Dear Mr. Sheydayi,

I am writing on behalf of the Matilija Coalition, an alliance of organizations, businesses and citizens committed to the removal of Matilija Dam and the restoration of the Ventura River. I have appreciated the opportunity to serve on the Technical Advisory Committee, as well as the consultant selection committee and the steering committee for the recently completed studies. Recognizing that there is still work to be done, I believe that the results of these studies provide a renewed opportunity to achieve our shared goals in an affordable and timely manner.

Comments on Project Alternatives:

The studies presented in the **Matilija Task 1.3 Draft Concepts Evaluation Report** benefit from information that was not available during the federal feasibility study of 2001-2004. Since then, several large dams have been removed from rivers on the west coast of the United States, and much has been learned. We now have real world examples demonstrating the power and resilience of riverine ecosystems to restore themselves, if given the chance. In every case, fish immediately migrated upstream of the former dam site, and downstream ecosystems absorbed and benefitted from the increased sediment transport. In no case were permanent negative impacts realized. And most notably, in the case of Condit Dam removal, we have witnessed the power of a single event to almost instantaneously reverse decades of negative impacts to a river through what was once predicted to result in "total biological annihilation."

The current studies apply this real world experience to demonstrate how the short-term impacts of a single sediment release will not permanently affect our local water supply. This provides a scientifically justified opportunity to take advantage of the energy of the Ventura River, saving tens of millions of dollars over mechanically moving and disposing of sediment, while significantly reducing the environmental footprint of the project.

1. ***Dam Removal Concept DRC-2:***

The analysis demonstrates that DRC-2, the low level orifice concept, provides the greatest benefits and least impact of the alternatives analyzed. This validates our previous comments, which have consistently advocated for natural transport of the sediments sequestered behind the dam. Because this is also the lowest cost approach, it is likely the most feasible from a funding standpoint.

2. Dam Removal Concept DRC-3:

DRC-3, the upstream sediment storage alternative essentially optimizes the "Alternative 4b" previously identified in the federal feasibility study completed in 2004, by eliminating the problematic slurry and disposal of fine sediments. However, the greater cost and increased impact caused by mechanical transport of a portion of the sediment make this less desirable than DRC-2.

3. Dam Removal Concept DRC-1:

DRC-1 as currently conceived is not a preferred option. The permanent and temporary impacts of constructing a tunnel through a geologically unstable ridge are unjustified for the cost. The multi-year dewatering of Matilija Creek and high discharges into N Fork Matilija Creek will cause undue stress to the aquatic ecosystem. There is also the potential for elevated risk to water supply and other downstream interests from temporary earthen cofferdams during intermediate storms.

We concur with the report's ranking of the alternatives, and support DRC-2 as the preferred alternative for achieving ecosystem restoration through dam removal.

Comments on Technical Assessments:

5.2 Steelhead Health

The comparative analysis uses steelhead health downstream of the Matilija Dam site as a parameter in evaluating the different alternatives. In some cases it assumes mortality of aquatic life downstream:

- *both DRC-1 and DRC-2 results in the substantial, but likely not complete, loss of a year class of fish in Matilija Creek and the Ventura River.*

This is a conservative conclusion, and while these dam removal alternatives will clearly create adverse downstream conditions, the report also states:

- *Matilija can obviously prove to be a challenging environment for steelhead to thrive; these conditions also stress the importance of tributary habitat, which provide refuge habitat from these natural events (and presumably would serve the same function following dam removal as well),* ***because a nominally lethal, high-sediment condition in a channel with available refugia does not necessarily result in mortality for mobile organisms that have evolved under these conditions****.*

In addition to the refugia value of tributaries such as the North Fork Matilija Creek and San Antonio Creek, a significant proportion of the native steelhead population resides in these tributaries as well as the headwaters upstream of the dam site. (see: **Steelhead Population and Habitat Assessment in the Ventura River / Matilija Creek Basin 2006-2012 FINAL REPORT (2015)**) So although there will certainly be impacts to downstream populations in the main stem of the Ventura River, decision makers should recognize that DRC-1 and DRC-2 will not result in the complete loss of the steelhead population. (One may even reasonably expect Phase I sediment release impacts to be similar to past geological events, hence within the evolutionary experience of the southern steelhead.)

Importantly, the study concludes that;

- *Phase II transport for all three dam removal concepts will likely have an indiscernible incremental effect over baseline conditions.*

The analyses clearly illustrate that, given the climate, geology, and naturally high sediment loads regularly experienced in the Ventura River, the future post-dam-removal fine sediment impacts will be within the natural range of turbidity for high flow events. This conclusion opens the way for implementation of cost-effective natural transport alternatives for dam removal without the previous fear of long-term downstream impacts.

Comments on Water supply mitigation:

The ***Matilija Task 3.2 Hydrologic Assessment for Water Supply*** study provides a comprehensive review of the contribution of Robles Diversion to Casitas Municipal Water District and the potential impacts of missed diversions on reservoir storage levels. This is also new information, which opens up opportunities above and beyond the assumptions made during the federal Feasibility process.

Most notably, the recent analysis revealed that diversions from the Ventura River at Robles have historically provided 23% of storage in Lake Casitas, in contrast to the prior assumption that Robles contributed fully 50% of supply. Furthermore, the analysis reveals that based on historic data, a single missed diversion event will only temporarily impact reservoir storage by 4-6%, and that this loss will be made up in the next flood event. While recognizing that this is only an estimate, this analysis provides a renewed perspective of the actual risk posed by utilizing natural transport to expedite dam removal. Most importantly, **it is now understood that a single missed diversion event is feasible**.

The ***Matilija Task 3.3 Water Supply Mitigation*** report presents a range of mitigation measures for water supply. However, based on the ***Task 3.2 Hydrologic Assessment for Water Supply*** analysis, it appears that water supply mitigation will not be necessary as a result of the project. Therefore, these measures should be considered part of a contingency plan rather than required mitigation for the project.

It is important to note that the impact of 4-6% reduction in storage is within the variability of diversion efficiency and conservation measures. The current operations are subject to fouling of fish screens, or even complete failure of the diversion dam (as in 1969), resulting in lost diversion opportunity. Also, current drought conservation efforts have successfully reduced demand by over 25%, demonstrating the feasibility of current and future conservation measures.

Moreover, this "loss" is not realized unless the lake runs dry and there is no supply to deliver to customers. Of relevance is the recent federal court decision regarding Robles Diversion, which determined that Casitas "…can establish a compensable injury when diversions resulting from the biological opinion criteria reduce the water project's safe yield to the point when deliveries are affected—i.e., to the point when use becomes constrained." (Casitas v United States, 102 Fed.Cl. at 473 – http://caselaw.findlaw.com/us-federal-circuit/1623229.html#sthash.0DL3qkmC.dpuf) As demonstrated in the ***Hydrologic Assessment for Water Supply*** analysis, it is highly unlikely that the project will result in delivery constraints to water use.

In the course of discussion there has also been concern over the impacts of silt on other water supplies, specifically the City of Ventura water diversions at Foster Park and Meiners Oaks Water District wells in the upper basin.

4.2.1.2 Ventura Water - Our understanding is that the City no longer uses the surface diversion that was the original justification for "mitigation wells" in the federal Feasibility Study. Water diversions are currently served by a well field at this location.

4.2.2 Groundwater - This section does not mention Meiners Oaks Water District concerns that silt will plug groundwater wells.
During the recent meeting, the consultants referenced case studies that demonstrate minimal impacts to groundwater pumping from silt-laden surface flows. This information and studies should be included in the final report.

The ***Task 3.3 Water Supply Mitigation*** report identifies several contingency measures that would provide adequate assurance that water supply reliability will be maintained during the short period of sediment release and/or if silt affects downstream wells. These include using Casitas water as backup/replacement supply, backflushing wells if silt does pose a problem, and CMWD Water Treatment Plant System Modifications.

Aside from these immediate contingency measures, conservation provides the greatest opportunity to offset any additional loss of water supply and provides a long-term benefit to the watershed, assuming that the yield is not seen as a new or "surplus" supply to induce growth.

Recommendations:

1. Pursue DRC-2 as the least cost, least impact, greatest benefit project
2. Re-examine downstream mitigation components for further cost reduction
3. Use consensus as a path forward for funding
4. Assess non-federal funding options to piece together State and local resources
5. Develop a Ventura River Parkway and Restoration Plan to solidify public support for local funding initiative

1. Pursue DRC-2 as the least cost, least impact, greatest benefit project
Of the alternatives analyzed, the low-level orifice concept provides the greatest potential benefit with the least impact. Because this is also the lowest cost approach, it is likely the most achievable in a reasonable timeframe given the current funding constraints.

2. Re-examine downstream mitigation components for further cost reduction
Further cost reductions may be possible by re-examining previously identified mitigation measures. Additional analysis should be conducted to reevaluate the downstream project components, such as levees and water supply mitigation, for potential project cost reductions. For example, the flood control objectives of the proposed Meiners Oaks levee may be achieved with a buried floodwall, which would not only reduce the long-term O&M costs but also minimize the impacts associated with a standard levee design (i.e. fencing, pesticides, herbicides, aesthetics, public access, etc.)

3. Use consensus as a path forward for funding
In recent years it has been difficult to develop a path for funding the project. Although everyone has agreed that Matilija Dam needs to be removed, the lack of project consensus has been problematic. There is now an opportunity to build support around a more affordable least impact project that everyone can agree on.

4. Assess non-federal funding options to piece together State and local resources
Regardless of whether this is a federal or nonfederal project, it will likely require at least $40 million in non-federal monies. This will require a mix of State, local, and private funding.

5. Develop a Ventura River Parkway and Restoration Plan to solidify public support for local funding initiative
The Ventura River Parkway has a strong local constituency with the Friends of the Ventura River coalition of local organizations. Recent progress includes National Recreation Trail designation of the Ventura River/Ojai Valley bike path, acquisition and restoration of hundreds of acres of floodplain and adjacent upland, and a growing recreation trail network. Incorporating public amenities into a Ventura River Parkway and Restoration Plan that includes Matilija Dam removal will help solidify public support for a dedicated local funding initiative.

On behalf of the Matilija Coalition I would like to thank the Ventura County Watershed Protection District for its ongoing support of this project, and the California Coastal Conservancy for sponsoring these important studies. We anticipate that the stakeholder group will reach consensus on a path forward, and look forward to continued progress in the near future.

Sincerely,

A. Paul Jenkin
Coordinator, Matilija Coalition
Ventura Campaign Coordinator, Surfrider Foundation
(805) 205-4953 pjenkin@surfrider.org

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

October 15, 2015

Tully Clifford, Director
Ventura County Watershed Protection District
800 So. Victoria Avenue,
Ventura, California 93003

RE: Matilija Dam Removal, Sediment Transport, and Robles Diversion Mitigation Project

Dear. Mr. Clifford:

NOAA's National Marine Fisheries Service has reviewed the two studies conducted by AECOM and Stillwater Sciences for the Ventura County Watershed Protection District (County) (Draft Dam Removal Concepts Evaluation Report, and Draft Water Supply Mitigation Concepts Evaluation Report, August 13, 2015) and hereby provides the County with preliminary comments on these two documents.

To begin with, we acknowledge the work of the County, consultants, and the various Matilija technical advisory groups in preparing these studies. These investigations have identified, at a conceptual level, a number of technically feasible, environmentally sound, and economically attractive alternatives for the removal of Matilija dam and the management of sediments, particularly fine sediments.

All three of the alternatives appear superior to the 4B alternative initially authorized by the Water Resources Development Act (WRDA) of 2007, in terms of costs, constructability, and environmental impacts and benefits. Of the three alternatives identified, Alternative DRC-2A and 2B (double bore holes) warrants further focused analysis, while potentially including elements of Alternative DRC-3 (temporary sediment storage). Based on the level of information and analysis provided in the studies, Alternative DRC-1 (bypass tunnel) has more components adding to the costs and uncertainties, making further development of that alternative a lower priority.

While the matrix of potential mitigation measures indicates that several actions might be feasible, the actual need for specific mitigation measures is not supported by the analysis; the retained options would be better characterized as "contingency" actions, pending the completion of an analysis that demonstrates they are in fact mitigations that address identified impacts. This should be the focus of follow-up design work.

Our detailed comments and suggested changes to the studies are contained in the enclosure. We hope these comments will be useful in finalizing both draft reports and provide guidance in taking the next steps in finalizing and implementing plans for the removal of Matilija Dam and the restoration of the Ventura River ecosystem.

If you have a question regarding these comments, please contact either Mark H. Capelli at (805) 963-6478 (mark.capelli@noaa.gov) or Brian L. Cluer at (707) 575-6061 (brian.cluer@noaa.gov).

Sincerely,

Anthony P. Spina
Chief, Southern California Branch
California Coastal Office

Enclosure

cc: Peter Shedaydi, Ventura County Watershed Protection District
Mary Larson, California Department of Fish Wildlife
Chris Dellith, U.S. Fish and Wildlife Service
Kevin Cooper, U.S. Forest Service
Kristi Klose, U.S. Forest Service
Steve Wickstrum, Casitas Municipal Water District
Darrel Buxton, U.S. Army Corps of Engineers
Sam Jenniches, California Coastal Conservancy
Administrative File: 151422SWR2002PR8272

COMMENTS OF NOAA'S NATIONAL MARINE FISHERIES SERVICE ON THE DRAFT DAM REMOVAL CONCEPTS EVALUATION REPORT AND THE DRAFT WATER SUPPLY MITIGATION CONCEPTS EVALUATION REPORT

October 14, 2015

Draft Dam Removal Concepts Evaluation Report

1.1 Project Background

Page 1

Lines 16-17. Suggest modifying the sentence to read "was one of the most productive steelhead spawning and rearing habitats in the Ventura River system, and provided important refugia habitat within the Los Padres National Forest."

