Implementation Plan for the Malibu Creek Watershed Nutrients TMDL (2003) and the Malibu Creek and Lagoon Sedimentation and Nutrients TMDL to Address Benthic Community Impairments (2013)

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I. INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) previously established two Total Maximum Daily Loads (TMDLs): the Malibu Creek Watershed TMDL for Nutrients on March 21, 2003 (2003 TMDL) and the Malibu Creek and Lagoon TMDL for Sedimentation and Nutrients to Address Benthic Community Impairments on July 2, 2013 (2013 TMDL). Because an implementation plan is not a required element of a TMDL established by U.S. EPA, these TMDLs do not include implementation plans or schedules to achieve the load allocations (LAs) and waste load allocations (WLAs) assigned to discharges in the Malibu Creek Watershed. This document presents the implementation plans and schedules proposed to be adopted by the Regional Water Quality Control Board, Los Angeles Region (Regional Water Board) for the two U.S. EPA-established TMDLs.

This Staff Report summarizes the U.S. EPA-established TMDLs, including environmental settings, numeric targets, source assessments, WLAs and LAs, and then describes the Implementation Plan proposed for Regional Water Board adoption. The Implementation Plan describes the plans, implementation schedules, regulatory tools, and other mechanisms by which the WLAs and LAs may be achieved and describes the associated monitoring requirements.

The environmental setting and numeric targets in the 2003 Nutrient TMDL and the 2013 Nutrient and Sedimentation TMDL are summarized together in Section II. In Sections II through IV, the source assessment, allocations, and implementation plan are summarized separately for nutrients and sedimentation. The monitoring requirements, implementation plan, and implementation alternatives and costs are combined again in Sections V through VII.

II. ENVIRONMENTAL SETTING AND NUMERIC TARGETS FOR NUTRIENT AND SEDIMENTATION TMDLS

A. Environmental Setting

The Malibu Creek Watershed (MCW) is located in western Los Angeles County and southeastern Ventura County. At 109 square miles, it extends from the Santa Monica Mountains and Simi Hills to the Santa Monica Bay at Malibu State Beach (also known as Surfrider Beach). The MCW contains the cities of Agoura Hills, Westlake Village, Calabasas, Thousand Oaks, Hidden Hills, Malibu, and Simi Valley; and the counties of Los Angeles and Ventura.

The MCW is comprised of numerous tributaries and lakes. The tributaries include streams draining to Lake Sherwood, which then discharges to Potrero Creek. Potrero Creek flows to Westlake Lake and down to Triunfo Creek to its confluence with Medea Creek to form Malibou Lake. Lindero Lake is located along Lindero Creek, which, along with Palo Comado Creek, is a tributary of Medea Creek. Malibou Lake drains into Malibu Creek. Farther downstream Las Virgenes Creek enters Malibu Creek at Malibu Creek State Park. Stokes Creek and Cold Creek are also major tributaries of Malibu Creek. Eventually, Malibu Creek empties into Malibu Lagoon and then the Pacific Ocean (U.S. EPA, 2013). Attachment 1 gives a visual representation of the relationships between lakes, tributaries, and streams.

Based on 2008 data compiled by the Southern California Association of Governments (SCAG), land use within the MCW largely consists of open space and residential land use, but also includes some agricultural, industrial, institutional, and commercial uses (Table 1).

Table 1: Land uses within the MCW

Land Use	Area (acres)	Percent (%)
Agriculture	932	1.3%
Barren	346	0.5%
Commercial	717	1.0%
Industrial	953	1.4%
Institutional	885	1.3%
Multifamily	922	1.3%
Office	1,574	2.2%
Open Water	522	0.7%
Orchards	162	0.2%
Park – Irrigated	523	0.7%
Single Family Residential <0.5 ac	5,048	7.2%
Single Family Residential >0.5 ac	2,830	4.0%
Transportation	406	0.6%
Undeveloped and Park - Non-irrigated	54,367	77.5%
TOTAL	**70,187**	**100%**

B. Numeric Targets

Table 2 summarizes the Clean Water Act Section 303(d) list of impaired waters within the MCW that are listed for benthic, sediment, and nutrient related impairments and which are addressed by the 2003 and 2013 TMDLs. A visual representation of the 303(d) listed waters addressed by the TMDLs can be found in Attachments 2-4.

Table 2: 303(d) listed waterbodies in the MCW for benthic, sediment, and nutrient related impairments addressed by the 2003 and 2013 TMDLs

Water Body Name	Water Body Type	Pollutant	Pollutant Category Impairment	First Year Listed on the 303(d) List
Lake Lindero	Lake & Reservoir	Algae Eutrophic Odor	Nutrient Impairment	1996
Lake Sherwood	Lake & Reservoir	Algae Ammonia Eutrophic	Nutrient Impairment	1996
		Organic Enrichment/ Low Dissolved Oxygen*	Nutrient Impairment	1998
Las Virgenes Creek	River & Stream	Nutrients (Algae) Organic Enrichment/ Low Dissolved Oxygen Scum/Foam	Nutrient Impairment	1996
		Sedimentation/ Siltation	Sediment Impairment	2002
		Benthic-Macroinvertebrate Bioassessments	Benthic Impairment	2010
Lindero Creek Reach 1	River & Stream	Algae Scum/Foam	Nutrient Impairment	1996
Lindero Creek Reach 2	River & Stream	Algae Scum/Foam	Nutrient Impairment	1998
Malibou Lake	Lake & Reservoir	Algae Eutrophic	Nutrient Impairment	1996
		Organic Enrichment/ Low Dissolved Oxygen	Nutrient Impairment	1998
Malibu Creek	River & Stream	Nutrients (Algae) Scum/Foam	Nutrient Impairment	1996
		Benthic-Macroinvertebrate Bioassessments	Benthic Impairment	2010
		Sedimentation/Siltation	Sediment Impairment	2002
Malibu Lagoon	Estuary	Eutrophic	Nutrient Impairment	1998
		Benthic Community Effects	Benthic Impairment	1998
Medea Creek Reach 1	River & Stream	Algae	Nutrient Impairment	1996
Medea Creek Reach 2	River & Stream	Algae	Nutrient Impairment	1996

Water Body Name	Water Body Type	Pollutant	Pollutant Category Impairment	First Year Listed on the 303(d) List
Westlake Lake	Lake & Reservoir	Algae Ammonia Eutrophic Organic Enrichment/ Low Dissolved Oxygen	Nutrient Impairment	1996

*Recent dissolved oxygen data demonstrate that conditions have improved in Lake Sherwood and data will be considered as part of the next 303(d) listing cycle.

Numeric targets are based on the narrative and numeric water quality objectives in the Basin Plan. Because the MCW impairments are a result of multiple interacting stressors, the 2003 and 2013 TMDLs set multiple numeric targets for the response indicators (algae cover, chlorophyll a, dissolved oxygen) and the pollutants causing the responses (nitrogen and phosphorus) to attain the water quality objectives. The 2003 TMDL set nutrient targets to address depressed dissolved oxygen, algae, odors, and scum (U.S. EPA, 2003). The 2013 TMDL set nutrient and sediment targets to address benthic community impacts (U.S. EPA, 2013). Therefore, the numeric targets that apply to the MCW include specific quantifiable measures directly associated with eutrophic conditions, biotic impairment, nutrients, and sedimentation (Table 3).

Table 3: MCW Numeric Targets

Pollutant	2003 TMDL Targets	2013 TMDL Targets
Ammonia	Malibu Creek one-hour average: 2.59 mg/L Malibu Creek 30-day average: 1.75 mg/L Lake Sherwood one-hour average: 6.7 mg/L Lake Sherwood 30-day average: 2.1 mg/L Westlake Lake one-hour average: 8.5 mg/L Westlake Lake 30-day average: 1.5 mg/L	
Chlorophyll a	Malibu Lagoon: 150 mg/m^2 MCW Streams: 150 mg/m^2 MCW Lakes: 10 µg/l	Malibu Creek, Malibu Creek tributaries and Lagoon: 150 mg/L

Pollutant	2003 TMDL Targets	2013 TMDL Targets
Dissolved Oxygen	Malibu Creek Watershed: 7 mg/L as annual mean Waters designated as WARM: no single determination below 5.0 mg/L Waters designated as COLD and SPWN: 7.0 mg/L as an average daily value.	Malibu Creek and tributaries: 7 mg/L as annual mean Waters designated as WARM: no single determination below 5.0 mg/L Waters designated as COLD and SPWN: 7.0 mg/L as an average daily value.
Algal Cover	Malibu Creek Watershed: Streams and Lagoon and lakes: Maximum 30% algal cover for floating algae (filamentous algae greater than 2 cm in length) Streams and Lagoon only: Maximum: 60% algal cover for bottom algae (diatoms and blue green algae mats greater than 0.3 cm in thickness) expressed as a seasonal mean	Malibu Creek and tributaries: Maximum 30% algal cover for floating algae (filamentous algae greater than 2 cm in length) Maximum: 60% algal cover for bottom algae (diatoms and blue green algae mats greater than 0.3 cm in thickness) expressed as a seasonal mean
Nutrients	Malibu Creek Watershed: <u>Summer</u> (April 15 to Nov 15): Nitrate+Nitrite: 1.0 mg/L Total Phosphorus: 0.1 mg/L <u>Winter</u> (Nov. 16 to April 14): Nitrate+Nitrite: 8.0 mg/L	Malibu Creek, Malibu main tributaries, and Malibu Lagoon: <u>Summer</u> (April 15 to Nov 15): Total Nitrogen: 0.65 mg/L Total Phosphorus:0.1 mg/L <u>Winter</u> (Nov. 16 to April 14) Total Nitrogen: 1.0 mg/L Total Phosphorus: 0.2 mg/L
Natural Sedimentation Rate		Malibu Creek and tributaries: 38% reduction in sedimentation loading
Benthic Community Diversity		Malibu Lagoon: Minimum taxa richness: 40 based on annual averages.

Pollutant	2003 TMDL Targets	2013 TMDL Targets
CSCI, pMMI, CA-O/E*		Malibu Creek and tributaries : Scores should equal between 5th and 10th percentile of the model reference distribution based on a median over four years.
SC-IBI*		Malibu Creek and tributaries: Minimum of 40 bioscore, based on a median over four years

*CSCI: California Stream Condition Index, pMMI: Predictive multi-metric index, CA-O/E: Ratio of observed to expected taxa, SC-IBI: Southern California Benthic Index of Biotic Integrity

III. NUTRIENTS

A. Source Assessment for Nutrients

The following section identifies the point sources and non-point sources of nutrients identified in the 2003 TMDL and the 2013 TMDL. Point sources include discharges from discrete human-engineered outfalls, except agricultural discharges. Nonpoint sources are defined to mean any source of water pollution that does not meet the legal definition of point source. Point sources are regulated through National Pollution Discharge Elimination System (NPDES) permits. Nonpoint sources are regulated through authority contained in the Porter Cologne Water Quality Control Act (Cal. Water Code Division 7).

1. Point Sources

In the MCW, point sources include direct discharges from the Tapia Water Reclamation Facility (WRF) and discharges from storm drains regulated under municipal separate storm sewer system (MS4) permits.

a) Tapia Water Reclamation Facility (WRF)

Las Virgenes Municipal Water District (Las Virgenes MWD) and Triunfo Sanitation District jointly own the Tapia WRF, a publicly owned treatment works (POTW) operated by Las Virgenes MWD. There are two types of discharges from the Tapia WRF: direct discharges and indirect discharges. Direct discharges include treated effluent discharged directly into Malibu Creek (Discharge No. 001 and Discharge No. 003), Las Virgenes Creek (Discharge No. 002), or, in certain instances, Arroyo Calabasas in the Los Angeles River watershed (Discharge No. 005) (LARWQCB, 2010). Direct discharge points are shown in Table 4. These direct discharges are currently regulated under an NPDES permit (Order No. R4-2010-0165). Indirect discharges include irrigation at the Tapia WRF or at other locations in the watershed and sludge disposal. Indirect discharges are summarized in section III.A.2, “Nonpoint Sources.”

Table 4: Description of the effluent discharge outfalls from Tapia WRF

Discharge No.	Description	Malibu Creek Subwatershed	Receiving Water
001	Primary outfall pipe	Middle Malibu Creek	Malibu Creek
002	Reservoir No. 2 overflow outfall	Lower Las Virgenes Creek	Las Virgenes Creek
003	Bypass- additional outlet during extremely high flow conditions	Lower Malibu Creek	Malibu Creek
005	Excess Effluent	N/A	Arroyo Calabasas Tributary to Los Angeles River

The Tapia WRF is prohibited from discharging to Malibu Creek during the dry season when a sand berm forms and closes off the entrance to Malibu Lagoon from the ocean (April 15 to November 15). However, exceptions to this prohibition apply for operational emergencies, for certain rain events when all other disposal options are exhausted, or for creek flow augmentation to maintain a minimum flow of 2.5 cubic feet per second (cfs) in lower Malibu Creek to support fish habitat, although augmentation cannot cause the sand berm to open (LARWQCB, 2010).

The 2013 TMDL estimates the Tapia WRF contributes 34.7% of the total nitrogen load and 61.5% of the total phosphorus load during the winter season. During the summer season, due to the prohibition, the Tapia WRF’s contribution to the total watershed nutrient load is minimal (1%); however, during the exceptions to the prohibition, the Tapia WRF’s contribution increases to 17% and 26.2% of the total nitrogen and total phosphorus load, respectively (U.S. EPA, 2013). It should be noted that, due to drought conditions, Tapia has discharged more frequently to maintain the minimum flow during the summer season, and therefore the Tapia WRF’s estimated contribution to the total nitrogen load and the total phosphorus load during drought conditions may be underestimated.

b) MS4 Storm Water

Discharges of stormwater and non-stormwater runoff from storm drains in the MCW are regulated through the Los Angeles County MS4 permit (Order No. R4-2012-0175 as amended by State Water Board WQ 2015-0075); the Ventura County MS4 permit (Order No. R4-2010-0108); the statewide stormwater permit issued to the California Department of Transportation

(Caltrans) (Order No. 2012-0011-DWQ), and the Phase II Small MS4 General permit (Order No. 2013-0001-DWQ). It should be noted that the 2003 TMDL and the 2013 TMDL do not address any industrial or construction stormwater or non-stormwater discharges. Within the MCW, permittees covered under the Los Angeles County MS4 permit include the Los Angeles County Flood Control District, the County of Los Angeles, and the cities of Malibu, Agoura Hills, Calabasas, Westlake Village, and Hidden Hills (LARWQCB, 2012). Permittees covered under the Ventura County MS4 permit include the Ventura County Watershed Protection District, the County of Ventura, and the cities of Thousand Oaks and Simi Valley (LARWQCB, 2010). While there are currently no designated small MS4 dischargers identified within the MCW, there may be in the future. Any future discharges from Small MS4s within the MCW will be implemented through the State Water Resources Control Board General Permit (Order No. 2013-0001-DWQ or successor order). The 2013 TMDL estimated that urban runoff contributes 13.7% of the nitrogen load and 3% of the phosphorus load during the winter season and 19.5% of the nitrogen load and 16% of the phosphorus load during the summer season (U.S. EPA, 2013).

2. Nonpoint Sources

Nonpoint sources in the MCW include sheet runoff from natural undeveloped areas, discharges from onsite wastewater treatment systems (OWTS, or septic systems), golf courses, agriculture, livestock, and indirect discharges from the Tapia WRF.

a) Runoff from Undeveloped Land

More than 75% of the MCW is undeveloped land consisting primarily of chaparral, scrub, and woodlands, with smaller areas of grasslands and forests. The Bureau of Land Management (BLM), National Parks Service, and County and City parks are the primary owners of these undeveloped, or protected, lands. Nutrients enter the waterways through surface runoff or through shallow groundwater transport, contributing 25.2% of the total nitrogen load and 5.5% of the total phosphorus load during the winter period and 9.3% of the total nitrogen load and 10.6% of the total phosphorus load during the summer period (U.S. EPA, 2013).

b) Onsite Wastewater Treatment Systems (OWTS)

Failing OWTS can be a source of nutrients in nearby waterbodies and, even when not near a waterbody and functioning properly, OWTS can be a source of nutrients through shallow groundwater that may eventually enter surface waters. Throughout the watershed, septic systems are commonly used in low-density rural residential areas and a few communities. The 2003 TMDL categorized a failing septic system as a system that has backed up or that has surfacing effluent, as well as a system that routinely has a poorly functioning leach field (U.S. EPA, 2003). EPA analyzed the number of septic systems within each subwatershed and estimated the total annual nutrient load per year. OWTS are estimated to contribute roughly 9.6% of the total nitrogen loading and 15.6% of the total phosphorus loading during the winter season and roughly 22.8% of the total nitrogen loading and 19.7% of the total phosphorus loading during the summer season (U.S. EPA, 2013).

c) Golf Courses

Most of the golf courses within the Malibu Creek watershed are near or adjacent to waterways and excess nutrients and soil runoff may be transported to waterways via shallow groundwater flows and sheet runoff. For example, both Lake Sherwood and Lake Lindero have golf courses just upstream of the lakes, and Westlake Lake has a golf course about 0.6 mile northeast of the lake. In addition, two golf courses are located in the upper portions of the Westlake and Upper Lindero Creek watersheds near perennial or intermittent streams. There is also a small private golf course on the west side of Malibu Lagoon (U.S. EPA, 2003). Golf courses are estimated to contribute 5.5% of the total nitrogen loading and 7.6% of the total phosphorus loading to the MCW in the winter season and 9.3% and 14.6% of the total nitrogen and total phosphorus loading, respectively, to the MCW in the summer season (U.S. EPA, 2013).

d) Agriculture/Livestock Runoff

Approximately 932 acres in the MCW are designated as agricultural land (U.S. EPA, 2013). Agricultural areas are commonly found along Hidden Valley Creek or lower Las Virgenes Creek. Fertilizers containing phosphorus and nitrogen applied to agricultural lands can be washed into receiving waters due to irrigation or stormwater runoff or shallow subsurface flow. Fertilizers applied to vineyards may also contribute nutrient loads; however, the 2013 TMDL found that many small “hobby vineyards” were not included in the 2008 SCAG agriculture land use layer and therefore agriculture usage within the watershed may be a larger source than what was estimated.

