U.S. Environmental Protection Agency

Los Angeles Area Lakes TMDLs
March 2012

Section 4 Peck Road Park Lake TMDLs

4 Peck Road Park Lake TMDLs

Peck Road Park Lake (#CAL4053100020000303195323) is listed as impaired for chlordane, DDT, eutrophication (originally on the consent decree, but not on current 303(d) list), lead, odor, organic enrichment/ low dissolved oxygen, and trash (SWRCB, 2010). In addition, dieldrin and PCB impairments have been identified by new data analyses since the 2008-2010 303(d) list data cut off. This section of the TMDL report describes the impairments and the TMDLs developed to address them: nutrients (see Section 4.2), organochlorine (OC) pesticides and PCBs (Sections 4.4 through 4.7), and trash (Section 4.8). Nutrient TMDLs are identified here based on existing conditions since nitrogen and phosphorus levels are achieving the chlorophyll *a* target level. Comparison of metals data to their associated hardness-dependent water quality objectives indicates that lead is currently achieving numeric targets at Peck Road Park Lake; therefore, a TMDL is not included for this pollutant. Analyses for lead are presented below (Section 4.3).

4.1 Environmental Setting

Peck Road Park Lake is located in the Los Angeles River Basin (HUC 18070105) in the city of Arcadia (Figure 4-1). The lake was originally a gravel pit that was converted to a lake and park in 1975 by the Los Angeles County Parks and Recreation Department (Figure 4-2). Recreation is primarily limited to fishing; trout are periodically stocked by the California Department of Fish and Game (CDFG, 2009). Visitors are not allowed to boat or swim in the lake. Bird feeding is another recreational activity at Peck Road Park Lake. While no bird feeding has been observed during recent fieldwork, birds do feed from trash cans and food litter at the park. The Arcadia Golf Course is located on the northwest shoreline and a recreational path encircles the lake. Restrooms in the park are connected to the city sewer system.

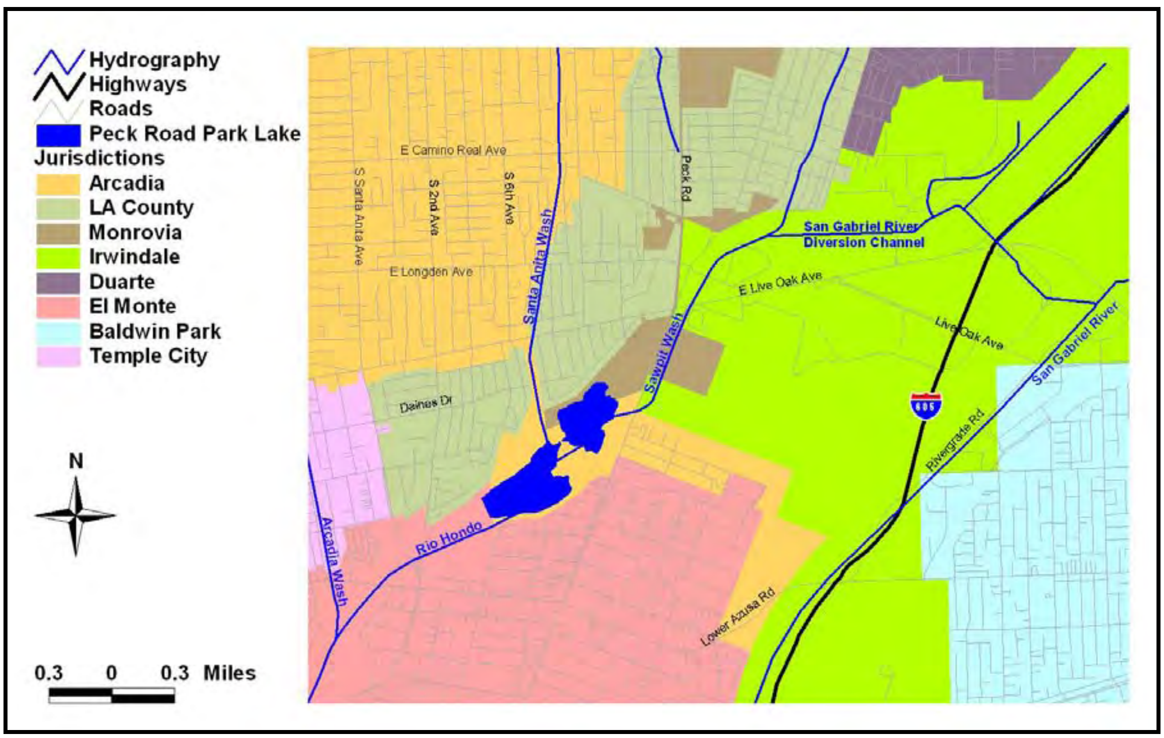

Figure 4-1. **Location of Peck Road Park Lake**

Two basins (north and south) connected by a narrow waterway have a surface area of 87.4 acres (based on Southern California Association of Governments [SCAG] 2005 land use), average depth of 30 feet (depth was calculated as an average of 2008 and 2009 sampling depths), and total volume of 2,622 acre-feet (calculated from the land use estimated surface area and average sampling depths). Inflows to the Lake include Sawpit Wash (Figure 4-3), Santa Anita Wash (Figure 4-4), and diversions from the Santa Fe Flood Control Basin. Water leaving Peck Road Park Lake discharges into Rio Hondo Wash. There is no known use of algaecide in this lake. Additional characteristics of the watershed are summarized below.

Figure 4-2. **Views of Peck Road Park Lake (Northern end on left; Southern lobe on right)**

Figure 4-3. **Sawpit Wash**

Figure 4-4. **Santa Anita Wash**

4.1.1 Elevation, Storm Drain Networks, and TMDL Subwatershed Boundaries

The Peck Road Park Lake watershed (23,564 total acres) ranges in elevation from 74 meters to 1,738 meters. The TMDL subwatershed boundaries selected for Peck Road Park Lake were based on more discrete boundaries obtained from the county of Los Angeles that were aggregated to three larger drainages. The subwatershed draining the western part of the watershed via Santa Anita Wash is 12,686 acres; the eastern subwatershed draining to Sawpit Wash is 10,557 acres. There is a mining operation in the southern part of the eastern watershed that has been removed from the loading analysis as it acts like a sink and does not drain towards the lake. The area surrounding the lake comprises 321 acres. Each subwatershed drains to a storm sewer system so all allocations except for trash will be wasteload allocations (Figure 4-5) (note: atmospheric deposition will be included as a load allocation). The spatial coverage for the storm drain network was obtained from the county of Los Angeles and is labeled on the figure accordingly. The trash TMDL includes load allocations due to direct dumping of trash along the shoreline and in the water by park visitors in the park area indicated in Figure 4-16 in the trash TMDL section.

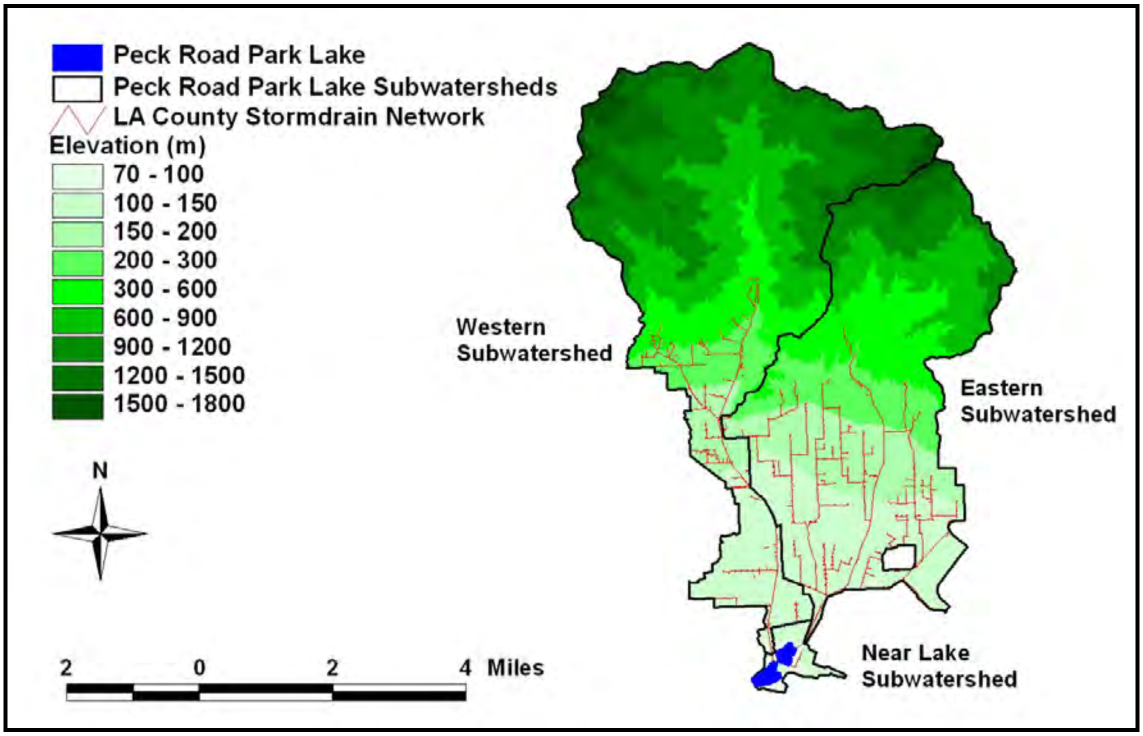

Figure 4-5. **Elevation, Storm Drain Networks, and TMDL Subwatershed Boundaries for Peck Road Park Lake**

4.1.2 MS4 Permittees

Figure 4-6 shows the MS4 stormwater permittees in the Peck Road Park Lake watershed. The western subwatershed is comprised of the county of Los Angeles, Sierra Madre, Arcadia, Monrovia, Angeles National Forest, and Caltrans areas. The eastern subwatershed is comprised of the county of Los Angeles, Monrovia, Duarte, Bradbury, Arcadia, Irwindale, Angeles National Forest, and Caltrans areas. The county of Los Angeles, Monrovia, Irwindale, Arcadia, and El Monte comprise the drainage around the lake. The park area is comprised of 152 acres adjacent to the lake.

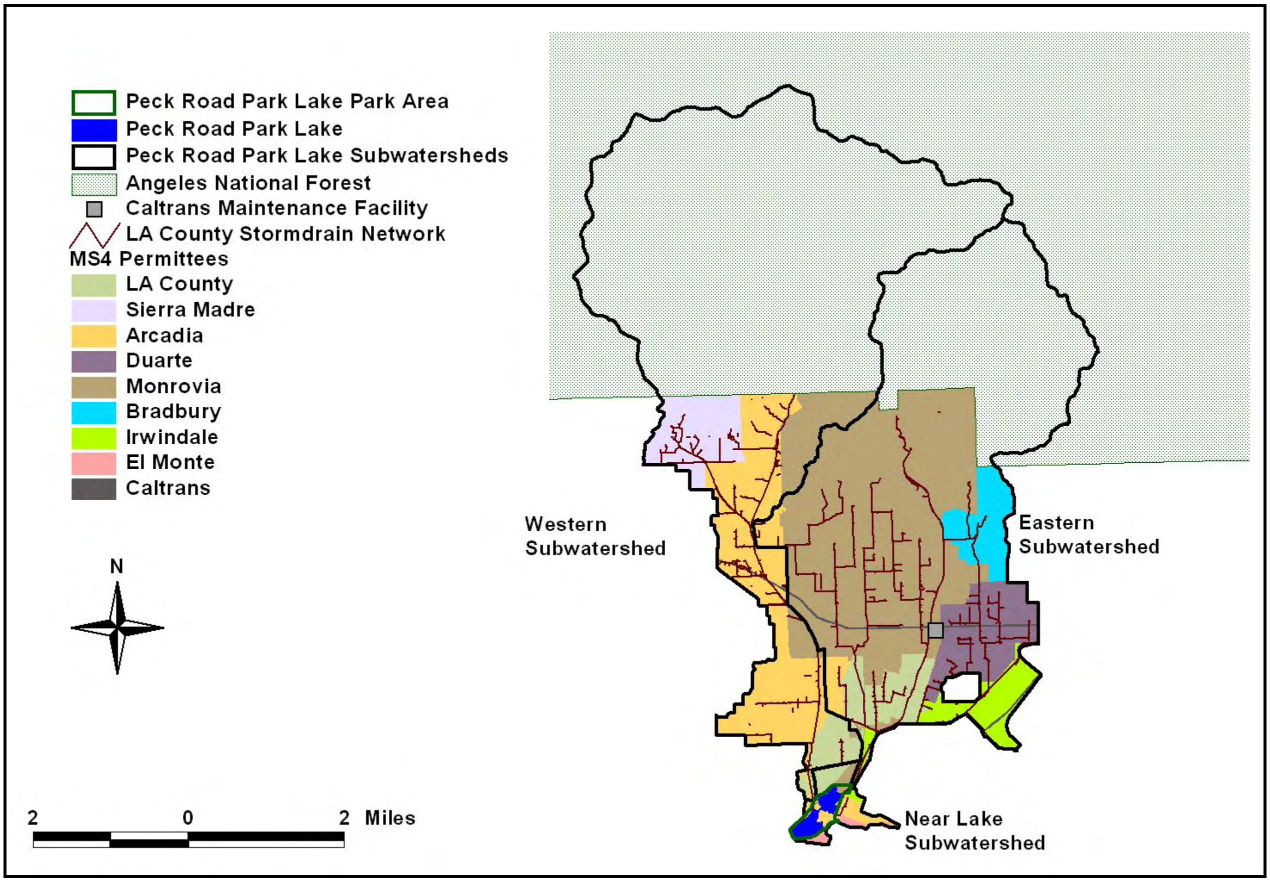

Figure 4-6. **MS4 Permittees and the Storm Drain Network in the Peck Road Park Lake Subwatersheds**

4.1.3 Non-MS4 NPDES Dischargers

There are several additional NPDES permits (non-MS4) in the Peck Road Park Lake watershed (Table 4-1). These include 53 dischargers covered under a general industrial stormwater permit (see Section 3.1 for a detailed discussion of these permit types) located throughout the watershed (Figure 4-7) that result in 510 disturbed acres. These permits were identified by querying excel files of permits from the Regional Board website (Excel files for each watershed are available from this link, www.waterboards.ca.gov/losangeles/water_issues/programs/regional_program/index.shtml#watershed, accessed on October 5, 2009). Specific information is not available regarding these dischargers; however, they are assigned existing loads and wasteload allocations based on their area (industrial stormwater) and their disturbed area (construction stormwater). There is one general NPDES permit for discharge of groundwater from potable water well maintenance activities, which will receive a concentration-based wasteload allocation.

Table 4-1. Non-MS4 Permits in the Peck Road Park Lake Watershed

Type of NPDES Permit	Number of Permits	Subwatershed	Jurisdiction	Disturbed Area
General Industrial Stormwater (Order No. 97-03-DWQ, CAS000001)	24	Eastern	Duarte	33.0

Type of NPDES Permit	Number of Permits	Subwatershed	Jurisdiction	Disturbed Area
General Industrial Stormwater (Order No. 97-03-DWQ, CAS000001)	10	Eastern	Irwindale	19.5
General Industrial Stormwater (Order No. 97-03-DWQ, CAS000001)	16	Eastern	Monrovia	133.5
General Industrial Stormwater (Order No. 97-03-DWQ, CAS000001)	1	Near Lake	Arcadia	14
General Industrial Stormwater (Order No. 97-03-DWQ, CAS000001)	1	Western	Arcadia	310
General Industrial Stormwater (Order No. 97-03-DWQ, CAS000001)	1	Western	Sierra Madre	0
General NPDES Permit for Potable Groundwater Well Discharges to Surface Water (Order No. R4-2003-0108, CAG994005)	1	Eastern	Arcadia	0

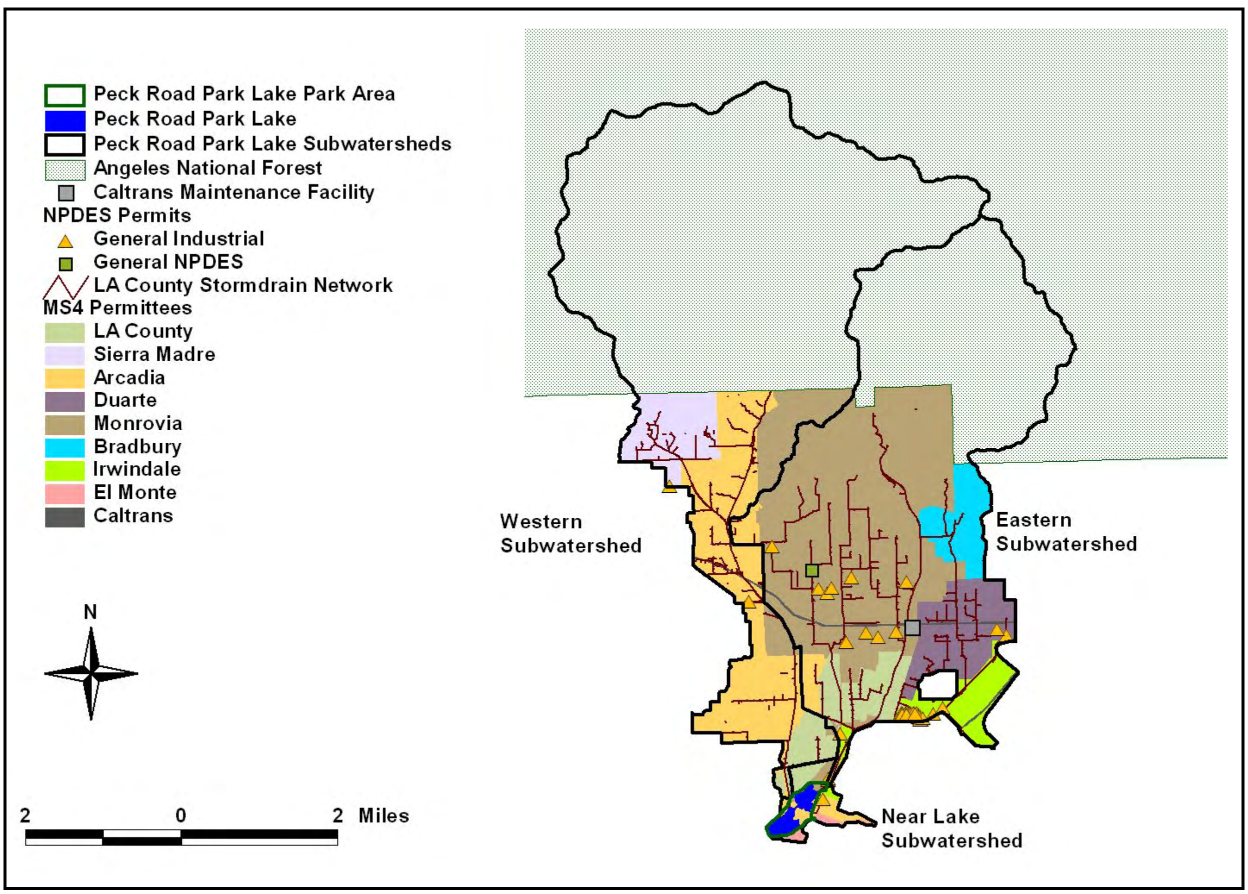

Figure 4-7. **Non-MS4 Permits in the Peck Road Park Lake Subwatersheds**

4.1.4 Land Uses and Soil Types

Several of the analyses for the Peck Road Park Lake watershed include source loading estimates obtained from the Los Angeles River Basin LSPC Model discussed in Appendix D (Wet Weather Loading) of this TMDL report. Land uses identified in the Los Angeles River Basin LSPC model are shown in Figure 4-8. Upon review of the SCAG 2005 database as well as current satellite imagery, it was evident that a portion of the areas classified by the LSPC model as agriculture were inaccurate. Land use classifications were changed to accurately reflect the conditions identified in the more recent data. Approximately 82 acres classified by LSPC as agriculture corresponded to orchards, vineyards, and horse farms and were not altered. However, approximately 27 acres of agriculture were reclassified as open space and 28 acres were reclassified as residential. All areas within the Caltrans jurisdiction were simulated as industrial since the Los Angeles River Basin LSPC model grouped transportation uses into the industrial category. Table 4-2, Table 4-3, and Table 4-4 summarize the land use areas for each TMDL subwatershed and jurisdiction.