Page 6

Lines 1-12. Suggest you modify the sentence to read "concerns over cost, constructability, and habitat and visual impacts, of the downstream disposal options for the fine sediment."

2.0 Project Objectives & Evaluation Criteria

Page 8.

2.1 Project Objectives

Line 13. Please clarify what is meant by "within the context of the federally authorized project." Alternatives DRC-1, DRC2A, and DRC-2B are substantially different from the 4B federally authorized project, and the consistency of Alternative 3 with the COE WRDA authorized project is unclear. It should also be noted that these new alternatives are not the COE WRDA authorized project covered by NMFS's Biological Opinion for the Matilija Dam Ecosystem Restoration Project.
The phrase "within the context of the federally authorize project" should be omitted to avoid any ambiguity and ensure consistency with a later statement that such an evaluation is not within the scope of the study plan.

3.0 Concept Descriptions

Page 13.

Lines 17-18. Please specify the nature and scope of "future fine sediment characterization" studies (either here or in some other part of the study); such studies should include characterization of where organic sediments are concentrated.

3.1 Dam Removal Concept – 1: Containment Berm with High Flow Bypass

Page 14.

Line 7. Please also express the discharge of 1,700 cubic feet per second in terms of a flood-frequency return interval.

Page 15.

Figure 3.1.1

Please clarify how juvenile or adult steelhead would migrate around the downstream temporary sediment containment berm under varying flow conditions, or the timing of its removal or modification, to allow steelhead passage in conjunction with the upstream cofferdam.

3.3.1 Bypass Tunnel

Page 16.

Lines 10-19. Please explain how large sediment (boulders) or woody debris originating from upstream would be either kept out of the bypass tunnel or be removed to prevent the blockage of flows or the unplanned breaching of the cofferdam. The study notes that the vertical orientation of the geologic formation through which with the tunnel would be carved could potentially contribute to the sediment loading within the bypass tunnel. This is one of a number of uncertainties with Alternative DRC-1. Others include how the abandonment of the tunnel would be accomplished, and the management of the downstream temporary containment berm. We also note that during the during period the tunnel would be used to bypass Matilija Creek flows it would be accessible from both Matilija Canyon Road and Highway 33 and could be an attractive nuisance, and its subsequent sealing could result in visual impacts from the two public roadways.

3.1.3 Temporary Containment Berm

Page 18.

Line 5. A 5-year storm event is not 115 cfs as indicated; this return interval should be re-calculated.

Pages 17-18.

See comment above temporary containment Berm.

3.3 Dam removal Concept – 3: Temporary Upstream Storage of Fine Sediment

Page 24.

Lines 12-17. The temporarily stored sediments would be considerably above the new surface flows (and groundwater) level as a result of the pilot channel excavation. These would most likely result in conditions unconducive to the support of riparian vegetation. The situation could persist for some extended period (years or decades), resulting in the extended loss of the existing vegetation until the sediments had been eroded down to the pre-dam streambed elevation. This aspect of DRC-3 should be reflected in the brief discussion of impacts to existing vegetation communities.

4.0 Technical Assessments

Page 28.

Lines 6-9. The temporary storage of sediments in the reservoir area could persist for a number of years (perhaps decades). This impact extends beyond the existing vegetation to include future vegetation succession, and is therefore a long term effect which would delay or prevent the reestablishment of certain vegetation communities, particularly riparian. See comment above.

4.0 Technical Assessments

4.2 Erosion and Transport of Impoundment Sediments

4.2.2 Organic Concentrations

Page 46.

Lines 18-19. See comments above specifying the nature and scope of "future fine sediment characterization" studies.

4.4 Steelhead Health Downstream of the Matilija Dam Site

Pages 59-60.

Lines 1-8. The question of the lethal and sub-lethal effects on steelhead is complex. No study on the behavior or tolerance of steelhead in the southern extreme of their range, where sediment loading is periodically and naturally extremely high, have been conducted. However, *Oncorhynchus mykiss* have been shown to exhibit a higher level of tolerance to sediment than other *Oncorhynchus* species (See for example, T.C. Bjorum *In* Stoltz and Schnell (ed.) Trout (1991). The analysis presented in this study should therefore be considered conservative, in the sense that is may over-estimate the projected sediment level effects on *O.* mykiss in the Ventura River system.

Figures 4.4-1, 4.4-2 and 4.4-3 See comment above regarding sediment impacts on *O. mykiss.*

Lines 8-12. Matilija Creek itself is one of several tributaries to the Ventura River, with several sub tributaries (*e.g.*, Upper North Fork, Murrieta Creek).

5.0 Results and Discussion

5.1 Steelhead Passage through the Project Area

Page 67.

Lines 26-29. While the waiting period for a large sediment-mobilization event associated with alternative DRC-3 is similar to DRC-1 and DRC-2, the time for the complete evacuation of the temporarily stored and protected sediments would likely take much longer because of the storage of sediments dredged from the pilot channel, and the temporary erosion protection. See comment above.

5.2 Steelhead Health

5.2.1. Impacts Under DRC-1

Page 69.

Lines 19-22 See comments above regarding projected impacts of elevated sediments on steelhead.

5.2.3 Impacts Under DRC-3

Page 71.

Lines 13-21 As noted above the projected levels of elevated sediments (on a periodic basis) could be extended over a considerable period of time (multiple years) as a result of the temporary stock-piling of sediments within the reservoir area. This is a potentially significant difference between alternatives DRC-1 and DRC-2. See comment above.

5.2.4 Summary

Page 71.

Lines 24-25 Suggest changing the phrase "with a one-time loss of most if not all fish in the system" to "with a potential loss of a significant number of fish, including but not limited to steelhead, and other aquatic organisms in the project area and downstream in Matilija Creek and the mainstem of the Ventura River . . . ," See comments above regarding sediment impacts on steelhead.

5.7 Water Supply

5.7-2 Water Supply Criteria Results

Lines 13-15. Phase II impacts on riparian vegetation for DRC-3 could be extended over a considerable period of time (multiple years) as a result of the temporary stock-piling of sediments within the reservoir area. This alternative could result in extending impacts on water quality/supply and riparian vegetation. This is a potentially significant difference between alternatives DRC-1 and DRC-2. These impacts should be reflected the brief discussion on DRC-3 vegetation impacts, as well as in section 5.2.3. See comments above.

Page 90.

Lines 3-6. Please clarify what is meant by drop in storage by 15%. Is this 15% of the total potential storage capacity of the Casitas Reservoir, or a 15% reduction in what would have otherwise been diverted and stored without the projected disruption in diversions?

Draft Water Supply Mitigation Concepts Evaluation Report

1.0 Introduction

Page 3.

Lines 17-17. The need for specific mitigation measures is not supported by the analysis; the options would be better characterized as "contingency actions" and should be described as such, pending the completion of an analysis that demonstrates that they are in fact mitigations that address identified impacts. This should be the focus of follow-up design work. Also, as noted above, the new alternatives to which these mitigation concepts are intended to apply are not the COE WRDA authorized project covered by NMFS's Biological Opinion for the Matilija Dam Ecosystem Restoration Project.
See additional comments below regarding impacts on groundwater well field operations.

4.0 Potential Impacts to Providers

4.1 Increased Suspended Sediment

Page 17.

Lines 9-14. While the Phase II impacts of alternatives DRC-1, DRC-2, and DRC-3 are broadly equivalent, Phase II impacts on riparian vegetation within the reservoir area for DRC-3 could be extended over a considerable period of time (multiple years) as a result of the temporary stock-piling of sediments within the reservoir area. This is a potentially significant difference between alternatives DRC-1 and DRC-2 which do not involve temporary storage and erosion protection of sediments, and should be reflected in the brief discussion in section in 4.1. See comments above.

4.1.2 Groundwater

Page 18.

Lines 2-12. The finding that elevated suspended sediments in the Ventura River from the various removal alternatives would not adversely impact groundwater supplies (as a result of the infiltration into the aquifer) and related groundwater extraction operations is significant new information. We believe this finding obviates the need for some of the mitigations identified in the report, specifically new well heads at Foster Park. See additional comments below.

5.0 Mitigation Options

Page 21.

Line 1. Re-title this section "Contingency Options".

Page 21.

Lines 3-5. This section needs to further develop the option to avoid surface diversions when Phase I sediment impacts are expected. This would include, in addition to the deployment of the gates associated with DRC-2B, the potential manipulation of fine sediments between storm flows to facilitate their evacuation in subsequent storm events. Additionally, the need for any water supply mitigation during Phase II impacts should be clearly related to actual impacts The uncertainties in hydrology that may manifest during and shortly after dam removal is likely the greatest source of uncertainty in all of the alternatives. Further analyzing multiple possible hydrologic scenarios to refine dam removal timing and adaptive management measures would further reduce uncertainty in water supply and further identify the scale and type of potential mitigation needs.

5.1 Types of Mitigations

Page 21.

Table 5-1 Summary of Mitigation Alternative Types.

See comment above regarding new well heads at Foster Park.

5.3 Description and Evaluation of Mitigation Options

5.3.1 Diversion Replacement (Full or Partial)

Lines 6-8. All three of these options (Matilija Creek Diversion to Robles-Casitas Canal; North Fork Matilija Diver to Roble-Casitas Canal; Matilija Creek Diversion to North fork Matilija Diversion to Roble-Casitas Canal) could potentially adversely impacts steelhead as well as other aquatic organisms and riparian vegetation, and these potential impacts should be acknowledged in the environmental evaluation summaries.

5.3.1.1 Matilija Creek Diversion to Robles-Casitas Canal

Page 24.

Lines 29-30. See comment above regarding environmental impacts.

5.3.1.2 North Fork Matilija Creek Diversion to Robles-Casita Canal

Page 25.

Lines 16-17. See comment above regarding environmental impacts.

5.3.1.3 Matilija Creek Diversion to North Fork Matilija Creek Diversion to Robles-Casitas Canal

Lines 25-26. See comment above regarding environmental impacts.

Lines 8-9 See comment above regarding environmental impacts.

5.3.2.1 Infiltration Galleries

Page 27.

Lines 1-2 See comment above regarding environmental impacts.

5.3.2.5 New Well Heads at Foster Park

Page 30.

Lines 17-26. As noted above, the finding that elevated suspended sediments in the Ventura River from the various removal alternatives would not adversely impact groundwater supplies and related groundwater extraction operations obviates the need for the mitigations identified for the wells at Foster Park.

Lines 31-36. The installation and operation of new well heads at the Foster Park wells, with increased pumping capacity, could potentially adversely impact steelhead and designated steelhead critical habitat in the Ventura River. The magnitude, timing and duration of surface flows, and thus the quantity and quality of critical habitat, within the lower Ventura River could be affected by the operations of these wells to varying degrees, depending on the time of year, the amount of rainfall during the wet season, and the rate of withdrawals from the wells.

The principal potential adverse effect of well operations in the Foster Park area are the loss of summer rearing habitat for juvenile steelhead as well as other aquatic organisms. However, adverse effects could also occur to migrating adult steelhead, spawning steelhead, eggs and fry if flows are reduced to critical levels during adult steelhead migration and spawning.

Potentially all juvenile steelhead in the Ventura River watershed could use the Foster Park area at some point in their life cycle, either for rearing or as a migration corridor on their return to the ocean. Consequently, pumping from these wells has the potential to affect all juvenile steelhead in the watershed, and this has implications for the survival, abundance, productivity, and spatial structure of the Ventura River steelhead population.

Finally, recent studies and computer modeling of precipitation for Southern California over the next hundred years show a potential increase in weather extremes, and a slight to modest decrease in annual precipitation occurring by the year 2100 (see for example, Cayan, *et al.* 2007, Climate Change Scenarios for the California Region. *Climate Change* DOI 10,1007). This predicted decrease in the average annual rainfall is expected to result in a greater frequency of dry rainfall years, and an increased frequency and duration of dry hydrologic conditions in the Ventura River Watershed. The increased frequency of dry conditions resulting from climate change would be exacerbated by withdrawals from the Foster Park wells.

5.3.3.1 Water Re-Use

5.5.5.1.1 Ojai Valley Water Treatment Plant

Page 32.

Lines 29-32. The requirement that all effluent be discharged to the Ventura River to maintain aquatic habitat, including fish habitat, is also part of the Conditional Use Permit issued by the County of Ventura for the reconstruction of the Ojai Valley Waste Water Treatment Plant.

5.4 Evaluation Matrix

Page 44.

Table 5-1. Evaluation Mitigation Alternatives

The "New Well Heads at Foster Park" should be deleted; as noted above this type of mitigation is problematic because it does not mitigate an identified impact and it has potentially significant adverse impacts on aquatic resources, including, but not limited to steelhead. Additionally, the three diversion replacement mitigations are also problematic, and should not be pursued further. See comments above.

From: Jeff Palmer [mailto:Jeff.Palmer@ojaisan.org]
Sent: Thursday, September 17, 2015 9:27 AM
To: Sheydayi, Peter <Peter.Sheydayi@ventura.org>
Cc: Steve Wickstrum (swickstrum@casitaswater.com) <swickstrum@casitaswater.com>
Subject: Draft Matilija Dam Mitigation Report

Peter,

In reviewing the Draft report, there is a section regarding OVSD. I will be sending you a formal letter with comments, however, there are two areas of concern:

1. I didn't see any reference to any mitigation for our collection system facilities along the main stem of the Ventura River. We have extensive trunklines, manholes, metering stations, siphons, force mains and pump stations that all are within the impact area and could face significant impacts. Those facilities and locations need to be identified, studied and appropriate mitigations and funding sources identified prior to any project consideration.
2. The treatment plant DOES NOT provide title 22 water that meets State guidelines for reuse. There are significant issues related to permitting, environmental impacts and costs that also need to be identified prior to the Plant water being earmarked as a source of water.