Horse and livestock areas can be found within Hidden Valley, the Palo Comado Creek area east of Agoura Hills, the Triunfo Creek and Lower Medea Creek areas in the vicinity and upstream of Malibou Lake, and the Cold Creek area around the community of Monte Nido. Cattle grazing areas are confined primarily to the Hidden Valley area in the upper western portion of the watershed, although in recent years cattle grazing has expanded to the Rancho Las Virgenes property in the upper Las Virgenes Creek subwatershed (U.S. EPA, 2003). Sheep and goat livestock reside in the Ahmanson Ranch area north and east of the Rancho Las Virgenes property. Manure produced by horses, cattle, sheep, and goats in the MCW is a source of both nutrients and bacteria. These loads can be introduced directly to the receiving waters in the case of cattle wading in streams, or indirectly during storm runoff. About 5.6% of the total nitrogen loading and about 2% of the total phosphorus loading are attributed to agriculture/livestock during the winter season. During the summer season, the percent contribution increases to about 8% for nitrogen and about 3.8% for phosphorus (U.S. EPA, 2013).

e) Tapia WRF

The nonpoint source discharges from the Tapia WRF include runoff from irrigation and sludge disposal areas, which can enter the creek via surface water runoff or groundwater flow.

The Las Virgenes MWD sells approximately 4,000 acre-feet, or roughly 60 percent, of the reclaimed wastewater from the Tapia WRF per year for irrigation purposes (U.S. EPA, 2003; U.S. EPA, 2013). Reclaimed wastewater is used at Pepperdine University (Order No. 94-055), and on commercial landscapes, parks, school yards, green belt areas, golf courses, agricultural areas, construction projects, and the Rancho Las Virgenes Farm/spray field (Order No. 87-86, readopted by Order No. 97-072) (LARWQCB, 1997; LARWQCB, 1987; LARWQCB, 1994).

Sludge from the Tapia WRF can either be sent to the Rancho Las Virgenes Compost Facility for composting or sent to Rancho Las Virgenes Farm for subsurface biosolids injection (LARWQCB, 2010). At the Rancho Las Virgenes Compost Facility, commercial haulers and people in the community take the compost for fertilizer or soil amendment. The compost is a Class A Exceptional Quality biosolid and is not subject to the land application general requirements and management practices required by the 40 CFR Part 503 Biosolids Rule. At Rancho Las Virgenes Farm, approximately 87 net acres, 16 plots, are available for sludge injection. Sludge injection consists of injecting the sludge six inches below the ground surface, then tilling the soil and planting crops to agronomically remove nutrients. The sludge injection is currently regulated under Waste Discharge Requirements (WDRs) contained in Order No. 79-107 (LARWQCB, 1979). Sludge has not been disposed at the Rancho Las Virgenes Farm since 2003. However, areas with previously disposed sludge can still be a potential legacy source of nutrients if nutrients from these areas enter the creek via surface water runoff or groundwater flow (U.S. EPA, 2013).

B. Allocations for Nutrients

The 2003 TMDL was established for MCW streams and lakes included on the 303(d) list as impaired due to the effects of nutrients, and allocations were assigned to discharges to all streams that were hydrologically connected to nutrient-impaired waterbodies. Therefore, the 2003 TMDL was established for all waterbodies within the MCW. The 2013 TMDL was established to address the benthic community impairments in Malibu Lagoon and benthic community impairments and sedimentation in Malibu Creek and Las Virgenes Creek. The 2013 TMDL assigned allocations to discharges to all streams that were hydrologically connected to sediment- and benthic-impaired waterbodies. Therefore, the 2013 TMDL was established for Malibu Creek, Las Virgenes Creek, Stokes Creek, and Cold Creek, Malibu Lagoon, and all lakes within MCW. Attachment 5 and Attachment 6 include maps that show the location of the streams and lakes addressed by the 2003 TMDL and the 2013 TMDL.

The 2013 TMDL found that the 2003 TMDL nutrient numeric targets were being achieved, but the 2003 TMDL algae numeric targets were not. Therefore, the 2013 TMDL concluded that the nutrient numeric targets from the 2003 TMDL were not sufficient to achieve the algae numeric targets from the 2003 TMDL, and more stringent numeric targets for nutrients were needed. The algae numeric targets are necessary to support the protection of the benthic community in Malibu Creek and Malibu Lagoon and attain beneficial uses. Therefore the 2013 TMDL carried over the numeric targets for algae from the 2003 TMDL, but set more stringent numeric targets for nutrients. For waterbodies included in both TMDLs, the 2013 TMDL numeric targets and associated allocations supersede the 2003 TMDL (U.S. EPA, 2013). Attachment 7 and 7A illustrates where the 2013 TMDL nutrient WLAs and LAs supersede those in the 2003 TMDL.

Table 5 identifies the 2003 TMDL WLAs and LAs for nitrogen and phosphorus during summer and winter periods for sources within the entire MCW (U.S. EPA, 2003).

Table 5: Nutrient WLAs and LAs set by the 2003 TMDL

Type of Allocation	Discharge Sources	Total Nitrogen (lbs/day) Summer	Total Nitrogen (mg/L) Winter	Total Phosphorus (lbs/day) Summer
WLA	Tapia WRF Direct Discharge	0	8	0
LA	Tapia WRF Indirect Discharge (Effluent Irrigation/Spray Field/Sludge)	0	0	0
LA	OWTS	6	8	0.9
LA	Runoff from developed areas	3	8	0.3
LA	Golf Courses	0	8	0
LA	Agriculture/ Livestock	3	8	0.2
LA	Dry Weather Urban Runoff	5	8	0.5
LA	Runoff from Undeveloped Land	4	8	0.5
LA	Other	8	8	0.6

Type of Allocation	Discharge Sources	Total Nitrogen (lbs/day) Summer	Total Nitrogen (mg/L) Winter	Total Phosphorus (lbs/day) Summer
Developed areas: Sum of commercial/industrial, high/medium density residential, low density residential and rural residential. Undeveloped areas: Sum of vacant, chaparral/sage scrub, grasslands, and woodlands. Other: Sum of atmospheric deposition, lagoon drains, birds, tidal inflow, groundwater, and sediment release. Summer: April 15-November 15. Winter: November 16-April 14. Total Nitrogen: Nitrate-N+Nitrite-N				

Although the 2003 TMDL does not assign a nutrient WLA to MS4 discharges, it does assign nutrient LAs to “runoff from developed areas” and “dry weather urban runoff,” which are types of discharges regulated by MS4 permits. Therefore, the nutrient LAs for these sources shall be considered MS4 nutrient WLAs for purposes of implementation. The nutrient LAs for the runoff from developed areas and dry weather urban runoff will be summed to create an MS4 WLA of 8.0 lbs/day of total nitrogen and 0.80 lbs/day for total phosphorus during the summer for the entire MCW. The nutrient WLAs are then apportioned between the Los Angeles County MS4, Ventura County MS4, and Caltrans based on the relative areas of Los Angeles County, Ventura County, and Caltrans in the MCW. All Ventura County MS4 storm drains are subject to the 2003 TMDL. Thus, the nutrient WLAs for the Ventura County MS4 are calculated by multiplying the percent area of Ventura County in the entre MCW (39%) by 8.0 lbs/day for total nitrogen and 0.80 lbs/day for total phosphorus. For the Los Angeles County MS4 and Caltrans, a portion of the storm drains are subject to the 2003 TMDL and a portion are subject to the 2013 TMDL. Thus, the nutrient WLAs for the Los Angeles County MS4 and Caltrans are calculated using a two-step process. Using Los Angeles County as an example, first the percent area of Los Angeles County in the entire MCW (61%) is multiplied by 8.0 lbs/day for total nitrogen and 0.80 lbs/day for total phosphorus. Second, the WLAs are further apportioned between the area of Los Angeles County above Malibou Lake (33%) and below Malibou Lake (67%). Caltrans WLAs were calculated using this same two-step process. Table 6 identifies the resulting nutrient WLAs for all MS4 discharges. The calculated nutrient WLAs for the Los Angeles County area and Caltrans area below Malibou Lake are ultimately superseded by the 2013 nutrient WLAs.

Table 6: MS4 WLAs derived from 2003 TMDL LAs

Type of Allocation	Total Nitrogen (lbs/day) Summer	Total Nitrogen (mg/L) Winter	Total Phosphorus (lbs/day) Summer
Ventura County MS4 WLA	3.1	8.0	0.31

Type of Allocation	Total Nitrogen (lbs/day) Summer	Total Nitrogen (mg/L) Winter	Total Phosphorus (lbs/day) Summer
LA County MS4 WLA (drainage area above Malibou Lake)	1.6	8.0	0.16
LA County MS4 WLA (drainage area below Malibou Lake)	3.3	8.0	0.33
Caltrans (drainage area above Malibou Lake)	0.032	8.0	0.0032
Caltrans (drainage area below Malibou Lake)	0.014	8.0	0.0014
Total Nitrogen = Nitrate-N + Nitrite-N			

The 2013 TMDL applies to the eastern portion of the MCW below Malibou Lake, setting allocations for sources that discharge to Malibu Creek and its main tributaries: Las Virgenes Creek, Cold Creek, Stokes Creek, and the four lakes: Lindero, Westlake, Sherwood, and Malibou. Table 7 identifies the 2013 TMDL WLAs and LAs for nitrogen and phosphorus during the summer and winter periods applicable to these waterbodies. The 2013 TMDL also assigns nutrient LAs to overflows from lakes in the MCW because water from the lakes may flow into Malibu Creek or its tributaries via spillway or channel. Although the area of the MCW draining to the lakes is not covered by the 2013 TMDL, the nature of the lakes allows for the retention of water for extended periods of time, which may accumulate nutrients that can then be discharged into Malibu Creek or its tributaries (U.S. EPA, 2013).

Table 7: Nutrient WLAs and LAs set by the 2013 TMDL

Type of Allocation	Discharge Sources	Total Nitrogen (mg/L) Summer	Total Nitrogen (mg/L) Winter	Total Phosphorus (mg/L) Summer	Total Phosphorus (mg/L) Winter
WLA	Tapia WRF Direct Discharge	1.00*	4.00	0.10*	0.2
WLA	Caltrans MS4 Permittees	1.00	4.00	0.10	0.2

Type of Allocation	Discharge Sources	Total Nitrogen (mg/L) Summer	Total Nitrogen (mg/L) Winter	Total Phosphorus (mg/L) Summer	Total Phosphorus (mg/L) Winter
WLA	Los Angeles County MS4 Permittees	1.00	4.00	0.10	0.2
LA	Agriculture	0.65	1.00	0.10	0.10
LA	Tapia WRF Indirect Discharge (Effluent Irrigation/Spray Field)	0.65	1.00	0.10	0.10
LA	Overflow Lakes/Dams	0.65	1.00	0.10	0.10
LA	Other non-point sources (Including Undeveloped Land-parks, and forest lands)	0.65	1.00	0.10	0.10
LA	OWTS	2.49	6.75	0.99	0.99

Total Nitrogen = Organic-N + Inorganic-N
Summer: April 15- November 15
Winter: November 16-April 14
* Applicable for summer flow augmentation, operational emergencies, and summer storm events when all other discharge options are exhausted.

C. Implementation Plan for Nutrients

The following sections give a description of the regulatory mechanisms that will be used to implement the nutrient allocations, how the nutrient allocations will be translated into regulatory requirements, potential implementation measures that could be used to attain the regulatory requirements, and an implementation schedule.

1. Tapia WRF

a) Tapia WRF WLAs

The regulatory mechanism used to implement the nutrient WLAs for the direct discharges from the Tapia WRF to Malibu Creek will be the Tapia WRF NPDES permit (Order No. R4-2010-0165 or successor order).

Possible implementation measures to attain the nutrient WLAs were presented to the Regional Water Board by the Las Virgenes-Triunfo Joint Powers Authority (JPA). The JPA's preliminary plans to meet the nutrient WLAs include the reduction of discharge to Malibu Creek during the winter except during major storm events. In order to reduce discharge during the winter, the JPA plans to seasonally store and repurpose the water for irrigation and potable water using advanced treatment, at the Las Virgenes Reservoir (JPA Board of Directors, 2015). During the summer, the Tapia WRF would cease to discharge to Malibu Creek except when conducting required flow augmentation to maintain 2.5 cfs, during operational emergencies, and for certain rain events when all other disposal options are exhausted. In order to meet the summer nutrient WLAs for these prohibition exceptions, the treated wastewater will be expected to undergo additional treatment. JPA is considering multiple options to meet the summer nutrient WLAs, such as further treating the wastewater through a side stream treatment facility and/or dilution using imported potable water.

The proposed schedule to meet the nutrient WLAs is based on the JPA's preliminary plans and the 2013 TMDL recommendations by U.S. EPA. The proposed implementation schedule for the Tapia WRF nutrient WLAs takes into consideration the time needed to design, permit, and construct any facilities needed to attain the WLAs (Table 8). The proposed implementation schedule includes interim nutrient WLAs until the final nutrient WLAs for total nitrogen and total phosphorus must be met. Current performance concentrations shall be equal to the maximum effluent concentration from the past three years and shall be updated during each permit renewal with the most current data or equal to the current permit[1] limitations, whichever are more stringent.

Table 8: Implementation Schedule for the Tapia WRF WLAs

Implementation Schedule	Total Nitrogen Summer WLA	Total Nitrogen Winter WLA	Total Phosphorus Summer WLA	Total Phosphorus Winter WLA
Upon effective date of the Implementation Plan	Current performance	Current performance	Current performance	Current performance
5 years from effective date of Implementation Plan	1.0 mg/L	Current performance	0.10 mg/L	Current performance

[1]The current permit limits for the Tapia WRF (Order No. R4-2010-0165) include a monthly average limit for nitrite-N + nitrate-N of 8 mg/l and 1.1×10^3 lbs/day and a monthly average limit for Total Phosphorus of 3.0 mg/L and 4.0×10^2 lbs/day during the summer and winter season. The permit also sets a daily maximum limit for Total Phosphorus at 4.0 mg/L and 5.4×10^2 lbs/day during the winter season.

Implementation Schedule	Total Nitrogen Summer WLA	Total Nitrogen Winter WLA	Total Phosphorus Summer WLA	Total Phosphorus Winter WLA
13.5 years from effective date of Implementation Plan	1.0 mg/L	4.0 mg/L	0.10 mg/L	0.20 mg/L
Total Nitrogen = Organic-N + Inorganic-N Summer: April 15-November 15 Winter: November 16-April 14				

The nutrient WLAs will be translated into effluent limitations expressed as concentration-based summer and winter seasonal averages. Compliance with the concentration-based seasonal averages shall be determined by calculating the sum of all nutrient concentration samples collected during the season divided by the number of samples collected during that season. The concentration-based winter seasonal averages do not apply during certain wet-weather events. This is because in order to comply with the winter WLAs, the JPA intends to eliminate the majority of Tapia's discharges to the creek during the winter season by purifying and storing the recycled water for future potable use. The project involves the construction of a 6-MGD advanced treatment facility. The advanced treatment facility, together with existing disposal options such as pumping to the Los Angeles River, will enable the JPA to handle approximately 11 MGD of treated effluent from the Tapia WRF without discharging to Malibu Creek. However, large winter storm events result in substantially higher flows to Tapia and would temporarily require discharges to Malibu Creek. Thus, when the Tapia WRF discharges the excess of 11 MGD to Malibu Creek or its tributaries due to a rain event and all other discharge options have been exhausted, the concentration-based averages do not apply and the mass-based limitation are as follows:

For total nitrogen:

$$\sum_{i=1}^{n} x_i \times 1.0 \frac{mg}{L} \times 0.35 \times 8.34$$

x = average flow at gage F-130 during the period of discharge (MGD)
i = number of days when Tapia's discharge is greater than 11 MGD

Compliance with the mass-based limitation for total nitrogen shall be determined by:

$$\sum_{i=1}^{n} y_i \times z_i \times 8.34$$

y = average flow of Tapia's discharge during the period of discharge (MGD)
z = total nitrogen concentration in Tapia's discharge (mg/L)

i = number of days when Tapia’s discharge is greater than 11 MGD

For total phosphorus:

$$\sum_{i=1}^{n} x_i \times 0.2\frac{mg}{L} \times 0.62 \times 8.34$$

x = average flow at gage F-130 during the period of discharge (MGD)
i = number of days when Tapia’s discharge is greater than 11 MGD

Compliance with the mass-based WLA for total phosphorus shall be determined by:

$$\sum_{i=1}^{n} y_i \times z_i \times 8.34$$

y = average flow of Tapia’s discharge during the period of discharge (MGD)
z = total phosphorus concentration in Tapia’s discharge (mg/L)
i = number of days when Tapia’s discharge is greater than 11 MGD

b) Tapia WRF LAs

The regulatory mechanisms used to implement the nutrient LAs for irrigation from the Tapia WRF to the Rancho Las Virgenes Farm (also known as the spray field), Pepperdine University, Rancho Las Virgenes Compost Facility, and other recycled water users will be the Tapia WRF Water Reclamation Requirements (Order Nos. 87-86, 97-072 and 94-055 or successor orders). The regulatory mechanisms used to implement the nutrient LAs for sludge applied to the Rancho Las Virgenes Farm will be the Rancho Las Virgenes Waste Discharge Requirements (Order No. 79-107 or successor order).

The nutrient LAs in the 2003 TMDL and the 2013 TMDL shall be incorporated into these permits as requirements for the application of sludge and reclaimed water for irrigation. The permits shall require that irrigation and sludge be applied in compliance with current regulations and at rates to ensure that the amount of total nitrogen and phosphorus applied does not exceed the vegetative requirements of the crops or landscaping. Monitoring requirements, as described in section V, “Monitoring for Nutrients and Sedimentation,” shall be included to confirm that nutrients are not applied in excess of agronomic rates.

The application of sludge and reclaimed wastewater for irrigation at agronomic rates are consistent with the existing requirements of the current permits, thus the nutrient LAs for the Tapia WRF’s indirect discharges shall be attained upon the effective date of the proposed implementation plan.

Based on the JPA's preliminary plans to meet the Tapia WRF's nutrient WLAs, there is a potential to have increased irrigation within the MCW as more water is recycled. To reflect the additional volume of irrigation water that may be discharged, the Water Reclamation Requirements for Tapia may need to be modified.