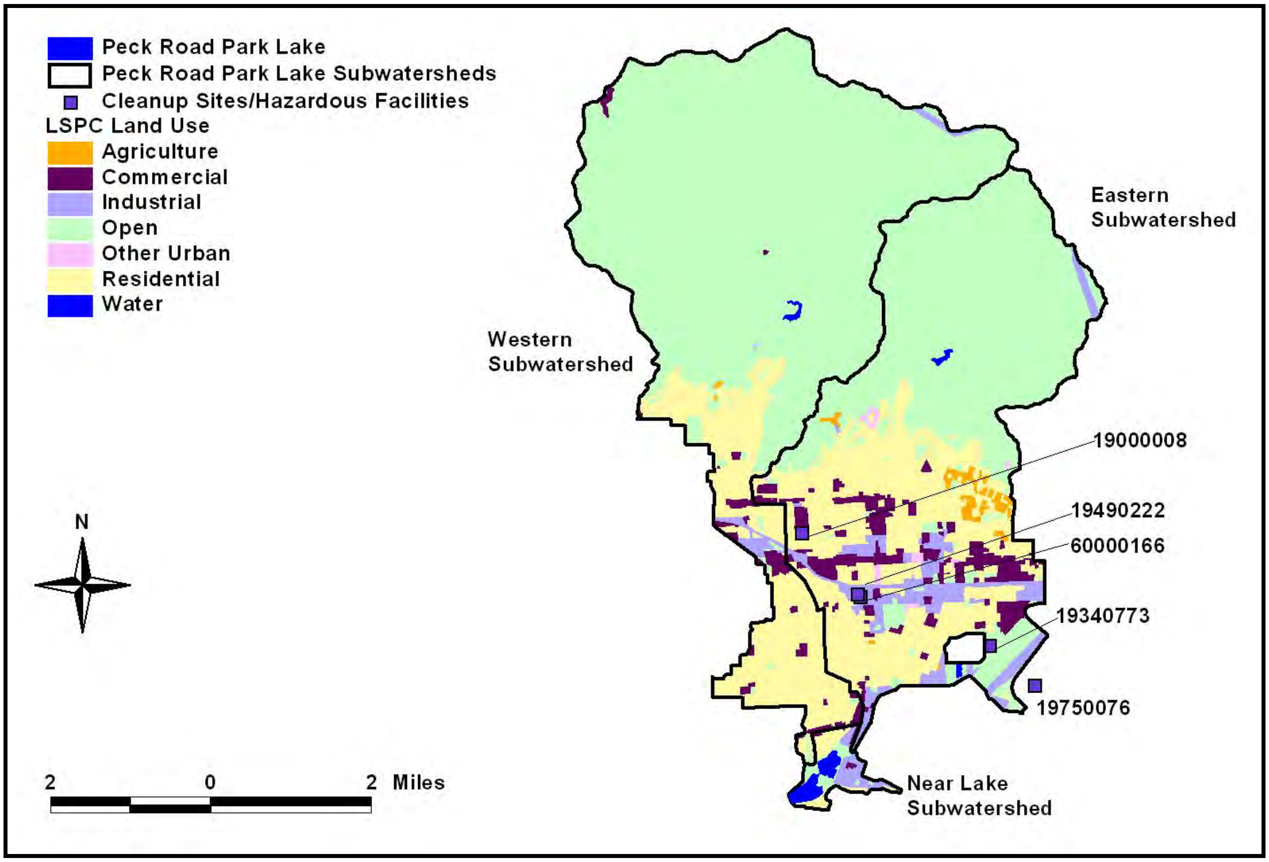

Figure 4-8. **LSPC Land Use Classes for the Peck Road Park Lake Subwatersheds**

Table 4-2. Land Use Areas (ac) Draining from Western Subwatershed of Peck Road Park Lake

Land Use	County of Los Angeles	Sierra Madre	Arcadia	Monrovia	Caltrans	Angeles National Forest	Total
Agriculture	0	4.19	0	0	0	**0**	**4.19**
Commercial	34.8	2.62	124	13.0	0	**0**	**175**
Industrial	0	0	70.4	0.319	16.9	**0**	**87.6**
Open	3.50	377	319	483	0	**9,104**	**10,286**
Other Urban	0	0	0.053	0	0	**0**	**0.053**
Residential	207	296	1,516	114	0	**0**	**2,133**
Total	**245**	**679**	**2,030**	**611**	**16.9**	**9,104**	**12,686**

Table 4-3. Land Use Areas (ac) Draining from Eastern Subwatershed of Peck Road Park Lake

Land Use	County of Los Angeles	Monrovia	Duarte	Bradbury	Arcadia	Irwindale	Caltrans	Angeles National Forest	Total
Agriculture	0	0	0	78.1	0	0	0	0	78.1
Commercial	24.8	430	232	0	33.9	12.7	0	0	733
Industrial	1.27	407	107	0	0	180	78.4	0	774
Open	5.29	1,419	53.5	229	16.0	274	0	3,511	5,508
Other Urban	0	51.0	1.74	2.90	1.71	0	0	0	57.3
Residential	467	2,149	424	193	158	15.5	0	0	3,406
Total	**499**	**4,456**	**818**	**503**	**209**	**483**	**78.4**	**3,511**	**10,557**

Table 4-4. Land Use Areas (ac) Draining from Near Lake Subwatershed of Peck Road Park Lake

Land Use	County of Los Angeles	Monrovia	Irwindale	Arcadia	El Monte	Total
Agriculture	0	0	0	0	0	**0**
Commercial	7.10	7.90	0	3.86	0	**18.9**
Industrial	0.0003	14.4	13.9	69.7	10.2	**108**
Open	0.233	24.6	0.187	61.6	0.984	**87.5**
Other Urban	0	0	0	0	0	**0**
Residential	60.4	1.30	0	4.18	40.9	**107**
Total	**67.7**	**48.1**	**14.1**	**139**	**52.1**	**321**

There are four Resource Conservation and Recovery Act (RCRA) cleanup sites within the Peck Road Park Lake watershed, and an additional RCRA cleanup site is located within 0.3 miles of the watershed. None of the active sites are expected to contribute to the existing nutrient, OC pesticides and PCBs, or trash impairments; however, some of the previously remediated locations may have historically contributed PCB loadings. In addition, as identified in Table 4-5, several facilities have the potential to discharge lead, but lead is currently meeting numeric targets in Peck Road Park Lake (Section 4.3). Table 4-5 summarizes the available information regarding these sites, which are illustrated in Figure 4-8.

Table 4-5. RCRA Cleanup Sites Located within or near the Peck Road Park Lake Watershed

Envirostor #	Facility Name	Cleanup Status	Potential Contaminants of Concern
19750076	Alpha II/Irwindale	No further action	Lead, polychlorinated biphenyls (PCBs), cadmium
60000166	Metric Machining	Active	Arsenic, motor oil, polycyclic aromatic hydrocarbons (PAHs)
19490222	So Cal Gas/Monrovia Mgp	Active	Lead, arsenic, polycyclic aromatic hydrocarbons (PAHs), cyanide
19340773	Southwest Products/Irwindale	No further action	Benzene
19000008	Trotter Apartments	Certified	Lead

Figure 4-9 shows the predominant soils identified by STATSGO in the Peck Road Park Lake subwatersheds. The most predominant soil type is Sobrante-Exchequer-Cieneba (MUKEY 660501), which is a hydrologic group C soil characterized as moderately-fine to fine-textured soils having low infiltration rates when wet and consisting chiefly of soils having a layer that impedes downward movement of water. In the headwaters of the watershed there is a small area of Tollhouse-Rock outcrop-Etsel family-Bakeoven soil, a hydrologic group D soil (MUKEY 660505), which has high runoff potential, very low infiltration rates, and consists chiefly of clay soils. The middle section of the watershed is comprised of Zamora-Urban land-Ramona soil (MUKEY 660480) for which the STATSGO database does not list the hydrologic soil group. Soil Urban land-Sorrento-Hanford (MUKEY 660473) makes up the southern part of the watershed. This soil is a hydrologic group B soil, which has moderate infiltration rates and moderately coarse textures.

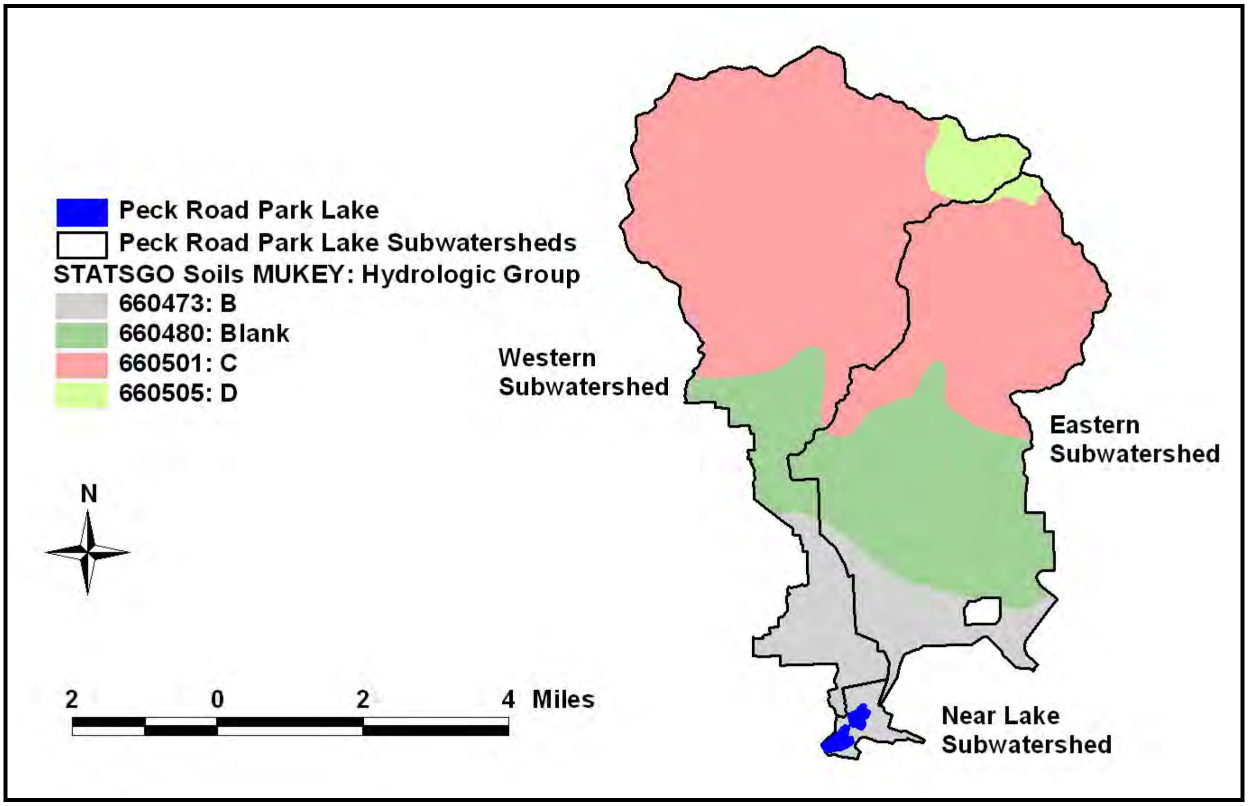

Figure 4-9. **STATSGO Soil Types Present in the Peck Road Park Lake Subwatersheds**

4.1.5 Additional Inputs

The 1994 Urban Lakes Study identified diversions of flow from the San Gabriel River as the primary source of water to Peck Road Park Lake. Based on data provided by the Los Angeles County Public Works Department, diversions provide an average of 8,737 ac-ft of water to Peck Road Park Lake annually. A small area of parkland is irrigated; however, it is greater than 600 ft from the lake and all of the water is expected to percolate into the ground and not reach the lake. It is therefore not included in the analysis.

4.2 Nutrient-Related Impairments

A number of the assessed impairments for Peck Road Park Lake may be associated with nutrients and eutrophication. Nutrient-related impairments for Peck Road Park Lake include odor and organic enrichment/low dissolved oxygen (DO) (SWRCB, 2010). The loading of excess nutrients enhances algal growth (eutrophication). Algae produce oxygen during photosynthesis but remove oxygen during respiration processes that occur in the absence of sunlight. Death and decay of large amounts of algae may cause odor problems by creating an anoxic environment that results in the release of sulfuric compounds.

4.2.1 Beneficial Uses

California state water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality

Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan, designed to be protective of the beneficial uses of each waterbody in the region. Peck Road Park Lake was not identified specifically in the Basin Plan; therefore, the beneficial uses associated with the downstream segment (Rio Hondo below Spreading Grounds) apply: REC1, REC2, WARM, WILD, MUN, and GWR (personal communication, Regional Board, December 22, 2009). Descriptions of these uses are listed in Section 2 of this TMDL report. Elevated nutrient levels are currently impairing the REC1, REC2, and WARM uses by stimulating algal growth that may form mats that impede recreational and drinking water use, alter pH and dissolved oxygen (DO) levels alter biology that impair the aquatic life use, and cause odor and aesthetic problems. At high enough concentrations WILD and MUN uses could become impaired.

4.2.2 Numeric Targets

The Basin Plan for the Los Angeles Region (LARWQCB, 1994) outlines the numeric targets and narrative criteria that apply to Peck Road Park Lake. The following targets apply to the odor and organic enrichment/low DO (see Section 2 for additional details and Table 4-6 for a summary):

- The Basin Plan addresses excess aquatic growth in the form of a narrative objective for nutrients. Excessive nutrient (e.g., nitrogen and phosphorous) concentrations in a waterbody can lead to nuisance effects such as algae, odors, and scum. The objective specifies, "waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growth causes nuisance or adversely affects beneficial uses." The Regional Board has not adopted numeric targets for biostimulatory nutrients or chlorophyll *a* in Peck Road Park Lake; however, as described in Tetra Tech (2006), summer (May – September) mean and annual mean chlorophyll *a* concentrations of 20 µg/L are selected as the maximum allowable level consistent with full support of contact recreational use and is also consistent with supporting warm water aquatic life. The mean chlorophyll *a* target must be met at half of the Secchi depth during the summer (May – September) and annual averaging periods.
- The Basin Plan states that "waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible aquatic resources, cause nuisance, or adversely affect beneficial uses."
- The Basin Plan states "at a minimum the mean annual dissolved oxygen concentrations of all waters shall be greater than 7 mg/L, and no single determinations shall be less than 5.0 mg/L, except when natural conditions cause lesser concentrations." In addition, the Basin Plan states, "the dissolved oxygen content of all surface waters designated as WARM shall not be depressed below 5 mg/L as a result of waste discharges." Deep lakes that thermally stratify during the summer months, such as Peck Road Park Lake, must meet the DO target in the epilimnion of the water column.

  The epilimnion is the upper stratum of more or less uniformly warm, circulating, and fairly turbulent water during summer stratification. The epilimnion floats above a cold relatively undisturbed region called the hypolimnion. The stratum between the two is the metalimnion and is characterized by a thermocline, which refers to the plane of maximum rate of decrease of temperature with respect to depth. For the purposes of these TMDLs, the presence of stratification will be defined by whether there is a change in lake temperature greater than 1 degree Celsius per meter. Deep lakes, such as Peck Road Park Lake, must meet the DO and pH targets in the water column from the surface to 0.3 meters above the bottom of the lake when the lake is not stratified. However, when stratification occurs (i.e., a thermocline is present) then the DO and pH targets must be met in the epilimnion, the portion of the water column above the thermocline.