Please feel free to contact me if you have any questions.

Jeff Palmer

(805) 646-5548 ofc
Jeff.palmer@ojaisan.org

OJAI VALLEY SANITARY DISTRICT
A Public Agency
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September 23, 2015

Peter A. Sheydayi, P.E., D.WRE
Deputy Director, Design and Construction Division
Ventura County Watershed Protection District
800 S. Victoria Avenue Ventura, CA 93009-1610

Subject: Draft Dam Removal Concepts Evaluation Report, Dated August 13, 2015 and Matilija Dam Ecosystem Restoration Project, EIS, F5 Milestone Report Dated July 2004

Dear Peter:

On September 17, 2015, the DOG/TAC for the Matilija Dam Removal Project met to discuss the Dam Removal/Robles Mitigation Study by URS and Stillwater Sciences consultant team. The Ojai Valley Sanitary District (OVSD) Staff has reviewed the referenced studies both from 2004 and 2015 as it relates to existing sanitary sewer facilities downstream of the subject site.

OVSD provides sanitary sewer services to the unincorporated area along the Ventura River, south of the Robles Diversion Structure. The OVSD Treatment Plant is a modern tertiary treatment plant located at the mouth of the Ojai Valley, just southerly of Foster Park. OVSD has numerous facilities located along, under and adjacent to the Ventura River over Reach Nos. 3, 4 and 5, as shown on page 4-2 of the 2004 Study. These facilities include trunk lines, metering stations, manholes, pump stations, force mains and the treatment plant.

In reviewing both the 2004 and 2015 Studies and considering the infrastructure integrity, water quality, environmental and permitting issues that OVSD currently operates under, we have some concerns about the proposed Dam Removal alternatives and related hydraulic analysis, scour and river configuration analysis, floodplain change and mitigation measures outlined in your Studies. The 2015 Study appears to introduce new removal alternatives that have different and more potentially significant hydraulic impacts to the river south of the Robles Diversion. These new and more significant impacts need to be studied to determine more appropriate mitigation measures as it relates to impacts to the OVSD Collection System and Treatment Plant.

Your Studies suggests that the preparation of these updated studies is a step in determining the preferred removal option. From OVSD's perspective, the next step should be to update the Ventura River hydraulics analysis to determine the effects of creating an intentional significant "flushing" event to carry a significant amount of debris down the river to the ocean. The debris amounts considered, under natural conditions, would be carried over many events, possibly over many years. The intentional "flushing" event will attempt to do this in one event creating un-natural and artificially intense hydraulic flow conditions.

We believe that the following questions should be answered before any additional steps are taken.

1. What will the impacts be to the river and adjacent property from the Robles Diversion to the Treatment Plant and to the ocean?

2. How will the river hydraulics, grades, channel location and braiding, freeboard depth, and what scour depths result from the proposed plan?

3. How will the beneficial uses, environmental conditions and water quality be impacted and mitigated?

4. What protection measures are needed to protect the Sanitary Sewer System and Treatment Plant from impacts?

5. What are the costs associated with those impacts and protection measures?

6. What are the environmental and right of way impacts and costs of those mitigation measures?

7. At this time, there is no definitive review or conclusions regarding the answers to these questions.

Before any decision is made regarding the preferred plan, options, mitigations, costs or schedules, there must be a clear understanding of the project impacts and that: (1) the project alternatives will not degrade water quality or impact beneficial uses, (2) OVSD and our rate payers will not be unduly burdened by costs and liabilities, and (3) that OVSD facilities will not be put at risk by impacts related to the hydraulic silt flushing or dam removal related impacts.

We are more than willing to meet and discuss the project, our facilities and appropriate mitigation and protection issues.

Best Regards,

Jeff Palmer, P.E.
General Manager

---------- Forwarded message ----------
From: "Waln, Karen" <kwaln@venturawater.net>
To: "Sheydayi, Peter" <Peter.Sheydayi@ventura.org>
Cc: Susan Rungren <srungren@ci.ventura.ca.us>, "Waln, Karen" <kwaln@ci.ventura.ca.us>, Shana Epstein <sepstein@ci.ventura.ca.us>
Date: Mon, 12 Oct 2015 21:49:27 +0000
Subject: Comments to Matilja Dam Removal - Draft Water Supply Mitigation Concepts Evaluation Report

Peter,

The City of Ventura appreciates having the opportunity to comment on the above subject report. Attached please find pages to the report that we have made comments on. In addition, I have attached the City's 2015 Comprehensive Water Resources Report dated May 18, 2105, that should provide you more current information to reference. Any questions please give Susan (654-2543) or I (677-4128) a call. Thanks again - Karen

Karen Waln
Management Analyst II
Ventura Water
City of Ventura
(805) 677-4128
kwaln@venturawater.net

3.0 Water Providers

There are many interconnected water providers within Ventura County. The principal surface water providers discussed in this conceptual evaluation of mitigation concepts are:

- CMWD, who diverts water from the Ventura River at the Robles Diversion Facility. CMWD's water demand in 2009 was 17,610 AF.
- The City of Ventura, who draws subsurface water from the Ventura River ~~via intakes at~~ Foster Park. ~~The City of Ventura's water demand in 2012 was 18,004 AF for the entire City.~~

in the vicinity of

See below

Major urban suppliers of groundwater include:

- Golden State Water of Ojai, who pumps from the Ojai Valley Groundwater Basin and supplement with surface water from CMWD. Golden State Water's water demand in 2009 was 1,778 AF.
- Ventura River Water District, who pumps from the Upper Ventura River Groundwater Basin and supplement with surface water from CMWD. Ventura River Water District's average annual demand is 1,324 AF.
- Meiners Oaks Water District, who pumps from the Upper Ventura River Groundwater Basin and supplement with surface water from CMWD. Meiners Oaks average annual water demand is approximately 1,100 AF.
- CMWD also operates one well in the Mira Monte area in the Upper Ventura River Groundwater Basin.

A map of selected regional groundwater basins is provided in Figure 3-1.

Estimations of approximately 6,000 AFY on average is available based on this operational scenario and is comparable to the 50-year average historical City production records between 1960 and 2009. However, current operational constraints allow a diversion efficiency of up to 70 percent (average 4,200 AFY) to be obtained under the City's operations schedule, which can be considered reliable for planning purposes and is roughly equal to the annual average for the last 10 years. Therefore the City's current reliable water supply from the Ventura River / Foster Park is 4,200 AFY. This supply number may further be drastically reduced by proposed regulatory and environmental constraints.

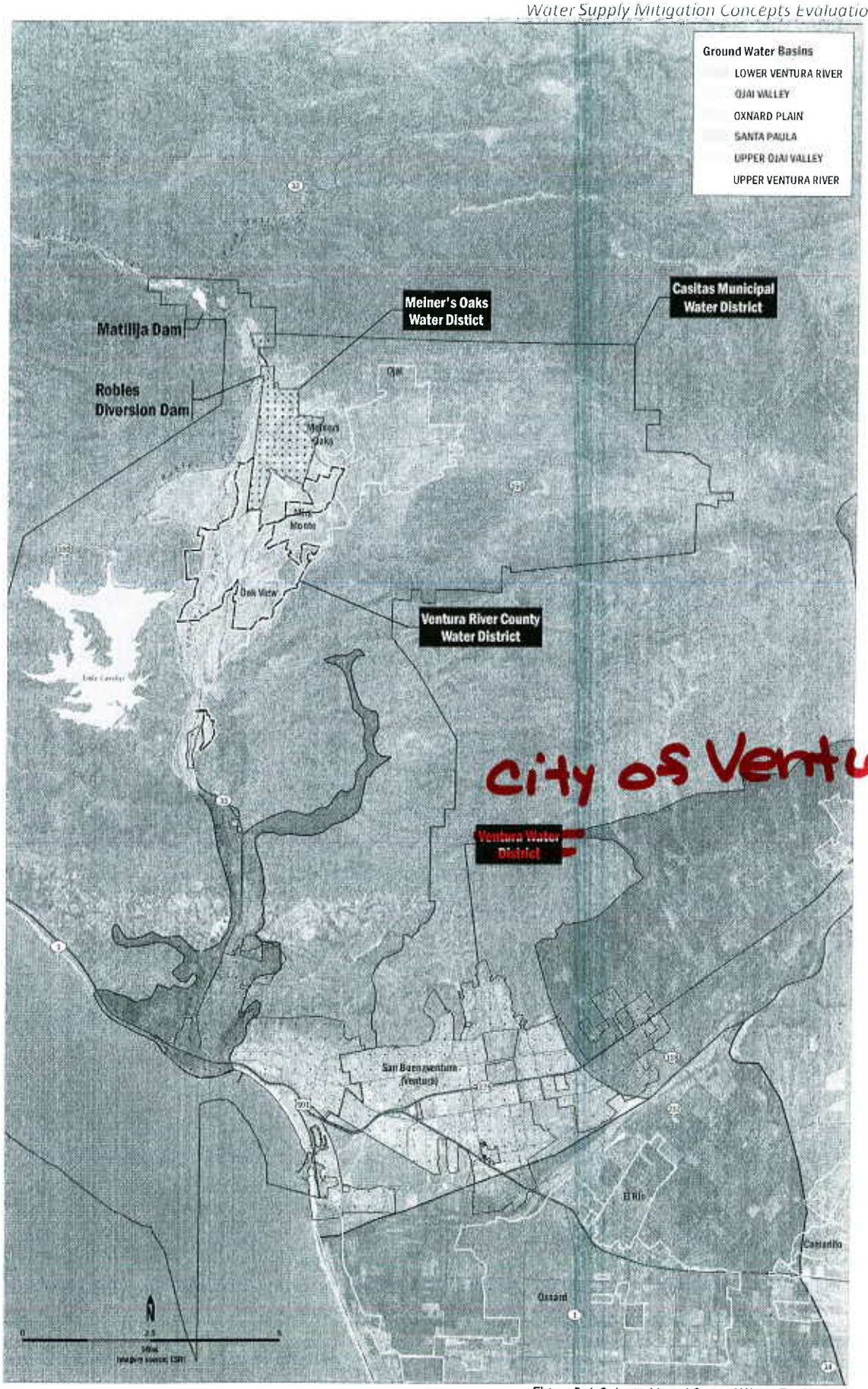

Figure 3-1:Selected Local Ground Water Basins and Water Purveyors in the Vicinity of the Ventura River Watershed

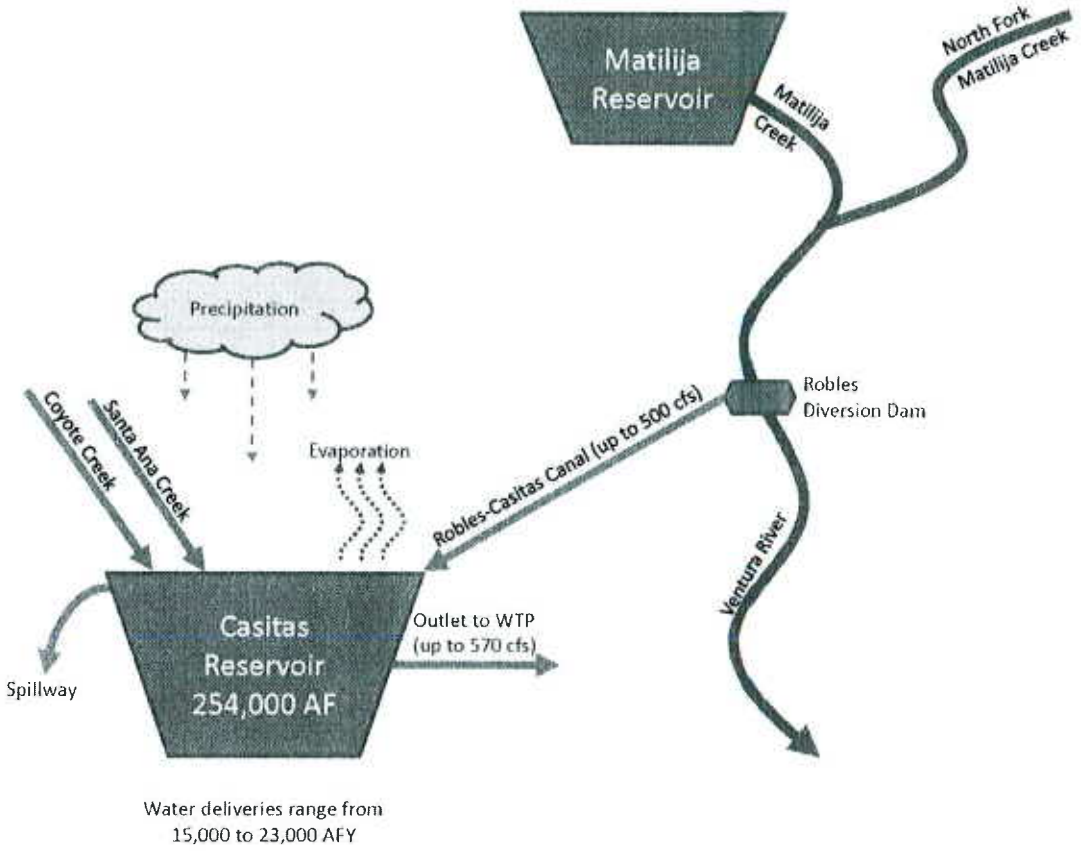

Figure 3-2: Casitas Reservoir and Robles Diversion (Location Map and Schematic)

3.1.2 Ventura Water

The City of Ventura operates Ventura Water. The City's potable water supply is derived from local groundwater basins, CMWD and subsurface intakes on the Ventura River at Foster Park. The City also has a 10,000 acre-foot per year (AFY) allocation from the California State Water Project. To date, the City has not received any of this water because there are no facilities to get the water to the City from its termination at Oxnard Water in east Oxnard. There are presently five local water sources that provide water to the City water system:

See attached page for wording

- Treated water from the CMWD treatment plant,
- Ventura River Foster Park Area, Wells Mound Groundwater Basin,
- Oxnard Plain Groundwater Basin,
- Santa Paula Groundwater Basin,
- Recycled water from the City's Ventura Water Reclamation Facility (VWRF).