2. MS4 Discharges

a) Los Angeles County and Ventura County MS4 Discharges

The 2003 TMDL encompasses the whole MCW; therefore, the 2003 TMDL MS4 nutrient WLAs will be implemented through the Los Angeles County and Ventura County MS4 permits and the Caltrans statewide storm water permit. The 2013 TMDL only addresses Malibu Lagoon, Malibu Creek, Cold Creek, Stokes Creek, Las Virgenes Creek, and the MCW lakes; therefore, the 2013 TMDL MS4 nutrient WLAs will be implemented through the Los Angeles County MS4 and Caltrans MS4 permits only because no MS4 storm drains are located in the portion of Ventura County subject to the 2013 TMDL. For additional responsible entities in the future, the 2003 and/or 2013 TMDL nutrient WLAs will be implemented through MS4 permits under Phase II of the U.S. EPA Stormwater Permitting Program or the residual designation authority of the state under CWA section 402(p)(2)(E) and other applicable regulatory programs.

The Los Angeles County MS4 permit shall incorporate the 2003 TMDL WLAs and the 2013 TMDL WLAs as water quality-based effluent limitations (WQBELs). The Ventura County MS4 permits shall incorporate the 2003 TMDL nutrient WLAs as WQBELs. The 2003 TMDL summer nutrient WLAs shall be incorporated as daily loads and the winter nutrient WLA shall be incorporated as a seasonal average. The 2013 TMDL summer and winter nutrient WLAs shall be incorporated as seasonal averages. MS4 permittees may be deemed in compliance with the WQBELs if any of the following requirements is demonstrated:

(1) There are no violations of the WQBELs at the Permittee's applicable MS4 outfall(s); or

(2) There are no exceedances of the numeric targets in the receiving water downstream of the Permittee's outfalls; or

(3) There is no direct or indirect discharge from the Permittee's MS4 to the receiving water during the time period subject to the WQBEL.

The MS4 permittees shall provide an implementation plan to the Regional Water Board outlining how they intend to achieve the nutrient WLAs. The plan shall include implementation methods, an implementation schedule, proposed interim milestones, and proposed outfall and/or receiving water monitoring to determine compliance. A Regional Water Board approved Watershed

Management Program (WMP) or Enhanced Watershed Management Program (EWMP) developed in accordance with an MS4 permit will satisfy the requirements of an implementation plan where the WMP or EWMP addresses the applicable waterbody-pollutant combinations of the TMDLs consistent with the implementation schedules in Table 9 and Table 10. MS4 permittees shall modify their WMP/EWMP no later than the next Adaptive Management Process cycle after provisions consistent with the assumptions and requirements of the TMDL nutrient WLAs are incorporated into the applicable MS4 permits.

The Los Angeles County MS4 permittees within the Malibu EWMP Group and the North Santa Monica Bay Coastal Watersheds (NSMBCW) EWMP Group have already developed approved EWMPs to meet the 2003 TMDL and the 2013 TMDL nutrient allocations. The NSMBCW EWMP includes the Legacy Park Regional Project, which is designed to retain the 0.75-inch design storm for most of the 306-acre Civic Center drainage area, as well as dry weather flows, and also includes low impact development (LID) projects to lower runoff volume and pump upgrades to increase runoff volume capacity. The NSMBCW EWMP does not propose any new BMPs to be installed within the NSMBCW EWMP area because Legacy Park captures more than the 85th percentile, 24-hour storm (NSMBCW EWMP Group, 2016). The Malibu EWMP includes both structural and non-structural BMPs, green streets, institutional and source controls, and LID projects. To address nutrients in stormwater, the Malibu EWMP reasonable assurance analysis sets the 90th percentile exceedance volume as the wet-weather critical condition. The Malibu EWMP plans to retain and/or treat the exceedance volume from each of the 68 subwatersheds in the Malibu EWMP area to achieve nutrient receiving water limitations. To address nutrients in non-stormwater discharges from the MS4, the Malibu EWMP concludes that because dry-weather runoff volumes are typically less than the 85th percentile water quality volume, dry-weather runoff will be treated through the stormwater BMPs proposed (Malibu EWMP Group, 2016).

The current Los Angeles County MS4 Permit (Order No. R4-2012-0175 as amended by State Water Board WQ 2015-0075) requires that the 2003 TMDL nutrient WLAs be achieved for the whole MCW by December 28, 2017. However, the current Los Angeles County MS4 permit does not reflect the newly interpreted summer WLAs for total nitrogen and total phosphorus (Table 6). Therefore, the Los Angeles County MS4 Permittees above Malibou Lake are assigned interim nutrient WLAs based on their current limitations contained in the Los Angeles County MS4 Permit and are given an extra four years to attain the newly interpreted 2003 TMDL summer nutrient WLAs (Table 6). The 2013 TMDL nutrient WLAs supersede the 2003 TMDL nutrient WLAs for MS4 permittees below Malibou Lake. The Los Angeles County MS4 permittees below Malibou Lake shall meet the 2013 TMDL nutrient WLAs by December 28, 2023. They are assigned interim nutrient WLAs based on their current limitations already contained in the Los Angeles County MS4 Permit. The compliance dates for Los Angeles County MS4 Permittees above Malibou Lake take into consideration the fact that 98% of all structural BMPs will be installed by July 2021 by the Malibu EWMP Group and that no new BMPs were proposed by the NSMBCW EWMP Group. An additional two years are given to Los Angeles County MS4 permittees below Malibou Lake to implement the remaining 2% of the structural BMPs and any new BMPs that may potentially be needed to meet the 2013 TMDL WLAs. The proposed implementation schedule for the Los Angeles County MS4 storm water permittees is shown in Table 9.

Table 9: Implementation Schedule for Los Angeles County MS4 Permittees

Implementation Schedule	Total Nitrogen Summer	Total Nitrogen Winter	Total Phosphorus Summer	Total Phosphorus Winter
LA County MS4s above Malibou Lake				
December 28, 2017	8.0 lbs/day*	8.0 mg/L*	0.80 lbs/day	N/A
December 28, 2021	1.6 lbs/day*	8.0 mg/L*	0.16 lbs/day	N/A
LA County MS4s below Malibou Lake				
December 28, 2017	8.0 lbs/day*	8.0 mg/L*	0.80 lbs/day	N/A
December 28, 2023	1.0 mg/L**	4.0 mg/L**	0.10 mg/L	0.20 mg/L

* Total Nitrogen = Nitrate-N + Nitrite-N
** Total Nitrogen = Organic-N + Inorganic-N
Summer: April 15 to November 15
Winter: November 16 to April 14

The current Ventura County MS4 Permit (Order No. R4-2010-0108) already contains effluent limits for MS4 discharges within the MCW equal to the 2003 TMDL winter total nitrogen WLA of 8.0 mg/L. Therefore, the Ventura County MS4 permittees shall meet the 2003 TMDL winter total nitrogen WLA no later than the effective date of this implementation plan. Regarding the summer nutrient WLAs, the current Ventura County MS4 Permit incorrectly sets the summer nutrient effluent limits equal to the existing nutrient loads, rather than the nutrient WLAs. In addition, the current Ventura County MS4 permit does not reflect the newly interpreted summer nutrient WLAs for total nitrogen and total phosphorus (Table 6). Therefore, the Ventura County MS4 Permittees shall attain the 2003 summer nutrient WLAs 5 years from the effective date of the Ventura County MS4 Permit adoption, renewal, or modification, but no later than 10 years from the effective date of this Implementation Plan (Table 10).

Table 10: Implementation Schedule for Ventura County MS4 Permittees

Implementation Schedule	Total Nitrogen Summer	Total Nitrogen Winter	Total Phosphorus Summer	Total Phosphorus Winter
Effective date of this Implementation Plan	Current Permit* limits	8.0 mg/L	Current Permit* limits	N/A
5 years from the effective date of the Ventura County MS4 Permit adoption, renewal, or modification, but no later than 10 years from the effective date of this Implementation Plan	3.1 lbs/day	8.0 mg/L	0.31 lbs/day	N/A
*Current Permit = Order No. 2010-0108 Total Nitrogen = Nitrate-N + Nitrite-N Summer: April 15 to November 15 Winter: November 16 to April 14				

b) Caltrans MS4 Discharges

The nutrient WLAs assigned to Caltrans will be implemented through the Caltrans statewide stormwater permit (Order No. 2012-0011-DWQ as amended by Order No. 2014-02006-EXEC, Order No. 2011-0077-DWQ, and Order No. 2015-0036-EXEC, or other successor order). Some of the 2013 TMDL nutrient WLAs are currently included Order No. 2012-0011-DWQ, but none of the 2003 TMDL nutrient WLAs are. Order No. 2012-0011-DWQ includes TMDL-specific requirements for the TMDLs incorporated into the permit. The TMDL-specific requirements include BMP effectiveness monitoring and an adaptive management strategy until the most appropriate BMPs are identified and installed for the control of a pollutant. The TMDL-specific requirements also include categorical pollutant permit requirements, which for nutrients are control measures to prevent erosion and sediment discharge, such as protecting hillsides, intercepting and filtering runoff, avoiding concentrated flows in natural channels and drains, and not modifying natural runoff flow patterns. Order No. 2012-0011-DWQ requires Caltrans to prioritize impaired reaches subject to TMDLs for implementation by reach, with a fixed number of “compliance units” that must be achieved each year so that all TMDLs are addressed by 2032. On September 10, 2015, State Board approved Caltrans’ Final TMDL Reach Prioritization, which included Lindero Canyon, Las Virgenes Creek, Medea Creek, Malibu Creek, and Triunfo Canyon as high priority reaches based on their inclusion in the 2013 TMDL.

In order to reflect this Implementation Plan, the reaches covered by the 2013 TMDL as identified in section III.B, "Allocation for Nutrients," and Attachment 6, which were previously not included in Order No. 2012-0011-DWQ, as well as all of the reaches covered by the 2003 TMDL identified in section III.B, "Allocation for Nutrients," and Attachment 5, shall be added to Attachment IV of Order No. 2012-0011-DWQ when it is reopened consistent with provision E.11.b. of the Order. Within a year of the permit reopener, Caltrans shall submit a revised TMDL Reach Prioritization to include the 2013 TMDL impaired reaches that were omitted from the prioritization and to add the 2003 TMDL impaired reaches. The schedule for attainment of the Caltrans nutrient WLAs is presented in Table 11.

Table 11: Implementation Schedule for Caltrans

Implementation Schedule	Total Nitrogen Summer	Total Nitrogen Winter	Total Phosphorus Summer	Total Phosphorus Winter
Caltrans above Malibou Lake				
According to the schedule in the revised TMDL Reach Prioritization, but no later than 2032	0.032 lbs/day*	8.0 mg/L*	0.0032 lbs/day	N/A
Caltrans below Malibou Lake				
According to the schedule in the revised TMDL Reach Prioritization, but no later than 2032	1.0 mg/L**	4.0 mg/L**	0.10 mg/L	0.20 mg/L

* Total Nitrogen = Nitrate-N + Nitrite-N
** Total Nitrogen= Organic-N + Inorganic-N
Summer: April 15 to November 15
Winter: November 16 to April 14

3. OWTS

The 2003 TMDL and 2013 TMDL nutrient LAs for OWTS shall be implemented through WDRs or waivers of WDRs and local agency oversight where local agencies (city and county health departments and/or building departments) are implementing their permitting authority. Commercial and multifamily OWTS are currently regulated by the Regional Water Board through WDRs (Order No. 01-031). Single family residential OWTS are currently regulated by local agencies through a memorandum of understanding (MOU) with the Regional Water Board or, in lieu of an MOU, by the Regional Water Board directly, via WDRs.

The Regional Water Board has issued approximately 60 WDRs to OWTS in the MCW. The Regional Water Board obtained inventories of OWTS that were permitted by Ventura and Los Angeles Counties and narrowed the countywide lists to OWTS within the MCW using GIS. According to this analysis, the following municipalities contain OWTS in the MCW that have been permitted by the counties:

- The City of Agoura Hills contains 572 OWTS;
- The City of Westlake Village contains two OWTS;
- The City of Thousand Oaks contains three OWTS;
- The City of Calabasas contains 54 OWTS;
- The City of Malibu contains 244 OWTS;
- The City of Simi Valley contains no OWTS;
- The City of Hidden Hills contains three OWTS;
- The County of Ventura unincorporated areas contain 228 OWTS; and
- The County of Los Angeles unincorporated areas contain 1560 OWTS.

The City of Malibu maintains a separate inventory of OWTS for which the City has issued permits. The City of Malibu has issued permits to approximately 162 OWTS within the MCW. These OWTS may overlap with the OWTS in the County of Los Angeles inventory, identified above. Attachment 8 illustrates the known OWTS locations within the MCW.

The State Water Board adopted a policy for siting, design, operation, and maintenance of onsite wastewater treatment systems (OWTS Policy) through Resolution No. 2012-0032 to comply with CWC sections 13290 and 13291 on June 19, 2012. The OWTS Policy became effective on May 13, 2013. The policy emphasizes local management of OWTS. The policy requires an Advanced Protection Management Program (APMP) for OWTS near impaired waterbodies. Local agencies are authorized to implement APMPs in conjunction with their existing programs and in collaboration with the Regional Water Board through a Local Agency Management Program (LAMP). (SWRCB, 2012).

OWTS owners are ultimately responsible for attaining LAs. The U.S.EPA-established TMDLs assign LAs generally to all OWTS in the watershed, but do not specify which, if any, specific OWTS must reduce discharges to meet the LAs. As such, the TMDLs define the geographic area for the APMP as the entire watershed. However, local agencies may conduct a special study to determine which existing OWTS are contributing to the nutrient loading to any waterbody within the MCW. Areas found not to be contributing to the overall loading may be removed from the APMP as approved in a LAMP. The study may build upon previous studies completed according to the Malibu Creek Bacteria TMDL (Resolution No. 2004-019). Existing, new, and replacement OWTS included in an APMP are required to be upgraded or modified to meet the supplemental treatment requirements for nitrogen per Tier 3 of the OWTS Policy and any other requirements of the APMP. If a local agency chooses to develop a LAMP, the LAMP shall include a schedule for upgrades or modifications based on the results of the study. Existing OWTS shall remain regulated by the existing MOU and LAMP until the above determination is made, the LAMP is revised, and subsequent OWTS upgrades are required.

Multiple studies to determine if discharges from OWTS have impacted or are impacting water quality have already been developed by local agencies in response to the Malibu Creek and Lagoon Bacteria TMDL. The studies and their conclusions are summarized as follows:

- The Ventura County Environmental Health Division's study determined that there are no OWTS located within 100 feet of a waterbody on the 303(d) list for bacteria and concluded that there were no high-risk areas (County of Ventura, 2007).
- The County of Los Angeles's study monitored for bacterial indicators and nutrients to determine whether discharges from OWTS are contributing to the impairment in Triunfo, Medea, Stokes, and Cold Creeks. The study showed that contributions from OWTS were present in Cold Creek, but the study did not identify OWTS in high-risk areas as was required by the Bacteria TMDL (LARWQCB, 2012; County of Los Angeles, 2007).
- The City of Agoura Hills methodology to identify high-risk areas for OWTS was approved by the Regional Water Board; however, the City of Agoura Hills has not submitted the final report identifying high-risk areas in the MCW to the Regional Water Board (City of Agoura Hills, 2007).
- The City of Malibu completed a risk assessment to evaluate the environmental impacts of current and potential future levels of OWTS management (City of Malibu, 2007). Along with other studies conducted by the Regional Water Board, this study lent evidence to support a Basin Plan amendment to prohibit OWTS in the Malibu Civic Center area (Resolution No. R4-2009-007) (LARWQCB, 2007).
- The City of Calabasas and the City of Westlake Village stated that no OWTS are located within city boundaries within the MCW (City of Westlake Village, 2007; City of Calabasas, 2007). The City of Thousand Oaks stated that their records show only one parcel in the MCW with one OWTS, located in the Triunfo Sanitation District (City of Thousand Oaks, 2007).
- The City of Hidden Hills stated that they do not have an MOU with the Regional Water Board and therefore do not assume responsibility for OWTS (City of Hidden Hills, 2007).

To the extent that these studies were responsive to the Bacteria TMDL, they focused mostly on bacteria when identifying OWTS within high-risk areas. To meet the nutrient LAs incorporated into this Implementation Plan, local agencies will need to expand upon their previous studies and assess if any OWTS within their boundaries are contributing or have the potential to contribute to the nutrient loading to any waterbody within the MCW. The special studies may include groundwater monitoring and modeling, hydrogeological modeling, surface water monitoring and use of modeling, existing reports, studies, and other data to predict the contributions of septic systems. The City of Malibu meets the special study requirement for this Implementation Plan through the Risk Assessment of Decentralized Wastewater Treatment Systems in High Priority Areas in the City of Malibu, completed in 2004.

The Regional Water Board will evaluate existing MOUs and any future submittal of a LAMP under the OWTS Policy to determine if additional changes are needed to implement the nutrient LAs. All OWTS discharges within the APMP shall achieve compliance with nutrient LAs as soon as possible, but no later than 10 years after the effective date of this implementation plan.

If it is found that areas no longer have OWTS and have been connected to the sewer line, these areas will be deemed in compliance with the assigned OWTS load allocations.

4. Golf Courses

The nutrient LAs for golf courses in the 2013 TMDL and the 2003 TMDL will be implemented through WDRs or conditional waivers of WDRs consistent with the State’s Nonpoint Source Implementation and Enforcement Policy. Golf courses can implement best management practices to prevent nutrients from entering surface water. BMPs may include application of fertilizers at agronomic rates to ensure that the amount of nitrogen and phosphorus applied does not exceed the daily vegetative requirements of the turf, use of irrigation systems that minimize surface runoff, and design of irrigation systems to cease operation under anticipated storm events. WDRs or conditional waivers of WDRs may include requirements that golf courses submit fertilizer application plans and implement designated types of BMPs to comply with the TMDLs. Golf courses shall attain the nutrient LAs within five years of the effective date of this implementation plan.

5. Agriculture/Livestock

The nutrient LAs for agriculture in the 2013 TMDL and the 2003 TMDL shall be implemented through the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Agricultural Lands (Order No. R4-2016-0143) (Agriculture Waiver) or other appropriate Regional Water Board order. Under the existing Agriculture Waiver, growers are required to monitor discharges and, if water quality exceeds benchmarks, growers are required to develop a water quality management plan and BMPs to attain benchmarks. The existing waiver includes the 2003 and 2013 TMDL nutrient LAs as benchmarks. Each owner and/or operator of irrigated agricultural lands, including vineyards, in the MCW shall be required to enroll in the waiver or other Regional Water Board order in order to comply with the nutrient LAs. Agricultural lands shall achieve the nutrient LAs in the 2003 and 2013 TMDL by October 14, 2022. This compliance date shall be updated in the waiver when it is renewed or replaced with another order by April 2022.