- The Basin Plan states that "the pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge." Deep lakes that thermally stratify during the summer months, such as Peck Road Park Lake, must meet the pH target in the epilimnion of the water column.

Nitrogen and phosphorus target concentrations within the lake are based on existing conditions as explained in Sections 4.2.5 and 4.2.6:

- 0.76 mg-N/L summer season average (May – September) and annual average
- 0.076 mg-P/L summer season average (May – September) and annual average

Table 4-6. Nutrient-Related Numeric Targets for Peck Road Park Lake

Parameter	Numeric Target	Notes
Chlorophyll *a*	20 µg/L summer average (May – September) and annual average	
Dissolved Oxygen	7 mg/L minimum mean annual concentrations and 5 mg/L single sample minimum except when natural conditions cause lesser concentrations	
pH	The pH of inland surface waters shall not be depressed below 6.5 or raised above 8.5 as a result of waste discharges. Ambient pH levels shall not be changed more than 0.5 units from natural conditions as a result of waste discharge. (Basin Plan) 6.5 – 9.0 (EPA's 1986 Recommended Criteria)	The existing water quality criteria for pH is very broad and in cases where waste discharges are not causing the alteration of pH it allows for a wider range of pH than EPA's recommended criteria. For this reason, EPA's recommended criteria is included as a secondary target for pH.
Total Nitrogen	0.76 mg-N/L summer average (May – September) and annual average	Conservatively based on existing conditions, which are maintaining chlorophyll *a* levels below the target of 20 µg/L
Total Phosphorous	0.076 mg-P/L summer average (May – September) and annual average	Based on an in-lake TN to TP ratio of 10, typical of natural systems

4.2.3 Summary of Monitoring Data

Water quality in Peck Road Park Lake has been monitored since the early 1990s. This section summarizes the monitoring data relevant to the nutrient impairments. Additional details regarding monitoring are discussed in Appendix G (Monitoring Data).

The southern basin was sampled during the 1992-93 monitoring period in support of the Urban Lakes Study. Nutrient levels were analyzed at relatively high detection limits. Of the 90 orthophosphate samples collected, only one exceeds the detection limit of 0.1 mg-P/L. This measurement was collected at a depth of 8 meters and had a value of 0.4 mg-P/L. Only 1 of 90 total phosphorus samples exceeded the detection limit of 0.1 mg-P/L: at a depth of 5 meters the TP measurement was 0.9 mg-P/L. Three nitrite samples exceeded the detection limit for this dataset of 0.1 mg-N/L. All three had values of 0.2 mg-N/L and were located at depths ranging from 7 to 14 meters. For nitrate, 23 samples were less than the detection limit (0.1 mg-N/L) and the maximum nitrate concentration measured was 1.1 mg-N/L. Twelve measurements of Total Kjeldahl Nitrogen (TKN), which includes the organic and ammonia species of nitrogen, were less than the detection limit (0.1 mg-N/L) and the maximum TKN concentration observed was 2.0 mg-N/L. For ammonium, 55 out of 90 measurements were less than the detection limit (0.1 mg-N/L) and 35 samples ranged from 0.1 mg-N/L to 1.2 mg-N/L. pH ranged from 7.3 to 8.8. The summary table lists chlorophyll *a* concentrations ranging from <1 µg/L to 19 µg/L with an average of

8 μg/L. The graphs displaying the depth profile data for Peck Road Park Lake show that dissolved oxygen typically declines to 0 mg/L during the summer months at depths greater than 5 meters. At depths less than 5 meters, dissolved oxygen concentrations were typically around 7 mg/L during the summer months. The study reported a “fishy” smell around the lake.

The Regional Board completed its Water Quality Assessment and Documentation Report for waterbodies in the Los Angeles Region in 1996 (LARWQCB, 1996). The summary table for Peck Road Park Lake states that dissolved oxygen (DO) was not supporting the aquatic life use: 195 measurements of DO were collected in the lake with concentrations ranging from 0.2 mg/L to 15.2 mg/L. The accompanying database does not contain the raw data associated with these measurements, so depth, temperature, date, and time cannot be established. The summary table also lists the odor impairment as not supporting both contact and non-contact recreation uses.

On June 17, 2008, the Regional Board sampled water quality from the middle of each lobe of Peck Road Park Lake (shoreline sampling is not discussed in this section but is described in Appendix G, Monitoring Data). Ammonia concentrations ranged from less than the detection limit (0.1 mg-N/L) to 0.437 mg-N/L. TKN ranged from 1.2 mg-N/L to 2.08 mg-N/L. Nitrite concentrations were less than the detection limit (0.1 mg-N/L) in both basins; nitrate was less than the detection limit (0.1 mg-N/L) in the southern basin and 0.24 mg-N/L in the northern basin. Orthophosphate and total phosphate measurements in both basins were less than the detection limits (0.4 mg-P/L and 0.5 mg-P/L, respectively). Field data were collected in both basins at depths ranging from the water surface to 2.5 meters. Temperature varied by approximately 1 ºC in the south basin and approximately 4 ºC in the north basin over the sampling depth. Dissolved oxygen in the lake was greater than 17 mg/L at all depths except in the northern basin at a depth of 2.5 meters where the concentration was 3 mg/L. pH measurements in the lake ranged from 8.0 to 9.4, although the meter was not calibrated due to equipment malfunction. Chlorophyll *a* measurements in the lake ranged from 4.0 μg/L to 11.4 μg/L. The field notes for this event did not mention odor.

Four sites were sampled by the Regional Board on December 11, 2008; samples were collected from the surface at each site. Measurements of TKN, nitrite, orthophosphate, and total phosphate were less than the detection limits at each site (1.0 mg-N/L, 0.1 mg-N/L, 0.4 mg-P/L, and 0.5 mg-P/L, respectively). Ammonia concentrations ranged from 0.209 mg-N/L to 0.273 mg-N/L; nitrate ranged from 0.162 mg-N/L to 0.287 mg-N/L. Chlorophyll *a* ranged from 1.8 μg/L to 4.0 μg/L. Field data were collected from the surface to 2.0 meters. DO ranged from 2.21 mg/L to 6.20 mg/L (field notes indicate that the meter was not calibrated prior to sampling and field team questioned accuracy of these readings). pH ranged from 7.47 to 7.81.

Water quality monitoring was also conducted by the USEPA and Regional Board on August 5, 2009 in both basins. Ammonia, TKN, nitrate, and nitrite were less than the detection limits (0.03 mg-N/L, 0.456 mg-N/L, 0.01 mg-N/L, and 0.01 mg-N/L, respectively). Orthophosphate ranged from 0.0112 mg-P/L to 0.0135 mg-P/L, and total phosphorus ranged from 0.022 mg-P/L to 0.116 mg-P/L. Chlorophyll *a* ranged from 5.3 μg/L to 8.0 μg/L. DO in the epilimnion was greater than 8 mg/L in both basins. pH ranged from 8.17 to 8.71 in the epilimnion. Field notes report “an unappealing smell that is hard to describe in both the channel connecting the northern and southern lobes and in the northern lobe of Peck Road Park Lake. This smell could possibly be coming from the water or from the industry buildings which are close to the shore of the northern lobe of the lake.”

On September 30, 2010, additional sampling was conducted at the mid-lake sites. Ammonia concentrations were below the detection limit of 0.03 mg-N/L. Nitrite ranged from 0.041 to 0.043 mg-N/L, and nitrate was below the detection limit of 0.01 mg-N/L. TKN ranged from 0.562 to 0.634 mg-N/L. Orthophosphate and total phosphorus ranged from 0.02 mg-P/L to 0.04 mg-P/L. Chlorophyll *a* ranged from 6.7 μg/L to 13.4 μg/L. During this event, two continuous monitoring probes were deployed over a 24-hour period. At an average depth of 0.6 meters, DO concentrations during the 24-hour period ranged from 8.6 mg/L to 10.1 mg/L. pH ranged from about 8.5 to 8.8. On September 30, 2010, DO measurements collected from the surface of the lake ranged from 8.5 mg/L to 10.9 mg/L. At 2 meters above the bottom, DO ranged from 0.2 to 4.0 mg/L.

In summary, Peck Road Park Lake has been sampled several times over the past two decades. Slight exceedances of the pH target have been observed in the lake and may be due to natural conditions. DO levels in the epilimnion are typically greater than 7 mg/L and impairment due to low DO is not evident in either the historic or recent sampling events (DO levels do approach zero in the deeper waters but no exceedances have been observed relative to the target depths). Readings collected in December 2008 were collected with an uncalibrated meter. Chlorophyll *a* concentrations are relatively low and no measurements greater than 19 µg/L (historic data) have been reported. The maximum chlorophyll *a* concentration measured recently is 13.4 µg/L and the average concentration is 6.2 µg/L. It does not appear, based on these data, that excessive nutrient loading is causing an impairment. It is unlikely that the source of the odor reported at Peck Road Park Lake is due to elevated nutrient and algal biomass levels. They are likely associated with the trash impairment addressed in Section 4.8. The nutrient TMDLs for Peck Road Park Lake presented in Section 4.2.6 are based on existing conditions.

4.2.4 Source Assessment

The source assessment for Peck Road Park Lake includes load estimates from the surrounding watershed (Appendix D, Wet Weather Loading; Appendix F, Dry Weather Loading) and atmospheric deposition (Appendix E, Atmospheric Deposition) (Table 4-7). Watershed loading accounts for 55.5 percent of the total nitrogen load and 80.2 percent of the total phosphorus load. Diversions from the San Gabriel River to Peck Road Park Lake (via the eastern subwatershed) contribute 41.1 percent of the total nitrogen load and 15.3 percent of the total phosphorus load. All existing loads to Peck Road Park Lake are summarized in Table 4-7.

Table 4-7. Summary of Average Annual Flows and Nutrient Loading to Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Flow (ac-ft/yr)	Total Phosphorus (lb-P/yr) (percent of total load)	Total Nitrogen (lb-N/yr) (percent of total load)
Eastern	Arcadia	MS4 Stormwater[1]	206	383 (2.0)	2,320 (1.2)
Eastern	Bradbury	MS4 Stormwater[1]	291	497 (2.6)	3,223 (1.7)
Eastern	Caltrans	State Highway Stormwater[1]	99.9	158 (0.8)	1,165 (0.6)
Eastern	Duarte	MS4 Stormwater[1]	850	1,540 (8.0)	9,616 (5.1)
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	34.9	55.1 (0.3)	432 (0.2)
Eastern	Irwindale	MS4 Stormwater[1]	325	496 (2.6)	3,487 (1.9)
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	20.6	32.5 (0.2)	255 (0.1)
Eastern	County of Los Angeles	MS4 Stormwater[1]	488	924 (4.8)	5,532 (2.9)
Eastern	Monrovia	MS4 Stormwater[1]	3,527	6,243 (32.3)	38,736 (20.7)

Subwatershed	Responsible Jurisdiction	Input	Flow (ac-ft/yr)	Total Phosphorus (lb-P/yr) (percent of total load)	Total Nitrogen (lb-N/yr) (percent of total load)
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	141	223 (1.2)	1,748 (0.9)
Eastern	Angeles National Forest	Stormwater[1]	309	92.5 (0.5)	2,692 (1.4)
Diversion	Los Angeles County Department of Public Works	Water Diversion	8,737	2,960 (15.3)	76,970 (41.1)
Near Lake	Arcadia	MS4 Stormwater[1]	102	158 (0.8)	1,115 (0.6)
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	14.8	23.4 (0.1)	183 (0.1)
Near Lake	El Monte	MS4 Stormwater[1]	52.8	96.2 (0.5)	602 (0.3)
Near Lake	Irwindale	MS4 Stormwater[1]	17.8	28.2 (0.1)	207 (0.1)
Near Lake	County of Los Angeles	MS4 Stormwater[1]	68.1	129 (0.7)	773 (0.4)
Near Lake	Monrovia	MS4 Stormwater[1]	38.0	60.4 (0.3)	415 (0.2)
Western	Arcadia	MS4 Stormwater[1]	1,493	2,840 (14.7)	16,334 (8.7)
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	328	517 (2.7)	4,058 (2.2)
Western	Caltrans	State Highway Stormwater[1]	21.6	34.2 (0.2)	251 (0.1)
Western	County of Los Angeles	MS4 Stormwate[1]r	248	467 (2.4)	2,818 (1.5)
Western	Monrovia	MS4 Stormwater[1]	275	425 (2.2)	2,678 (1.4)
Western	Sierra Madre	MS4 Stormwater[1]	406	695 (3.6)	4,254 (2.3)
Western	Angeles National Forest	Stormwater[1]	802	240 (1.2)	6,981 (3.7)
Lake Surface		Atmospheric Deposition[3]	139	NA	69 (0.04)
Total			**19,034**	**19,319**	**186,914**

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. The disturbed area associated with general construction and general industrial stormwater permittees (510 acres) was subtracted out of the appropriate city areas and allocated to these permits.

[3] Loads for atmospheric deposition are based on direct precipitation to the lake (calculated by the annual average precipitation multiplied by the surface area of the lake).

4.2.5 Linkage Analysis

The linkage analysis defines the connection between numeric targets and identified pollutant sources and may be described as the cause-and-effect relationship between the selected indicators, the associated numeric targets, and the identified sources. This provides the basis for estimating total assimilative capacity and any needed load reductions.

To simulate the impacts of nutrient loading on Peck Road Park Lake, the nutrient numeric endpoints (NNE) BATHTUB Tool was set up and calibrated to lake-specific conditions. The NNE BATHTUB Tool is a version of the US Army Corps of Engineers (USACE) BATHTUB model and was developed to support risk-based nutrient numeric endpoints in California (Tetra Tech, 2006).

BATHTUB is a steady-state model that calculates nutrient concentrations, chlorophyll *a* concentration (or algal density), turbidity, and hypolimnetic oxygen depletion based on nutrient loadings, hydrology, lake morphometry, and internal nutrient cycling processes. BATHTUB uses a typical mass balance modeling approach that tracks the fate of external and internal nutrient loads between the water column, outflows, and sediments. External loads can be specified from various sources including stream inflows, nonpoint source runoff, atmospheric deposition, groundwater inflows, and point sources. Internal nutrient loads from cycling processes may include sediment release and macrophyte decomposition. The net sedimentation rates for nitrogen and phosphorus reflect the balance between settling and resuspension of nitrogen and phosphorus within the waterbody. Thus, internal loading is implicitly accounted for in the model. Since BATHTUB is a steady-state model, it focuses on long-term average conditions rather than day-to-day variations in water quality.

Target nutrient loads and resulting allocations are determined based on the secondary target – summer mean chlorophyll *a* concentration. The NNE spreadsheet tool allows the user to specify a chlorophyll *a* target and predicts the probability that current conditions will exceed the target, as well as showing a matrix of allowable nitrogen and phosphorus loading combinations to meet the target. The user-defined chlorophyll *a* target can be input directly by the user, or can be calculated based on an allowable change in water transparency measured as Secchi depth. Appendix A (Nutrient TMDL Development) describes additional details on the NNE BATHTUB Tool and its use in determining allowable loads of nitrogen and phosphorus.

In addition to loading rates of nitrogen and phosphorus, the NNE BATHTUB Tool requires basic bathymetry data for the simulation of chlorophyll *a* during the summer. For Peck Road Park Lake, the following inputs apply: surface area of 87.4 acres, average depth of 30 ft, and volume of 2,622 ac-ft. Based on the phosphorus turnover ratio for this lake (Walker, 1987), the summer averaging period is appropriate (i.e., loads delivered from May through September are input to the model rather than annual loads). Without adjusting calibration factors in the model (calibration factors on net sedimentation rates set to 1), the average annual loads presented in Section 4.2.4 yield total nitrogen, total phosphorus, and chlorophyll *a* concentrations of 1.19 mg-N/L, 0.077 mg-P/L, and 12.8 µg/L, respectively.

Average conditions for Peck Road Park Lake with regard to algal stimulation are assessed based on measurements collected between the surface and twice the observed Secchi depth. Average annual observed total nitrogen, total phosphorus, and chlorophyll *a* concentrations over the assessment depth (4.2 meters) are 0.76 mg-N/L, 0.05 mg-P/L, and approximately 6 µg/L, respectively, assuming measurements less than detection are equal to half the detection limit. Even with simulated nitrogen and phosphorus concentrations 2 to 3 times higher than those observed in the lake (i.e., calibration factors left at 1), simulated chlorophyll *a* (12.8 µg/L) remains below the target concentration of 20 µg/L. Calibrating the NNE BATHTUB Tool would result in lower simulated concentrations of nitrogen, phosphorus, and chlorophyll *a*. Thus, the NNE BATHTUB Tool indicates that Peck Road Park Lake is not directly impaired by elevated nutrient loads or excessive algal growth. (Since the calibration factor on the net phosphorus sedimentation rate would have been adjusted even lower during calibration, the method described in Appendix A (Nutrient TMDL Development) was used to estimate internal loading. Based on the inflow concentrations, in-lake concentrations, and residence time of this system, the internal loading calculation resulted in a negative number which indicates that settling is more dominant than resuspension, and internal loading of phosphorus is insignificant relative to other sources.)

Based on historic and recent monitoring data, Peck Road Park Lake is not impaired by low DO or excessive nutrient loading (Section 4.2.3). Though odor has been noted as a problem at the lake, it is likely not due to eutrophication as no algal blooms have been observed in the lake and chlorophyll *a* concentrations are relatively low. To protect Peck Road Park Lake from degradation, nutrient loading should remain at or below existing levels as an antidegradation measure to ensure future loading does not increase the chlorophyll *a* concentration.

4.2.6 TMDL Summary

A waterbody's loading capacity represents the maximum load of a pollutant that can be assimilated without violating water quality standards (40 CFR 130.2(f)). This is the maximum nutrient load consistent with meeting the numeric target of 20 µg/L of chlorophyll *a* as a summer average. The methodology for determining the loading capacity is described briefly in this section. For more detail, refer to Appendix A (Nutrient TMDL Development).