From CMWD, Ventura Water is allowed the maximum amount of its in-district demand, which varies, but is approximately 5,000 AFY on average. This represents a significant proportion of the City's current ~~total in-district and out-of-district~~ water supply, ~~which ranges from 18,000 AFY to 19,600 AFY. Figure 3-3 below presents the City's typical water supply volumes by source.~~

Wordings to use:

Current Water Supply

The City's potable water supply is derived from local groundwater basins, Lake Casitas and sub-surface water from the Ventura River. The City also has a 10,000 acre-foot per year allocation from the California State Water Project. To date the City has not received any of this water because there are no facilities to get the water to the City. There are presently five local water sources that provide water to the City water system:

- Casitas Municipal Water District (Casitas)
- Ventura River Foster Park Area (Foster Park)
  - Surface Water Intake
  - Upper Ventura River Groundwater Basin/Subsurface Intake and Wells
- Mound Groundwater Basin (Mound Basin)
- Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)
- Santa Paula Groundwater Basin (Santa Paula Basin)

The City also provides recycled water from the Ventura Water Reclamation Facility (VWRF). The City's current reliable water supply is 19,600 AFY, although it could drop as low as 18,000 AFY at any time.

Estimated Water Demand

The City's total water consumption for the most recent complete calendar year (2012) was 18,004 AFY. Historical water consumption data was evaluated for the previous 10-year period to develop a baseline water demand condition. Based on a review of historical consumption data, it was determined that the most recent 5-year average of the annual water consumption would be used to establish the baseline water demand. This Report will utilize a baseline water demand of 17,601 AFY.

There are currently 47 projects that have received City approval for development. Of those 47 projects, a few are in construction, while the majority are approved for development. Utilizing water demand factors developed specifically for the City, based on historical data, it is estimated that the approved projects will require an additional 1,042 AFY of water supply, resulting in a total projected water demand of 18,643 AFY. Using an assumed absorption rate of 350 dwelling units per year (and an equivalent absorption rate for the non-residential development), it is estimated that the City will reach the projected demand condition in year 2019.

Figure ES-1 provides a graphical representation of the current water consumption, projected water demand through year 2020, and the anticipated water supply range over the same time period.

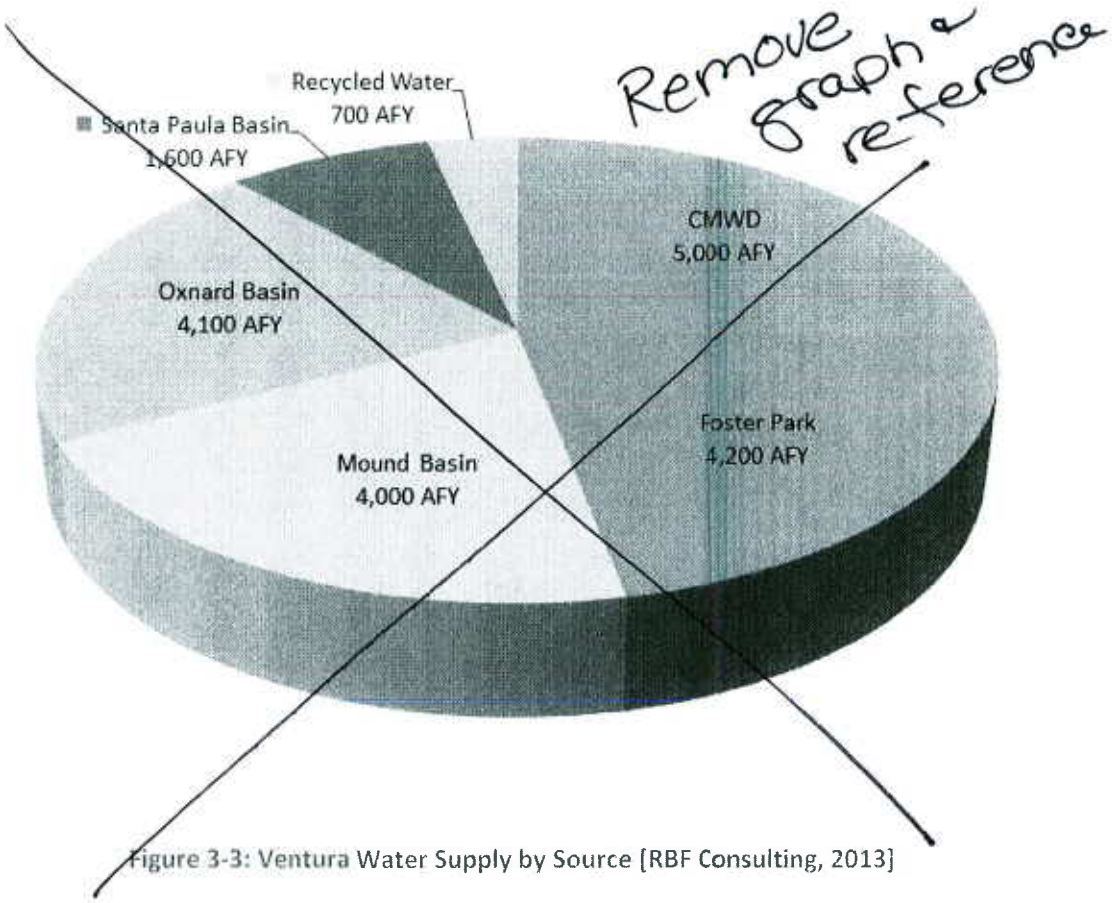

Figure 3-3: Ventura Water Supply by Source [RBF Consulting, 2013]

The Oxnard Plain Groundwater Basin is regulated by the Fox Canyon Groundwater Management Agency. Due to the current drought, the Management Agency issued Emergency Ordinance E in April 2014, reducing the amount of withdrawal from the basin, ~~and eliminating this source of water from the City's supply.~~

From the Santa Paula Basin, the City is allowed to produce up to a total of 21,000 AF over a 7-year period, with a maximum of 3,000 AFY. The City currently has three wells within this basin, with two currently in operation. The total maximum production from all three wells is ~~1,600 AFY~~ 3,000 AFY allowed ~~This needs to be updated~~

3.2 Groundwater Providers by Basin

There are four groundwater basins in the Ventura River Watershed: Upper Ojai, Ojai Valley, Upper Ventura River and Lower Ventura River. These are tapped by 11 mutual water companies in the watershed, serving from less than 10 to hundreds of customers each. Some providers within the watershed also import water from basins outside the watershed. The Santa Paula and Oxnard Plain basins are also discussed in this section for this reason. The groundwater basins discussed in this conceptual evaluation are shown on Figure 3-1.

3.2.1 Upper Ojai Groundwater Basin

The Upper Ojai Groundwater Basin is the highest basin in the watershed, located above San Antonio Creek, a tributary to the Ventura River. The basin does not supply water to any of the major urban water

Ynez Mountains. The valley is drained by Canada Larga and the Ventura River. Average annual precipitation ranges from 14 to 16 inches." (CDWR, 2003)

This groundwater basin is directly connected to the Pacific Ocean. The basin is minimally used and most of the wells are agricultural. No public water suppliers use the basin.

3.2.5 Santa Paula Groundwater Basin

The Santa Paula Groundwater Basin is a basin along the Santa Clara River located southeast from the Ventura River Watershed. CDWR describes the basin as:

"The northern boundary of the Santa Paula Subbasin is the contact between Pleistocene and younger alluvium and impervious rocks of the Topatopa Mountains. The southern boundary is formed by impervious rocks of Oak Ridge and South Mountain, the Oak Ridge fault, and the Saticoy fault... The eastern edge of the subbasin is marked by a bedrock constriction, with the boundary placed at the position of maximum rising water ... The western boundary of the subbasin separates it from the Mound and Oxnard subbasins, with the western boundary placed where there is a distinct change in the slope of the water table... The Santa Clara River and Santa Paula Creek drain the valley westward toward the Pacific Ocean. Average annual precipitation ranges from 14 to 18 inches." (CDWR, 2003)

3.2.6 Oxnard Plain Groundwater Basin

see attached pages for revised information from 2013 & 2015 CWRR for consultants to reuse this section using.

Oxnard Plain Groundwater Basin is regulated by the Fox Canyon Groundwater Management Agency. ~~The basin has had an agreement with the City of Ventura to supply limited amounts of groundwater for municipal distribution. However, due to the current drought, the Management Agency issued Emergency Ordinance E in April 2014, reducing the amount of withdrawal from the basin, and eliminating this source of water from the City's supply.~~ CDWR describes the basin as follows:

"Oxnard Subbasin is a subbasin of the Santa Clara River Valley Basin, located in southern Ventura County. The northern boundary of the subbasin is the Oak Ridge fault. The southern boundary is formed by contact of permeable alluvium with the semi-permeable rocks of the Santa Monica Mountains.... The eastern edge of the subbasin lies against the Pleasant Valley and Las Posas Valley Basins.... The western edge of the subbasin is the Pacific Ocean.... Calleguas Creek and other tributary creeks drain the surface waters of the area westward into the Pacific Ocean and the Santa Clara River provides recharge along the northern border of the subbasin.... Average precipitation ranges from 14 to 16 inches per year." (CDWR, 2003)

3.2.7 Mound Groundwater Basin

The Mound Groundwater Basin is a basin located along the Santa Clara River. The majority of recharge is from percolation of surface flow from the Santa Clara River and other minor tributaries. CDWR describes the basin as:

Historical agricultural and private well uses have typically extracted about 2,000 AFY while the City's average annual extraction for the last ten years has been approximately 4,000 AFY. Therefore the City's current reliable water supply from the Mound Basin is 4,000 AFY.

4. Oxnard Plain Groundwater Basin (Fox Canyon Aquifer)

Wells near the Buenaventura Golf Course have drawn from the Oxnard Plain Groundwater Basin since 1961. Currently, two wells, Golf Course Wells No. 5 and 6, produce potable water for the City's system and a third well (Golf Course Well No. 3) is out of service for major rehabilitation. This third well could be used as an emergency source and will only return to service during a drought, following the replacement of wellhead, pump, electrical and raw water connection. These wells pump from the Fox Canyon Aquifer of the Oxnard Plain Groundwater Basin.

The Fox Canyon Groundwater Management Agency (GMA) was created by state legislation in 1982 to manage local groundwater resources in a manner to reduce overdraft of the Oxnard Plain and stop seawater intrusion. A major goal of the GMA is to regulate and reduce future extractions of groundwater from the Oxnard Plain aquifers, in order to operate and restore the basin to a safe yield. In August 1990, the GMA passed Ordinance No. 5, which required existing groundwater users to reduce their extractions by five percent every five years until a 25 percent reduction was reached by the year 2010.

The City's historical allocation was set by the GMA at 5,472 AFY, which was the average extraction from the Golf Course Wells for the base period 1985 to 1989. Beginning in 1992, historical extractions set by the GMA were reduced by five percent (5%) to 5,198 AFY, in 1995 it was reduced to 4,925 AFY, in 2000 it was reduced to 4,651 AFY and further reduced in 2010 to the current allocation of 4,100 AFY. Therefore the City's current reliable water supply from the Oxnard Plain Basin is 4,100 AFY.

5. Santa Paula Groundwater Basin (Santa Paula Basin)

The Saticoy Water Company was acquired by the City in 1968, which included Saticoy Well No. 1 that produced water from the Santa Paula Basin. Due to casing failure, the well was destroyed and replaced in 1991 with a new well designated as Saticoy Well No. 2. Well No. 2 was placed in

Projected Future Water Supply

The 2014 CWRR projected future water supply numbers were revised in the 2015 CWRR to reflect changes to the City's existing supply sources that have come up over the past year including the continued drought condition and the projection of the drought through 2016. The water supply sources revisions are due to the following water supply issues:

- Casitas: A reduction in the amount of available water from Casitas due to the extended drought. At the time of this report the storage in Lake Casitas is below 50% capacity. As indicated in the City's existing 1995 agreement with Casitas that refers to Casitas Ordinance 92-7, it is anticipated that Casitas Municipal Water District will require a cutback in the City's supply. We have included an anticipated required reduction of 20% to our Casitas supply for the projection of the current drought through 2016. The Casitas supply is based on existing and approved projects within the Casitas boundary.

- Ventura River/Foster Park: Due to the continued drought conditions, the City's ability to draw water from the Ventura River has been significantly impacted. We have included a lower range to reflect the minimum supply projections from the Ventura River for the projection of the continued drought through 2016.

- Mound Groundwater Basin: No revisions were made to this supply source.