The nutrient LAs for livestock in the 2003 and 2013 TMDLs, including horse facilities and grazing, shall be regulated by WDRs, conditional waivers of WDRs, or other regulatory mechanisms in accordance with the Nonpoint Source Implementation and Enforcement Policy. The Regional Water Board will determine which horse/livestock facilities and grazing operations shall be subject to the WDRs, waivers of WDRs or other regulatory mechanisms during the development of these regulatory mechanisms based on factors that may include, but are not limited to, type of operation, density of animals, and risk to water quality. As part of the proposed program, horse/livestock facilities and grazing operations shall be required to develop management plans for Executive Officer approval and implement management measures identified in management plans to attain nutrient LAs. Compliance with nutrient LAs will be demonstrated with monitoring approved by the Executive Officer of the Regional Water Board through the monitoring program developed as part of the waiver, WDR, or other regulatory mechanism. Monitoring may consist of documentation of BMP implementation, and may include water quality monitoring as needed. BMPs may include actions to keep animals away from waterbodies, and improved manure management. Horse/livestock facilities and grazing operations shall achieve compliance with the nutrient LAs in the 2003 and 2013 TMDLs within five years of the effective date of this Implementation Plan.

6. Lakes

The nutrient LAs in the 2013 TMDL assigned to overflow from Malibou Lake, Lindero Lake, Westlake Lake, and Sherwood Lake are considered grouped LAs. The nutrient LAs for each lake are shared among the cities, counties, state, and federal lands in the subwatersheds draining to each lake, and the owners/operators of each lake. The four subwatersheds draining to each lake are shown in Attachment 9. The entities that are collectively responsible for the grouped nutrient LAs are shown in Table 12. Cooperative parties for the lake nutrient LAs are identified, not as responsible parties or as dischargers, but as landowners and lake operators who have an interest in source identification of nutrient pollutants entering and exiting the lakes within MCW.

Table 12: Cooperative parties for lake overflow load allocation

Lakes	Cooperative Parties

Lakes	Cooperative Parties
Malibou Lake	Los Angeles County Los Angeles County Flood Control District Ventura County City of Agoura Hills City of Westlake Village U.S. National Park Service California Department Parks and Recreation City of Simi Valley Owner/Operator: Malibou Lake Mountain Club, Ltd.
Lake Lindero	Los Angeles County Flood Control District Ventura County City of Thousand Oaks City of Agoura Hills City of Westlake Village City of Simi Valley Owner/Operator: Lake Lindero Homeowners Association
Westlake Lake	Los Angeles County Los Angeles County Flood Control District Ventura County Ventura County Watershed Protection District City of Thousand Oaks City of Westlake Village Owners: Windward Shores Homeowners Association Westshore Homeowners Association Westlake Bay Homeowners Association Southshore Homeowners Association Lakeshore Homeowners Association Westlake Island Homeowners Association Northshore Homeowners Association The Landing Operator: The Westlake Management Association
Sherwood Lake	Ventura County U.S. National Park Service

Lakes	Cooperative Parties
	Owner/Operator: Sherwood Valley Homeowners Association

The Regional Water Board will implement the nutrient LAs through WDRs, conditional waivers of WDRs, or other regulatory mechanisms in accordance with the Nonpoint Source Implementation and Enforcement Policy. The nutrient LAs apply at the outlet of the lake or dam.

The nutrient LAs will be implemented in stages. First, the Regional Water Board will issue investigative orders to the cooperative parties for each lake that will require them to submit a monitoring plan to the Regional Water Board within one year of receipt of an investigative order. The monitoring plan shall be designed to determine the impact of lake overflows on nutrient loading downstream. The monitoring plan shall include sufficient samples to characterize overflows from the lake during both dry- and wet-weather conditions. Then, if monitoring results show an impact on nutrient loading downstream, the Regional Water Board will revise the implementation plan within five years of its effective date. The revised implementation plan will include implementation methods to reduce the external loading to the lakes and/or internal loading within the lakes and a schedule to meet the nutrient LAs. Cooperative parties may propose their own approaches for the revised implementation plan that the Regional Water Board may consider.

D. Summary of Nutrient Implementation Schedule

Table 13: Summary of Nutrient Implementation Schedule

Task	Date*
Tapia WRF	
Tapia WRF shall attain nutrient LAs for indirect discharges	Upon the effective date of this Implementation Plan
Tapia WRF shall attain interim 2013 TMDL nutrient winter WLAs and final 2013 TMDL nutrient summer WLAs	Five years from the effective date of this Implementation Plan
Tapia WRF shall attain final 2013 TMDL nutrient winter WLAs	13.5 years from the effective date of this Implementation Plan
Los Angeles County MS4-whole MCW	

Task	Date*
Los Angeles County MS4 permittees within the whole MCW shall submit a nutrient implementation plan or modify existing WMP or EWMP	By the next adaptive management process cycle after WLAs are incorporated into MS4 permit
Los Angeles County MS4-above Malibou Lake	
Los Angeles County MS4 permittees above Malibou Lake shall attain their current permit limits for nutrients (as set forth in Order R4-2012-0175)	December 28, 2017
Los Angeles County MS4 permittees above Malibou Lake shall attain newly interpreted 2003 nutrient WLAs	December 28, 2021
Los Angeles County MS4-below Malibou Lake	
Los Angeles County MS4 permittees below Malibou Lake shall attain their current permit limits for nutrients (as set forth in Order R4-2012-0175)	December 28, 2017
Los Angeles County MS4 permittees below Malibou Lake shall attain 2013 nutrient WLAs	December 28, 2023
Ventura County MS4	
Ventura County MS4 permittees shall attain 2003 TMDL nutrient winter WLAs for MS4 discharges	Upon the effective date of this Implementation Plan
Ventura County MS4 permittees shall submit an MS4 nutrient implementation plan or WMP or EWMP	One year from the effective date of this Implementation Plan or as per the schedule in the draft WMP under the MS4 permit
Ventura County MS4 permittees shall attain newly interpreted 2003 TMDL nutrient summer WLAs for MS4	5 years from the effective date of the Ventura County MS4 Permit adoption, renewal, or modification, but no later than 10 years from the effective date of this Implementation Plan
Caltrans-entire MCW	

Task	**Date***
Additional reaches subject to the 2003 and 2013TMDLs shall be added to Attachment IV of Order No. 2012-0011-DWQ	Upon reopener of Order No. 2012-0011-DWQ consistent with provision E.11.b. of the Order
Caltrans shall submit a revised TMDL Reach Prioritization to include the 2013 TMDL impaired reaches that were omitted from the prioritization and to add the 2003 TMDL impaired reaches	Within a year of reopener of Order No. 2012-0011-DWQ
Caltrans-above MCW	
Caltrans above Malibou Lake shall attain newly interpreted 2003 nutrient WLAs	According to the schedule in the revised TMDL Reach Prioritization, but no later than 2032
Caltrans-below MCW	
Caltrans below Malibou Lake shall attain final 2013 nutrient WLAs	According to the schedule in the revised TMDL Reach Prioritization, but no later than 2032
Onsite Wastewater Treatment Systems	
Local agencies (city and county health departments and/or building departments) may submit a work plan for a study to determine which existing OWTS are contributing to the nutrient loading to any waterbody within the MCW for approval by the Executive Officer.	Three years from the effective date of the Implementation Plan
Local agencies (city and county health departments and/or building departments) may complete the OWTS study and submit a final report to the Regional Water Board.	Five years from the effective date of the Implementation Plan
Owners of OWTS shall attain 2003 or 2013 nutrient LAs, depending on OWTS location	Ten years from the effective date of the Implementation Plan
Golf Courses	
Owners of golf courses shall attain 2003 or 2013 nutrient LAs	Five years from the effective date of the Implementation Plan
Agriculture	

Task	Date*
Owners and/or operators of irrigated agricultural land shall attain 2003 and 2013 nutrient LAs	October 14, 2022
Horse/Livestock and Grazing	
Owners and/or operators of horse/livestock facilities and grazing operations shall attain 2003 and 2013 nutrient LAs	Five years from the effective date of the Implementation Plan
Lakes	
Cooperative parties (as defined in section III.c.6. "Lakes") for each lake shall submit a monitoring plan to determine the impact of lake overflows on nutrient loading downstream	One year from the effective date of the Implementation Plan

IV. SEDIMENTATION

A. Source Assessment for Sedimentation

The 2013 TMDL relied upon a stressor identification analysis, following the Causal Analysis/Diagnosis Decision Information System (CADDIS), to identify critical stressors and sources in the Malibu Creek Watershed. The TMDL found that the key sources of sediment loading to Malibu Creek and its main tributaries are altered hydrology and urban runoff. The key sources of sediment loading to Malibu Lagoon are altered hydrology and urban runoff, as well as channel alteration. These sources are described further below.

Altered Hydrology

Hydrology in Malibu Creek has been altered by a combination of increased impervious area, which increases flow peaks; irrigation and onsite wastewater disposal, which increase base flow levels; and impoundments, which decrease net flows and smooth out peaks. Hydrology in the Malibu Lagoon has been altered due to changes in upstream flow, filling and constrictions of the Lagoon, and changes in the rate of opening to the ocean.

Urban Runoff

Urbanization accounts for an increase in impervious surface in the watershed from near zero in the 1960s to 5.26% in 1990 and to 6.95% in 2008. While most of the watershed remains undeveloped, this impervious area percentage increase is concentrated along the I-101 corridor. Impervious surfaces alter the flow regime by reducing infiltration and increasing surface runoff. Rapid runoff increases stream channel flow and power, exacerbating downstream channel erosion and contributing to increased sediment loads.

Channel Alteration

The major alterations to the channel of Malibu Creek and its tributaries have been the creation of several lakes or impoundments that trap sediment, changing the sediment balance, modifying the flow, and changing sediment transport capacity. Malibu Lagoon has been extensively modified over the years by sediment fill, surrounding development, construction of railroad and road crossings, and intentional breaching of the barrier beach to allow draw down of impounded water.

B. Allocations for Sedimentation

The 2013 TMDL considers that sediment supply is naturally elevated in the MCW and that the movement of sediment through the channel is controlled more by sediment transport capacity than by supply. The TMDL establishes an allowable sedimentation rate based on the change in sediment transport capacity (effective work) caused by development in the MCW. The 2013 TMDL calculated the effective work in the MCW for pre-development and post-development conditions based on hydrological data from 1932-1965 and 1993-2009, respectively. The TMDL determined that the pre-development work on the channel was 62% of the post-development work. Therefore, a 38% reduction in effective work from the existing condition is needed to restore the natural sedimentation regime.

The required 38 percent reduction in effective work was applied to the existing sedimentation rate in the MCW and combined with a 15% margin of safety to obtain a sediment loading capacity of 5,817 tons/year. The TMDL allocates the loading capacity among the sources in the MCW based on their relative contributions of stormwater flow, which is based on the amount of impervious land within their jurisdiction. An LA is also assigned at the outlet of Malibou Lake to the combined area upstream of Malibou Lake. The TMDL found that there is a large load of sediment held behind impoundments in the watershed, but that there is insufficient evidence to quantify the potential for discharge of this sediment load. Table 14 identifies the 2013 TMDL WLAs and LAs for sedimentation.

Table 14: Sedimentation WLAs and LAs

Allocation Type	Responsible Party	Impervious Area (acres)	Pervious Area (acres)	Allocation Fraction	Sedimentation Allocation (tons/yr)
WLA	Los Angeles County below Malibou Lake	887	10,612	17.4%	1,012
WLA	Caltrans below Malibou Lake	60	61	0.8%	44

Allocation Type	Responsible Party	Impervious Area (acres)	Pervious Area (acres)	Allocation Fraction	Sedimentation Allocation (tons/yr)
LA	Unincorporated area draining to Las Virgenes Creek*	8	267	0.3%	16
LA	Protected land below Malibou Lake**	253	16,820	13.7%	796
LA	Combined area upstream of Malibou Lake	3,669	37,550	68.9%	3,950
Total		**4,878**	**65,310**	**100%**	**5,817**

* This area of unincorporated lands covers open space and small private lands in Ventura County.
** Protected land includes Bureau of Land Management, National Park Service, county and city parks, etc.

The Tapia discharge was not considered a significant source of sediment and must meet the existing TSS and turbidity limits in its current NPDES permit.

C. Implementation Plan for Sedimentation

The following section gives a description of the regulatory mechanisms that will be used to implement the sediment allocations, how the sediment allocations will be translated into regulatory requirements, potential implementation measures that could be used to attain the regulatory requirements, and an implementation schedule.

The focus of the TMDL on sediment transport capacity, rather than sediment supply, indicates that implementation should be closely aligned with hydromodification management efforts. It also means that it is appropriate to consider channel restoration projects that improve stability or reduce channel erosion risk.

1. WLA for Los Angeles County and Caltrans MS4 Discharges below Malibou Lake

Compliance with the sedimentation WLAs can be achieved through the individual compliance alternative presented here or as part of the watershed-wide implementation alternative described in section IV.C.5. "Watershed-wide Approach." Under the individual compliance alternative, the sedimentation WLAs shall be incorporated into the Los Angeles County and Caltrans MS4 permits as receiving water limits. To determine compliance, the annual sediment load at the F-130 gage shall be multiplied by the allocation fractions (17.4% for Los Angeles County MS4 permittees subject to the WLA and 0.8% for Caltrans) and compared to the respective sedimentation WLAs in Table 14. Due to the annual variability of sediment transport, which is linked to wet-weather events, compliance shall be averaged over a three-year period.

The Los Angeles County MS4 permittees shall provide an implementation plan to the Regional Water Board outlining how they intend to achieve the sedimentation WLAs. The plan shall include implementation methods, proposed interim milestones, and proposed receiving water monitoring to determine compliance. A Regional Water Board approved WMP or EWMP developed in accordance with a MS4 permit that explicitly addresses the sedimentation WLAs will satisfy the requirements of an implementation plan.

The approved 2016 Malibu EWMP addresses the 2013 TMDL sedimentation allocations in addition to the 2003 and 2013 TMDL nutrient allocations. The Malibu EWMP uses peak flow as a surrogate for effective work. The model calculates the reduction in peak flow that will occur by implementing the BMPs to meet the nutrient allocations, which is 43%. This percent reduction is more than the 38% reduction in sediment transport capacity required by the TMDL, so the EWMP concludes that implementing the BMPs to meet the nutrient TMDLs will also meet the sedimentation TMDL. The Malibu EWMP proposes a compliance date of 2032 to attain the sediment WLAs, but as for nutrients, 98% of all structural BMPs will be installed by July 2021 to meet the WLAs. Thus, it is not expected that the EWMP agencies will need until 2032 to meet WLAs. However, EWMP agencies may need until beyond 2021 to meet WLAs because their model likely under predicts the reduction in sedimentation from the proposed BMPs. For example, the model only estimates the reduction in peak flow from the land surface in the EWMP area and not the reduction in peak flow in-stream near the F-130 gage and it does not account for bank erosion. The model also predicts the 43% reduction in peak flow at the 2-year return interval, not at the 10-year return interval assumed in the TMDL calculations, and may not ensure full compliance with the sedimentation allocations. Therefore, an additional four years from the nutrient WLA deadline are allowed for attainment of the sedimentation WLAs.

Caltrans shall implement Order No. 2012-0011-DWQ as discussed in section III.C.2.b, "Caltrans MS4 Discharges" in order to meet the sedimentation WLAs. In order to reflect this Implementation Plan, additional TMDL specific monitoring requirements shall be added to

Attachment IV of Order No. 2012-0011-DWQ when it is reopened consistent with provision E.11.b. of the Order.

If individual compliance is chosen, at the F-130 station the Los Angeles County MS4 permittees and Caltrans below Malibou Lake and above gage F-130 shall attain the sedimentation WLAs by December 2025.

2. LA for Nonpoint Source Discharges from Protected Land below Malibou Lake

Below Malibou Lake, there is over 17,000 acres of protected land that do not drain to an MS4 before reaching a waterbody. This land includes State Parks and National Park Service. Two percent of this land is impervious. The sedimentation LAs in the 2013 TMDL for the protected land below Malibou Lake will be implemented through WDRs, conditional waivers of WDRs, or other regulatory mechanisms in accordance with the Nonpoint Source Implementation and Enforcement Policy. Compliance with the sedimentation LA can be achieved individually or through the watershed-wide implementation alternative described in section IV.C.5. “Watershed-wide Approach.”. Under the individual compliance alternative, the sedimentation LAs may be incorporated into the regulatory mechanisms as water quality benchmarks or receiving water limits. To determine compliance, the annual sediment load at the F-130 gage will be multiplied by the allocation fraction of 13.7% and compared to the respective sedimentation LAs in Table 14. Due to the annual variability of sediment transport, which is linked to wet-weather events, compliance will be averaged over a three-year period. If the sedimentation LAs are not being achieved, the responsible entities will be required to submit a plan(s) for riparian/stream bank restoration and/or improved operation and management of impervious areas, including roads. If individual compliance is chosen, the sedimentation LA for protected land below Malibou Lake shall be attained by December 2025.

3. LA for Discharges from Combined Area Upstream of Malibou Lake

The parties responsible for implementing the sedimentation LA in the 2013 TMDL for the area above Malibou Lake are the same as the cooperative parties identified in Table 12. To implement the sedimentation LA, the 2013 sedimentation TMDL recommends that more investigation be conducted to determine the rate and amount of sediment transported from impoundments in the MCW. The 2013 TMDL specifies that the LA applies at a point below Malibou Lake. Therefore, within one year of the effective date of the Implementation Plan, the Regional Water Board intends to issue an investigative order to the combined parties in Table 12 to install a new gage below Malibou Lake. TSS and flow data collected from the gage will be used to determine the annual sediment load from the area above Malibou Lake and to compare it to the LA in Table 14. If monitoring results show that the sediment discharged is greater than the LA of 3,950 tons/year, the Regional Water Board will revise the Implementation Plan within five years of its effective date to identify applicable sedimentation WLAs and LAs for specific jurisdictions upstream of Malibou Lake.[2]

Compliance with the potential sedimentation WLAs in the future can be achieved individually or as part of the watershed wide implementation alternative included in section IV.C.5. “Watershed-wide Approach.”