Based on observed levels of chlorophyll *a* and DO in Peck Road Park Lake, existing levels of nitrogen and phosphorus loading are resulting in attainment of both the chlorophyll *a* and DO targets. Monitoring data indicate that the average in-lake total nitrogen concentration is 0.76 mg-N/L (Appendix G, Monitoring Data). Because the majority of in-lake phosphorous samples have been less than the detection limits for the analytical laboratory, the phosphorus target concentration is based on an in-lake ratio of total nitrogen concentration to total phosphorus concentration close to 10. This ratio was selected to match that typically observed in natural systems and to balance biomass growth and prevent limitation by one nutrient (Thomann and Mueller, 1987). The corresponding in-lake concentrations of nitrogen and phosphorus are

- 0.76 mg-N/L summer average (May – September) and annual average
- 0.076 mg-P/L summer average (May – September) and annual average

To prevent degradation of this waterbody, nutrient TMDLs will be allocated based on existing loading. These TMDLs are broken down into wasteload allocations (WLAs), load allocations (LAs), and Margins of Safety (MOS) using the general TMDL equation. Note that the MOS is zero because these TMDLs are equal to the existing load.

$$TMDL = \sum WLA + LA + MOS$$

For total nitrogen, the allocatable load is equal to the existing load and is divided among WLAs and LAs. The resulting TMDL equation for total nitrogen is then:

186,914 lb-N/yr = 186,845 lb-N/yr + 69.3 lb-N/yr + 0 lb-N/yr

For total phosphorus, the allocatable load is equal to the existing load and allocated to WLAs only: LAs are zero as explained in Section 4.2.6.2. The resulting TMDL equation for total phosphorous is then:

19,319 lb-P/yr = 19,319 lb-P/yr + 0 lb-P/yr + 0 lb-P/yr

Allocations are assigned for these TMDLs by requiring equal percentage reductions of all sources. Details associated with WLAs, LAs, and MOS are presented in the following three sections.

As previously mentioned, in-lake concentrations of nitrogen and phosphorus have been determined for the lake based on recent and historical monitoring data (see Section 4.2.5). These in-lake concentrations reflect internal cycling processes (see Appendix A, Nutrient TMDL Development) and, therefore, differ from concentrations associated with various inflows. Nutrient concentrations associated with the WLA and LA inputs are described below. These values are provided as examples as they are calculated based on existing flow volumes (and will need to be recalculated if flow volumes change). Because the input concentrations do not consider internal cycling processes and are based on existing flow volumes, they do not match the allowable in-lake nitrogen and phosphorous concentrations.

4.2.6.1 Wasteload Allocations

Responsible jurisdictions are encouraged to consider the construction of wetland systems and bioswales (or other retention or treatment options) to treat the stormwater and supplemental water flows entering the lake, as well as stormwater diversion and infiltration using methods such as porous pavements and rain gardens. Implementing these options can reduce the lake's nutrient loads and, in the case of recirculation through constructed wetlands, reduce in-lake nutrient concentrations. Additionally, persons that apply algaecides as part of an overall lake management strategy must comply with the Aquatic Pesticide General Permit (General Permit Order No. 2004-0009-DWQ, CAG990005).

Local jurisdictions have performed studies on nearby waterbodies that may be considered when evaluating nutrient-reduction strategies for this lake. For example, the City of Los Angeles has modeled expected nutrient concentration reductions to stormwater flows to Echo Park Lake from constructed wetlands, and construction is currently underway. Information about this and other City of Los Angeles water quality improvement projects are available on Proposition O website: http://www.lapropo.org/sitefiles/lariver.htm. The Peck Road Park Lake watershed drains to a series of storm drains prior to discharging to the lake. Therefore, all nutrient loads associated with the surrounding drainage area are assigned wasteload allocations (WLAs). The Caltrans areas and facilities that operate under a general industrial stormwater permit also receive WLAs.

Relevant permit numbers are

- County of Los Angeles (including the cities of Arcadia, Bradbury, Duarte, Irwindale, Monrovia, and Sierra Madre): Board Order 01-182 (as amended by Order No. R4-2006-0074 and R4-2007-0042), CAS004001
- Caltrans: Order No 99-06-DWQ, CAS000003
- General Industrial Stormwater: Order No. 97-03-DWQ, CAS000001

WLAs are presented in Table 4-8. Federal regulations require that NPDES permits incorporate water quality based effluent limitations (WQBELs) consistent with the requirements and assumptions of any available WLAs. These TMDLs establish WLAs at their point of discharge. Note that WLAs are equal to existing loading rates because no reductions in loading are required. These loading values (in pounds per year) represent the TMDLs wasteload allocations (Table 4-8). All responsible jurisdictions must meet the WLAs as a mass load except for storm water permittees under the general industrial stormwater permit and the general NPDES permit for the Colorado Well Aquifer (Order No. R4-2003-0108, CAG994005), that are receiving concentration-based WLAs. In Table 4-8 below, permittees under these general permits must meet the concentration values to achieve compliance with the WLAs. The phosphorous and nitrogen WLA concentrations are based on the average targeted concentrations of nutrients (allowable load divided by inflow volume): 0.37 mg-P/L and 3.61 mg-N/L. Each wasteload allocation must be met at the point of discharge. A three-year average will be used to evaluate compliance. However, if applicable water quality criteria for ammonia, dissolved oxygen and pH, and the chlorophyll *a* target are met in the lake, then the total phosphorous and total nitrogen allocations are considered attained.

Table 4-8. Wasteload Allocations of Phosphorus and Nitrogen Loading to Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation Total Phosphorus (lb-P/yr)[4]	Wasteload Allocation Total Nitrogen (lb-N/yr)[4]
Eastern	Arcadia	MS4 Stormwater[1]	383	2,320
Eastern	Bradbury	MS4 Stormwater[1]	497	3,223
Eastern	Caltrans	State Highway Stormwater[1]	158	1,165
Eastern	Duarte	MS4 Stormwater[1]	1,540	9,616
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	55.1 (0.37 mg/L P)[2]	432 (3.61 mg/L N)[2]
Eastern	General Groundwater Discharge Permittees[3]	Groundwater Discharge	0.37 mg/L P[3]	3.61 mg/L N[3]
Eastern	Irwindale	MS4 Stormwater[1]	496	3,487
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)[3]	General Industrial Stormwater[1]	32.5 (0.37 mg/L P)[2]	255 (3.61 mg/L N)[2]
Eastern	County of Los Angeles	MS4 Stormwater[1]	924	5,532
Eastern	Monrovia	MS4 Stormwater[1]	6.243	38,736
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)[3]	General Industrial Stormwater[1]	223	1,748
Eastern	Angeles National Forest	Stormwater[1]	92.5	2,692
Diversion	Los Angeles County Department of Public Works	Water Diversion	2,960	76,970
Near Lake	Arcadia	MS4 Stormwater[1]	158	1,115
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)[3]	General Industrial Stormwater[1]	23.4 (0.37 mg/L P)[2]	183 (3.61 mg/L N)[2]
Near Lake	El Monte	MS4 Stormwater[1]	96.2	602
Near Lake	Irwindale	MS4 Stormwater[1]	28.2	207
Near Lake	County of Los Angeles	MS4 Stormwater[1]	129	773
Near Lake	Monrovia	MS4 Stormwater[1]	60.4	415
Western	Arcadia	MS4 Stormwater[1]	2,840	16,334
Western	General Industrial Stormwater Permittees (in the city of Arcadia)[3]	General Industrial Stormwater[1]	517 (0.37 mg/L P)[2]	4,058 (3.61 mg/L N)[2]
Western	Caltrans	State Highway Stormwater[1]	34.2	251

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation Total Phosphorus (lb-P/yr)[4]	Wasteload Allocation Total Nitrogen (lb-N/yr)[4]
Western	County of Los Angeles	MS4 Stormwater[1]	467	2,818
Western	Monrovia	MS4 Stormwater[1]	425	2,678
Western	Sierra Madre	MS4 Stormwater[1]	695	4,254
Western	Angeles National Forest	Stormwater[1]	240	6,981
Total			**19,319**	**186,845**

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. The disturbed area associated with general construction and general industrial stormwater permittees (510 acres) was subtracted out of the appropriate city areas and allocated to these permits. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations (see footnote #3).

[3] For these responsible jurisdictions, the concentration-based WLA will be used to evaluate compliance.

[4] Each wasteload allocation must be met at the point of discharge. A three year average will be used to evaluate compliance. However, if applicable water quality criteria for ammonia, dissolved oxygen and pH, and the chlorophyll *a* target are met in the lake, then the total phosphorous and total nitrogen allocations are considered attained.

4.2.6.2 Load Allocations

Atmospheric deposition of nitrogen to the lake surface is a nonpoint source and is assigned a load allocation (LA). Table 4-9 presents the LAs for atmospheric deposition, which are equivalent to existing loading rates because no reductions in loading are required. Atmospheric deposition does not contribute significant loads of phosphorus (Appendix E, Atmospheric Deposition). These loading values (in pounds per year) represent the TMDL load allocations (Table 4-9). Each load allocation must be met at the point of discharge. A three-year average will be used to evaluate compliance. However, if applicable water quality criteria for ammonia, dissolved oxygen and pH, and the chlorophyll *a* target are met in the lake, then the total phosphorous and total nitrogen allocations are considered attained.

Table 4-9. Load Allocations of Nitrogen Loading to Peck Road Park Lake

Input	Load Allocation Total Phosphorus (lb-P/yr)[1]	Load Allocation Total Nitrogen (lb-N/yr)[1]
Atmospheric Deposition (to the lake surface)[2]	NA	69
Total	**NA**	**69**

[1] Each load allocation must be met at the point of discharge. A three year average will be used to evaluate compliance. However, if applicable water quality criteria for ammonia, dissolved oxygen and pH, and the chlorophyll *a* target are met in the lake, then the total phosphorous and total nitrogen allocations are considered attained.

[2] Loads for atmospheric deposition are based on direct precipitation to the lake (calculated by the annual average precipitation multiplied by the surface area of the lake).

4.2.6.3 Margin of Safety

TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. The MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. This lake is currently achieving the in-lake chlorophyll *a* target and TMDLs are being established at the existing loads. This conservative anti-degradation measure is the implicit margin of safety for these TMDLs.

4.2.6.4 Critical Conditions/Seasonality

TMDLs must include consideration of critical conditions and seasonal variation to ensure protection of the designated uses of the waterbody at all times. Critical conditions for nutrient impaired lakes typically occur during the warm summer months when water temperatures are elevated and algal growth rates are high. Elevated temperatures not only reduce the saturation levels of DO, but also increase the toxicity of ammonia and other chemicals in the water column. Excessive rates of algal growth may cause large swings in DO, elevated pH, odor, and aesthetic problems. Loading of nutrients to lakes during winter months are often biologically available to fuel algal growth in summer months. These nutrient TMDLs account for summer season critical conditions by using the NNE Bathtub model to calculate possible annual loading rates consistent with meeting the summer chlorophyll *a* target concentration of 20 µg/L. These TMDLs are based on existing conditions as an anti-degradation measure since nitrogen and phosphorus levels are currently achieving the chlorophyll *a* target level. These TMDLs therefore protect for critical conditions.

4.2.6.5 Daily Load Expression

USEPA recommends inclusion of a daily load expression for all TMDLs to comply with the 2006 D.C. Circuit Court of Appeals decision for the Anacostia River. These TMDLs present a maximum daily load according to the guidelines provided by USEPA (2007). Because the majority of nutrient loading to Peck Road Park Lake occurs during wet weather events that deliver pollutant loads from both the surrounding watershed and diversions from the San Gabriel River, the daily maximum allowable loads of nitrogen and phosphorus are calculated from the maximum daily storm flow rate (estimated from the 99^{th} percentile flow) to the Lake multiplied by the average allowable concentrations consistent with achieving the long-term loading targets. These maximum loads must be met each day of the year because the annual loads specified by the TMDLs must also be achieved. The WLA and LA loads presented above are annual loading caps that cannot be exceeded.

No USGS gage currently exists in the Peck Road Park Lake watershed, but there is a gage downstream. USGS Station 11101250, Rio Hondo above Whittier Narrows Dam, was selected as a surrogate for flow determination. The 99^{th} percentile flow was chosen to represent the peak flow for this drainage. Choosing the 99^{th} percentile flow eliminates errors due to outliers and is reasonable for development of a daily load expression.

The USGS StreamStats program was used to determine the 99^{th} percentile flow for Rio Hondo (952 cfs) (Wolock, 2003). To estimate the peak flow to Peck Road Park Lake from the surrounding watershed, the 99^{th} percentile flow for Rio Hondo was scaled down by the ratio of drainage areas (23,564 acres/58,368 acres; Peck Road Park Lake watershed area/Rio Hondo watershed area at the gage). The resulting peak flow estimate for Peck Road Park Lake is 384 cfs. The 99^{th} percentile diverted flow from the San Gabriel River to Peck Road Park Lake is 328 cfs. Therefore, the total peak daily flow rate is 712 cfs.

The average allowable concentrations of phosphorus and nitrogen were calculated from the allowable loads (19,319 lb-P/yr and 186,914 lb-N/yr, respectively) divided by the total volume reaching the lake from runoff and diversions (19,034 ac-ft) (Table 4-7). Multiplying the average allowable concentrations (0.37 mg-P/L for phosphorous and 3.61 mg-N/L for nitrogen) by the 99^{th} percentile peak daily flow (712 cfs) yields the daily maximum load associated with wet weather runoff. The wet weather runoff daily maximum allowable loads of phosphorus and nitrogen for Peck Road Park Lake are 1,433 lb-P/d and 13,868 lb-N/d, respectively. These loads are associated with the MS4 stormwater permittees and the water diversion. As described above, in order to achieve in-lake nutrient targets as well as annual load-based allocations, the maximum allowable daily loads cannot be discharged to the lake every day. The WLA and LA loads presented above are annual loading caps that cannot be exceeded.

4.2.6.6 Future Growth

Much of the Peck Road Park Lake watershed remains in forested and other undisturbed land uses. As development occurs in this watershed, best management practices (BMPs) will be required such that loading rates are consistent with the allocations established by these TMDLs. Therefore, no load allocation has been set aside for future growth. It is unlikely that any dischargers of significant nutrient loading will be permitted in the watershed.

If any sources currently assigned load allocations are later determined to be point sources requiring NPDES permits, those load allocations are to be treated as wasteload allocations for purposes of determining appropriate water quality-based effluent limitations pursuant to 40 CFR 122.44(d)(1).

4.3 Lead Impairment

Peck Road Park Lake was listed as impaired for lead in 1996 based on an assessment in the Regional Board's Water Quality Assessment and Documentation Report (LARWQCB, 1996). Consistent with project plan recommendations provided in California's Impaired Waters Guidance (SWRCB, 2005), USEPA and local agencies collected 30 additional samples (12 wet weather) between December 2008 and September 2010 to evaluate current water quality conditions. There were zero dissolved lead exceedances in 30 samples (Appendix G, Monitoring Data). USEPA also collected two sediment samples during September 2010 to further evaluate lake conditions. There were zero sediment lead exceedances of the 128 ppm freshwater (Probable Effect Concentrations) sediment target (Appendix G, Monitoring Data). Therefore, Peck Road Park Lake meets lead water quality standards, and USEPA concludes that preparing a TMDL for lead is unwarranted at this time. USEPA recommends that Peck Road Park Lake not be identified as impaired by lead in California's next 303(d) list.

4.4 PCB Impairment

Polychlorinated biphenyls (PCBs) consist of a family of many related congeners. The individual congeners are often referred to by their "BZ" number. Environmental analyses may address individual congeners, homologs (groups of congeners with the same number of chlorine atoms), equivalent concentrations of the commercial mixtures of PCBs known by the trade name Aroclors, or total PCBs. The environmental measurements and targets described in this section are in terms of total PCBs, defined as the "sum of all congener or isomer or homolog or Aroclor analyses" (CTR, 40 CFR 131.38(b)(1) footnote v).

The PCB impairment of Peck Road Park Lake affects beneficial uses related to recreation, municipal water supply, wildlife health, and fish consumption. PCBs are no longer in production. While some loading of PCBs continues to occur in watershed runoff, the primary source of PCBs in the water column and aquatic life in Peck Road Park Lake is from historic loads stored in the lake sediments. Like other organochlorine compounds, PCBs accumulate in aquatic organisms and biomagnify in the food chain. As a result, low environmental exposure concentrations can result in unacceptable levels in higher trophic level fish in the lake.

4.4.1 Problem Statement

California state water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan, designed to be protective of the beneficial uses of each waterbody in the region. Peck Road Park Lake was not identified specifically in the Basin Plan; therefore, the beneficial uses associated with the downstream segment (Rio Hondo below Spreading Grounds) apply: REC1, REC2, WARM, WILD, MUN, and GWR (personal communication, Regional Board, December 22, 2009). Descriptions of these uses are listed in Section 2 of this TMDL report. Elevated levels of PCBs potentially impair the REC1, REC2, WARM, WILD, and MUN uses by causing toxicity to aquatic organisms and raising fish tissue concentrations to levels that are unsafe for human consumption (which can result in fish consumption advisories) and impairing sport fishing recreational uses.

4.4.2 Numeric Targets

The Basin Plan designates water column concentrations associated with MUN and WARM beneficial uses. There are no numeric criteria specified for sediment or fish tissue concentrations of PCBs in the Basin Plan. For the purposes of this TMDL, additional numeric targets for these endpoints are based on the consensus-based sediment quality guidelines defined in MacDonald et al. (2000) and the fish tissue concentration goal, referred to as the fish contaminant goal (FCG), defined by OEHHA (2008) for fish consumption. The numeric targets used for PCBs are listed below. The fish tissue concentration goal was also used to back calculate site-specific targets in sediment, with the most stringent target applying. See Section 2 of this TMDL report for additional details.