- Oxnard Plain Groundwater Basin (Fox Canyon Aquifer): After several special meetings and several iterations of an emergency ordinance, the Fox Canyon Groundwater Management Agency (FCGMA) Board approved Emergency Ordinance E at a Special Meeting on April 11, 2014. The emergency ordinance limits pumping from groundwater extraction facilities, within the FCGMA boundary, suspends use of credits and prohibits the construction of any groundwater extraction facilities and/or the issuance of any groundwater extraction facilities permit. As of January 1, 2016, the City will be restricted to 242 AF less (3,862 AF) than the City's current allocation of 4,104 AF. The City will pay surcharges for exceeding its allocation because the City may not rely on its conservation credits that were set aside during wet years. Prior to approval of Ordinance E, the city was relying on approximately 25,000 AF of conservation credits that have now been suspended. The City was utilizing approximately 1,000 AF of conservation credits annually. On June 14, 2014, the City requested a variance to our allocation per Ordinance E and

was denied by FCGMA staff. The City then made an appeal to the FCGMA Board on January 28, 2015, and was denied by the FCGMA Board.

- Santa Paula Groundwater Basin (Santa Paula Basin): The low range has been decreased from 1,600 AF to 1,141 AF for the projection of the drought through 2016. This is based on an assumed worst case scenario that the basin will be determined to be in a Stage 2 overdraft per the Court's Stipulated Judgment. No additional water rights were acquired for the development within the Santa Paula Basin area; therefore the City's acquired water rights remain as 5.8 AF.

- Recycled Water: No revisions were made to this supply source.

RECOMMENDATIONS

The results of this Report indicate that the spread between the current water demand and the current water supply is very tight, and if the drought persists the supply could be less than the demand. This presents significant challenges for the City moving forward in the ability to allocate water supply to development projects that will generate additional water demands. The recommendations for the City moving forward include:

1. Track the total water consumption on an annual basis.
2. Re-calculate the 3-year, 5-year and 10-year water consumption averages on an annual basis.
3. Update the water supply portfolio on an annual basis.
4. Update the existing land use data on an annual basis. This can be done through a system that tracks the development projects as the transition from "Under Construction" to "Existing," and "Approved" to "Under Construction."
5. All future development projects should be evaluated based on current supply and demand conditions.
6. Consider adding a new project type in the land use tracking spreadsheet for approved projects under CIP or other City approval processes.
7. Use the City-specific water usage factors to calculate the water demand of all development projects as the projects proceed through the City process prior to approval.
8. Continue to develop water supply through demand side management, securing water rights, establishing an in-lieu fee ordinance and continue to integrate the new water supply sources into the City's water supply portfolio.

Environmental – The infiltration gallery would be installed parallel to the Ventura River stream bed and would require a comprehensive environmental review.

Feasibility – The environmental review, permitting, and construction period would be difficult to implement in a timely manner. Additionally, there is limited space available, making it difficult to acquire the required land area for this alternative.

Adaptability – Once the dam removal is complete and sediment and organic values return to typical levels, the infiltration gallery would no longer be required. However, the infiltration galleries could be used instead of the Robles Diversion Dam facility for reduced environmental impacts to the river.

5.3.2.2 Water Transfers

5.3.2.2.1 State Water Project

Both the City of Ventura and CMWD has the potential to obtain water from the State Water Project (SWP). However, the lack of existing facilities and agreements, as well as the timing of water availability from SWP do not favor these alternatives.

City of Ventura

The City of Ventura has a 10,000 AFY allocation from the State Water Project. At this time, the City does not have the facilities required to deliver this water into the distribution system. The City has estimated that the cost of wheeling water through Metropolitan Water District facilities would be over $1,300/AF, not including the wheeling charges assessed by local agencies (Water Report, 2013).

CMWD

CMWD is a member agency of the SWP, with a 5,000 AF entitlement. The nearest SWP facility is Castaic Dam. In 1991, Ventura County agencies estimated that the infrastructure required to deliver water from Lake Castaic to the City of Ventura would cost approximately $120M.

There is also potential CMWD access at Carpinteria, approximately 15 miles to the north of Casitas, where a connection at the terminus of the South Coast Conduit (SCC), at Carpinteria Reservoir, would allow for connection to the State Water Project. However, the pipeline is the primary source of water for the Goleta Water District, City of Santa Barbara, Montecito, Summerland and Carpinteria Valley areas and the design and age of the system constrain the ability of the SCC to function at the system's original design capacity. In addition, the system is already suffering demand deficits. In 2014, the available water from the State Water Project was 5%, and is not likely to change in the foreseeable future. This makes the State Water an unreliable source. Coupled with the timing of Casitas' water needs, it is unlikely that sufficient supply would be available during a dry period, even after a single large storm.

5.3.2.2.2 CMWD Transfers to MOWD

Meiners Oaks Water District (MOWD) is a water purveyor in Ventura County. The District owns and operates 5 wells located near the Ventura River with an average annual water demand of approximately

The time required to hold a hearing would delay most temporary transfers to the point that they could not take place in the year proposed."

The only scenario in which is it possible that groundwater could be transferred out of one of the nearby groundwater basins, such as Ojai, is one where recent precipitation has allowed the groundwater to recharge, but reservoir levels have not yet recuperated from the drought. However, all local groundwater basins are sufficiently depleted at the time of this memorandum that this alternative was considered to be infeasible. In the event that the project is implemented during a wet cycle instead, the alternative will not be needed, as there is likely to be sufficient water in Casitas Reservoir to meet needs.

5.3.2.3 Desalination

In this option, a new desalination plant would be constructed to replace the lost diversion volumes due to the increased sediment and organics load from the dam removal. A desalination plant was sized at 5 MGD, would be equivalent to 50% of the average annual diversions that Casitas Reservoir receives through the Robles-Casitas Canal.

The desalination plant would require an open ocean intake and would require new transmission infrastructure to convey the water to the existing distribution system.

Evaluation

Cost – The estimated cost of the desalination plant is $65M. This cost does not include the transmission facilities that are required to connect the plant to the distribution system

Environmental – A new desalination plant would present significant environmental concerns and be subject to an extensive environmental review.

Feasibility – Due to the environmental permitting required, the construction of a new desalination plant would be difficult to implement in a timely manner.

Adaptability – The desalination plant would continue to operate after the dam removal project is complete and function as an additional water source. Water production from the plant is not subject to local hydrology and as such would provide a measure of drought protection and the additional supply is moved to the combined City-Casitas service area.

5.3.2.4 New Wells in Santa Paula Basin

This is not a viable option + should be removed from the report.

CMWD provides approximately 5,000 AFY of supply to the City of Ventura. Any additional supply for the City of Ventura would result in reduced demand for CMWD water and is therefore equivalent to an additional supply for CMWD.

The City of Ventura has an entitlement of 3,000 AFY from the Santa Paula Basin however the City's existing wells only have a capacity of 1,600 AFY, leaving a potential additional available supply of 1,400 AFY. In order to extract the additional 1,400 AFY entitled to the City of Ventura, a new well would need to be constructed.

Remove

Evaluation

Cost – The construction cost of a new well with an average capacity of 1,400 AFY is estimated at $250K. There will be an additional cost to connect the well to the existing transmission system. The cost for the connection will depend on the location of the well and nearby infrastructure and is not considered in the presented cost above.

Environmental – No significant environmental issues are anticipated with the well construction. The City of Ventura currently operates wells that extract water from the Santa Paula ground water basin. However, the Fox Canyon Groundwater Management Agency has rejected administrative and legal attempts by the City to increase its extraction from the basin. In addition, legal action is currently pending regarding overdraft of the Oxnard Plain Groundwater Basin.

Feasibility – This option would require a new well to be drilled and new wellhead constructed and could be completed prior to the dam removal. The option is equally beneficial for all dam removal concepts.

Adaptability – The new well would function as additional water supply for the City of Ventura and could be used beyond the dam removal as the City is not currently using their entire water entitlements. The increased production would allow for additional operational flexibility in the future.

5.3.2.5 New Well Heads at Foster Park

City of Ventura

The Foster Park Facilities divert water from the Ventura River via a surface and subsurface water intake owned and operated by the ~~VCWPD.~~ Surface water from the Ventura River is collected via surface diversion, subsurface collector, and shallow wells. Groundwater is extracted from the Upper Ventura River Groundwater Basin via a series of wells.

As part of the Matilija Dam Ecosystem Restoration Project, two additional wells, identified as Wells No. 12 and 13, were installed at Foster Park as part of the mitigation measures of the dam removal. The wells were constructed and funded through a grant received by the VCWPD for the City of Ventura in order to mitigate potential water lost as a result of increased turbidity. However, the wells were never completed. While the wells have been drilled, wellheads have not been constructed and therefore the wells are not currently operational. The wellhead design is reportedly 90% complete.

Evaluation

Cost – The estimated cost of the two new well heads based on the current 90% design plans is $1.5M. However, there may be potential cost savings by eliminating certain proposed project features in the current design, such as a SCADA system, which may not be needed for temporary mitigation purposes.

Environmental –The wells have already been drilled and only require construction of the well heads. No environmental permitting is expected for production in regards to mitigation for dam removal. However the Santa Barbara Channel Keepers has recently filed a lawsuit against the State Water Resources Control Board over the City of Ventura's take of water at Foster Park The lawsuit seeks to compel the State Water Board to perform a Reasonable Use Analysis of the City of Ventura's extraction from the Ventura River.

Feasibility – The wells have already been drilled and the City currently has 90% design plans for the construction of the wellheads and regulatory permits. It is likely the project could be completed and the wells brought online prior to the dam removal.

Adaptability – The original purpose of the wells was specifically for mitigation purposes for the removal of Matilija Dam. However, the wells could be converted to production wells for the City once the dam removal project is completed, with limitations on extraction dependent on the City's water rights. Re-purposing the wells for alternate production would ~~likely~~ require further environmental and regulatory review.

5.3.2.6 San Antonio Creek Diversion Dam Expansion

The San Antonio Creek Spreading Grounds Rehabilitation Project was intended to reduce reliance on imported water supplies from CMWD through increasing the groundwater storage and recharge in the Ojai Basin by diverting surface water from the San Antonio Creek into a series of infiltration ponds and recharge wells. The project stakeholders are composed of the Ojai Basin Groundwater Management Agency, the Ojai Water Conservation District, the Golden State Water Company, the Casitas Municipal Water District and the Ventura County Watershed Protection District. The project was completed in July 2014.

This option considers the expansion of existing facilities to divert additional water from San Antonio Creek and convey the water to Casitas Reservoir via the Robles-Casitas Canal. The option assumes the maximum diversion rate is 25 cfs, identical to the existing diversions to the recharge ponds. The pipe diameter required to meet the design flow rate is 24 inches. The pipeline would be approximately 6.5 miles long and travels along existing roadways following mainly Highway 150 and Highway 33.

There may be potential customers in the Ojai Basin which are closer to the diversion site. The existing infrastructure and connection points would need to be confirmed. If diversions can be delivered to nearby customers, there could be a reduction in costs as a result of a shorter pipeline. However, it is likely that diversions from the creek will only be available during the winter seasons when demand is typically lower. In addition, there is minimal system storage available in the Ojai Basin region. As such, the actual reduction in water demand mitigation may be less than expected.

Evaluation

Cost – The cost of the transmission pipeline is estimated at $17M.

Environmental – The project would require a comprehensive environmental review as the San Antonio Creek is the main sub-watershed for steelhead refuge. Additionally, the 25 cfs in the current design is only available during a 100-year storm. In order to be useful in offsetting the effects of dam removal, the diversion would need to be modified to capture more storm flows, which would require new permits. The increased diversion may also reduce the supply available for downstream intake facilities, such as Foster Park.

Feasibility – The right of way acquisition and environmental permitting would be a lengthy process and be difficult to implement in a timely manner. The 25 cfs in the current design is only available during a 100-year storm event which would not produce a significant volume of water.

Adaptability – Diverting San Antonio Creek flows to Casitas Reservoir would provide an additional water source and provide CMWD with additional operational flexibility. The continued use and volume available for diversion would likely depend on requirements for the Steelhead habitats and that the increased diversions do not negatively impact the recharge of the Ojai Groundwater Basin.

5.3.3 Re-use and Conservation

5.3.3.1 Water Re-use

See attached cover of report that should be used & referenced to write their section.

5.3.3.1.1 Ojai Valley Waste Water Treatment Plant

The Ojai Valley Waste Water Treatment Plant (WWTP) is operated by the Ojai Valley Sanitation District (OVSD) and serves 20,000 residents of the City of Ojai. The plant receives average flows of 1.55 MGD. There have been discussions about implementing a recycled water program to supply customers with recycled water, reducing the demand of potable water. Currently, the tertiary treated water is discharged to the Ventura River to enhance Steelhead habitat and thus, could not be used for mitigation purposes, making this option infeasible if the additional supply is moved to the combined City-Casitas service area.

Not a report to use See attached report cover

While the plant does not currently serve any recycled water customers, and existing agreements prohibit this, a 2007 Re-Use Feasibility Report (Stoecker Ecological 2007) identified potential customers currently supplied with domestic water from the City of Ventura that could be converted to recycled water, thus freeing up approximately 1,000 AFY of domestic water for distribution to the City's customers.

The City of Ventura currently leases the WWTP land to OVSD. As part of the agreement with the City OVSD would be expected to deliver any recycled water to the City, should the existing mandate for Steelhead be altered.

This option involves modifying the project permits to divert some of the recycled water away from Steelhead habitat enhancement and for use instead by City customers, including constructing distribution pipelines to those customers.

Evaluation

Cost – The costs associated with this option are based on the construction of new distribution pipelines to deliver recycled water to customers. The cost per mile of pipe is estimated at $300 per lineal foot (LF). The length and alignment of the pipelines depends on the location of the potential customers. A recycled water program may be eligible for state grants.