4. Discharges from Unincorporated Area along Las Virgenes Creek

The unincorporated area draining to Las Virgenes Creek covers open space and small private lands in Ventura County. To meet the sedimentation LA in the 2013 TMDL for the unincorporated area along Las Virgenes Creek, sediment monitoring must be conducted at the county line or at an appropriate downstream site. Within one year of receipt of an investigative order, Ventura County shall submit a monitoring plan to collect sediment data in order to determine the annual sediment load for the unincorporated area along Las Virgenes Creek and to compare it to the sedimentation LA. If monitoring results show sediment has discharged is greater than the LA of 16 tons/year, the Regional Water Board will revise the implementation plan within five years of its effective date to identify potential sedimentation WLAs and/or LAs for specific jurisdictions in the unincorporated area along Las Virgenes Creek.

Compliance with the potential sedimentation WLAs in the future can be achieved individually or as part of the watershed wide implementation alternative included in section IV.C.5. “Watershed-wide Approach.”

5. Watershed-wide approach

The responsible entities in the MCW may work collaboratively to develop a comprehensive implementation approach to reduce sediment transport capacity watershed-wide. This compliance alternative is a hybrid of the implementation options described above and would ensure long-term compliance with the TMDL and attainment the required 38% reduction in sediment transport capacity at gage F-130. This approach would include a combination of (1) projects to reduce work on the stream caused by elevated flows in the upper urbanized portion of

[2] Since the 2013 TMDL was established, additional investigation was conducted of the flow attenuation associated with impoundments in the MCW (Tetratech, 2016). The findings of the investigation indicate that during high flows, Malibou Lake provides little to no peak flow attenuation. Therefore, it is likely that the sedimentation LA for the Malibou Lake outlet will be exceeded and that sedimentation WLAs will need to be identified and peak flows upstream of the lake managed. It should be noted that the existing Malibu EWMP covers the entire portion of the Los Angeles County MS4 within the MCW. Thus, the existing Malibu EWMP may address some of the peak flow reductions from Los Angeles County if monitoring shows that they are required.

the watershed above gage F-130 and (2) stream restoration projects on eroding stream channels in the upper and lower watershed (above and below gage F-130) caused by the elevated work on the stream.

A watershed-based approach implemented collectively by the responsible parties should focus on reducing effective work because effective work is what controls sediment transport capacity. Effective work is based on excess shear stress and stream velocity. Compliance will be assessed by demonstrating a reduction in the 2-year and 10-year peak flows to achieve a 38 percent reduction in effective work at gage F-130 within 15 years of the effective date of this implementation plan. The 2013 TMDL report identifies the required peak flows at gage F-130 for the two storm sizes (1,180 cfs for the 2-year interval and 5,370 cfs for the 10-year interval) and the calculation of change in effective work.

Compliance monitoring for this alternative shall include monitoring at gage F-130 and additional monitoring throughout the impaired reaches and areas downstream of LID projects, regional BMP facilities, and channel restoration projects. These data should be collected to ensure accurate calculation of effective work and 2-year and 10-year peak flows at gage F-130. If this watershed-wide compliance strategy is chosen, responsible entities will work collaboratively, but their responsibilities and requirements will be included in their individual regulatory mechanisms.

6. Malibu Lagoon Restoration

Efforts within the Malibu Lagoon to improve the lagoon’s benthic impairment due to poor tidal flow, upstream runoff, low DO, and invasive species have already been completed. The California State Coastal Conservancy, in partnership with the Resource Conservation District of the Santa Monica Mountains, Heal the Bay, and California State Department of Parks and Recreation, the Malibu Lagoon Technical Advisory Committee, the Malibu Lagoon Restoration Working Group, as well as numerous other city, county, and state agencies developed the Malibu Lagoon Restoration and Enhancement Project with partial funding by the Santa Monica Bay Restoration Commission. The overall goal of the project is to restore the biological and physical functions to the lagoon while minimizing impacts to the existing system. The project was conducted in two phases and was completed in 2013. Phase 1 included relocation and redesign of the existing Malibu State Park parking lot to maximize available wetland habitat area and provide water quality benefits through the implementation of BMPs. Phase 2 included biological and water quality monitoring, permitting, habitat restoration, and public access paths. The restoration removed contaminated soil and trash, and re-contoured the western channels to improve water flows and circulation. In addition, the project enhanced the native habitat for native wildlife by invasive species removal, creating several acres of new wetlands, nesting islands, and creating channel connections to the lagoon. The restoration provides opportunities to use the lagoon for recreation by providing an access trail with public educational information about the Lagoon. The project also includes a comprehensive monitoring plan that monitors during-construction and post-construction conditions of Malibu Lagoon using hydrologic, chemical, and biological data. In conjunction with upstream efforts, the restoration of the Lagoon should help improve the Lagoon conditions for the benthic community (Moffatt & Nichol, 2005) (2NDNATURE, 2007) (SMBRC, 2013).

D. Summary of Sediment Implementation Schedule

Table 15: Summary of Sediment Implementation Schedule

Task	Date*
Los Angeles County MS4-below Malibou Lake	
Los Angeles County MS4 permittees below Malibou Lake shall attain 2013 sedimentation WLAs (if watershed-wide approach is not chosen)	December 28, 2025
Ventura County	
Ventura County shall submit a monitoring plan for the area along Los Virgenes Creek to determine the annual sediment load	One year from receipt of an investigative order
Caltrans	
The area of the Caltrans MS4 below Malibou Lake shall attain 2013 sedimentation WLAs (if watershed-wide approach is not chosen)	December 28, 2025
Lakes	
Cooperative parties (as defined in section III.c.6, "Lakes") for the combined area upstream of Malibou Lake shall submit a monitoring plan to determine the annual sediment load from the area above Malibou Lake	One year from receipt of an investigative order
Protected Land below Malibou Lake	
State Parks and National Park Service shall attain 2013 sedimentation LAs (if watershed-wide approach is not chosen)	December 2025
2013 Sedimentation TMDL - All Responsible Parties	
If watershed-wide approach is chosen all responsible parties for the sedimentation TMDL shall submit an implementation plan for comprehensive approach to reduce sediment transport capacity by 38% watershed-wide	Two years from the effective date of this Implementation Plan

Task	Date*
If watershed-wide approach is chosen all responsible parties for the sedimentation TMDL shall attain 38% reduction in sediment transport capacity at gage F-130 and implement stream restoration projects on eroding stream channels in the upper and lower watershed (above and below gage F-130) caused by the elevated work on the stream	15 years from the effective date of this Implementation Plan

V. MONITORING FOR NUTRIENT AND SEDIMENTATION

To comply with the 2003 TMDL and the 2013 TMDL, monitoring programs will be designed to measure improvement in water quality and pollutant load reductions. The TMDL monitoring programs consist of two components: (1) TMDL effectiveness monitoring in the receiving water to assess implementation progress and attainment of numeric targets, and (2) compliance monitoring of discharges to determine compliance with the WLAs and LAs. Monitoring requirements may be included in subsequent permits or other orders and are subject to Executive Officer approval.

A. TMDL Effectiveness Monitoring

Responsible entities are responsible for developing and implementing a comprehensive TMDL Effectiveness monitoring plan within two years of the effective date of this Implementation Plan to assess numeric target attainment and to determine the effectiveness of implementation actions on receiving water quality. Monitoring shall commence within six months of approval of the TMDL effectiveness monitoring plan.

1. Nutrient Monitoring

Responsible entities include the Las Virgenes-Triunfo JPA, the Ventura County Watershed Protection District, the County of Ventura, the County of Los Angeles, the County of Los Angeles Flood Control District, Caltrans, the City of Thousand Oaks, the City of Westlake Village, the City of Agoura Hills, the City of Calabasas, the City of Hidden Hills, the City of Malibu, the California Department of Parks and Recreation, and the National Park Service. Responsible entities shall outline a nutrient monitoring program for total nitrogen (organic-N+inorganic-N), total phosphorus, dissolved oxygen, pH, temperature, ammonia, and chlorophyll a. Monitoring shall also include field observations for percent algae cover, the presence of scum/foam, the presence of odors, and whether Malibu Lagoon is open or closed to the ocean.

The sampling frequency and locations must be adequate to assess beneficial use conditions and attainment of nutrient related water quality objectives. Monitoring locations should be located at the upstream and downstream ends of nutrient impaired

303(d) listed streams and at downstream ends of hydrologically-connected segments directly above their confluence with listed streams. At a minimum, nutrient r monitoring shall be conducted monthly in Malibu Lagoon, the Malibu Lagoon inlet, Malibu Creek, Las Virgenes Creek, Medea Creek Reach 1 and Reach 2, and Lindero Creek Reach 1 and Reach 2. In addition, nutrient monitoring shall be conducted quarterly in Hidden Valley Creek, Potrero Valley Creek, Triunfo Creek Reach 1 and Reach 2, Palo Comado Creek, Chesebooro Canyon Creek, Stokes Creek, and Cold Creek. To account for the critical condition for dissolved oxygen, dissolved oxygen shall be monitored at pre-dawn. Responsible entities may request a reduction in the frequency of nutrient sampling after four years of sampling has been conducted if justified based on a demonstration of no variability between sample events or consistent improvements in water quality.

2. Benthic Monitoring

   Responsible entities include the Las Virgenes-Triunfo JPA, the County of Los Angeles, the County of Los Angeles Flood Control District, Caltrans, the City of Agoura Hills, the City of Calabasas, the City of Hidden Hills, and the City of Malibu, the California Department of Parks and Recreation, and the National Park Service.

   Responsible entities shall include a benthic monitoring program to collect invertebrate and physical habitat data for benthic community evaluations and stream health assessments using the SC-IBI bioscore and the CSCI, pMMI, and CA-O/E scores.

   The sampling frequency and locations must be adequate to assess the beneficial use condition and attainment of benthic-related water quality objectives. Monitoring locations should be located at the upstream and downstream ends of benthic impaired 303(d) listed streams. At a minimum, benthic monitoring shall be conducted annually in Las Virgenes Creek, Middle Malibu Creek, the Malibu Lagoon inlet, and Malibu Lagoon. Attainment of the benthic community diversity numeric targets will be calculated as an annual average. Attainment of the SC-IBI, CSCI, pMMI, CA-O/E numeric targets will be calculated as a median of four years of data to account for year-to-year variability.

Responsible entities may build upon existing monitoring programs in the MCW when developing the TMDL effectiveness monitoring plans. TMDL effectiveness water monitoring requirements shall be incorporated into the regulatory mechanisms for each responsible entity upon issuance, renewal, or modification or through separate investigatory order. Monitoring procedures, analysis, and quality assurance shall be SWAMP comparable and shall continue beyond the final implementation date of the TMDL unless the Executive Officer approves a reduction or elimination of such monitoring. Exceedances of the biological response numeric targets (percent algae cover, benthic community diversity, or biological scores) at the Malibu Lagoon inlet at frequencies greater than the averaging periods specified in the numeric targets section will trigger additional TMDL effectiveness monitoring and additional preventative activities to reduce nutrient and sediment loads to Malibu Lagoon through existing adaptive management processes in Regional Board orders such as the Los Angeles County MS4 permit and/or a reconsideration of this Implementation Plan.

B. Compliance Monitoring

To assess attainment of the nutrient and sedimentation WLAs and LAs, compliance monitoring shall include monitoring for total nitrogen (as defined by the 2003 TMDL or the 2013 TMDL), total phosphorus, TSS, and flow. The monitoring frequencies to comply with the WLAs and LAs are as follows:

- To demonstrate compliance with the nutrient WLAs for the Tapia WRF, nutrient monitoring shall be conducted monthly at the Tapia WRF discharge points.
- To demonstrate compliance with the nutrient LAs for the Tapia WRF nonpoint source discharges, quarterly groundwater monitoring shall be incorporated into the WDRs for the Rancho Las Virgenes Farm spray fields to evaluate the quantity and quality of reclaimed water that re-enters the system through groundwater. In addition, while sludge has not been disposed at the Rancho Las Virgenes Farm since 2003, monitoring is necessary to evaluate the farm as a potential nutrient legacy source from past sludge application.
- To demonstrate compliance with the nutrient LAs for agriculture, dischargers shall monitor according to the requirements of Order No. R4-2016-0143 or other appropriate Regional Water Board order.
- To demonstrate compliance with the nutrient LAs for horse/livestock facilities, grazing operations, and golf courses, monitoring may consist of documentation of BMP implementation, and may include water quality monitoring as needed to determine the effectiveness of the BMPs in reducing nutrient loadings.
- To demonstrate compliance with the nutrient LAs for OWTS, monitoring will be conducted in accordance with the local agencies' LAMPs.
- To demonstrate compliance with the nutrient LAs for lake overflow, cooperative parties shall conduct monitoring as described in the nutrient implementation section.
- To demonstrate compliance with the nutrient WLAs for MS4 discharges, monitoring will be conducted three times within the year during storm events and four times during non-storm events, with a minimum of two non-stormwater samples within the summer season. Stormwater monitoring will target the first significant rain event of the storm year. During dry weather, sampling shall occur a minimum of 72 hours after a storm event. MS4 permittees shall address the TMDL compliance monitoring requirements through their Monitoring Reporting Programs (MRPs). The Regional Board will modify the

MRPs, or approve coordinated integrated monitoring program (CIMP) modifications proposed by permittees, to incorporate additional monitoring requirements to determine compliance with nutrient WLAs. Compliance monitoring will require MS4 permittees to include representative outfall and receiving water monitoring locations within their jurisdiction within the Malibu Creek watershed. To demonstrate compliance with the sedimentation WLAs for Los Angeles County MS4 discharges, monitoring shall include flow and TSS during dry and wet weather to calculate the annual sediment load moving past gage F-130 if the individual compliance option is chosen. Dischargers shall modify their /CIMPs to include sufficient sampling to accurately calculate the sediment load. Additional parameters that are more cost-effective or continuous may be useful to collect, such as turbidity. With a robust dataset, these can be used to develop statistical relationships and expand the extent of data. Upon approval by the Executive Officer, alternative parameters (based on statistical analyses) could be used to document compliance with the sedimentation WLAs. In addition, existing monitoring at gage F-130 conducted under other programs can be leveraged to assist in meeting these monitoring requirements.

- To demonstrate compliance with the nutrient and sediment WLAs for Caltrans MS4 discharges, Caltrans will monitor according to the requirements of State Board Order No. 2012-0011-DWQ.

- To demonstrate compliance with the sedimentation LA for the area above Malibou Lake, if the individual compliance option is chosen, responsible entities shall conduct monitoring as described in section IV.C.3.

- To demonstrate compliance with the sedimentation LA for the discharges from the unincorporated area along Las Virgenes Creek, if the individual compliance option is chosen, Ventura County shall conduct monitoring as described in section IV.C.4.

- To demonstrate compliance with the sedimentation LA for the discharges from the protected land below Malibou Lake and above F-130, if the individual compliance option is chosen, State Parks, and National Parks Service shall conduct monitoring as described in section IV.C.2.

- To demonstrate compliance with the sedimentation LAs and WLAs if the watershed-wide compliance option is chosen, responsible entities shall conduct monitoring as described in section IV.C.5.

Compliance monitoring shall be required through the regulatory mechanisms used to implement the sedimentation and nutrient WLAs and LAs. The monitoring procedures/methods, analysis, and quality assurance shall be SWAMP comparable where appropriate.

VI. IMPLEMENTATION SCHEDULE FOR NUTRIENTS AND SEDIMENTATION

The TMDL implementation schedule is designed to provide responsible entities and cooperative parties flexibility to implement appropriate BMPs to address nutrient and sedimentation impairments in the MCW. The schedule includes a reconsideration based on the results of any new information or data (Table 16).

Table 16: Malibu Creek Watershed Nutrient and Sedimentation: Implementation Schedule

Task	Date*
The Regional Water Board will reconsider this Implementation Plan within five years of its effective date.	Five years from the effective date of this Implementation Plan
Tapia WRF	
Tapia WRF shall attain nutrient LAs for indirect discharges	Upon the effective date of this Implementation Plan
Las Virgenes-Triunfo JPA shall submit a TMDL effectiveness monitoring plan for nutrients and benthic community evaluations individually or in collaboration with other responsible entities	Two years from the effective date of this Implementation Plan
Tapia WRF shall attain interim 2013 TMDL nutrient winter WLAs and final 2013 TMDL nutrient summer WLAs	Five years from the effective date of this Implementation Plan
Tapia WRF shall attain final 2013 TMDL nutrient winter WLAs	13.5 years from the effective date of this Implementation Plan
Los Angeles County MS4-whole MCW	
Los Angeles County MS4 permittees within the whole MCW shall submit a nutrient implementation plan or modify existing WMP or EWMP	By the next adaptive management process cycle after WLAs are incorporated into MS4 permit
Los Angeles County MS4 permittees within the whole MCW shall submit a TMDL effectiveness monitoring plan for nutrients and benthic community evaluations individually or in collaboration with other responsible entities	Two years from the effective date of this Implementation Plan

Task	Date*
Los Angeles County MS4-above Malibou Lake	
Los Angeles County MS4 permittees above Malibou Lake shall attain their current permit limits for nutrients (as set forth in Order No.R4-2012-0175)	December 28, 2017
Los Angeles County MS4 permittees above Malibou Lake shall attain newly interpreted 2003 nutrient WLAs	December 28, 2021
Los Angeles County MS4-below Malibou Lake	
Los Angeles County MS4 permittees below Malibou Lake shall attain their current permit limits for nutrients (as set forth in Order No.R4-2012-0175)	December 28, 2017
Los Angeles County MS4 permittees below Malibou Lake shall attain 2013 nutrient WLAs	December 28, 2023
Los Angeles County MS4 permittees below Malibou Lake shall submit a sedimentation implementation plan	By the next adaptive management process cycle after WLAs are incorporated into MS4 permit
Los Angeles County MS4 permittees below Malibou Lake shall attain 2013 sedimentation WLAs (if watershed-wide approach is not chosen)	December 28, 2025
Ventura County	
Ventura County shall submit a monitoring plan for the area along Los Virgenes Creek to determine the annual sediment load	One year from receipt of an investigative order
Ventura County MS4	
Ventura County MS4 permittees shall attain 2003 TMDL nutrient winter WLAs for MS4 discharges	Upon the effective date of this Implementation Plan
Ventura County MS4 permittees shall submit an MS4 nutrient implementation plan or WMP or EWMP	One year from the effective date of this Implementation Plan or as per the schedule for the WMP/EWMP under the MS4 permit if appropriate
Ventura County MS4 permittees shall submit a TMDL effectiveness monitoring plan for nutrients individually or in collaboration with other responsible entities	Two years from the effective date of this Implementation Plan