The water column criteria for PCBs in the Basin Plan are associated with a specific beneficial use. For waters designated MUN, the Basin Plan lists a maximum contaminant level of 0.0005 mg/L, or 0.5 µg/L, total PCBs in water. The Plan also contains a narrative criterion that toxic chemicals not be present at levels that are toxic or detrimental to aquatic life (LARWQCB, 1994). Each waterbody addressed in this report is designated WARM, at a minimum, and must meet this requirement. A chronic criterion for the sum of PCB compounds in freshwater systems to protect aquatic life is included in the CTR as 0.014 µg/L (USEPA, 2000a). The CTR also provides a human health-based water quality criterion for the consumption of both water and organisms and organisms only of 0.00017 µg/L (0.17 ng/L). The human health criterion of 0.17 ng/L is the most restrictive applicable criteria specified for water column concentrations and is selected as the water column target.

For sediment, the consensus-based sediment quality guidelines provided in MacDonald et al. (2000) for the threshold effects concentration (TEC) for total PCBs in sediment is 59.8 µg/kg dry weight. The consensus-based guidelines have been incorporated into the most recent set of NOAA Screening Quick Reference Tables (SQuiRT) (Buchman, 2008) and are recommended by the State Water Resources Control Board for interpretation of narrative sediment objectives under the 303(d) listing policy. This target is designed to protect benthic dwelling organisms and explicitly does not consider "the potential for bioaccumulation in aquatic organisms nor the associated hazards to the species that consume aquatic organisms (i.e., wildlife and humans)." The existing sediment PCB concentrations in Peck Road Park Lake are lower than the consensus-based TEC target, and existing fish tissue concentrations are higher than the fish tissue target. Thus, a separate sediment target calculation based on a biota-sediment accumulation factor (BSAF) is carried out to ensure that fish tissue concentration goals are met.

The fish contaminant goal for PCBs defined by OEHHA (2008) is 3.6 ppb wet weight in muscle tissue (filets). Elevated fish tissue concentrations are largely attributable to foodweb bioaccumulation derived from contaminated sediment. A biota-sediment accumulation factor (BSAF) approach is appropriate to correlate sediment and fish tissue targets. For total PCBs, the corresponding sediment concentration target determined using the BSAF is 1.29 µg/kg dry weight, as described in detail in Section 4.4.5. All applicable targets are shown below in Table 4-10. For sediment, the lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target.

Table 4-10. PCB Targets Applicable to Peck Road Park Lake

Medium	Source	Target
Fish (ppb wet weight)	OEHHA FCG	3.6
Sediment (µg/kg dry weight)	Consensus-based TEC	59.8
Sediment (µg/kg dry weight)	BSAF-derived target	1.29
Water (ng/L)	CTR	0.17

Note: Shaded cells represent the selected targets for this TMDL.

4.4.3 Summary of Monitoring Data

This section summarizes the monitoring data for Peck Road Park Lake related to the PCB impairment. Additional details regarding monitoring data are discussed in Appendix G (Monitoring Data).

For PCBs, as well as other organochlorine compounds, sample analyses include both a detection limit and a method reporting limit. For example, a typical detection limit for total PCBs in sediment reported by UCLA is 0.53 µg/kg dry weight, while the reporting limit is 15 µg/kg dry weight.

Water column sampling was conducted as part of an organics study performed by UCLA (funded by a grant managed by the Regional Board) in the summer of 2008 at five locations (six samples) and again in the fall of 2008 at two locations (three samples) in Peck Road Park Lake and its tributaries. Three of the samples collected during the summer were below detectable levels (1.5 – 1.58 ng/L; which is greater than the ambient water quality criterion of 0.17 ng/L), while two samples collected in the summer of 2008 and both samples collected in the fall of 2008 had detections of PCB congeners, but at levels too low to be quantified (at reporting limits of 15 – 16.67 ng/L). As the detection limit is greater than the CTR target these samples are greater than the ambient water quality criterion of 0.17 ng/L.

Additional water column sampling was conducted by the Regional Board on December 11, 2008 at four in-lake locations in Peck Road Park Lake. All four sites sampled were below detectable concentrations of PCBs (1 ng/L; the detection limit is above the water quality criterion). A summary of the water column data is shown in Table 4-11.

Table 4-11. Summary of Water Column Samples for PCBs in Peck Road Park Lake

Station	Average Water Concentration (ng/L)[1]	Number of Samples	Number of Samples above Detection Limits	Number of Samples between Detection and Reporting Limits
Sawpit Wash	[8.64]	2	2	2
Santa Anita Wash	[4.31]	3	2	2
North Basin Outfall	(0.76)	2	0	0
North Basin	(0.60)	2	0	0
South Basin	[2.30]	2	1	1
South Basin East	(0.50)	1	0	0

Station	Average Water Concentration (ng/L)[1]	Number of Samples	Number of Samples above Detection Limits	Number of Samples between Detection and Reporting Limits
South Basin West Side	(0.50)	1	0	0
In-Lake Average[2]	[2.37]			
Water Column Target	0.17			

[1] Total PCBs in a sample represents the sum of all quantified PCB congeners, including results reported below the method reporting limit. If all congeners were non-detect, the total is represented as one-half the detection limit. Results of any laboratory duplicate analyses of the same sample were averaged. Results for each station represent the average of individual samples. Results in parentheses indicate that the sample average is based only on the detection limits of the samples and that no PCBs were quantified in any of the collected samples. Sample averages based only on detected results below the reporting limit plus non-detects are shown in square brackets.

[2] Overall average is the average of individual station averages (excludes the tributary samples).

Concentrations of PCBs on suspended sediment were also analyzed at two in-lake stations during the summer and fall of 2008 as part of the UCLA study; one location was analyzed during the summer and two during the fall. During the summer event, PCB congener BZ-110 was detected below reporting limits (51.35 μg/kg dry weight), and the fall sampling detected congeners, including BZ-138 and BZ-180, but each was below reporting limits (23.63 μg/kg to 144.23 μg/kg dry weight).

Porewater was sampled as part of the UCLA study in the summer and fall of 2008. During the summer event, two of the four PCB samples were less than the detection limit of 15 ng/L, while the other two samples had detected, but not reportable concentrations (<150 ng/L). The three sites sampled for porewater during the fall of 2008 were all below the detection limit of 15 ng/L for total PCBs. Three porewater suspended sediment samples collected in the summer of 2008 were below reportable levels for total PCBs (22.55 μg/kg to 66.03 μg/kg dry weight), and one sample was below the detection limit of 9.25 μg/kg dry weight.

Suspended solids (TSS) from Peck Road Park Lake were collected in the summer and fall of 2008. In summer of 2008, only one station had enough suspended matter to perform the analysis. None of the pesticides were detected in the sample (detection limit of 5.14 μg/kg dry weight). PCB-110 was detected, but not within reportable limits (reporting limit of 51.35 μg/kg dry weight). In fall 2008, samples were analyzed at two stations with detection limits ranging from 2.36 μg/kg to 20.41 μg/kg dry weight. In one sample, PCB congener BZ-138 was detected, but not within reportable limits (reporting limit of 23.63 μg/kg dry weight), while BZ-180 was detected in the other sample, but below reporting limits (reporting limit of 144.23 μg/kg dry weight).

UCLA also collected bed sediment samples at four locations in Peck Road Park Lake in summer and fall 2008. Samples related to tributaries were collected in the lake near the tributary outfall. Two of the nine lake sediment samples collected during 2008 had reportable levels of PCBs, with a maximum of 276 μg/kg dry weight (in excess of the consensus-based TEC value of 59.8 μg/kg dry weight). Four in-lake locations were sampled by USEPA and the county of Los Angeles on November 16, 2009; total PCB concentrations ranged from 1.0 μg/kg to 23.3 μg/kg dry weight. All lake stations were averaged to estimate an exposure concentration of 12.28 μg/kg dry weight total PCBs (with non-detects included at one-half the detection limit for each sample). Stations located near outfalls, are taken as an estimate of the concentrations on incoming sediment. A summary of the sediment data is shown in Table 4-12.

Fish tissue concentrations of total PCBs from Peck Road Park Lake have been analyzed in largemouth bass (SWAMP and TSMP) by composite samples consisting of filet tissue from five fish. Total PCB concentrations in the fish tissue resulted in concentrations of 22.7 and 55.3 ppb, in two largemouth bass composite samples taken during the summer of 2007, while an April 2010 composite resulted in a concentration of 25.3 ppb total PCBs, both in excess of the fish tissue target for total PCBs (FCG of 3.6 ppb). Earlier analyses for PCB Aroclor analyzed from 1986-1992 resulted in nondetectable concentrations (at an unreported detection limit) in all four largemouth bass samples. Considering only data collected in the past 10 years, the average concentration of PCBs in largemouth bass was 34.4 ppb. This average is based on the three largemouth bass composite samples collected in 2007 and 2010 with an average lipid fraction of 0.54 percent. Recent fish-tissue data for Peck Road Park Lake are summarized in Table 4-13. Bottom-feeding fish data (e.g., carp) are not available for Peck Road Park Lake.

Table 4-12. Summary of Sediment Samples for PCBs in Peck Road Park Lake, 2008-2009

Station	Average Sediment Concentration (µg/kg dry weight)[1]	Number of Samples	Number of Samples above Detection Limits	Number of Samples between Detection and Reporting Limits
Near Sawpit Wash	5.89	1	1	0
Near Santa Anita Wash	49.52	3	2	0
North Basin	7.12	4	3	1
South Basin	[5.07]	3	2	2
North Inlet	[1.00]	1	1	1
South Inlet	[5.10]	1	1	1
In-Lake Average[2]	12.28			
Influent Average	15.38			
Consensus-based TEC	59.8			

[1] Total PCBs in a sample represents the sum of all quantified PCB congeners, including results reported below the method reporting limit. If all congeners were non-detect, the total is represented as one-half the detection limit. Results of any laboratory duplicate analyses of the same sample were averaged. Results for each station represent the average of individual samples. Results in parentheses indicate that the sample average is based only on the detection limits of the samples and that no PCBs were quantified in any of the collected samples. Sample averages based only on detected results below the reporting limit plus non-detects are shown in square brackets.
[2] Overall average is the average of individual station averages.

Table 4-13. Summary of Recent Fish Tissue Samples for PCBs in Peck Road Park Lake

Sample Date	Fish Species	Total PCBs (ppb wet weight)[1]
6 June 2007	Largemouth Bass	55.3
6 June 2007	Largemouth Bass	22.7
19 April 2010	Largemouth Bass	25.3
2007 – 2010 Average		34.4
FCG		3.6

[1] Composite samples of filet from five individuals.

In sum, recent fish tissue samples collected from Peck Road Park Lake are an order of magnitude greater than the OEHHA fish consumption guidelines for total PCBs. Measured concentrations in sediment are below the consensus-based TEC. Concentrations in water have not exceeded method reporting limits; however, several recent samples were above detection limits that themselves exceed the CTR criterion.

4.4.4 Source Assessment

PCBs in Peck Road Park Lake are primarily due to historical loading and storage within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Stormwater loads from the watershed were estimated based on simulated sediment load and observed PCB concentrations on sediment near inflows to the lake.

Watershed loads of PCBs may arise from spills from industrial and commercial uses, improper disposal, and atmospheric deposition. Industrial and commercial spills will tend to be associated with specific land areas, such as older industrial districts, junk yards, and transformer substations. Improper disposal could have occurred at various locations (indeed, waste PCB oils were sometimes used for dust control on dirt roads in the 1950s). Atmospheric deposition occurs across the entire watershed.

There is no definitive information on specific sources of elevated PCB load within the watershed at this time. Therefore, an average concentration of sediment is applied to all contributing areas. The average concentration of PCBs on incoming sediment was estimated to be 15.38 µg/kg dry weight and the estimated annual sediment load to Peck Road Park Lake is 990.3 tons/yr, including sediment delivered through the water diversion (see Appendix D, Wet Weather Loading). The resulting estimated wet weather load of PCBs is approximately 13.8 g/yr. Table 4-14 shows the annual PCB load estimated from each jurisdiction.

Table 4-14. Total PCB Loads Estimated for Each Jurisdiction and Subwatershed in the Peck Road Park Watershed (g/yr)

Subwatershed	Responsible Jurisdiction	Input	Sediment Load (tons/yr)	Total PCB Load (g/yr)	Percent of Total Load
Eastern	Arcadia	MS4 Stormwater[1]	12.1	0.17	1.22%
Eastern	Bradbury	MS4 Stormwater[1]	44.4	0.62	4.48%
Eastern	Caltrans	State Highway Stormwater[1]	9.6	0.13	0.96%
Eastern	Duarte	MS4 Stormwater[1]	57.2	0.80	5.78%
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	0.8	0.01	0.08%
Eastern	Irwindale	MS4 Stormwater[1]	23.3	0.33	2.36%
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.6	0.02	0.16%
Eastern	County of Los Angeles	MS4 Stormwater[1]	28.6	0.40	2.89%
Eastern	Monrovia	MS4 Stormwater[1]	200	2.80	20.24%
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	16.3	0.23	1.65%
Eastern	Angeles National Forest	Stormwater[1]	12.1	0.17	1.22%
Diversion	Los Angeles County Department of Public Works	Water Diversion	379	5.29	38.31%
Near Lake	Arcadia	MS4 Stormwater[1]	7.6	0.11	0.77%
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.7	0.02	0.17%

Subwatershed	Responsible Jurisdiction	Input	Sediment Load (tons/yr)	Total PCB Load (g/yr)	Percent of Total Load
Near Lake	El Monte	MS4 Stormwater[1]	3.5	0.05	0.36%
Near Lake	Irwindale	MS4 Stormwater[1]	1.7	0.02	0.17%
Near Lake	County of Los Angeles	MS4 Stormwater[1]	4.0	0.06	0.41%
Near Lake	Monrovia	MS4 Stormwater[1]	2.6	0.04	0.26%
Western	Arcadia	MS4 Stormwater[1]	68.1	0.95	6.88%
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	37.8	0.53	3.82%
Western	Caltrans	State Highway Stormwater[1]	2.1	0.03	0.21%
Western	County of Los Angeles	MS4 Stormwater[1]	14.7	0.21	1.49%
Western	Monrovia	MS4 Stormwater[1]	9.3	0.13	0.94%
Western	Sierra Madre	MS4 Stormwater[1]	19.9	0.28	2.01%
Western	Angeles National Forest	Stormwater[1]	31.4	0.44	3.18%
Total Load from Watershed			**990.3**	**13.7**	**100%**

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. The disturbed area associated with general construction and general industrial stormwater permittees (510 acres) was subtracted out of the appropriate city areas and allocated to these permits.

As described in Appendix E (Atmospheric Deposition), Section E.5, the net atmospheric deposition of PCBs directly to the lake surface is estimated to be close to zero, with deposited loads balanced by volatilization losses. Atmospheric deposition onto the watershed is implicitly included in the estimates of watershed load.

4.4.5 Linkage Analysis

The linkage analysis provides the quantitative basis for determining the loading capacity of PCBs into Peck Road Park Lake consistent with achieving water quality standards. The loading capacity is used to calculate the TMDL and corresponding allocations of that load to permitted point sources (wasteload allocations) and nonpoint sources (load allocations).

Lake sediments are often the predominant source of PCBs in biota. The bottom sediment serves as a sink for organochlorine compounds that can be recycled through the aquatic life cycle. PCBs are strongly sorbed to sediments and have long half-lives in sediment and water. Incoming loads of PCBs will mainly be adsorbed to particulates from stormwater runoff (eroded sediments from legacy contamination sites or from atmospheric deposition).

The use of bioaccumulation models and the fish tissue data in Peck Road Park Lake are discussed in detail in Appendix H (Organochlorine Compounds TMDL Development) and Appendix G (Monitoring Data), respectively. The existing sediment PCB concentrations in Peck Road Park Lake are lower than the consensus-based TEC target, and existing fish tissue concentrations are higher than the fish tissue target. Therefore, a sediment target to achieve FCGs is calculated based on biota-sediment bioaccumulation (a BSAF approach), using the ratio of the FCG to existing fish tissue concentrations of 3.6/34.4 = 0.105. This ratio is applied to the observed in-lake sediment concentration of 12.28 µg/kg dry weight to obtain the site-specific sediment target concentration to achieve fish tissue goals of 1.29 µg/kg dry weight. The fish tissue-based target concentrations were calculated using only recent data (collected in the past 10 years) because the loads and exposure concentrations of PCBs are likely to have declined steadily since the cessation of production and use of the chemical. The resulting fish-tissue based concentration of PCBs in the sediment of Peck Road Park Lake is shown in Table 4-15.

The BSAF-derived sediment target is less than the consensus-based sediment quality guideline TEC of 59.8 µg/kg dry weight. (The consensus-based sediment quality guideline is for the protection of benthic organisms, and explicitly does not address bioaccumulation and human-health risks from the consumption of contaminated fish.) The lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target. In addition, the CTR criterion for human health (0.17 ng/L) is the selected numeric target for the water column and protects both aquatic life and human health.

Table 4-15. Fish Tissue-Based Total PCB Concentration Targets for Sediment in Peck Road Park Lake

Total PCB Concentration	Sediment (µg/kg dry weight)
Existing	12.28
BSAF-derived target	1.29
Required Reduction	89.5%

The toxicant loading model described in Appendix H (Organochlorine Compounds TMDL Development) can be used to estimate the loading rate that would be required to yield the existing sediment concentration under steady-state conditions. This yields an estimate that a load of 1,005 g/yr would be required to maintain observed sediment concentrations under steady-state conditions. The estimated current watershed loading rate is 13.8 g/yr, or 1.4 percent of this amount. Therefore, impairment due to elevated fish tissue concentrations of PCBs in Peck Road Park Lake is primarily due to the storage of historic loads of PCBs in the lake sediment.