Environmental – There are no direct environmental concerns with supplying customers with recycled water. However, the OVSD discharge permit currently requires all effluent to be discharged to the Ventura River for fish habitat. An environmental review would be required to ensure that reducing the volume of discharges to the river does not cause a detrimental effect to the local biology.

Feasibility – The OVSD WWTP currently treats water to tertiary levels which is sufficient for customer use and so construction would be limited to transmission pipelines. A recycled water distribution system

Feasibility Study on the Reuse of Ojai Valley Sanitary District Effluent- Final Facilities Planning Report

Provided to:

City of San Buenaventura
Public Works Department

Provided by:

Nautilus Environmental
Brown & Caldwell
Foothill Associates
KHE

September 21, 2007

could likely be completed and online to meet the dam removal schedule. In addition, a potential demand for recycled water has been previously identified.

Adaptability – Developing a recycled water demand would remain useful after the dam removal project is completed. Substituting recycled water for existing water supplies will reduce the City's reliance on surface and subsurface diversions and provides a measure of drought protection.

5.3.3.1.2 [redacted]

The Ventura Water Reclamation Facility is a tertiary wastewater treatment plant which provides wastewater treatment services to 98% of City residences in addition to wastewater services for McGrath State Beach Park and the North Coast Communities. The tertiary plant is located in the Ventura Harbor area near the mouth of the Santa Clara River.

Average annual flows to the facility total approximately 9 MGD, with a total capacity of approximately 12 MGD. Currently, the City has a small recycled water demand at 700 AFY. The recycled water customers consist of two golf courses, a City park, and landscape irrigation areas along the existing distribution alignment. The remaining effluent is discharged to the Santa Clara Estuary.

Expanding the recycled water customer base ~~would~~ could reduce the amount of water that CMWD supplies to the City resulting in increased water supply for CMWD. possibly [redacted]

This option would consist of expanding the tertiary treatment plant and construction distribution pipelines to new customers.

Evaluation

Cost – The City of Ventura has existing infrastructure for delivering recycled water to customers. Expanding the recycled water program consists of constructing water pipelines to new customers. The estimated cost of the pipeline is $4300 per LF. Grants may be available for expanding the recycled water program.

Environmental – Environmental concerns are limited to the effects of lower volume of discharges to the Santa Clara River Estuary. A biological review will be required to determine the lower volumes do not harm the local wildlife.

Feasibility – The City already serves several customers. Expansion of the system entails identifying new customers and construction of additional pipelines to convey the recycled water. If users could be identified near the treatment facility, deliveries could likely be initiated in a timely manner.

Adaptability – Expanding the City's recycled water customer base has benefits beyond the dam removal by reducing the City's reliance on surface/subsurface diversions which provides a measure of drought protection.

5.3.3.1.3 Scalping Plants in Ojai Valley

Scalping plants are small-scale wastewater treatment systems that produce recycled water by intercepting a portion of the influent in sanitary sewer mains. The wastewater is treated locally and then delivered to

customers. In scalping plants, only the liquid waste is treated. The solid waste is returned back to the sewer main for treatment at the local wastewater treatment plant. Because the waste water is treated locally, there is potential to reduce infrastructure costs related to piping and pumping. However, in order to produce a useable volume of recycled water, the scalping plants are required to be located in areas that generate sizeable amounts of wastewater.

The 2013 Sustainable Water Use in the Ventura River Watershed Report (Bren School of Environmental Science & Management, 2013), identified two golf courses in Ojai that could potentially be served with recycled water from scalping plants. The recycled water demand from the two golf courses is estimated at 220 AFY.

This option considers construction of a new scalping plant to produce recycled water to meet irrigation water demands at two golf courses in Ojai.

Evaluation

Cost – The 2013 Bren report estimates construction costs of a 224 AFY capacity scalping plant at $2M. Annual operations and maintenance costs are estimated at $210K. This does not include any costs associated with permitting, land acquisition or additional required infrastructure.

There may be also added costs at the OVSD WWTP. As scalping plants only treat liquid waste, the concentration of the influent to the OVSD WWTP may change and potentially require modifications to treatment and/or operations.

Environmental – Currently, all effluent from the OVSD WWTP is discharged to the Ventura River for fish habitat. A scalping plant intercepts influent that would normally be delivered to the treatment plant, resulting in lower effluent discharge volumes. The reduction in discharge volumes from the OVSD WWTP would require approval from regulatory agencies.

Feasibility – The location of the scalping plant requires specific site conditions in order to optimize operations. The site would need to be located near a sanitary sewer force main that meets the volume requirements of the scalping plant. Additionally, the site should ideally be located near the golf courses to minimize the amount of new infrastructure required to deliver the recycled water.

Adaptability – The scalping plants could remain in operation after the dam removal. The use of recycled water is a sustainable practice and provides a measure of drought protection. Conservation Measures

5.3.3.1.4 Urban and Agricultural Conservation

This is a very fuzzy option. Not as effective as the rest. also drought reduction already in place may not see that great of conserv. savings as anticipated in this report.

A main concern of the dam removal project is a loss in water volume to Casitas Reservoir during fine sediment flushing. Implementing water conservation policies would reduce demand, which is equivalent to increasing water supplies. Recent emergency drought measures are striving to reach 15-30% demand reduction in Ventura County. If local water districts are successful in implementing a conservation strategy that reaches a portion of that goal, those same measures could potentially be extended to help mitigate the potential impacts associated with dam removal. This option evaluates potential water conservation methods and their effectiveness for the City of Ventura and CMWD.

City of Ventura

Based on the City of Ventura's 2010 Urban Water Management Plan (Kennedy/Jenks 2011), the City has employed several urban conservation incentives such as: rebates for high efficiency appliances, tiered water rates, and educational programs. The City has seen a 7% decrease in water demand per year since the implementation of the conservation plan, and it estimated that further savings could occur with additional incentives.

The City has recently developed a new conservation program called The Water Wise Incentive Program that is set to launch in July 2015. The program offers monetary incentives for replacing high water use landscaping with water saving landscapes and measures.

The City has no agricultural customers so demand reductions within the City's service area are not possible through agricultural conservation programs.

CMWD

CMWD has a small urban demand and has employed similar conservation methods to the City of Ventura. While both the City of Ventura and CMWD have already enacted water conservation plans, increasing the awareness of the conservations programs available may lead to additional water savings.

CMWD has also implemented policies for agricultural efficiencies such as rebates for smart irrigation controllers and educating agricultural customers on improving irrigation distribution uniformity and irrigation scheduling.

Evaluation

Cost – The estimated cost is $100K and represents a grant to the City and CMWD for costs related to promotion of the existing water conservation programs. In addition, new programs could be developed to augment existing programs; such as requiring new, water efficient appliances whenever a home is sold. The reduction in water usage due to conservation would cause a loss of revenue in water sales. The loss in water sales is estimated at $91,000[1]

Environmental – There are no environmental concerns with this option. This alternative would represent an environmental benefit.

Feasibility – Conservation programs have already been enacted. The option proposes increasing promotion and awareness of the programs through marketing in order to increase the adoption rate.

Adaptability – Expanding the urban conservation plan has benefits beyond the dam removal project. Reducing the average annual demand of water will allow the City and CMWD to maintain a higher surplus of water and allow for greater operational flexibility, especially in times of drought.

[1] This value is based on an estimated additional conservation of 250 AFY between City of Ventura and CMWD. The water rate was estimated at $0.831 per hundred cubic feet (HCF) as shown in the CMWD 2010 Urban Water Management Plan.

6.0 Recommendations

Some of the dam removal concepts currently being evaluated could require between one and three large storm events to flush impounded sediments from the reservoir. The *Hydrologic Assessment for Water Supply* (URS and Stillwater Sciences 2014) memorandum concludes that restricting diversions during a typical "wet cycle" period would have little to no effect on water levels in Lake Casitas. However, implementation of the dam removal project during a typical "dry cycle" would result in a loss of water volume of approximately 5% (12,700 AF) of the total reservoir volume, per storm event.

For this analysis, it is assumed that only one high-flow storm event occurs in a single year during a dry cycle period. Multiple high-flow storm events in a single year would be indicative of a wet cycle, where restricting diversions would have minimal impact on water levels in the reservoir. As such, the recommendations presented below evaluate the potential mitigation water volumes against the loss of water during a dry cycle period.

Of the 23 Mitigation Options presented, 9 are being recommended for further analysis and are summarized in Table 6-1 below. While any of these alternatives can be executed in isolation, in order to mitigate the full range of possible impacts, it is recommended that each be examined further.

Table 6-1. Recommended Mitigation Alternatives

Type of Mitigation	Description	Volume[1] (AFY)	Volume[2] (% per year)	Cost ($)
Replacement Supplies	CMWD Transfers to MOWD	N/A	N/A	$20K
	~~New Wells at Santa Paula Basin~~	~~1,400~~	~~11%~~	~~$250K~~
	New Well Head at Foster Park	750	5.9%	$1.5M
Re-Use & Conserve	Urban and Agricultural Conservation	250	2.0%	$191K
	Crop Idling Transfers	800	6.3%	$5.95M
Treatment	Casitas Reservoir Oxygenation Enhancement	N/A	N/A	$5K
	Back-flushing of Meiners Oaks Wells 1 and 2	83	0.7%	$20K
	CMWD Water Treatment Plant System Modifications	Varies[3].	Varies[3].	$250K + $10K/year

1. Potential additional or saved volume of water.
2. Potential percentage of loss water volume mitigated.
3. Amount of volume mitigated depends on level of additional treatment implemented.

Impacts to Meiners Oaks Water District from the potential loss of Wells 1 and 2 along the Ventura River could be mitigated by importing additional water from CMWD at surcharged rates, as well as by providing a one- time well flushing of each well, following the peak flushing of Phase I.

~~Additional supply to the City of Ventura from new wells in the Santa Paula Basin and~~ completion of the wells at Foster Park would increase overall water supply flexibility to all of CMWD's customers as well as the City.

MATILIJA DAM REMOVAL, SEDIMENT TRANSPORT, AND ROBLES DIVERSION MITIGATION PROJECT

WATER SUPPLY MITIGATION OPTIONS EVALUATION REPORT

MARCH 2016

ATTACHMENT 2: COMMENT RESPONSE MATRIX

Matilja Dam Removal, Sediment Transport, and Robles Diversion Mitigation Project - Document Comment Form
DOG Comments on Draft Water Supply Mitigation Concepts Evaluation Report, dated 8/13/15

Comment Response Matrix

Item	Chapter/ Section	Page #	Line Number(s)	Reviewer Agency	Comments	Comment Reference	Response
1	Water Supply Mitigation			Matilija Coalition	The Matilija Task 3.2 Hydrologic Assessment for Water Supply study provides a comprehensive review of the contribution of Robles Diversion to Casitas Municipal Water District and the potential impacts of missed diversions on reservoir storage levels. This analysis provides a renewed perspective of the actual risk posed by utilizing natural transport to expedite dam removal. Most importantly, **it is now understood that a single missed diversion event is feasible.** **See Matilija Coalition EXCERPT #3 from comment letter for detailed comment.**	Letter dated Oct 17, 2015	Noted.
2	Water Supply Mitigation			Matilija Coalition	The Matilija Task 3.3 Water Supply Mitigation report presents a range of mitigation measures for water supply. However, based on the Task 3.2 Hydrologic Assessment for Water Supply analysis, it appears that water supply mitigation will not be necessary as a result of the project. Therefore, these measures should be considered part of a contingency plan rather than required mitigation for the project. As demonstrated in the Hydrologic Assessment for Water Supply analysis, it is highly unlikely that the project will result in delivery constraints to water use. **See Matilija Coalition EXCERPT #4 from comment letter for detailed comment.**	Letter dated Oct 17, 2015	The purpose of the Task 3.3 report is to consider a range of possible impacts of the dam removal concepts on water supply, and identify and evaluate potential options to offset any lost water supply. For purposes of this study, the term "mitigation" is not meant to suggest any regulatory compliance implications, but rather is associated with reducing the severity of any potential impact (in this case potential lost water supply). Further detailed evaluation will be needed before implementation of any of these water supply options. Report text has been verified under Section 1.1 (Project Background and Purpose) to clarify.
3	4.2.1.2 Ventura Water			Matilija Coalition	Ventura Water: In the course of discussion there has also been concern over the impacts of silt on other water supplies, specifically the City of Ventura water diversions at Foster Park and Meiners Oaks Water District wells in the upper basin. Ventura Water - Our understanding is that the City no longer uses the surface diversion that was the original justification for "mitigation wells" in the federal Feasibility Study. Water diversions are currently served by a well field at this location.	Letter dated Oct 17, 2015	The latest information we have received from the City still indicates surface water as an supply source.
4	4.2.2 Groundwater			Matilija Coalition	Groundwater: This section does not mention Meiners Oaks Water District concerns that silt will plug groundwater wells. During the recent meeting, the consultants referenced case studies that demonstrate minimal impacts to groundwater pumping from silt-laden surface flows. This information and studies should be included in the final report.	Letter dated Oct 17, 2015	A discussion of the concerns regarding higher suspended sediment concentrations in the Ventura River leading to a reduction in adjacent well efficiency is discussed in Section 4.1.2. Based on research by Cui et al (2008), fine sediment infiltrates to a very limited depth and should not impact groundwater wells.
5				Matilija Coalition	The Task 3.3 report identifies several contingency measures that would provide adequate assurance that water supply reliability will be maintained during the short period of sediment release and/or if silt affects downstream wells. These include using Casitas water as backup/replacement supply, backflushing wells if silt does pose a problem, and CMWD Water Treatment Plant System Modifications. Aside from these immediate contingency measures, conservation provides the greatest opportunity to offset any additional loss of water supply and provides a long-term benefit to the watershed, assuming that the yield is not seen as a new or "surplus" supply to induce growth.	Letter dated Oct 17, 2015	Noted. Potential conservation measures are discussed in Section 5.3.3.
6	1.0 Introduction	3	17-17?	NMFS	The need for specific mitigation measures is not supported by the analysis; the options would be better characterized as "contingency actions" and should be described as such, pending the completion of an analysis that demonstrates that they are in fact mitigations that address identified impacts. This should be the focus of follow-up design work. Also, as noted above, the new alternatives to which these mitigation concepts are intended to apply are not the COE WRDA authorized project covered by NMFS's Biological Opinion for the Matilija Dam Ecosystem Restoration Project. See additional comments below regarding impacts on groundwater well field operations.	Letter dated Oct 15, 2015	The purpose of the Task 3.3 report is to consider a range of possible impacts of the dam removal concepts on water supply, and identify and evaluate potential options to offset any lost water supply. For purposes of this study, the term "mitigation" is not meant to suggest any regulatory compliance implications, but rather is associated with reducing the severity of any potential impact (in this case potential lost water supply). Further detailed evaluation will be needed before implementation of any of these water supply options. Report text has been verified under Section 1.1 (Project Background and Purpose) to clarify. We note that the revised DRCs are not the COE WRDA authorized project covered by the BO.