Task	Date*
Ventura County MS4 permittees shall attain newly interpreted 2003 TMDL nutrient summer WLAs	5 years from the effective date of the Ventura County MS4 Permit adoption, renewal, or modification, but no later than 10 years from the effective date of this Implementation Plan
Caltrans-entire MCW	
Additional reaches subject to the 2003 and 2013TMDLs shall be added to Attachment IV of Order No. 2012-0011-DWQ	Upon reopener of Order No. 2012-0011-DWQ consistent with provision E.11.b. of the Order
Caltrans shall submit a revised TMDL Reach Prioritization to include the 2013 TMDL impaired reaches that were omitted from the prioritization and to add the 2003 TMDL impaired reaches	Within a year of reopener of Order No. 2012-0011-DWQ
Caltrans shall submit a TMDL effectiveness monitoring plan for nutrients and benthic community evaluations individually or in collaboration with other responsible entities	Two years from the effective date of this Implementation Plan
Caltrans-above MCW	
Caltrans above Malibou Lake shall attain newly interpreted 2003 nutrient WLAs	According to the schedule in the revised TMDL Reach Prioritization, but no later than 2032
Caltrans-below MCW	
Caltrans below Malibou Lake shall attain final 2013 nutrient WLAs	According to the schedule in the revised TMDL Reach Prioritization, but no later than 2032
The area of the Caltrans MS4 below Malibou Lake shall attain 2013 sedimentation WLAs (if watershed-wide approach is not chosen)	December 28, 2025
Onsite Wastewater Treatment Systems	

Task	Date*
Local agencies (city and county health departments and/or building departments) may submit a work plan for a study to determine which existing OWTS are contributing to the nutrient loading to any waterbody within the MCW for approval by the Executive Officer.	Three years from the effective date of the Implementation Plan
Local agencies (city and county health departments and/or building departments) may complete the OWTS study and submit a final report to the Regional Water Board.	Five years from the effective date of the Implementation Plan
Owners of OWTS shall attain 2003 or 2013 nutrient LAs, depending on OWTS location	Ten years from the effective date of the Implementation Plan
Golf Courses	
Owners of golf courses shall attain 2003 or 2013 nutrient LAs	Five years from the effective date of the Implementation Plan
Agriculture	
Owners and/or operators of irrigated agricultural land shall attain 2003 and 2013 nutrient LAs	October 14, 2022
Horse/Livestock and Grazing	
Owners and/or operators of horse/livestock facilities and grazing operations shall attain 2003 and 2013 nutrient LAs	Five years from the effective date of the Implementation Plan
Lakes	
Cooperative parties(as defined in section III.c.6, “Lakes”) for each lake shall submit a monitoring plan to determine the impact of lake overflows on nutrient loading downstream	One year from receipt of an investigative order
Cooperative parties (as defined in section III.c.6, “Lakes”) for the combined area upstream of Malibou Lake shall submit a monitoring plan to determine the annual sediment load from Malibou Lake	One year from receipt of an investigative order
Protected Land below Malibou Lake	
State Parks and National Park Service shall attain 2013 sedimentation LAs (if watershed-wide approach is not chosen)	December 2025
2013 Sedimentation TMDL - All Responsible Parties	

Task	Date*
If a watershed-wide approach is chosen all responsible parties for the sedimentation TMDL shall submit an implementation plan and a monitoring plan for a comprehensive approach to reduce sediment transport capacity by 38% watershed-wide	Two years from the effective date of this Implementation Plan
If a watershed-wide approach is chosen all responsible parties for the sedimentation TMDL shall attain a 38% reduction in sediment transport capacity at gage F-130 and implement stream restoration projects on eroding stream channels in the upper and lower watershed (above and below gage F-130) caused by the elevated work on the stream	15 years from the effective date of this Implementation Plan

* Rationale for compliance dates is provided in sections III.C. and IV.C.

VII. COST ANALYSIS FOR IMPLEMENTATION ALTERNATIVES

There are many implementation alternatives available to reduce nutrient and sediment loading. Rather than a single treatment solution, a combination of implementation measures may be required to reduce nutrients and sediment to acceptable levels. The following discussion presents several potential implementation strategies that could be used to comply with the TMDL and their associated costs. The cost estimates for the potential implementation actions are intended to provide the Regional Water Board with a reasonable range of potential costs of implementing this TMDL. The cost estimates are not additive. Responsible parties may implement individual potential treatment alternatives or a combination of alternatives and the costs would vary accordingly. The cost estimates account for a range of economic factors and include a number of assumptions regarding the extent of implementing many of the measures.

A. Tapia WRF Upgrades

In order to meet the winter nutrient WLAs set by the 2013 TMDL, the JPA has proposed to significantly reduce the discharge of recycled water from the Tapia WRF into the creek from November 15 to April 15. JPA proposes to repurpose the recycled water for irrigation and seasonal storage at the Las Virgenes Reservoir for indirect potable reuse. The recycled water would undergo advanced treatment prior to storage at the Las Virgenes Reservoir. The total cost for this option is estimated to range between $80-95 million, with operation and maintenance costs of $3-4 million per year (JPA Board of Directors, 2015).

In order to meet the summer nutrient WLAs set by the 2013 TMDL, the JPA may need to construct a side stream treatment facility for the Tapia WRF to further treat the water. According to JPA staff, the total cost for a small treatment facility is estimated to range between $6.5-6.7 million, with operational costs of $77,200- 91,600 per year (Lippman, 2016).

B. MS4 Implementation Alternatives

The MS4 permittees will likely implement a combination of structural and non-structural BMPs to achieve compliance with their waste load allocations. Examples of structural BMPs that can be implemented are biofilters, infiltration basins, and constructed wetlands.

- Biofilters, also known as vegetated swales and filter strips, are vegetated slopes and channels designed and maintained to transport runoff slowly over vegetation. The slow movement of runoff through the vegetation provides an opportunity for infiltration, reducing runoff volumes sediments and nutrients. Swales convey flows to a vegetation-lined channel and grass filter strips intercept sheet runoff to a uniformly graded buffer zone. Green streets and vegetated swales can function as pretreatment systems for water entering bioretention systems or other BMPs. These can be installed as on-site features of developments or in street medians, parking lot islands, or curb extensions particulates to be filtered and degraded through biological activity.

- An infiltration basin is an impoundment that captures stormwater and allows it to infiltrate into the ground over a period of days. The basin temporarily stores runoff for a storm of a specific design size. The applicability of an infiltration basin is dependent on soil type, slope, depth to the water table, depth to the bedrock or impermeable layer, contributing watershed area, land use, and proximity to wells and surface waters. Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them.

- Constructed treatment wetlands are designed to maximize the removal of pollutants from storm water and dry-weather urban runoff through settling and uptake and filtering by vegetation. Constructed wetlands temporarily store runoff in a shallow marsh that support conditions suitable for the growth of wetland plants. These excess nutrients are absorbed by wetland soils and taken up by plants and microorganisms. The treatment efficiency of constructed wetlands varies considerably (TN 26% $\pm$ 49%, TP 43% $\pm$ 40%); however, proper design and maintenance helps to improve their performance (U.S. EPA, 2003a).

Non-structural BMPs include source control measures, such as pollution prevention, increased catch basin cleanings, good housekeeping practices, and more frequent and efficient street sweeping.

In order to estimate the costs of potential MS4 implementation alternatives in LA County, staff consulted the EWMPs prepared for the Malibu Creek Watershed. The MCW EWMP Group includes the Cities of Agoura Hills, Calabasas, Hidden Hills, and Westlake Village; the County of Los Angeles; and the Los Angeles County Flood Control District. To meet both the 2003 and

2013 TMDL WLAs, the MCW EWMP group has proposed BMPs, including institutional/source controls, bioretention, infiltration basins and chambers, storm water harvest and reuse, and green streets. The Malibu EWMP estimates the total cost to achieve the 2003 and 2013 TMDLs, as well as the Malibu Creek Trash TMDL, to be $195 million, with operation and maintenance costs to be $3.7 million (Malibu EWMP Group, 2016).

The NSMBCW EWMP Group includes the City of Malibu, the County of Los Angeles, and the Los Angeles County Flood Control District. To meet both the 2003 and 2013 TMDL WLAs, the NSMBCW EWMP Group completed in 2010 the Legacy Park Project. The total cost of the project was over $50 million (NSMBCW EWMP Group, 2016).

To estimate the costs of potential MS4 implementation alternatives in Ventura County, unit costs for potential BMPs alternatives are presented from the California Stormwater Quality Association Handbook (CASQA).

- The costs of bioretention sites can range between $10-$40 per square foot, based on the need for control structures, curbing, storm drains and underdrains. Retrofitting a site may cost more due to higher costs associated with demolition of existing concrete and existing structures. Bioretention requires frequent landscaping maintenance, including measures to ensure that the area is functioning properly. The operational and maintenance costs for bioretention will be comparable to those of typical landscaping costs (CASQA, 2003).

- Infiltration basins are relatively cost-effective practices because little infrastructure is needed when constructing them. Construction costs for a 0.25–acre basin may cost about $2 per foot, with maintenance costs estimated at 5%- 10% of construction costs (CASQA, 2003).

- Wetlands are relatively inexpensive storm water practices. Wetlands consume about 3 to 5 percent of the land that drains to them. In areas like Ventura where land value is high, wetlands may not be a feasible option in all areas. CASQA estimates a 1 acre-foot wetland to cost $57,000 (CASQA, 2003).

C. Lake Management

Implementation of the lakes LAs may include lake management strategies to reduce nutrient concentrations, prevent excessive algal growth, and maintain adequate dissolved oxygen concentrations. Lake management strategies include dredging projects, installation of aeration systems, and construction of floating islands.

Dredging

Dredging is the removal of accumulated sediments from the lake bottom. In general, surface layers of loose nutrient rich organic material are removed. One method of dredging is hydraulic dredging. A hydraulic dredge floats on the water and is approximately the size of a boat. It has a flexible pipe that siphons a mix of water and sediment from the bottom of the lake. The flexible pipe is attached to a stationary pipe that extends to an offsite location. The sediment that is removed from the lake bottom is pumped to a settling pond to dry.

Malibou Lake has previously undergone maintenance hydraulic dredging to remove excess sediments from upstream flows. These projects can be used to estimate TMDL implementation costs. On May 23, 2016, Malibou Lake Mountain Club began hydraulic dredging within Malibou Lake. Maintenance dredging within the lake will remove a maximum of 70,000 cubic yards over five years (LARWQCB, 2014). Malibou Lake Mountain Club owns its own dredging equipment. Therefore, the cost of the dredging activities only includes labor, repairs, pumping, and permits, totaling $52,000 (Terry Endsley, Personal Communication, 2016). This results in less than $1 per cubic yard.

A recent hydraulic dredging operation that occurred outside of the MCW is the Machado Lake restoration project in the City of Los Angeles. That project removed approximately 264,000 cubic yards of sediment. The total cost of the dredging operation was $27 million, including mobilization, lake sediment excavation, dewatering/drying sediments, water treatment prior to discharge back into the lake, handling sediments, testing, hauling, and disposal of sediments, remobilization, and demobilization. This results in a unit cost of approximately $100 per cubic yard.

Another recent dredging project was the Colorado Lagoon restoration project in the City of Long Beach. The project included dredging of about 63,000 cubic yards of contaminated sediment. The total cost of the project was $5 million, including all components associated with the dredging project as well as culvert cleaning, trash trap installation, and a low flow diversion. This results in a unit cost of $80 per cubic yard, which includes additional activities beyond dredging.

For the lakes in the MCW, a unit cost of $20 per cubic yard is assumed, which comprises delivery, set up and operation of equipment, pumping, dewatering, sludge/sediment management, cleaning, labor, and transportation of waste. Based on an assumed dredge depth of one foot, the estimated cost of hydraulic dredging would be $4 M for Westlake Lake and $5.3 M for Sherwood Lake (Table 17).

Table 17: Estimated Costs of Hydraulic Dredging

Lake	Approximate Area (ft^2)	Estimated Dredge Depth (ft)	Estimated Dredge Volume (yd^3)	Total Cost
Sherwood Lake	7,143,840	1	264,587	$5,291,740
Westlake Lake	5,445,000	1	201,667	$4,033,340

Aeration Systems

Lake aeration systems help to increase the dissolved oxygen content in the water by either injecting air or mechanically mixing/agitating the water. For an aeration system with a treatment area of 1-2 acres, the average annual cost ranges from $150 for a windmill aerator to $775 for an electric aerator (Outdoor Water Solutions). An example of early implementation of an aeration system is Lake Sherwood. In 2008, the Sherwood Valley Homeowners Association installed and began operation of an aeration system near the dam (Lake Sherwood HOA, 2010)Lake Sherwood HOA). These efforts have improved dissolved oxygen levels in the lake.

Floating Islands

Floating islands are constructed islands that provide terrestrial and aquatic habitat while at the same time reduce nutrient concentrations in the lake. The island provides nesting and resting habitat for bird species and the roots below the water provide fish habitat. Floating islands are beneficial in removing nutrients from the water column through the roots of plants that are exposed in the water column rather than rooted in the sediments of the lake. Most floating islands are prefabricated, and fairly economic for installation. They also require minimal maintenance. The estimated cost of a floating island is $700, not including plants (CanadianPond.ca Products Ltd.).

D. OWTS Repairs and Upgrades

Both the 2003 TMDL and the 2013 TMDL call for aggressive actions to identify and repair septic systems that do not function properly and whose seepage is most likely to reach surface waters. Local agencies will conduct a special study to investigate the impacts from OWTS to nutrient loading in the MCW. The results of this study will be used to determine which OWTS need to be repaired or upgraded in order to attain the load allocations. A similar OWTS study for the Ventura River watershed is currently underway and is estimated to cost $242,465. The County of Ventura recently applied for and received federal CWA 319(h) grant funding to pay for this study (Ventura County, 2015).

For the OWTS that are determined to be contributing nutrient loading to the MCW, various actions may be required to reduce the loading from OWTS to attain load allocations within twelve years. These may include actions ranging from inspections and maintenance to the installation of supplemental treatment. OWTS inspection and maintenance could cost up to $5,000 dollars. The cost of upgraded systems could cost up to $22,000 dollars (SWRCB, 2012). There would also be ongoing maintenance and monitoring requirements to ensure the advanced treatment is performing well. According to the County of Los Angeles, some upgrades and enhanced systems can cost more than this. For example, the County provided information on three approved OWTS enhanced systems and their cost estimates: Advantex systems ($19,000 to $48,000 depending on tank size), MicroSepTec systems (approximately $30,000), and Jett systems ($34,000 to $43,000 depending on tank size). Maintenance estimates for these three systems are between $250 and $1200 per year. Federal and State funding are available to help offset costs. The Regional Water Board encourages the local agencies to coordinate and assist homeowners in applying for funding, if upgrades are determined to be necessary.

E. Agriculture Management Practices

Runoff from agriculture can be treated through various implementation alternatives. BMPs may include nutrient management, irrigation management, sediment management, or the installation of treatment devices designed to reduce nutrient loadings, such as filter strips.

Nutrient Management

Nutrient management includes applying nutrients at rates necessary to achieve realistic crop yields, improving the timing of nutrient application, and using agronomic crop production technology to increase nutrient use efficiency (U.S. EPA, 2003). The National Resource Conservation Service (NRCS) cost estimate for a nutrient management plan is $76 per acre-year (NRCS, 2016).

Irrigation management

Often replacing a traditional irrigation system with a drip/micro irrigation system can reduce nutrient runoff. Improved maintenance of the systems may further reduce farm runoff. Costs for installing and maintaining drip/micro irrigation systems vary according to the type of crop production found in the watershed, pipe diameter, and equipment used. According to the NRCS Field Office Technical Guide (FOTG) for micro-irrigation systems, on average, the installation cost is $1784 per acre, with a maintenance cost of $84 per acre-year (NRCS FOTG Cost Data 2010).

Mulching

Nutrients contained in fertilizers may be limited by preventing sediment transport downstream through mulching. NRCS estimates that mulching costs $1,292 per acre of mulch applied (NRCS, 2016). The NRCS Conservation Practice Standard for Mulching (Code 484) specifies that mulching should be applied at a rate to achieve a minimum of 70 percent ground cover to provide erosion control. Therefore, the cost of mulching is $904 per acre of agricultural land treated. According to the Mulching FOTG, the reported lifespan for this practice is one year, but local NRCS staff has reported that woody mulch can last two to three years and mulch residue can last up to five years. Assuming a lifespan of three years and a 5% discount rate, the annual cost of mulching is $331 per acre-year.

Filter Strips

NRCS estimates that filter strips (NRCS Practice Code 393) planted with native plant material are $1,163 per acre of filter strip installed (NRCS, 2016). Assuming a ratio of treated agricultural land area to filter strip area of 60:1, consistent with the NRCS Conservation Practice Standard for Filter Strips (Code 393), the cost of filter strips is $19 per acre of agricultural land treated. According to Code 393, filter strips should be designed to have a 10-year lifespan. Assuming a 10-year lifespan and a 5 percent discount rate, the annual cost of filter strips is $2.46 per acre-year.

F. Horse and Livestock Management Practices

Manure management requires horses facility owners to collect, store, and dispose of manure in a manner that minimizes nutrient contributions to the river. One method to properly store manure is to construct manure bunkers that prevent stormwater and dry-weather runoff from carrying nutrients to the river. The average cost to construct a manure bunker is $5,000 (Ecology Action, personal communication, in CCRWQCB 2009; adjusted to 2016 dollars). This cost applies to bunkers constructed on an existing cement slab, or a where a new one was poured, and includes a permanent roof or a tarp cover. The cost of bunkers varies depending on the size and materials, and ranges from $3000 to $17,000.

Grazing management protects stream banks, riparian zones, and minimizes nutrient contributions to the river and tributaries. Grazing management includes using fencing, stream crossings, and alternative drinking locations in order to exclude livestock from sensitive areas. Grazing management can also reduce upland erosion through prescribed grazing, seeding, and gully erosion control, which utilizes grade stabilization and ponds (U.S. EPA, 2003). Preventing livestock access to waterways requires the installation of fences along portions of streams susceptible to damage and installation of watering facilities to provide an alternative water source for the animals. An average installation cost of fencing is $7.6 per feet of fence. The costs range depending on the type of fencing from $2.20 for electric fencing to $13 for woven wire. The demand for alternative water facilities is related to the size of the ranching operation and the unit cost for watering facilities varies based on volume. The average cost of a typical watering facility is $1,356.