4.4.6 TMDL Summary

Because PCB impairment in Peck Road Park Lake is predominantly due to historic loads stored in the lake sediment, this impairment is not amenable to a direct calculation of loading capacity expressed as mass per unit time. Instead, allocations are first assigned on a concentration basis, with the goal of attaining the concentrations identified above for water and sediment, as well as fish tissue. The concentration targets apply to water and sediment entering the lake and within the lake.

The PCB TMDL will be allocated to ensure achievement of the loading capacity. TMDLs are broken down into the wasteload allocations (WLAs), load allocations (LAs), and Margins of Safety (MOS) using the general TMDL equation.

$$TMDL = \sum WLA + LA + MOS$$

Note that since this TMDL is being expressed as a concentration in sediment, in this scenario, the loading capacity is equal to 1.29 µg/kg dry weight total PCBs. The wasteload allocations and load allocations are also equal to 1.29 µg/kg dry weight total PCBs in sediment. There is no explicit MOS. Allocations are assigned for this TMDL by requiring equal concentrations of all sources. Details associated with the WLAs, LAs, and MOS are presented in the following three sections.

4.4.6.1 Wasteload Allocations

Federal regulations require that NPDES permits incorporate water quality based effluent limitations (WQBELs) consistent with the requirements and assumptions of any available wasteload allocations (WLAs). This TMDL establishes WLAs at their point of discharge. This TMDL also establishes alternative wasteload allocations for total PCBs ("Alternative WLAs if the Fish Tissue Target is Met") described in Section 4.4.6.1.2. The alternative wasteload allocations will supersede the wasteload allocations in Section 4.4.6.1.1 if the conditions described in Section 4.4.6.1.2 are met.

4.4.6.1.1 Wasteload Allocations

The entire watershed of Peck Road Park Lake is contained in MS4 jurisdictions, and watershed loads are therefore assigned WLAs. The Caltrans areas and facilities that operate under a general industrial stormwater permit also receive WLAs.

Relevant permit numbers are

- County of Los Angeles (including the cities of Arcadia, Bradbury, Duarte, Irwindale, Monrovia, and Sierra Madre): Board Order 01-182 (as amended by Order No. R4-2006-0074 and R4-2007-0042), CAS004001
- Caltrans: Order No 99-06-DWQ, CAS000003
- General Industrial Stormwater: Order No. 97-03-DWQ, CAS000001

PCBs in water flowing into Peck Road Park Lake are below detection limits, and most PCB load is expected to move in association with sediment. Therefore, no separate wasteload allocation or reduction is explicitly assigned to the Colorado Well Aquifer (Order No. R4-2003-0108, CAG994005) as it is not expected to deliver sediment loads. The suspended sediment in water flowing into the lake is assigned wasteload allocations. Additionally, the TMDL establishes wasteload allocations for PCBs in the water column equal to the CTR based water column target. The CTR based water column target includes both dissolved PCBs and PCBs associated with suspended sediment. The existing concentration of sediment entering the lake is 15.38 µg/kg dry weight. Therefore, a reduction of 91.6 percent [(15.38 – 1.29)/ 15.38*100] is required on the sediment-associated load from the watershed.

The wasteload allocations are shown in Table 4-16 and each wasteload allocation must be met at the point of discharge.

Table 4-16. Wasteload Allocations for Total PCBs in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for PCBs Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for PCBs in the Water Column[3] (ng/L)
Eastern	Arcadia	MS4 Stormwater[1]	1.29	0.17
Eastern	Bradbury	MS4 Stormwater[1]	1.29	0.17
Eastern	Caltrans	State Highway Stormwater[1]	1.29	0.17
Eastern	Duarte	MS4 Stormwater[1]	1.29	0.17
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	1.29	0.17
Eastern	Irwindale	MS4 Stormwater[1]	1.29	0.17

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for PCBs Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for PCBs in the Water Column[3] (ng/L)
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.29	0.17
Eastern	County of Los Angeles	MS4 Stormwater[1]	1.29	0.17
Eastern	Monrovia	MS4 Stormwater[1]	1.29	0.17
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	1.29	0.17
Eastern	Angeles National Forest	Stormwater[1]	1.29	0.17
Diversion	Los Angeles County Department of Public Works	Water Diversion	1.29	0.17
Near Lake	Arcadia	MS4 Stormwater[1]	1.29	0.17
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.29	0.17
Near Lake	El Monte	MS4 Stormwater[1]	1.29	0.17
Near Lake	Irwindale	MS4 Stormwater[1]	1.29	0.17
Near Lake	County of Los Angeles	MS4 Stormwater[1]	1.29	0.17
Near Lake	Monrovia	MS4 Stormwater[1]	1.29	0.17
Western	Arcadia	MS4 Stormwater[1]	1.29	0.17
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.29	0.17
Western	Caltrans	State Highway Stormwater[1]	1.29	0.17
Western	County of Los Angeles	MS4 Stormwater[1]	1.29	0.17
Western	Monrovia	MS4 Stormwater[1]	1.29	0.17
Western	Sierra Madre	MS4 Stormwater[1]	1.29	0.17
Western	Angeles National Forest	Stormwater[1]	1.29	0.17

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

4.4.6.1.2 Alternative Wasteload Allocations if the Fish Tissue Target is Met

The wasteload allocations listed in Table 4-16 will be superseded, and the wasteload allocations in Table 4-17 will apply, if:

1. The responsible jurisdictions submit to USEPA and the Regional Board material describing that the fish tissue target of 3.6 ppb wet weight has been met for the preceding three or more years. A

demonstration that the fish tissue target has been met in any given year must at minimum include a composite sample of skin off fillets from at least five largemouth bass each measuring at least 350mm in length,

2. The Regional Board Executive Officer approves the request and applies the alternative wasteload allocations in Table 4-17, and
3. USEPA does not object to the Regional Board's determination within 60 days of receiving notice of it.

Each wasteload allocation must be met at the point of discharge.

Table 4-17. Alternative Wasteload Allocations for Total PCBs in Peck Road Park Lake if the Fish Tissue Target is Met

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for PCBs Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for PCBs in the Water Column[3] (ng/L)
Eastern	Arcadia	MS4 Stormwater[1]	59.8	0.17
Eastern	Bradbury	MS4 Stormwater[1]	59.8	0.17
Eastern	Caltrans	State Highway Stormwater[1]	59.8	0.17
Eastern	Duarte	MS4 Stormwater[1]	59.8	0.17
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	59.8	0.17
Eastern	Irwindale	MS4 Stormwater[1]	59.8	0.17
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	59.8	0.17
Eastern	County of Los Angeles	MS4 Stormwater[1]	59.8	0.17
Eastern	Monrovia	MS4 Stormwater[1]	59.8	0.17
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	59.8	0.17
Eastern	Angeles National Forest	Stormwater[1]	59.8	0.17
Diversion	Los Angeles County Department of Public Works	Water Diversion	59.8	0.17
Near Lake	Arcadia	MS4 Stormwater[1]	59.8	0.17
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	59.8	0.17
Near Lake	El Monte	MS4 Stormwater[1]	59.8	0.17
Near Lake	Irwindale	MS4 Stormwater[1]	59.8	0.17
Near Lake	County of Los Angeles	MS4 Stormwater[1]	59.8	0.17
Near Lake	Monrovia	MS4 Stormwater[1]	59.8	0.17
Western	Arcadia	MS4 Stormwater[1]	59.8	0.17
Western	General Industrial Stormwater Permittees (in	General Industrial Stormwater[1]	59.8	0.17

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for PCBs Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for PCBs in the Water Column[3] (ng/L)
	the city of Arcadia)			
Western	Caltrans	State Highway Stormwater[1]	59.8	0.17
Western	County of Los Angeles	MS4 Stormwater[1]	59.8	0.17
Western	Monrovia	MS4 Stormwater[1]	59.8	0.17
Western	Sierra Madre	MS4 Stormwater[1]	59.8	0.17
Western	Angeles National Forest	Stormwater[1]	59.8	0.17

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

4.4.6.2 Load Allocations

This TMDL establishes load allocations (LAs) at their point of discharge. This TMDL also establishes alternative load allocations for total PCBs ("Alternative LAs if the Fish Tissue Target is Met") described in Section 4.4.6.2.2. The alternative load allocations will supersede the load allocations in Section 4.4.6.2.1 if the conditions described in Section 4.4.6.2.2 are met.

4.4.6.2.1 Load Allocations

No part of the watershed of Peck Road Park Lake is outside MS4 jurisdiction; therefore no LAs are assigned to watershed loads. No load is allocated to atmospheric deposition of PCBs.

The legacy PCB stored in lake sediment is the major cause of use impairment due to elevated fish tissue concentrations, and is assigned a load allocation. The in-lake allocation is in concentration terms: specifically, the responsible jurisdiction (County of Los Angeles) should achieve a PCB concentration of 1.29 µg/kg dry weight in lake bottom sediments (Table 4-18).

Table 4-18. Load Allocations for Total PCBs in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	1.29

4.4.6.2.2 Alternative Load Allocations if the Fish Tissue Target is Met

The load allocations listed in Table 4-18 will be superseded, and the load allocations in Table 4-19 will apply, if:

1. The responsible jurisdiction submits to USEPA and the Regional Board material describing that the fish tissue target of 3.6 ppb wet weight has been met for the preceding three or more years. A demonstration that the fish tissue target has been met in any given year must at minimum include a composite sample of skin off fillets from at least five largemouth bass each measuring at least 350mm in length,

2. The Regional Board Executive Officer approves the request and applies the alternative load allocations in Table 4-19, and
3. USEPA does not object to the Regional Board's determination within 60 days of receiving notice of it.

Table 4-19. Alternative Load Allocations for Total PCBs in Peck Road Park Lake if the Fish Tissue Target is Met

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	59.8

4.4.6.3 Margin of Safety

TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. The MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. This TMDL contains an implicit MOS based on conservative assumptions. The allocations are set based on the lower of either the BSAF-derived sediment target or the consensus-based TEC sediment target to ensure achievement of the OEHHA FCG target in fish tissue. The selected BSAF-derived target concentration in sediment is considerably lower than the consensus-based TEC target.

4.4.6.4 Critical Conditions/Seasonality

TMDLs must include consideration of critical conditions and seasonal variation to ensure protection of the designated uses of the waterbody at all times. This TMDL protects beneficial uses by reducing fish tissue concentrations to the FCG target and protecting benthic biota in sediment. Because fish bioaccumulate PCBs, concentrations in tissues of edible sized game fish integrate exposure over a number of years. As a result, overall average loading is more important for the attainment of standards than instantaneous or daily concentrations. WLAs and LAs in this TMDL are assigned as concentrations and protect during all seasons and in both high and low flow conditions. This TMDL therefore protects for critical conditions.

4.4.6.5 Daily Load Expression

USEPA recommends inclusion of a daily load expression for all TMDLs to comply with the 2006 D.C. Circuit Court of Appeals decision for the Anacostia River. This TMDL includes a maximum daily load estimated according to the guidelines provided by USEPA (2007).

Because the PCB WLAs are expressed as concentrations on sediment, the daily maximum allowable load is calculated from the maximum daily sediment load multiplied by the TMDL WLA concentration. The maximum daily sediment load is estimated from the 99^{th} percentile daily flow and the sediment event mean concentration that yields the estimated annual sediment load.

No USGS gage currently exists in the Peck Road Park Lake watershed. USGS Station 11101250, on the Rio Hondo River above the Whittier Narrows Dam, was selected as a surrogate for flow determination. The 99^{th} percentile flow was chosen to represent the peak flow for this drainage. Choosing the 99^{th} percentile flow eliminates errors due to outliers and is reasonable for development of a daily load expression.

The USGS StreamStats program was used to determine the 99th percentile flow for the Rio Hondo (952 cfs) (Wolock, 2003). To estimate the peak flow to Peck Road Park Lake, the 99th percentile flow for the Rio Hondo was scaled down by the ratio of drainage areas (23,564 acres/58,368 acres; Peck Road Park Lake watershed area/Rio Hondo watershed area at the gage). The resulting peak flow estimate for Peck Road Park Lake is 384 cfs. The 99th percentile diverted flow from the San Gabriel River to Peck Road Park Lake is 328 cfs. Therefore, the total peak daily flow rate is 712 cfs.

The event mean concentration of sediment in stormwater (71.7 mg/L) was calculated from the estimated existing watershed sediment load of 990.3tons/yr (Table 4-14) divided by the stormwater flow volume entering the lake (10,158 ac-ft, Table 4-7). Multiplying the sediment event mean concentration by the 99th percentile peak daily flow (712 cfs) yields a daily maximum sediment load from stormwater of 137.7 tons/d. Applying the wasteload allocation concentration of 1.29 ng total PCBs per dry g of sediment yields the stormwater daily maximum allowable load of 0.161 g/d of total PCBs. This load is associated with the MS4 stormwater permittees and the water diversion. The maximum allowable daily load must be met on all days, and the concentration-based WLAs must be met to ensure compliance with the TMDL.

4.4.6.6 Future Growth

USEPA regulates PCBs under the Toxic Substances Control Act (TSCA), which generally bans the manufacture, use, and distribution in commerce of the chemicals in products at concentrations of 50 parts per million or more, although TSCA allows USEPA to authorize certain uses, such as to rebuild existing electrical transformers during the transformers' useful life. Therefore, no additional allowance is made for future growth in the PCB TMDL.

If any sources currently assigned load allocations are later determined to be point sources requiring NPDES permits, those load allocations are to be treated as wasteload allocations for purposes of determining appropriate water quality-based effluent limitations pursuant to 40 CFR 122.44(d)(1).

4.5 Chlordane Impairment

Total chlordane consists of a family of related chemicals, including cis- and trans-chlordane, oxychlordane, trans-nonachlor, and cis-nonachlor. Observations and targets discussed in this section all refer to total chlordane. Chlordane was used as a pesticide in field, commercial, and residential uses. Chlordane is no longer in production, but persists in the environment from legacy loads.

The chlordane impairment of Peck Road Park Lake affects beneficial uses related to recreation, municipal water supply, wildlife health, and fish consumption. While some loading of chlordane continues to occur in watershed runoff, the primary source of chlordane in the water column and aquatic life in Peck Road Park Lake is from historic loads stored in the lake sediments. Chlordane, like other organochlorine compounds, accumulates in aquatic organisms and biomagnifies in the food chain. As a result, low environmental concentrations can result in unacceptable levels in higher trophic level fish in the lake. The approach for chlordane is similar to that for PCBs.

4.5.1 Beneficial Uses

California state water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan, designed to be protective of the beneficial uses of each waterbody in the region. Peck Road Park Lake was not identified specifically in the Basin Plan; therefore, the beneficial uses associated with the downstream segment (Rio Hondo below Spreading Grounds) apply: REC1, REC2, WARM, WILD, MUN, and GWR (personal communication, Regional Board, December 22, 2009). Descriptions of these uses are listed in Section 2 of this TMDL report. Elevated levels of chlordane are currently impairing the REC1, REC2 and WARM uses by causing toxicity to aquatic organisms and raising fish tissue concentrations to levels that are unsafe for human consumption (which can result in fish consumption advisories) and impairing sport fishing recreational uses. At high enough concentrations WILD and MUN uses could become impaired.

4.5.2 Numeric Targets

The Basin Plan designates water column concentrations associated with MUN and WARM beneficial uses. There are no numeric criteria specified for sediment or fish tissue concentrations of chlordane listed in the Basin Plan. For the purposes of this TMDL, additional numeric targets for these endpoints are based on the consensus-based sediment quality guidelines defined in MacDonald et al. (2000) and the fish tissue concentration goal, referred to as the fish contaminant goal (FCG), for chlordane defined by the Office of Environmental Health Hazard Assessment (OEHHA) for fish consumption. The numeric targets used for chlordane are listed below. The fish tissue concentration goal was also used to back calculate site-specific targets in sediment, with the most stringent target applying. See Section 2 of this TMDL report for additional details.

The water column criteria for chlordane in the Basin Plan are associated with a specific beneficial use. For waters designated MUN, the Basin Plan lists a maximum contaminant level of 0.0001 mg/L, or 0.1 μg/L. The Basin Plan also contains a narrative criterion that toxic chemicals not be present at levels that are toxic or detrimental to aquatic life (LARWQCB, 1994). Acute and chronic criterion for chlordane in freshwater systems are defined by the California Toxics Rule as 2.4 μg/L and 0.0043 μg/L, respectively (USEPA, 2000a). The CTR also includes human health criteria for the consumption of water and organisms and for the consumption of organisms only as 0.00057 μg/L and 0.00059 μg/L, respectively (USEPA, 2000a). For Peck Road Park Lake, the Regional Board has determined that the appropriate human health criterion is 0.00059 μg/L (0.59 ng/L) as the MUN use is not an existing use and may be removed.

For sediment, the consensus-based sediment quality guidelines provided in Macdonald et al. (2000) for the threshold effects concentration (TEC) for chlordane is 3.24 μg/kg dry weight. The consensus-based guidelines have been incorporated into the most recent set of NOAA Screening Quick Reference Tables (SQuiRT) (Buchman, 2008) and are recommended by the State Water Resources Control Board for interpretation of narrative sediment objectives under the 303(d) listing policy. This target is designed to protect benthic dwelling organisms and explicitly does not consider “the potential for bioaccumulation in aquatic organisms nor the associated hazards to the species that consume aquatic organisms (i.e., wildlife and humans).” The existing sediment chlordane concentrations in Peck Road Park Lake are lower than the consensus-based TEC target, and existing fish tissue concentrations are higher than the fish tissue target. Thus, a separate sediment target calculation based on a biota-sediment accumulation factor (BSAF) is carried out to ensure that fish tissue concentration goals are met.