Item	Chapter/ Section	Page #	Line Number(s)	Reviewer Agency	Comments	Comment Reference	Response
7	4.1 Increased Suspended Sediment	17	9-14	NMFS	While the Phase II impacts of alternatives DRC-1, DRC-2, and DRC-3 are broadly equivalent, Phase II impacts on riparian vegetation within the reservoir area for DRC-3 could be extended over a considerable period of time (multiple years) as a result of the temporary stockpiling of sediments within the reservoir area. This is a potentially significant difference between alternatives DRC-1 and DRC-2 which do not involve temporary storage and erosion protection of sediments, and should be reflected in the brief discussion in section in 4.1. See comments above.	Letter dated Oct 15, 2015	This report focuses on water supply impacts as opposed to impacts to biological resources. We agree with the comment and refer to the final Dam Removal Concepts Evaluation Report (AECOM and Stillwater Sciences 2016).
8	4.1.2 Groundwater	18	2-12	NMFS	The finding that elevated suspended sediments in the Ventura River from the various removal alternatives would not adversely impact groundwater supplies (as a result of the infiltration into the aquifer) and related groundwater extraction operations is significant new information. We believe this finding obviates the need for some of the mitigations identified in the report, specifically new well heads at Foster Park. See additional comments below.	Letter dated Oct 15, 2015	The new well heads at Foster Park are intended to serve as a surface water supply replacement option, rather than a mitigation for specific impacted groundwater supplies. Lake Casitas provides 5,000 AF to the City of Ventura annually on average. In the event that diversions from the Ventura River to Lake Casitas are suspended during flushing of accumulated sediments, there would be an associated lost diversion volume (4-15% of reservoir capacity). The two proposed well heads at Foster Park would enable additional water supply to Ventura, thereby lowering the volume they would need to obtain from Casitas.
9	5.0 Mitigation Options	21	3-5	NMFS	This section needs to further develop the option to avoid surface diversions when Phase I sediment impacts are expected. This would include, in addition to the deployment of the gates associated with DRC-2B, the potential manipulation of fine sediments between storm flows to facilitate their evacuation in subsequent storm events. Additionally, the need for any water supply mitigation during Phase II impacts should be clearly related to actual impacts The uncertainties in hydrology that may manifest during and shortly after dam removal is likely the greatest source of uncertainty in aII of the alternatives. Further analyzing multiple possible hydrologic scenarios to refine dam removal timing and adaptive management measures would further reduce uncertainty in water supply and further identify the scale and type of potential mitigation needs.	Letter dated Oct 15, 2015	Agreed that uncertainties in hydrology that may manifest during and shortly after dam removal is likely the greatest source of uncertainty for the project. Refinements (e.g. post flush sediment manipulation, optional gate, etc.) to dam removal alternatives are important to reduce impacts to the extent feasible, and will be considered in future design phases. The purpose of this report is to consider all potential impacts and identify and options to offset those impacts. Further detailed evaluation will be needed before implementation of any water supply offset options. Report text has been modified under Section 1.1 to clarify.
10	5.1 Types of Mitigations	21	Table 5-1	NMFS	See comment above regarding new well heads at Foster Park.	Letter dated Oct 15, 2015	See response to Comment #8.
11	5.3.1 Diversion Replacement (Full or Partial)	24	6-8	NMFS	All three of these options (Matilija Creek Diversion to Robles-Casitas Canal; North Fork Matilija Diversion to Roble-Casitas Canal; Matilija Creek Diversion to North fork Matilija Diversion to Roble-Casitas Canal) could potentially adversely impact steelhead as well as other aquatic organisms and riparian vegetation, and these potential impacts should be acknowledged in the environmental evaluation summaries	Letter dated Oct 15, 2015	Text updated as suggested.
12	5.3.1.1 Matilija Creek Diversion to Robles-Casitas Canal	24	29-30	NMFS	See comment above regarding environmental impacts.	Letter dated Oct 15, 2015	Text updated as suggested.
13	5.3.1.2 North Fork Matilija Creek Diversion to Robles-Casitas Canal	25	16-17	NMFS	See comment above regarding environmental impacts.	Letter dated Oct 15, 2015	Text updated as suggested.

Item	Chapter/ Section	Page #	Line Number(s)	Reviewer Agency	Comments	Comment Reference	Response
14	5.3.1.3 Matilija Creek Diversion to North Fork Matilija Creek Diversion to Robles-Casitas Canal	25	25-26	NMFS	See comment above regarding environmental impacts.	Letter dated Oct 15, 2015	Text updated as suggested.
15	5.3.1.3 Matilija Creek Diversion to North Fork Matilija Creek Diversion to Robles-Casitas Canal	26	8-9	NMFS	See comment above regarding environmental impacts.	Letter dated Oct 15, 2015	Text updated as suggested.
16	5.3.2.2 Infiltration Galleries	27	1-2	NMFS	See comment above regarding environmental impacts.	Letter dated Oct 15, 2015	Text updated as suggested.
17	5.3.2.5 New Well Heads at Foster Park	30	17-26	NMFS	As noted above, the finding that elevated suspended sediments in the Ventura River from the various removal alternatives would not adversely impact groundwater supplies and related groundwater extraction operations obviates the need for the mitigations identified for the wells at Foster Park.	Letter dated Oct 15, 2015	See response to Comment #8.
18	5.3.2.5 New Well Heads at Foster Park	30	31-36	NMFS	The installation and operation of new well heads at the Foster Park wells, with increased pumping capacity, could potentially adversely impact steelhead and designated steelhead critical habitat in the Ventura River. **See Excerpt NMFS #1 from comment letter for detailed comment** Finally, recent studies and computer modeling of precipitation for Southern California over the next hundred years show a potential increase in weather extremes, and a slight to modest decrease in annual precipitation occurring by the year 2100. The increased frequency of dry conditions resulting from climate change would be exacerbated by withdrawals from the Foster Park wells. **See Excerpt NMFS #1 from comment letter for detailed comment.**	Letter dated Oct 15, 2015	Text updated in Section 5.3.2.5 to document concern.
19	5.3.3.1.1 Ojal Valley Wastewater Treatment Plant	32	29-32	NMFS	The requirement that all effluent be discharged to the Ventura River to maintain aquatic habitat, including fish habitat, is also part of the Conditional Use Permit issued by the County of Ventura for the reconstruction of the Ojai Valley Waste Water Treatment Plant.	Letter dated Oct 15, 2015	Incorporated into text under Section 5.3.3.1.1 (Ojai Valley Wastewater Treatment Plant), referenced this comment as source
20	5.4 Evaluation Matrix	44	Table 5-1	NMFS	The "New Well Heads at Foster Park" should be deleted; as noted above this type of mitigation is problematic because it does not mitigate an identified impact and it has potentially significant adverse impacts on aquatic resources, including, but not limited to steelhead. Additionally, the three diversion replacement mitigations are also problematic, and should not be pursued further. See comments above.	Letter dated Oct 15, 2015	For the comment on the new well heads at Foster Park option, please see responses to Comments #s 8 and 17-19. This report does not recommend the diversion replacement options for further analysis (see Section 6.0).

Item	Chapter/ Section	Page #	Line Number(s)	Reviewer Agency	Comments	Comment Reference	Response
21				OVSD	OVSD has spent millions of dollars since the 1960's improving and maintaining the sanitary sewer system, upgrading the treatment plant, monitoring the conditions in the river and responding to the requirements of the Clean Water Act to improve the water quality of the Ventura River. The silt flushing options appear to potentially have significant impact on water quality and beneficial uses. The flushing effort will set back those efforts to improve the river. We would encourage evaluation of alternatives that do not have such significant water quality impacts.	Email from Jeff Palmer dated Sep 24, 2015	The analyses provided in the evaluation report indicate that primary impacts of fine sediment flushing include short-term impacts to downstream biological resources and surface water supply (Casitas will suspend diversions at Robles for a short period during flushing event). Approximately 980,000 cubic yards of fine silts and clays are anticipated to mobilize during the initial flushing event, and nearly all this material will flow fairly quickly through the river system to the ocean. The flushing event itself will not significantly impact downstream hydraulics, flooding, or OVSD's sanitary sewer system. Long-term hydraulic and flooding impacts (associated with coarse sediment moving downstream over time) are being addressed by proposed downstream flood improvements being designed and implemented separately.
22				OVSD	I didn't see any reference to any mitigation for our collection system facilities along the main stem of the Ventura River. We have extensive trunk lines, manholes, metering stations, siphons, force mains and pump stations that all are within the impact area and could face significant impacts. Those facilities and locations need to be identified, studied and appropriate mitigations and funding sources identified prior to any project consideration.	Email from Jeff Palmer dated Sep 17, 2015	Since the impacts associated with flushing the accumulated fine sediments are limited to short-term increases in suspended sediment concentrations, and not downstream hydraulics or flooding, there is no anticipated impacts to OVSD's infrastructure.
23				OVSD	The treatment plant DOES NOT provide title 22 water that meets State guidelines for reuse. There are significant issues related to permitting, environmental impacts and costs that also need to be identified prior to the Plant water being earmarked as a source of water.	Email from Jeff Palmer dated Sep 17, 2015	Text in Section 5.3.3.1.1 updated to incorporate information from comment.
24				OVSD	The 2015 Study appears to introduce new removal alternatives that have different and more potentially significant hydraulic impacts to the river south of the Robles Diversion. These new and more significant impacts need to be studied to determine more appropriate mitigation measures as it relates to impacts to the OVSD Collection System and Treatment Plant. **See Excerpt OVSD #1 from comment letter for detailed comment**	Letter dated Sep 23, 2015	Since the impacts associated with flushing the accumulated sediments are limited to short-term increases in suspended sediment concentrations, and not downstream hydraulics or flooding, there is no anticipated impacts to OVSD's infrastructure.
25				OVSD	We believe that the following questions should be answered before any additional steps are taken. 1. What will the impacts be to the river and adjacent property from the Robles Diversion to the Treatment Plant and to the ocean? **See Excerpt OVSD #2 from comment letter for detailed comment**	Letter dated Sep 23, 2015	Flooding impacts associated with the dam removal project is covered through downstream flood improvement projects identified in the project EIS/EIR, which are being designed and implemented separately. Short term impacts from flushing accumulated sediments are primarily associated with surface water supply (Robles Diversion) and downstream biological resources (high suspended sediment concentrations negatively impacting fish and wildlife).
26				OVSD	2. How will the river hydraulics, grades, channel location and braiding, freeboard depth, and what scour depths result from the proposed plan?. **See Excerpt OVSD #2 from comment letter for detailed comment**	Letter dated Sep 23, 2015	The flushing of accumulated sediments, which is the focus of this study, does not alter river hydraulics, grades, channel location and braiding, freeboard depth, or scour depths. These issues were addressed in the certified EIS/R.