G. Stream Restoration

Stream channel restoration opportunities focus on in-stream measures that maintain stable streambanks and riparian areas to improve hydraulic conditions (reduce in shear stress and velocities) and limit the delivery of excess sediment that is a result of increased storm event flow and mass wasting of unstable streambanks. Bioengineered solutions rather than hard structures such as concrete or riprap should be used for streambank stabilization.

Opportunities can be selected where evidence of significant channel erosion and instability is found and where restoration is likely to have the greatest success at restoring functionality. Once opportunities are identified, additional field reconnaissance can be conducted to determine the specific restoration needs of the stream reaches. Conceptual plans for each stream reach can be developed that describe the measures necessary to address channel erosion and instability.

Another important management measure for stream channel protection is riparian buffer restoration. Riparian habitat exists between stream channels and upland areas and typically intersects with the floodplain. Riparian buffer restoration involves restoring natural vegetation where riparian habitat has been previously impacted or destroyed. Riparian buffer restoration can provide an important management strategy, particularly when coupled with preservation and channel restoration. Much of the riparian vegetation in the watershed has been disturbed; however, a significant area of land exists where it can be restored. Appropriate plant communities would need to be selected and a planting plan should be developed for each site that identifies planting zones based on hydrology, soils, slopes and other factors for the selected plant communities.

Costs for reducing sedimentation through stream bank restoration were obtained from the Napa River Watershed Sediment TMDL and Habitat Enhancement Plan (SF Bay RWQCB, 2009). The Napa River TMDL provided costs estimates for bank stabilization and enhancement of stream-riparian habitat along 16 miles of the Napa River. The costs ranged from $30 to $49 million for design, construction, and maintenance of the restoration project. This results in approximately $1.9 to $3 million per mile of stream restoration.

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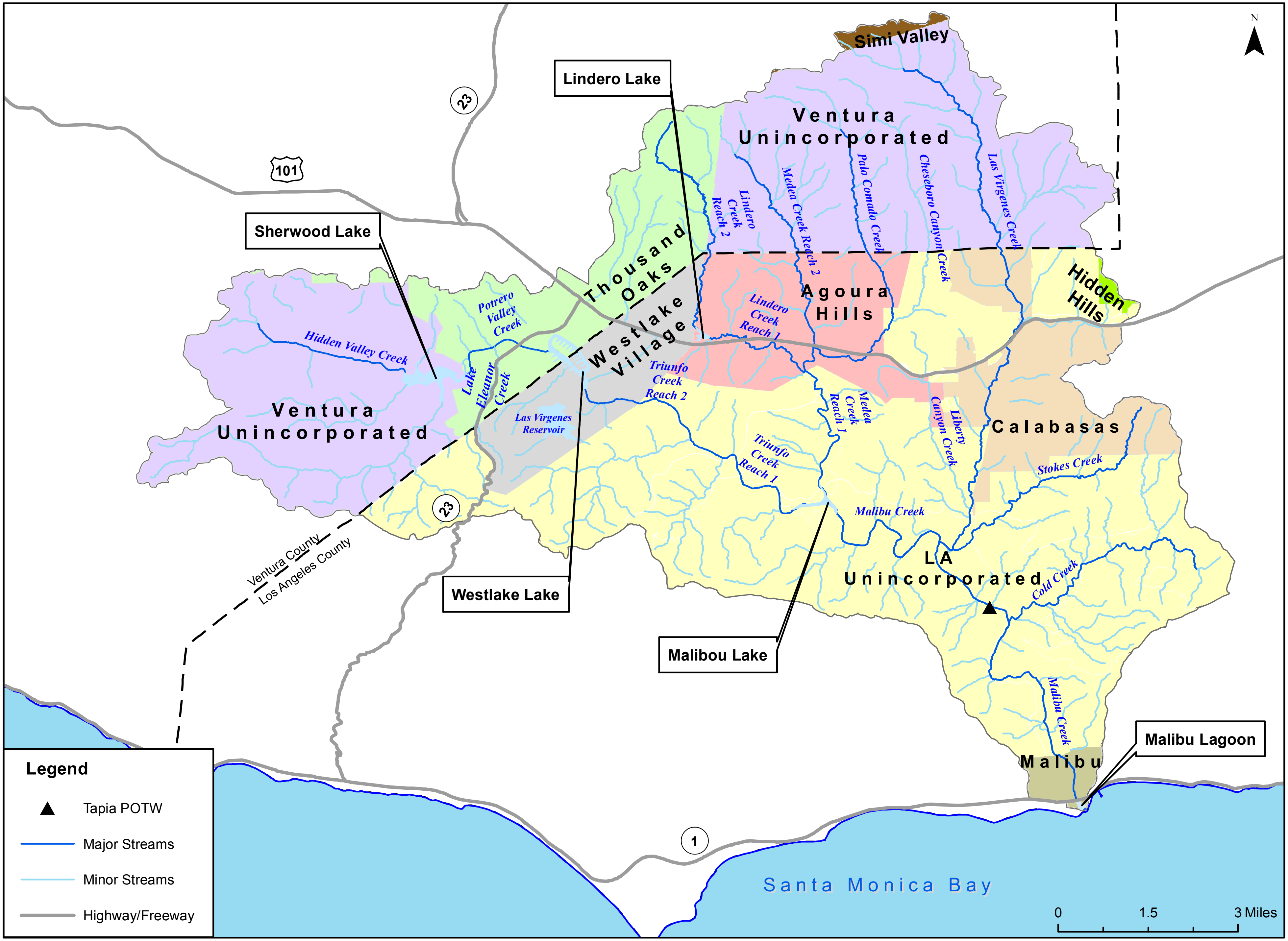
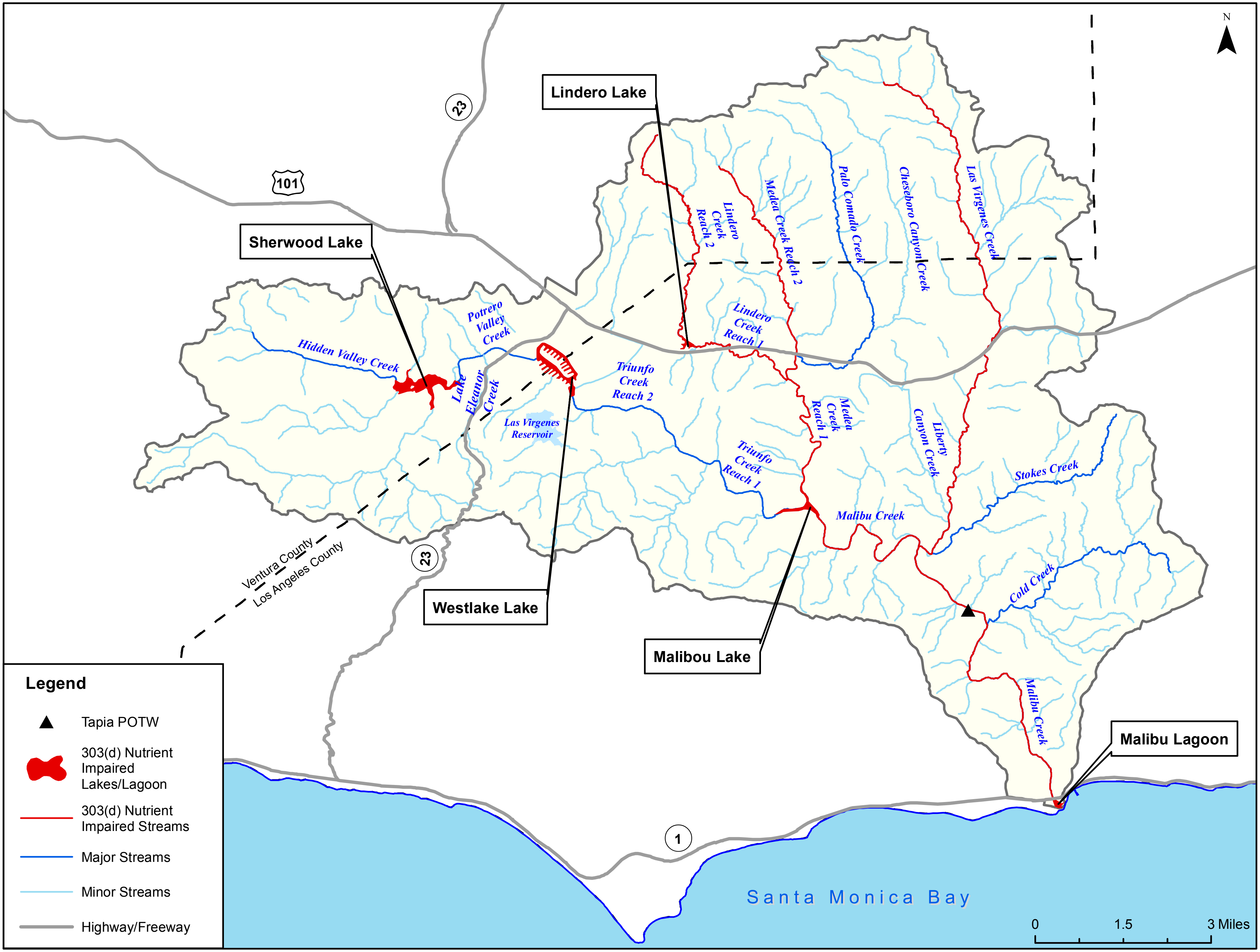
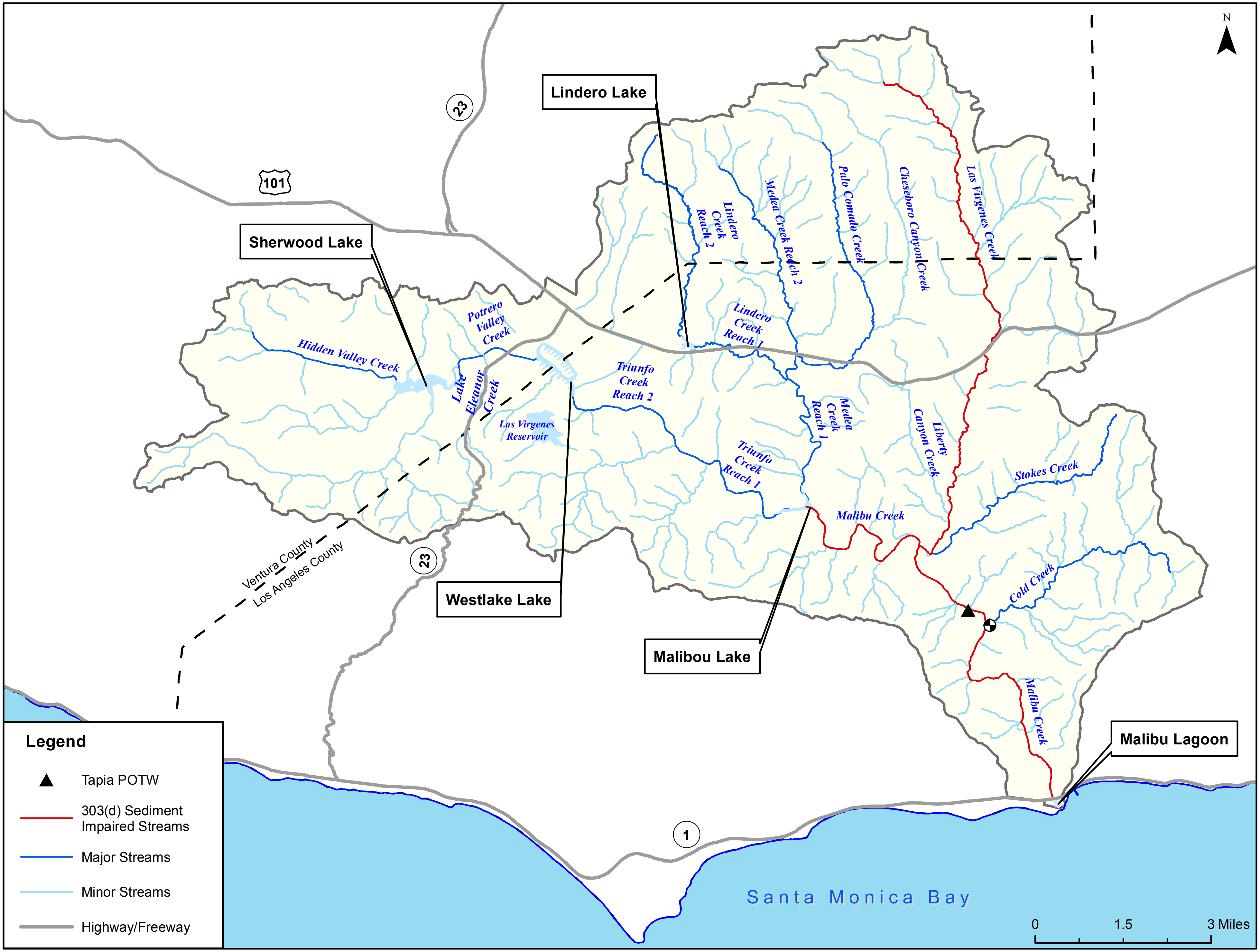
Attachment 1:Malibu Creek Watershed



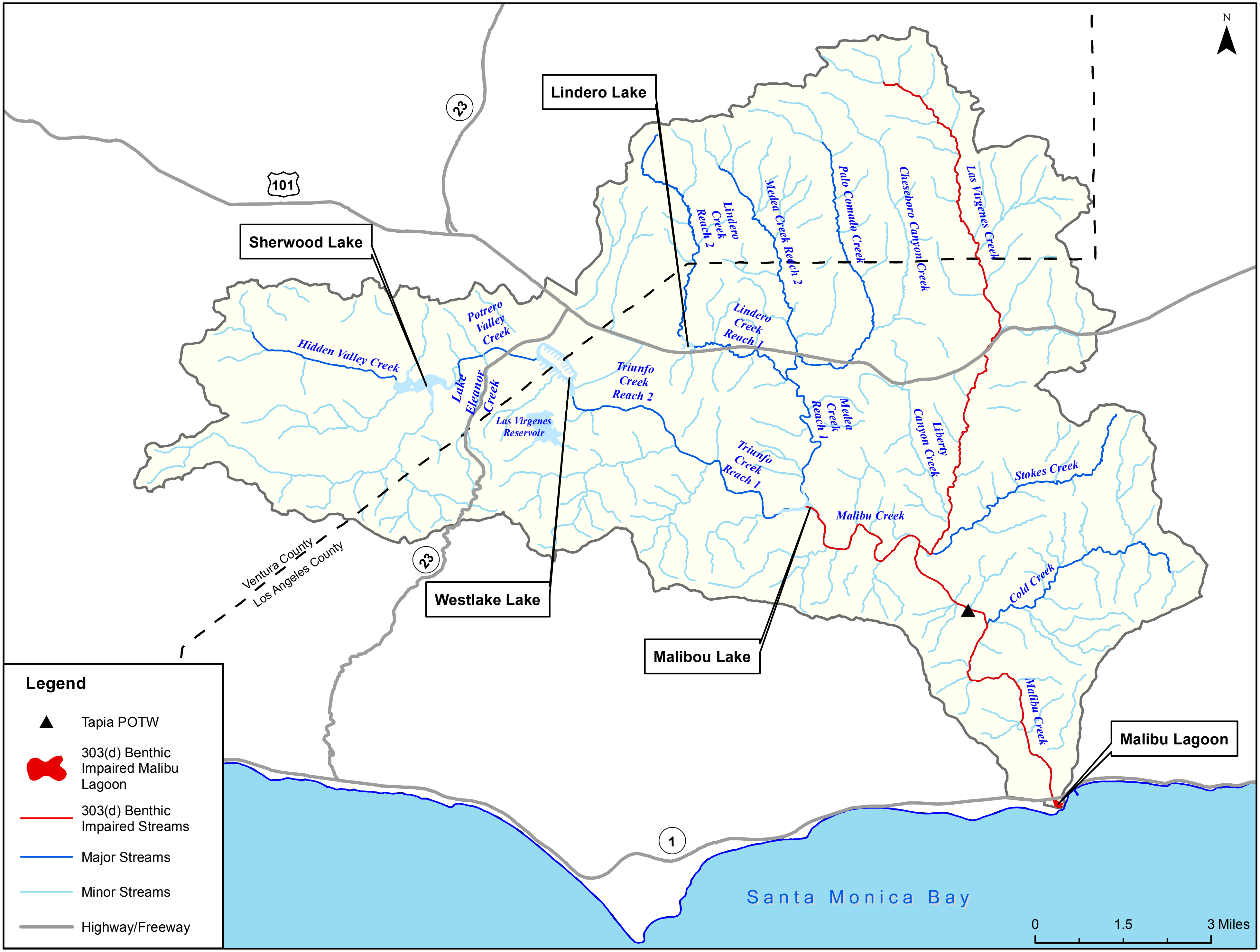
Attachment 2: 303(d) Listed Nutrient Impaired Waterbodies Addressed in the 2003 TMDL or the 2013 TMDL