The fish contaminant goal for chlordane defined by OEHHA (2008) is 5.6 ppb wet weight in muscle tissue (filets). Elevated fish tissue concentrations are largely attributable to foodweb bioaccumulation derived from contaminated sediment. A biota-sediment accumulation factor (BSAF) approach is appropriate to correlate sediment and fish tissue targets. For chlordane, the corresponding sediment concentration determined using the BSAF is 1.73 μg/kg dry weight, as described in Section 4.5.5. All applicable targets are shown below in Table 4-20. For sediment, the lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target.

Table 4-20. Total Chlordane Targets Applicable to Peck Road Park Lake

Medium	Source	Target
Fish (ppb wet weight)	OEHHA FCG	5.6
Sediment (ng /dry g)	Consensus-based TEC	3.24
Sediment (µg/kg dry weight)	BSAF-derived target	1.73
Water (ng/L)	CTR	0.59

Note: Shaded cells represent the selected targets for this TMDL.

4.5.3 Summary of Monitoring Data

This section summarizes the monitoring data for Peck Road Park Lake related to the chlordane impairment. Additional details regarding monitoring data are discussed in Appendix G (Monitoring Data).

Water column sampling was conducted as part of an organics study performed by UCLA (funded by a grant managed by the Regional Board) in the summer of 2008 at five locations (six samples) and again in the fall of 2008 at two locations (three samples) in Peck Road Park Lake. These samples measured cis- and trans-chlordane, but not oxychlordane or nonachlor. All of these samples were less than sample detection limits (1.5 – 1.67 ng/L; note that the detection limit for chlordane is higher than the water quality criterion of 0.59 ng/L). Additional water column sampling was conducted by the Regional Board on December 11, 2008 at four in-lake locations in Peck Road Park Lake, including the oxychlordane and nonachlor components. All four samples were below the detection limit (1 ng/L, which is also above the water quality criterion). A summary of the water column data is shown in Table 4-21. (Note that these results are identical to those shown for PCBs because all samples were non-detect and the detections limits were the same for chlordane and PCBs.)

Table 4-21. Summary of Water Column Samples for Total Chlordane in Peck Road Park Lake

Station	Average Water Concentration (ng/L)	Number of Samples	Number of Samples Above Detection Limits[1]
Sawpit Wash	(0.81)[2]	2	0
Santa Anita Wash	(0.78)	3	0
North Basin Outfall	(0.76)	2	0
North Basin	(0.60)	2	0
South Basin	(0.60)	2	0
South Basin East	(0.50)	1	0
South Basin West Side	(0.50)	1	0
In-Lake Average[3]	(0.60)		
Water Column Target	0.59		

[1] Non-detect samples were included in reported averages at one-half of the sample detection limit.

[2] Numbers in parentheses indicate that the sample is based only on the detection limits of the samples, and that no chlordane were detected in any of the collected samples.

[3] Overall average is the average of individual station averages.

In 2008, concentrations of chlordane on suspended sediment were analyzed in the summer at one location and in the fall at two locations as part of the UCLA study. All three samples were below detectable limits (2.26 µg/kg to 20.41 µg/kg dry weight). Porewater was sampled by UCLA in both the summer and fall of 2008. Specifically, chlordane concentrations in the porewater sampled at four sites during the summer of 2008 and three sites during the fall were all less than the detection limit of 15 ng/L. All four porewater suspended sediment samples collected in the summer of 2008 were below detectable levels (2.26 µg/kg to 9.25 µg/kg dry weight).

UCLA also collected sediment samples at four locations in Peck Road Park Lake in summer and fall 2008. As with the water column analyses by UCLA, these report cis- and trans-chlordane, but not oxychlordane or nonachlor. Only one of nine lake sediment samples was above the detection limit (which ranged from 0.34 µg/kg to 0.72 µg/kg dry weight) with a maximum of 7.1 µg/kg dry weight (in excess of the consensus-based TEC for sediment of 3.24 µg/kg dry weight).

Four in-lake sediment locations were sampled by USEPA and the county of Los Angeles on November 16, 2009, resulting in concentrations from 1.0 µg/kg to 19.5 µg/kg dry weight, with three of the four samples exceeding the consensus-based TEC of 3.24 µg/kg dry weight. These analyses do include oxychlordane and nonachlor. All lake stations were averaged to estimate an exposure concentration for chlordane in Peck Road Park Lake sediments of 4.14 µg/kg dry weight (with non-detects included at one-half the detection limit for each sample). Stations located near outfalls, are taken as an estimate of the concentrations on incoming sediment. A summary of the sediment data is shown in Table 4-22.

Table 4-22. Summary of Sediment Samples for Total Chlordane in Peck Road Park Lake

Station	Average Sediment Concentration (ng dry/g)[1]	Number of Samples	Number of Samples above Detection Limits	Number of Samples between Detection Limit and Reporting Limit
Near Sawpit Wash	(0.19)	1	0	0
Near Santa Anita Wash	(0.23)	3	0	0
North Basin	5.96	4	2	0
South Basin	6.30	3	1	0
North Inlet	[1.00]	1	1	1
South Inlet	11.20	1	1	0
In-Lake Average[2]	4.14			
Influent Average	3.15			
Consensus-based TEC	3.24			

[1] Total chlordane in a sample represents the sum of all reported measurements for alpha and gamma chlordane, oxychlordane, and cis- and trans-nonachlor, including results reported below the method reporting limit. If all components were non-detect, the total is represented as one-half the detection limit. Results of any laboratory duplicate analyses of the same sample were averaged. Results for each station represent the average of individual samples. Results in parentheses indicate that the sample average is based only on the detection limits of the samples and that no chlordane quantified in any of the collected samples. Sample averages based only on detected results below the reporting limit plus non-detects are shown in square brackets.

[2] Overall average is the average of individual station averages.

Fish tissue concentrations of total chlordane from Peck Road Park Lake have been analyzed in largemouth bass (SWAMP and TSMP). Four largemouth bass samples collected between 1986 and 1992 ranged from non-detect to 42 ppb with an average of 21 ppb, well in excess of the FCG for chlordane

(5.6 ppb). Because chlordane is no longer in use, fish tissue concentrations are likely to have declined since these samples were taken. Recent fish tissue concentrations of chlordane have been analyzed in largemouth bass in two composite samples of filet tissue from five fish collected in summer 2007 and another composite sample collected in April 2010 (Table 4-23). These had an average total chlordane concentration of 13.44 ppb, in excess of the FCG. The average lipid fraction was 0.54 percent. Data from bottom-feeding fish (e.g., carp) are not available for Peck Road Park Lake.

Table 4-23. Summary of Recent Fish Tissue Samples for Total Chlordane in Peck Road Park Lake

Sample Date	Fish Species	Total Chlordane (ppb wet weight)[1]
6 June 2007	Largemouth Bass	19.212
6 June 2007	Largemouth Bass	8.637
19 April 2010	Largemouth Bass	12.465
2007 - 2010 Average		13.44
FCG		5.6

[1]Composite sample of filets from five individuals.

In sum, recent fish tissue concentrations in Peck Road Park Lake are consistently above the FCG in the three available largemouth bass composite samples. The average concentration in sediment is below the consensus-based TEC, although individual samples exceed the TEC. Water column samples have all been below detection limits.

4.5.4 Source Assessment

Chlordane in Peck Road Park Lake is primarily due to historical loading and storing within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Stormwater loads from the watershed were estimated based on simulated sediment load and observed chlordane concentrations on sediment near inflows to the lake. Watershed loads of chlordane may arise from past pesticide applications, improper disposal, and atmospheric deposition. Pesticide applications were most likely associated with agricultural, commercial, and residential areas. Improper disposal could have occurred at various locations, while atmospheric deposition occurs across the entire watershed.

There is no definitive information on specific sources within the watershed at this time. Therefore, an average concentration of sediment is applied to all contributing areas. The average concentration of chlordane on incoming sediment was estimated to be 3.15 µg/kg dry weight (Table 4-22), and the annual sediment load to Peck Road Park Lake is 990.3 tons/yr, including sediment delivered through the water diversion (see Appendix D, Wet Weather Loading). The resulting estimated wet weather load of chlordane is approximately 2.83 g/yr (Table 4-24).

Table 4-24. Total Chlordane Loads Estimated for Each Jurisdiction and Subwatershed in the Peck Road Park Lake Watershed (g/yr)

Subwatershed	Responsible Jurisdiction	Input	Sediment (tons/yr)	Total Chlordane Load (g/yr)	Percent of Total Load
Eastern	Arcadia	MS4 Stormwater[1]	12.1	0.034	1.22%
Eastern	Bradbury	MS4 Stormwater[1]	44.4	0.127	4.48%
Eastern	Caltrans	State Highway Stormwater[1]	9.6	0.027	0.96%
Eastern	Duarte	MS4 Stormwater[1]	57.2	0.163	5.78%
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	0.8	0.002	0.08%
Eastern	Irwindale	MS4 Stormwater[1]	23.3	0.067	2.36%
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.6	0.005	0.16%
Eastern	County of Los Angeles	MS4 Stormwater[1]	28.6	0.082	2.89%
Eastern	Monrovia	MS4 Stormwater[1]	200	0.573	20.24%
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	16.3	0.047	1.65%
Eastern	Angeles National Forest	Stormwater[1]	12.1	0.035	1.22%
Diversion	Los Angeles County Department of Public Works	Water Diversion	379	1.084	38.31%
Near Lake	Arcadia	MS4 Stormwater[1]	7.6	0.022	0.77%
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.7	0.005	0.17%
Near Lake	El Monte	MS4 Stormwater[1]	3.5	0.010	0.36%
Near Lake	Irwindale	MS4 Stormwater[1]	1.7	0.005	0.17%
Near Lake	County of Los Angeles	MS4 Stormwater[1]	4.0	0.012	0.41%
Near Lake	Monrovia	MS4 Stormwater[1]	2.6	0.007	0.26%
Western	Arcadia	MS4 Stormwater[1]	68.1	0.195	6.88%
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	37.8	0.108	3.82%
Western	Caltrans	State Highway Stormwater[1]	2.1	0.006	0.21%
Western	County of Los Angeles	MS4 Stormwater[1]	14.7	0.042	1.49%
Western	Monrovia	MS4 Stormwater[1]	9.3	0.026	0.94%

Subwatershed	Responsible Jurisdiction	Input	Sediment (tons/yr)	Total Chlordane Load (g/yr)	Percent of Total Load
Western	Sierra Madre	MS4 Stormwater[1]	19.9	0.057	2.01%
Western	Angeles National Forest	Stormwater[1]	31.4	0.090	3.18%
Total Load from Watershed			**990.3**	**2.83**	**100%**

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. The disturbed area associated with general construction and general industrial stormwater permittees (510 acres) was subtracted out of the appropriate city areas and allocated to these permits.

As described in Appendix E (Atmospheric Deposition), Section E.5, the net atmospheric deposition of chlordane directly to the lake surface is estimated to be close to zero, with deposited loads balanced by volatilization losses. Atmospheric deposition onto the watershed is implicitly included in the estimates of watershed load.

4.5.5 Linkage Analysis

The linkage analysis provides the quantitative basis for determining the loading capacity of total chlordane into Peck Road Park Lake. The loading capacity is used to estimate the TMDL and corresponding allocations of that load to permitted point sources (wasteload allocations) and other nonpoint sources (load allocations).

Lake sediments are often the predominant source of total chlordane in biota. The bottom sediment serves as a sink for organochlorine compounds that can be recycled through the aquatic life cycle. Chlordanes are strongly sorbed to sediments and have long half-lives in sediment and water. Incoming loads of total chlordane will mainly be adsorbed to particulates from stormwater runoff (eroded sediments from legacy contamination sites or from atmospheric deposition).

The use of bioaccumulation models and the fish tissue data in Peck Road Park Lake are discussed in detail in Appendix H (Organochlorine Compounds TMDL Development) and Appendix G (Monitoring Data), respectively. The existing sediment chlordane concentrations in Peck Road Park Lake are lower than the consensus-based TEC target, and existing fish tissue concentrations are higher than the fish tissue target. Therefore, a sediment target to achieve FCGs is calculated based on biota-sediment bioaccumulation (a BSAF approach), using the ratio of the FCG to existing fish tissue concentrations of 5.6/13.44 = 0.417. This ratio is applied to the observed sediment concentration of 4.14 µg/kg dry weight to obtain the site-specific sediment target concentration to achieve fish tissue goals of 1.73 µg/kg dry weight. The fish tissue-based target concentrations were calculated using only recent data (collected in the past 10 years) because the loads and exposure concentrations of chlordane are likely to have declined steadily since the cessation of production and use of the chemical. The resulting target concentration of chlordane in the sediment in Peck Road Park Lake is shown in Table 4-25.

Table 4-25. Fish Tissue-Based Chlordane Concentration Targets for Sediment in Peck Road Park Lake

Total Chlordane Concentration	Sediment (µg/kg dry weight)
Existing	4.14
BSAF-derived Target	1.73
Required Reduction	58.2%

The BSAF-derived sediment target is less than the consensus-based TEC of 3.24 µg/kg dry weight. (The consensus-based sediment quality guideline is for the protection of benthic organisms, and explicitly does not address bioaccumulation and human-health risks from the consumption of contaminated fish.) The lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target. In addition, the CTR criterion for human health (0.59 ng/L) is the selected numeric target for the water column and protects both aquatic life and human health.

The toxicant loading model described in Appendix H (Organochlorine Compounds TMDL Development) can be used to estimate the loading rate required to yield the existing sediment concentration under steady-state conditions. This yields an estimate that a load of 696 g/yr would be required to maintain observed sediment concentrations under steady state conditions. The estimated watershed loading rate is 2.83 g/yr, or 0.4 percent of this amount. Therefore, impairment due to elevated fish tissue concentrations of chlordane in Peck Road Park Lake is primarily due to the storage of historic loads of chlordane in the lake sediment.

4.5.6 TMDL Summary

Because chlordane impairment in Peck Road Park Lake is predominantly due to historic loads stored in the lake sediment, this impairment is not amenable to a standard, load-based TMDL analysis. Instead, allocations are first assigned on a concentration basis, with the goal of attaining the concentrations identified above for water and sediment, as well as fish tissue (The concentration targets apply to water and sediment entering the lake and within the lake.

The chlordane TMDL will be allocated to ensure achievement of the loading capacity. TMDLs are broken down into the wasteload allocations (WLAs), load allocations (LAs), and Margins of Safety (MOS) using the general TMDL equation.

$$TMDL = \sum WLA + LA + MOS$$

Note that since this TMDL is being expressed as a concentration in sediment, in this scenario, the loading capacity is equal to 1.73 µg/kg dry weight chlordane. The wasteload allocations and load allocations are also equal to 1.73 µg/kg dry weight chlordane in sediment. There is no explicit MOS. Allocations are assigned for this TMDL by requiring equal concentrations of all sources. Details associated with the WLAs, LAs, and MOS are presented in the following three sections.

4.5.6.1 Wasteload Allocations

Federal regulations require that NPDES permits incorporate water quality based effluent limitations (WQBELs) consistent with the requirements and assumptions of any available wasteload allocations (WLAs). This TMDL establishes WLAs at their point of discharge. This TMDL also establishes alternative wasteload allocations for chlordane ("Alternative WLAs if the Fish Tissue Target is Met") described in Section 4.5.6.1.2. The alternative wasteload allocations will supersede the wasteload allocations in Section 4.5.6.1.1 if the conditions described in Section 4.5.6.1.2 are met.

4.5.6.1.1 Wasteload Allocations

The entire watershed of Peck Road Park Lake is contained in MS4 jurisdictions, and therefore receives WLAs. The Caltrans areas and facilities that operate under a general industrial stormwater permit also receive WLAs.

Relevant permit numbers are

- County of Los Angeles (including the cities of Arcadia, Bradbury, Duarte, Irwindale, Monrovia, and Sierra Madre): Board Order 01-182 (as amended by Order No. R4-2006-0074 and R4-2007-0042), CAS004001
- Caltrans: Order No 99-06-DWQ, CAS000003
- General Industrial Stormwater: Order No. 97-03-DWQ, CAS000001

Total chlordane concentrations in water flowing into Peck Road Park Lake are below detection limits, and most chlordane load is expected to move in association with sediment. Therefore no separate wasteload allocation or reduction is explicitly assigned to the Colorado Well Aquifer (Order No. R4-2003-0108, CAG994005) as it is not expected to deliver sediment loads. On the other hand, the suspended sediment in the water flowing into the lake is assigned wasteload allocations. Additionally, the TMDL establishes wasteload allocations for chlordane in the water column equal to the CTR based water column target. The CTR based water column target includes both dissolved chlordane and chlordane associated with suspended sediment. The existing concentration of sediment entering the lake is 3.15 µg/kg dry weight. Therefore, a reduction of (3.15 – 1.73)/3.15 = 45.1 percent is required on the sediment-associated load from the watershed.

The wasteload allocations are shown in Table 4-26 and each wasteload allocation must be met at the point of discharge.