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27				OVSD	3. How will the beneficial uses, environmental conditions and water quality be impacted and mitigated?. **See Excerpt OVSD #2 from comment letter for detailed comment**	Letter dated Sep 23, 2015	Water supply impacts associated with water quality, and potential mitigation options, are discussed in Sections 4 and 5. Dam Removal environmental impacts associated with downstream biological resources (steelhead is primary species of concern) are included in Sections 4.4 and 5.2 of the Dam Removal Concepts Evaluation Report (AECOM 2016). Project impacts to other beneficial uses are covered in the certified EIS/R.
28				OVSD	4. What protection measures are needed to protect the Sanitary Sewer System and Treatment Plant from impacts? . **See Excerpt OVSD #2 from comment letter for detailed comment.**	Letter dated Sep 23, 2015	See response to comment #24. Although we do not anticipate any significant impacts to OVSD infrastructure, specific locations of concern could be visited during final design to clarify OVSD concerns.
29				OVSD	5. What are the costs associated with those impacts and protection measures? . **See Excerpt OVSD #2 from comment letter for detailed comment**	Letter dated Sep 23, 2015	See response to comment #24. Although we do not anticipate any significant impacts to OVSD infrastructure, specific locations of concern could be visited during final design to clarify OVSD concerns.
30				OVSD	6. What are the environmental and right of way impacts and costs of those mitigation measures? . **See Excerpt OVSD #2 from comment letter for detailed comment**	Letter dated Sep 23, 2015	See response to comment #24. Although we do not anticipate any significant impacts to OVSD infrastructure, specific locations of concern could be visited during final design to clarify OVSD concerns.
31				OVSD	7. At this time, there is no definitive review or conclusions regarding the answers to these questions.. **See Excerpt OVSD #2 from comment letter for detailed comment**	Letter dated Sep 23, 2015	See response to comment #24. Although we do not anticipate any significant impacts to OVSD infrastructure, specific locations of concern could be visited during final design to clarify OVSD concerns.
32		9	6-7	Ventra Water	Modify text to …, who draws subsurface water from the Ventura River in the vicinity of Foster Park. Add reliable water supply information from provided reference.	Email and Markups dated Oct 12, 2015	Text revised as suggested.
33		10	Figure	Ventra Water	Revise label to "City of Ventura"	Email and Markups dated Oct 12, 2015	Figure label revised as suggested.
34		12	4-18	Ventra Water	Revise Section 3.1.2 per suggested text.	Email and Markups dated Oct 12, 2015	Section updated per suggested text.
35		13	Figure	Ventra Water	Remove Figure 3-3	Email and Markups dated Oct 12, 2015	Figure removed.
36		13	6-7	Ventra Water	Delete ….."and eliminating this source of water from the City's supply."	Email and Markups dated Oct 12, 2015	Text revised as suggested.
37		13	10	Ventra Water	Revise last sentence to read " The total maximum allowed production from all three wells is 3,000 AF."	Email and Markups dated Oct 12, 2015	Text revised as suggested.
38		15	19-23	Ventra Water	Delete existing text and see attached pages for revised information from 2013 and 2015 CWRR for Consultants to revise this section.	Email and Markups dated Oct 12, 2015	Section revised per information within reference provided.
39		27	12	Ventra Water	Delete extra parenthesis	Email and Markups dated Oct 12, 2015	Text revised as suggested.

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40		27	15	Ventra Water	Revise "the" to "their"	Email and Markups dated Oct 12, 2015	Text revised as suggested.
41	5.3.2.4	29	28-34	Ventra Water	This is not a viable option and should be removed from the report.	Email and Markups dated Oct 12, 2015	While we did not remove the option from the report, the City's input was provided in the report text, and this option no longer is recommended for further study.
42		30	18	Ventra Water	Change "VCWPD" to "City of Ventura"	Email and Markups dated Oct 12, 2015	Text revised as suggested.
43		31	7	Ventra Water	Delete "likely"	Email and Markups dated Oct 12, 2015	Text revised as suggested.
44	5.3.3.1.1	32		Ventra Water	See attached cover of report that should be used and referenced to write this section.	Email and Markups dated Oct 12, 2015	Section updated using the suggested reference.
45		33	15	Ventra Water	Change "would" to "could"	Email and Markups dated Oct 12, 2015	Text revised as suggested.
46		33	16	Ventra Water	insert "possibly"	Email and Markups dated Oct 12, 2015	Text revised as suggested.
47	5.3.3.1.4	34		Ventra Water	This is a very fuzzy option. Not sure as effective as think. Also drought reduction already in place may not see that great of conservation savings as anticipated in report.	Email and Markups dated Oct 12, 2015	The management team for the project feels strongly that conservation should be part of any solution. The budget set aside for this would be dedicated to increasing the public participation in conservation programs.
48		35	3	Ventra Water	rebates are for Casitas service area only	Email and Markups dated Oct 12, 2015	Text added to report to indicate that rebates are for Casitas service area only.
49		35	20-21	Ventra Water	Not sure what you're talking about.	Email and Markups dated Oct 12, 2015	To help offset any potential lost water supply, budget could be provided to promote expansion of existing conservation programs, or development of new conservation programs.
50		35	28	Ventra Water	rates are already in City's municipal code and is tied to conservation stages.	Email and Markups dated Oct 12, 2015	Text revised. Regardless of adoption rate cited in the municipal code, the goal of this option would be to provide an incremental increase in participation in conservation programs.
51		35	footnote	Ventra Water	Why is rate based on CMWD rates which are lower?	Email and Markups dated Oct 12, 2015	CMWD rates were used here as an example. Future studies would compare other local rates and updated estimates appropriately.
52		45	14	Ventra Water	replace 9 with 8	Email and Markups dated Oct 12, 2015	Text revised.

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53		45	16-19	Ventra Water	Delete New Wells at Santa Paula Basin from Table	Email and Markups dated Oct 12, 2015	Done.
54		45	23	Ventra Water	Delete first phrase from first sentence.	Email and Markups dated Oct 12, 2015	Text revised.

Comment Letter Excerpts

Matilija Coalition EXCERPT #1	Letter dated Oct 17, 2015	The studies presented in the Matilija Task 1.3 Draft Concepts Evaluation Report benefit from information that was not available during the federal feasibility study of 2001-2004. Since then, several large dams have been removed from rivers on the west coast of the United States, and much has been learned. We now have real world examples demonstrating the power and resilience of riverine ecosystems to restore themselves, if given the chance. In every case, fish immediately migrated upstream of the former dam site, and downstream ecosystems absorbed and benefitted from the increased sediment transport. In no case were permanent negative impacts realized. And most notably, in the case of Condit Dam removal, we have witnessed the power of a single event to almost instantaneously reverse decades of negative impacts to a river through what was once predicted to result in "total biological annihilation." The current studies apply this real world experience to demonstrate how the short-term impacts of a single sediment release will not permanently affect our local water supply. This provides a scientifically justified opportunity to take advantage of the energy of the Ventura River, saving tens of millions of dollars over mechanically moving and disposing of sediment, while significantly reducing the environmental footprint of the project.
Matilija Coalition EXCERPT #2	Letter dated Oct 17, 2015	The comparative analysis uses steelhead health downstream of the Matilija Dam site as a parameter in evaluating the different alternatives. In some cases it assumes mortality of aquatic life downstream: *. both DRC-1 and DRC-2 results in the substantial, but likely not complete, loss of a year class of fish in Matilija Creek and the Ventura River.* This is a conservative conclusion, and while these dam removal alternatives will clearly create adverse downstream conditions, the report also states: *. Matilija can obviously prove to be a challenging environment for steelhead to thrive; these conditions also stress the importance of tributary habitat, which provide refuge habitat from these natural events (and presumably would serve the same function following dam removal as well),* ***because a nominally lethal, high-sediment condition in a channel with available refugia does not necessarily result in mortality for mobile organisms that have evolved under these conditions*** *.* In addition to the refugia value of tributaries such as the North Fork Matilija Creek and San Antonio Creek, a significant proportion of the native steelhead population resides in these tributaries as well as the headwaters upstream of the dam site. (see: **Steelhead Population and Habitat Assessment in the Ventura River / Matilija Creek Basin 2006-2012 FINAL REPORT (2015)**) So although there will certainly be impacts to downstream populations in the main stem of the Ventura River, decision makers should recognize that DRC-1 and DRC-2 will not result in the complete loss of the steelhead population. (One may even reasonably expect Phase I sediment release impacts to be similar to past geological events, hence within the evolutionary experience of the southern steelhead.) Importantly, the study concludes that; *. Phase II transport for all three dam removal concepts will likely have an indiscernible incremental effect over baseline conditions.* The analyses clearly illustrate that, given the climate, geology, and naturally high sediment loads regularly experienced in the Ventura River, the future post-dam-removal fine sediment impacts will be within the natural range of turbidity for high flow events. This conclusion opens the way for implementation of cost-effective natural transport alternatives for dam removal without the previous fear of long-term downstream impacts.
Matilija Coalition EXCERPT #3	Letter dated Oct 17, 2015	The ***Matilija Task 3.2 Hydrologic Assessment for Water Supply*** study provides a comprehensive review of the contribution of Robles Diversion to Casitas Municipal Water District and the potential impacts of missed diversions on reservoir storage levels. This is also new information, which opens up opportunities above and beyond the assumptions made during the federal Feasibility process. Most notably, the recent analysis revealed that diversions from the Ventura River at Robles have historically provided 23% of storage in Lake Casitas, in contrast to the prior assumption that Robles contributed fully 50% of supply. Furthermore, the analysis reveals that based on historic data, a single missed diversion event will only temporarily impact reservoir storage by 4-6%, and that this loss will be made up in the next flood event. While recognizing that this is only an estimate, this analysis provides a renewed perspective of the actual risk posed by utilizing natural transport to expedite dam removal. Most importantly, **it is now understood that a single missed diversion event is feasible.**

Comment Letter Excerpts

Matilija Coalition EXCERPT #4	Letter dated Oct 17, 2015	The ***Matilija Task 3.3 Water Supply Mitigation*** report presents a range of mitigation measures for water supply. However, based on the ***Task 3.2 Hydrologic Assessment for Water Supply*** analysis, it appears that water supply mitigation will not be necessary as a result of the project. Therefore, these measures should be considered part of a contingency plan rather than required mitigation for the project. It is important to note that the impact of 4-6% reduction in storage is within the variability of diversion efficiency and conservation measures. The current operations are subject to fouling of fish screens, or even complete failure of the diversion dam (as in 1969), resulting in lost diversion opportunity. Also, current drought conservation efforts have successfully reduced demand by over 25%, demonstrating the feasibility of current and future conservation measures. Moreover, this "loss" is not realized unless the lake runs dry and there is no supply to deliver to customers. Of relevance is the recent federal court decision regarding Robles Diversion, which determined that Casitas "…can establish a compensable injury when diversions resulting from the biological opinion criteria reduce the water project's safe yield to the point when deliveries are affected—i.e., to the point when use becomes constrained." (Casitas v United States, 102 Fed.Cl. at 473 – http://caselaw.findlaw.com/us-federal-circuit/1623229.html#sthash.0DL3qkmC.dpuf) As demonstrated in the ***Hydrologic Assessment for Water Supply*** analysis, it is highly unlikely that the project will result in delivery constraints to water use.
OVSD EXCERPT #1		In reviewing both the 2004 and 2015 Studies and considering the infrastructure integrity, water quality, environmental and permitting issues that OVSD currently operates under, we have some concerns about the proposed Dam Removal alternatives and related hydraulic analysis, scour and river configuration analysis, floodplain change and mitigation measures outlined in your Studies. The 2015 Study appears to introduce new removal alternatives that have different and more potentially significant hydraulic impacts to the river south of the Robles Diversion. These new and more significant impacts need to be studied to determine more appropriate mitigation measures as it relates to impacts to the OVSD Collection System and Treatment Plant. Your Studies suggests that the preparation of these updated studies is a step in determining the preferred removal option. From OVSD's perspective, the next step should be to update the Ventura River hydraulics analysis to determine the effects of creating an intentional significant "flushing" event to carry a significant amount of debris down the river to the ocean. The debris amounts considered, under natural conditions, would be carried over many events, possibly over many years. The intentional "flushing" event will attempt to do this in one event creating un-natural and artificially intense hydraulic flow conditions.
OVSD EXCERPT #2		We believe that the following questions should be answered before any additional steps are taken. 1. What will the impacts be to the river and adjacent property from the Robles Diversion to the Treatment Plant and to the ocean? 2. How will the river hydraulics, grades, channel location and braiding, freeboard depth, and what scour depths result from the proposed plan? 3. How will the beneficial uses, environmental conditions and water quality be impacted and mitigated? 4. What protection measures are needed to protect the Sanitary Sewer System and Treatment Plant from impacts? 5. What are the costs associated with those impacts and protection measures? 6. What are the environmental and right of way impacts and costs of those mitigation measures? 7. At this time, there is no definitive review or conclusions regarding the answers to these questions. Before any decision is made regarding the preferred plan, options, mitigations, costs or schedules, there must be a clear understanding of the project impacts and that: (1) the project alternatives will not degrade water quality or impact beneficial uses, (2) OVSD and our rate payers will not be unduly burdened by costs and liabilities, and (3) that OVSD facilities will not be put at risk by impacts related to the hydraulic silt flushing or dam removal related impacts.

Comment Letter Excerpts

NMFS EXCERPT #1		The installation and operation of new well heads at the Foster Park wells, with increased pumping capacity, could potentially adversely impact steelhead and designated steelhead critical habitat in the Ventura River. The magnitude, timing and duration of surface flows, and thus the quantity and quality of critical habitat, within the lower Ventura River could be affected by the operations of these wells to varying degrees, depending on the time of year, the amount of rainfall during the wet season, and the rate of withdrawals from the wells. The principal potential adverse effect of well operations in the Foster Park area are the loss of summer rearing habitat for juvenile steelhead as well as other aquatic organisms. However, adverse effects could also occur to migrating adult steelhead, spawning steelhead, eggs and fry if flows arc reduced to critical levels during adult steelhead migration and spawning. Potentially all juvenile steelhead in the Ventura River watershed could use the Foster Park area at some point in their life cycle, either for rearing or as a migration corridor on their return to the ocean. Consequently, pumping from these wells has the potential to affect all juvenile steelhead in the watershed, and this has implications for the survival, abundance, productivity, and spatial structure of the Ventura River steelhead population. Finally, recent studies and computer modeling of precipitation for Southern California over the next hundred years show a potential increase in weather extremes, and a slight to modest decrease in annual precipitation occurring by the year 2100 (see for example, Cayan, et al. 2007, Climate Change Scenarios for the California Region. Climate Change DOI 10,1007). This predicted decrease in the average annual rainfall is expected to result in a greater frequency of dry rainfall years, and an increased frequency and duration of dry hydrologic conditions in the Ventura River Watershed. The increased frequency of dry conditions resulting from climate change would be exacerbated by withdrawals from the Foster Park wells.