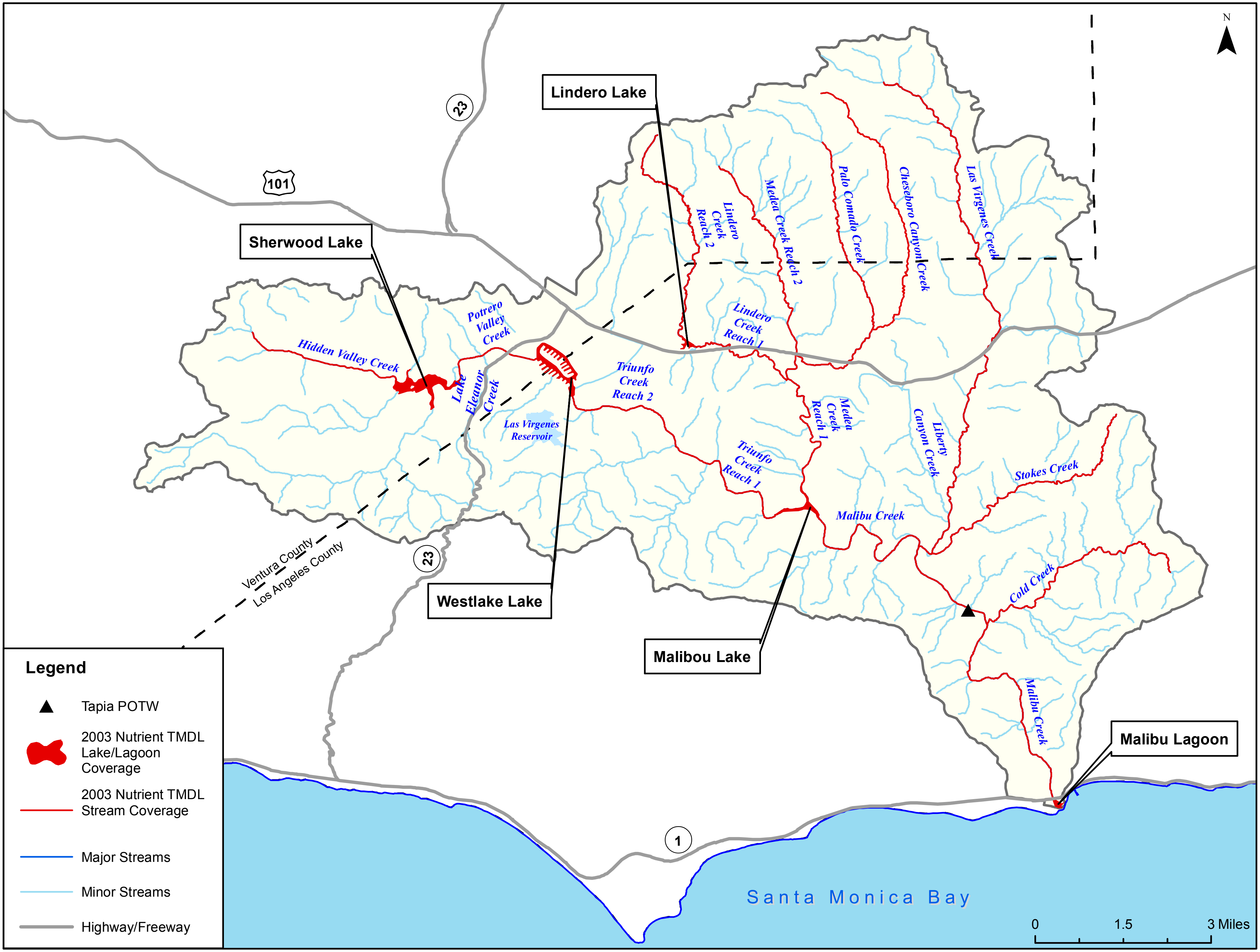
Attachment 3: 303(d) Listed Sediment Impaired Waterbodies Addressed in the 2013 TMDL



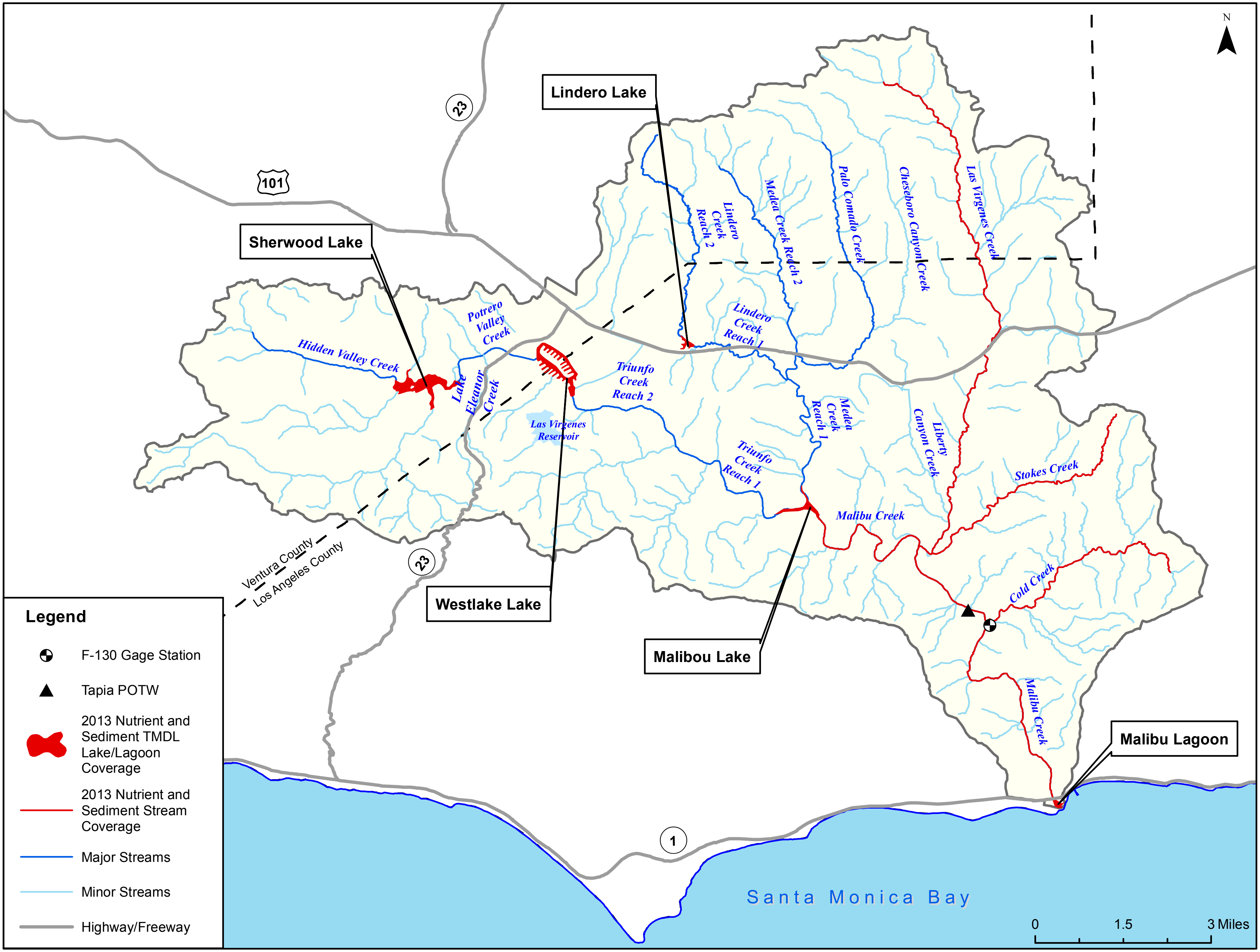
Attachment 4: 303(d) Listed Benthic Impaired Waterbodies Addressed in the 2013 TMDL



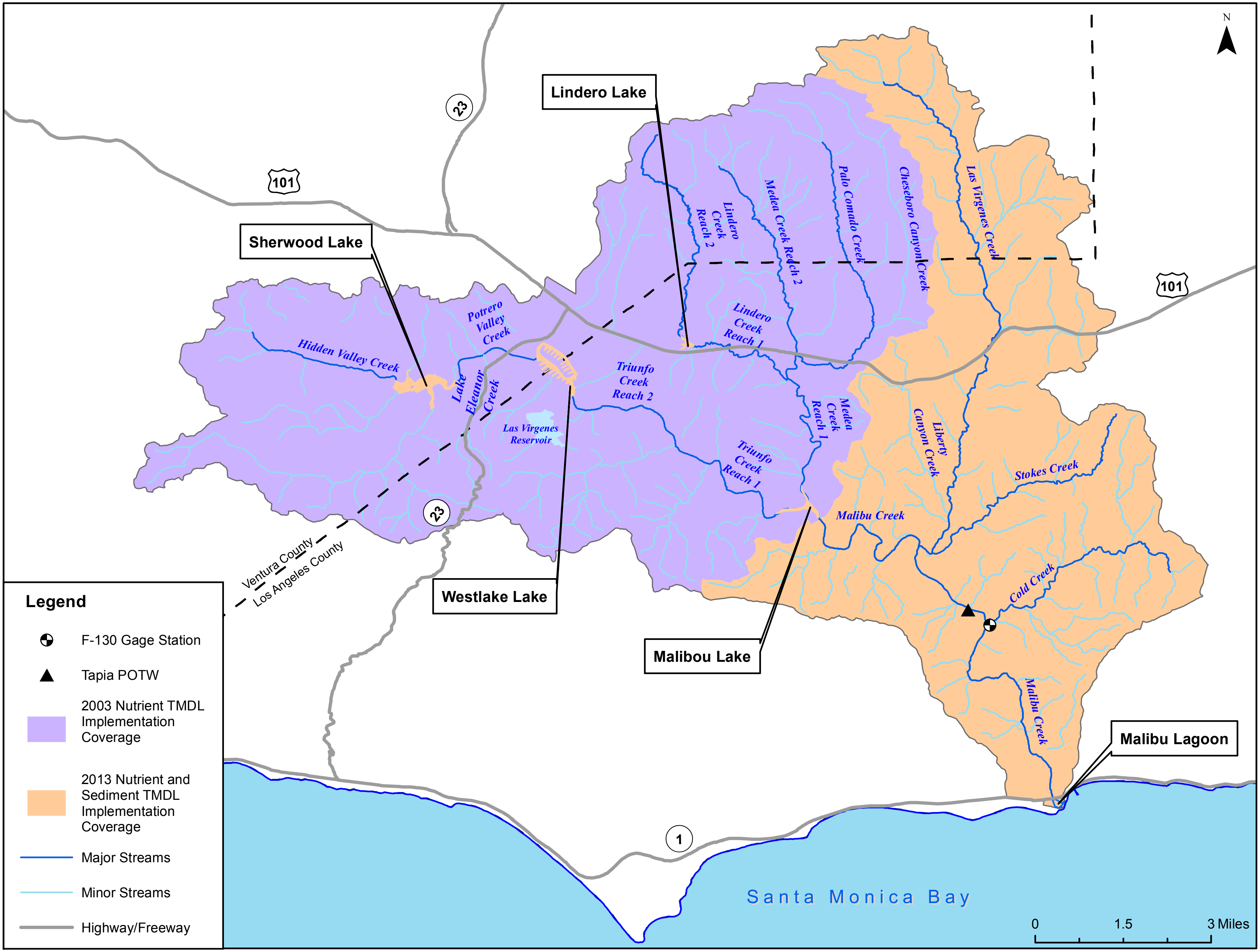
Attachment 5: Waterbodies Covered Under the 2003 Nutrient TMDL



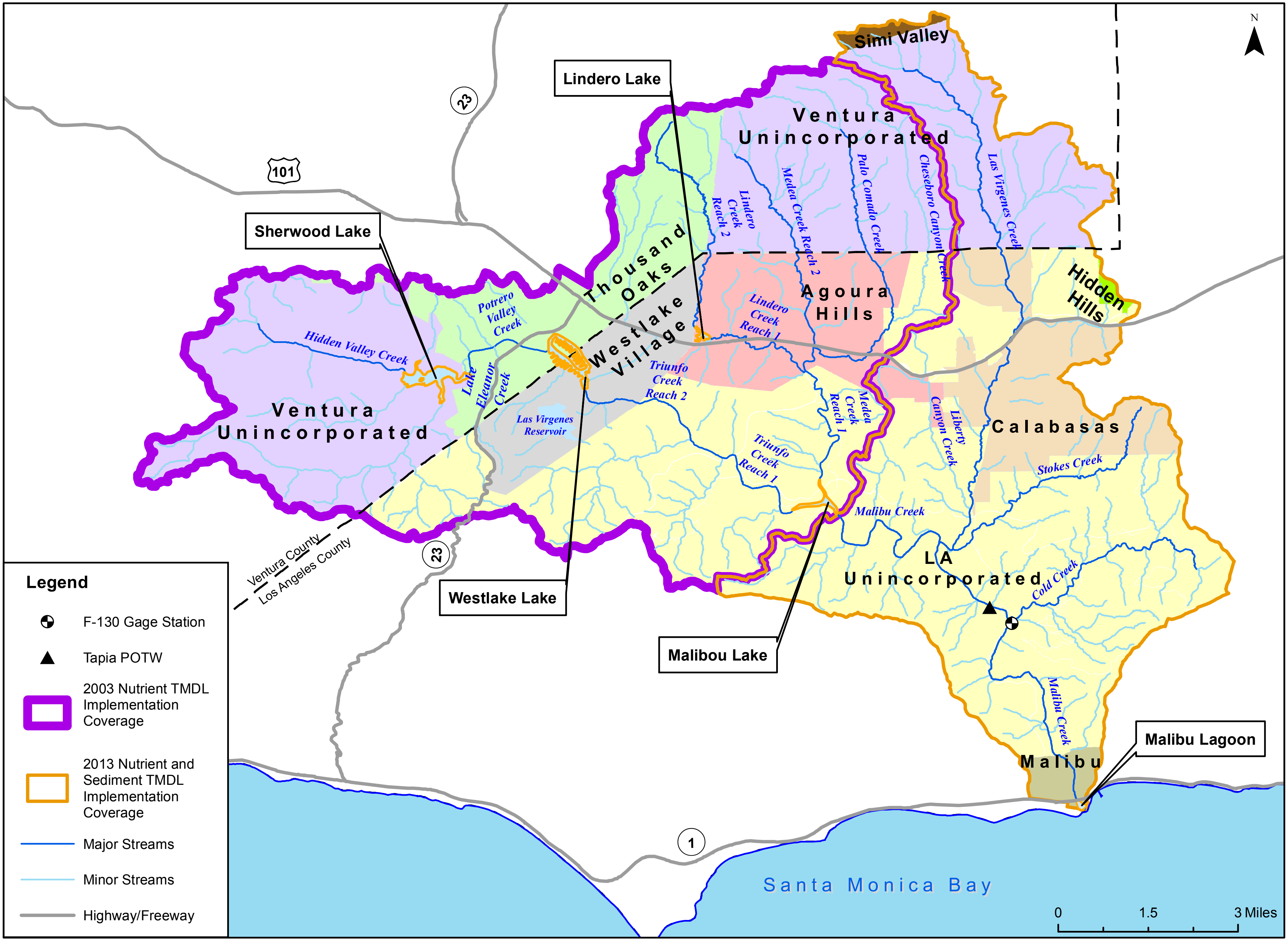
Attachment 6: Waterbodies Covered Under the 2013 Nutrient and Sediment TMDL



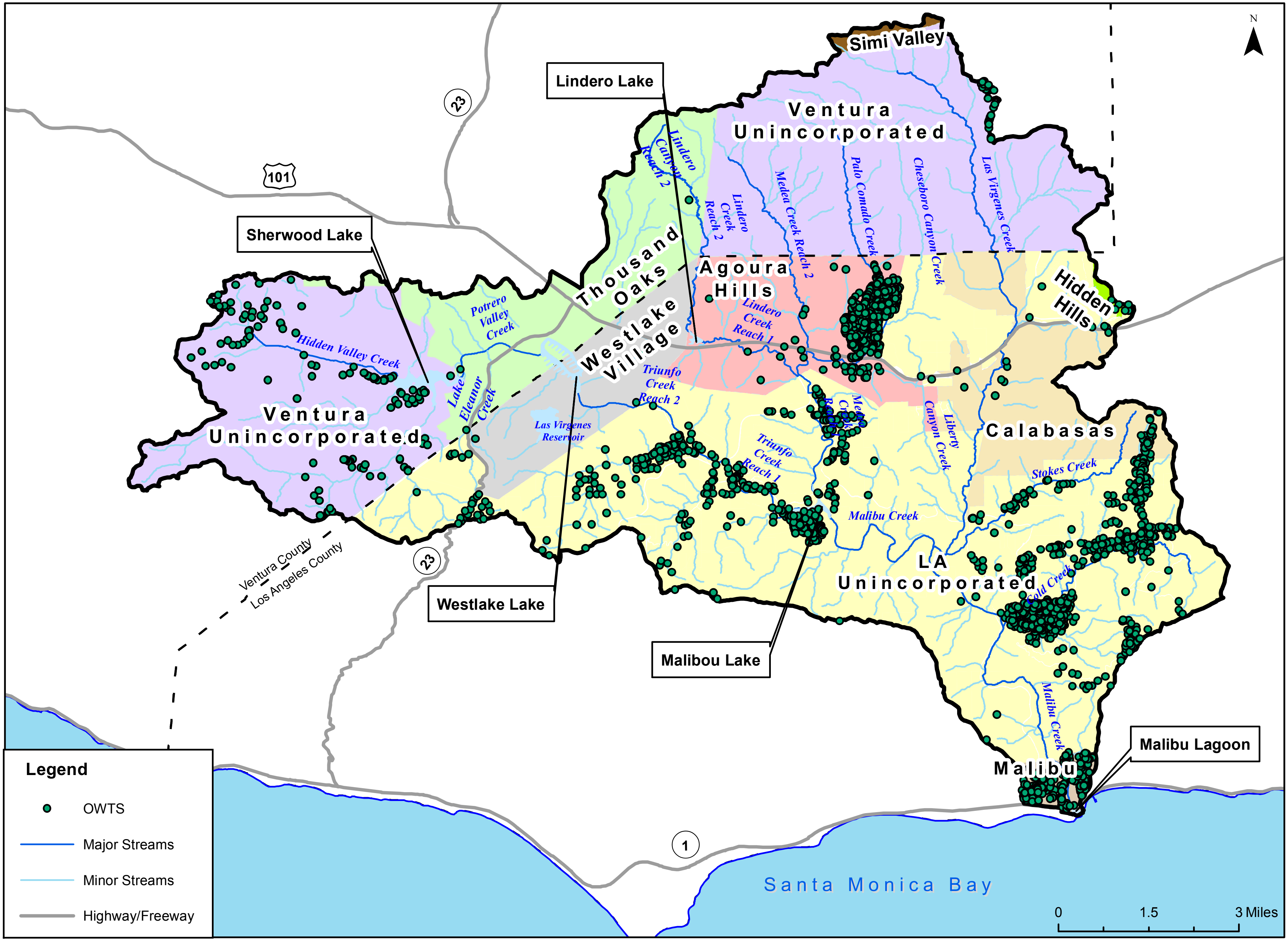
Attachment 7: 2003 TMDL and 2013 TMDL Areas where WLAs and LAs Apply



Attachment 7A: 2003 TMDL and 2013 TMDL Areas where WLAs and LAs Apply with City Boundaries



Attachment 8: OWTS within Malibu Creek Watershed



Attachment 9: Subwatersheds that Drain to Lakes in Malibu Creek Watershed