Table 4-26. Wasteload Allocations for Total Chlordane in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for Total Chlordane Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Chlordane in the Water Column[3] (ng/L)
Eastern	Arcadia	MS4 Stormwater[1]	1.73	0.59
Eastern	Bradbury	MS4 Stormwater[1]	1.73	0.59
Eastern	Caltrans	State Highway Stormwater[1]	1.73	0.59
Eastern	Duarte	MS4 Stormwater[1]	1.73	0.59
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	1.73	0.59
Eastern	Irwindale	MS4 Stormwater[1]	1.73	0.59
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.73	0.59
Eastern	County of Los	MS4 Stormwater[1]	1.73	0.59

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for Total Chlordane Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Chlordane in the Water Column[3] (ng/L)
	Angeles			
Eastern	Monrovia	MS4 Stormwater[1]	1.73	0.59
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	1.73	0.59
Eastern	Angeles National Forest	Stormwater[1]	1.73	0.59
Diversion	Los Angeles County Department of Public Works	Water Diversion	1.73	0.59
Near Lake	Arcadia	MS4 Stormwater[1]	1.73	0.59
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.73	0.59
Near Lake	El Monte	MS4 Stormwater[1]	1.73	0.59
Near Lake	Irwindale	MS4 Stormwater[1]	1.73	0.59
Near Lake	County of Los Angeles	MS4 Stormwater[1]	1.73	0.59
Near Lake	Monrovia	MS4 Stormwater[1]	1.73	0.59
Western	Arcadia	MS4 Stormwater[1]	1.73	0.59
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.73	0.59
Western	Caltrans	State Highway Stormwater[1]	1.73	0.59
Western	County of Los Angeles	MS4 Stormwater[1]	1.73	0.59
Western	Monrovia	MS4 Stormwater[1]	1.73	0.59
Western	Sierra Madre	MS4 Stormwater[1]	1.73	0.59
Western	Angeles National Forest	Stormwater[1]	1.73	0.59

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

4.5.6.1.2 Alternative Wasteload Allocations if the Fish Tissue Target is Met

The wasteload allocations listed in Table 4-26 will be superseded, and the wasteload allocations in Table 4-27 will apply, if:

1. The responsible jurisdictions submit to USEPA and the Regional Board material describing that the fish tissue target of 5.6 ppb wet weight has been met for the preceding three or more years. A demonstration that the fish tissue target has been met in any given year must at minimum include a composite sample of skin off fillets from at least five largemouth bass each measuring at least 350mm in length,
2. The Regional Board Executive Officer approves the request and applies the alternative wasteload allocations in Table 4-27, and
3. USEPA does not object to the Regional Board's determination within 60 days of receiving notice of it.

Each wasteload allocation must be met at the point of discharge.

Table 4-27. Alternative Wasteload Allocations for Total Chlordane in Peck Road Park Lake if the Fish Tissue Target is are Met

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for Total Chlordane Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Chlordane in the Water Column[3] (ng/L)
Eastern	Arcadia	MS4 Stormwater[1]	3.24	0.59
Eastern	Bradbury	MS4 Stormwater[1]	3.24	0.59
Eastern	Caltrans	State Highway Stormwater[1]	3.24	0.59
Eastern	Duarte	MS4 Stormwater[1]	3.24	0.59
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	3.24	0.59
Eastern	Irwindale	MS4 Stormwater[1]	3.24	0.59
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	3.24	0.59
Eastern	County of Los Angeles	MS4 Stormwater[1]	3.24	0.59
Eastern	Monrovia	MS4 Stormwater[1]	3.24	0.59
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	3.24	0.59
Eastern	Angeles National Forest	Stormwater[1]	3.24	0.59
Diversion	Los Angeles County Department of Public Works	Water Diversion	3.24	0.59
Near Lake	Arcadia	MS4 Stormwater[1]	3.24	0.59
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	3.24	0.59
Near Lake	El Monte	MS4 Stormwater[1]	3.24	0.59
Near Lake	Irwindale	MS4 Stormwater[1]	3.24	0.59
Near Lake	County of Los Angeles	MS4 Stormwater[1]	3.24	0.59
Near Lake	Monrovia	MS4 Stormwater[1]	3.24	0.59
Western	Arcadia	MS4 Stormwater[1]	3.24	0.59

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for Total Chlordane Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Chlordane in the Water Column[3] (ng/L)
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	3.24	0.59
Western	Caltrans	State Highway Stormwater[1]	3.24	0.59
Western	County of Los Angeles	MS4 Stormwater[1]	3.24	0.59
Western	Monrovia	MS4 Stormwater[1]	3.24	0.59
Western	Sierra Madre	MS4 Stormwater[1]	3.24	0.59
Western	Angeles National Forest	Stormwater[1]	3.24	0.59

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

4.5.6.2 Load Allocations

This TMDL establishes load allocations (LAs) at their point of discharge. This TMDL also establishes alternative load allocations for chlordane ("Alternative LAs if the Fish Tissue Target is Met") described in Section 4.5.6.2.2. The alternative load allocations will supersede the load allocations in Section 4.5.6.2.1 if the conditions described in Section 4.5.6.2.2 are met.

4.5.6.2.1 Load Allocations

No part of the Peck Road Park Lake watershed is located outside of an MS4 jurisdiction; therefore no LAs are assigned to watershed loads. No load is allocated to net direct atmospheric deposition of chlordane. The legacy chlordane stored in lake sediment is the major cause of use impairment due to elevated fish tissue concentrations, and is assigned a load allocation. The in-lake allocation is in concentration terms: specifically, the responsible jurisdictions (County of Los Angeles) should achieve a total chlordane concentration of 1.73 µg/kg dry weight of lake bottom sediments (Table 4-28).

Table 4-28. Load Allocations for Total Chlordane in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	1.73

4.5.6.2.2 Alternative Load Allocations if the Fish Tissue Target is Met

The load allocations listed in Table 4-28 will be superseded, and the load allocations in Table 4-29 will apply, if:

1. The responsible jurisdiction submits to USEPA and the Regional Board material describing that the fish tissue target of 5.6 ppb wet weight has been met for the preceding three or more years. A demonstration that the fish tissue target has been met in any given year must at minimum include a composite sample of skin off fillets from at least five largemouth bass each measuring at least 350mm in length,
2. The Regional Board Executive Officer approves the request and applies the alternative load allocations in Table 4-29, and
3. USEPA does not object to the Regional Board's determination within 60 days of receiving notice of it.

Table 4-29. Alternative Load Allocations for Total Chlordane in Peck Road Park Lake if the Fish Tissue Target is Met

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	3.24

4.5.6.3 Margin of Safety

TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. The MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. This TMDL contains an implicit MOS based on conservative assumptions. The allocations are set based on the lower of either the BSAF-derived sediment target or the consensus-based TEC sediment target to ensure achievement of the OEHHA FCG target in fish tissue. The selected BSAF-derived target concentration in sediment is considerably lower than the consensus-based TEC target.

4.5.6.4 Critical Conditions/Seasonality

TMDLs must include consideration of critical conditions and seasonal variation to ensure protection of the designated uses of the waterbody at all times. This TMDL protects beneficial uses by reducing fish tissue concentrations to the FCG target and protecting benthic biota in sediment. Because fish bioaccumulate chlordane, concentrations in tissues of edible sized game fish integrate exposure over a number of years. As a result, overall average loading is more important for the attainment of standards than instantaneous or daily concentrations. WLAs and LAs in this TMDL are assigned as concentrations and protect during all seasons and in both high and low flow conditions. This TMDL therefore protects for critical conditions.

4.5.6.5 Daily Load Expression

USEPA recommends inclusion of a daily load expression for all TMDLs to comply with the 2006 D.C. Circuit Court of Appeals decision for the Anacostia River. This TMDL includes a maximum daily load estimated according to the guidelines provided by USEPA (2007).

Because the PCB WLAs are expressed as concentrations on sediment, the daily maximum allowable load is calculated from the maximum daily sediment load multiplied by the TMDL WLA concentration. The maximum daily sediment load is estimated from the 99th percentile daily flow and the sediment event mean concentration that yields the estimated annual sediment load.

No USGS gage currently exists in the Peck Road Park Lake watershed. USGS Station 11101250, on the Rio Hondo River above the Whittier Narrows Dam, was selected as a surrogate for flow determination. The 99th percentile flow was chosen to represent the peak flow for this drainage. Choosing the 99th percentile flow eliminates errors due to outliers and is reasonable for development of a daily load expression.

The USGS StreamStats program was used to determine the 99th percentile flow for the Rio Hondo (952 cfs) (Wolock, 2003). To estimate the peak flow to Peck Road Park Lake, the 99th percentile flow for the Rio Hondo was scaled down by the ratio of drainage areas (23,564 acres/58,368 acres; Peck Road Park Lake watershed area/Rio Hondo watershed area at the gage). The resulting peak flow estimate for Peck Road Park Lake is 384 cfs. The 99th percentile diverted flow from the San Gabriel River to Peck Road Park Lake is 328 cfs. Therefore, the total peak daily flow rate is 712 cfs.

The event mean concentration of sediment in stormwater (71.7 mg/L) was calculated from the estimated existing watershed sediment load of 990.3tons/yr (Table 4-14) divided by the stormwater flow volume reaching the lake (10,158 ac-ft, Table 4-7). Multiplying the sediment event mean concentration by the 99th percentile peak daily flow (712 cfs) yields a daily maximum sediment load from stormwater of 137.7 tons/d. Applying the wasteload allocation concentration of 1.73 ng total chlordane per dry g of sediment yields the stormwater daily maximum allowable load of 0.216 g/d of total chlordane. This load is associated with the MS4 stormwater permittees and the water diversion. The maximum allowable daily load must be met on all days, and the concentration-based WLAs must be met to ensure compliance with the TMDL.

4.5.6.6 Future Growth

The manufacture and use of chlordane is currently banned. Therefore, no additional allowance is made for future growth in the chlordane TMDL.

If any sources currently assigned load allocations are later determined to be point sources requiring NPDES permits, those load allocations are to be treated as wasteload allocations for purposes of determining appropriate water quality-based effluent limitations pursuant to 40 CFR 122.44(d)(1).

4.6 DDT Impairment

Dichlorodiphenyltrichloroethane (DDT) is a synthetic organochlorine insecticide once used throughout the world to control insects. Technically DDT consists of two isomers, 4,4'-DDT and 2,4'-DDT, of which the former is the most toxic. In the environment, DDT breaks down to form two related compounds: DDD (tetrachlorodiphenylethane) and DDE (dichlorodiphenyl-dichloroethylene). DDD and DDE often predominate in the environment and USEPA (2000c) recommends that fish consumption guidelines be based on the sum of DDT, DDD, and DDE – collectively referred to as total DDTs.

The DDT impairment of Peck Road Park Lake affects beneficial uses related to recreation, municipal water supply, wildlife health, and fish consumption. DDT, like PCBs and chlordane, is an organochlorine compound that is strongly sorbed to sediment and lipids, and is no longer in production. As such, the approach for the DDT impairment is similar to that for PCBs and chlordane.

4.6.1 Beneficial Uses

California state water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan, designed to be protective of the beneficial uses of each waterbody in the region. Peck Road Park Lake was not identified specifically in the Basin Plan; therefore, the beneficial uses associated with the downstream segment (Rio Hondo below Spreading Grounds) apply: REC1, REC2, WARM, WILD, MUN, and GWR (personal communication, Regional Board, December 22, 2009). Descriptions of these uses are listed in Section 2 of this TMDL report. Elevated levels of DDT are currently impairing the REC1, REC2 and WARM uses by causing toxicity to aquatic organisms and raising fish tissue concentrations to levels that are unsafe for human consumption (which can result in fish consumption advisories) and impair sport fishing recreational uses. At high enough concentrations WILD and MUN uses could become impaired.

4.6.2 Numeric Targets

Targets for DDT are complex because of the many different ways in which the compound is measured. The Basin Plan designates water column concentrations associated with MUN and WARM beneficial uses for several DDTs. There are no numeric criteria specified for sediment or fish tissue concentrations of DDTs listed in the Basin Plan. For the purposes of this TMDL, additional numeric targets for these endpoints are based on the consensus-based sediment quality guidelines defined in MacDonald et al. (2000) and the fish tissue concentration goal, referred to as the fish contaminant goal (FCG), defined by OEHHA (2008) for fish consumption. The numeric targets used for DDTs are listed below. The fish tissue concentration goal was also used to back calculate site-specific targets in sediment, with the most stringent target applying. See Section 2 of this TMDL report for additional details.

The water column criteria for DDT in the Basin Plan are associated with a specific beneficial use. The Basin Plan also contains a narrative criterion that toxic chemicals not be present at levels that are toxic or detrimental to aquatic life (LARWQCB, 1994). Each waterbody addressed in this report is designated WARM, at a minimum, and must meet this requirement. Acute and chronic criteria for 4,4'-DDT in freshwater systems are included in the CTR as 1.1 µg/L and 0.001 µg/L, respectively (USEPA, 2000a). CTR criteria are considered protective of aquatic life. Acute and chronic values for other DDT compounds were not specified. The CTR also includes human health criteria for 4,4'-DDT for the consumption of water and organisms or organisms only as 0.00059 µg/L for both uses (USEPA, 2000a). Because the human health criterion is the most restrictive applicable criterion, a water column target of 0.00059 µg/L (0.59 ng/L) for 4,4'-DDT is the appropriate target. The CTR also specifies a criterion of 0.59 ng/L for 4,4'-DDE (for both consumption of water and organisms or organisms only), while for 4,4'-DDD the criteria are 0.83 ng/L for consumption of water and organisms and 0.84 ng/L for consumption of organisms only. For Peck Road Park Lake, the Regional Board has determined that the appropriate human health criterion for 4,4'-DDD is 0.00084 µg/L (0.84 ng/L) as the MUN use is not an existing use. The CTR does not specify a criterion for total DDTs. For this TMDL the DDT, DDD, and DDE targets in CTR are selected as water column targets.

For sediment, the consensus-based sediment quality guidelines provided in MacDonald et al. (2000) for the threshold effects concentration (TEC) for 4,4'- plus 2,4'-DDT is 4.16 µg/kg dry weight, and the TEC for total DDTs is 5.28 µg/kg dry weight. The consensus-based guidelines have been incorporated into the most recent set of NOAA Screening Quick Reference Tables (SQuiRT) (Buchman, 2008) and are recommended by the State Water Resources Control Board for interpretation of narrative sediment objectives under the 303(d) listing policy. These targets are designed to protect benthic dwelling organisms and explicitly do not consider "the potential for bioaccumulation in aquatic organisms nor the associated hazards to the species that consume aquatic organisms (i.e., wildlife and humans)." Thus, a separate sediment target calculation based on a biota-sediment accumulation factor (BSAF) is carried out to ensure that fish tissue concentration goals are met.

The fish contaminant goal for total DDTs defined by OEHHA (2008) is 21 ppb wet weight in muscle tissue (filets). Elevated fish tissue concentrations are largely attributable to foodweb bioaccumulation derived from contaminated sediment. A biota-sediment accumulation factor (BSAF) approach is appropriate to correlate sediment and fish tissue targets. For DDTs, the corresponding sediment concentration target determined using the BSAF is 6.90 µg/kg dry weight, as described in further detail in Section 4.6.5. All applicable targets are shown below in Table 4-30. For sediment, the lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target.

Table 4-30. DDT Targets Applicable to Peck Road Park Lake

Medium	Source	4,4'-DDT	4,4'-DDT + 2,4'-DDT	DDE[1]	DDD[1]	Total DDTs
Fish (ppb wet weight)	OEHHA FCG					21
Sediment (µg/kg dry weight)	Consensus-based TEC		4.16	3.16[1]	4.88[1]	5.28
Sediment (µg/kg dry weight)	BSAF-derived target					6.90
Water (ng/L)	CTR	0.59		0.59[1]	0.84[1]	

[1] CBSQG specifies sediment targets for total DDE and total DDD. The CTR specifies water column targets specifically for 4,4'-DDE and 4,4'-DDD.

Note: Shaded cells represent the selected targets for this TMDL.

4.6.3 Summary of Monitoring Data

This section summarizes the monitoring data for Peck Road Park Lake related to the DDT impairment. Additional details regarding monitoring data are discussed in Appendix G (Monitoring Data).

Water column sampling was conducted as part of an organics study performed by UCLA (funded by a grant managed by the Regional Board) in the summer of 2008 at five locations (six samples) and again in the fall of 2008 at two locations (three samples) in Peck Road Park Lake. These analyses quantified only the 4,4' isomers of DDT, DDD, and DDE. All samples collected as part of the UCLA study during the summer and fall, were less than the sample detection limits (3.0 – 3.3 ng/L, all higher than the water quality criteria of 0.59 – 0.84 ng/L). Additional water column sampling was conducted by the Regional Board on December 11, 2008 at four in-lake locations in Peck Road Park Lake, including both the 4,4' and 2,4' isomers. All four sites sampled were below detectable levels of DDT (1 ng/L, which is also higher than the water quality criterion). A summary of the water column data is shown in Table 4-31.

Table 4-31. Summary of Water Column Samples for Total DDTs in Peck Road Park Lake

Station	Average Water Concentration (ng/L)	Number of Samples	Number of Samples Above Detection Limits[1]
Sawpit Wash	(1.62)[1]	2	0
Santa Anita Wash	(1.56)	3	0
North Basin Outfall	(1.52)	2	0
North Basin	(1.0)	2	0
South Basin	(1.0)	2	0

Station	Average Water Concentration (ng/L)	Number of Samples	Number of Samples Above Detection Limits[1]
South Basin East	(0.50)	1	0
South Basin West Side	(0.50)	1	0
In-Lake Average[3]	(0.80)		
Water Column Target	0.59		

[1] Non-detect samples were included in reported averages at one-half of the sample detection limit.

[2] Numbers in parentheses indicate that sample is based only on the detection limits of the samples, and that no DDTs were detected in any of the collected samples.

[3] Overall average is the average of individual station averages (excludes the tributary samples).

Concentrations of total DDTs on suspended sediment were also analyzed by UCLA in the summer and fall of 2008. One in-lake location was analyzed in the summer and two in the fall; all three samples were below detectable limits for DDT (4.73 µg/kg to 40.82 µg/kg dry weight). Porewater samples were collected during the summer and fall of 2008; DDT concentrations in all of the porewater samples were less than the detection limit of 30 ng/L. All four porewater suspended sediment samples collected in the summer of 2008 were below detectable levels (4.51 µg/kg to 18.50 µg/kg dry weight).

UCLA also collected bed sediment samples at four locations in Peck Road Park Lake in summer and fall 2008. As with the UCLA water column samples, these included only the 4,4' isomers. Only one of nine sediment samples collected in 2008 (average of 10.2 µg/kg dry weight) was above method reporting limits for DDTs; two samples were detected at less than the reporting limits (which ranged from 6.87 µg/kg to 13.06 µg/kg dry weight). Four in-lake locations were sampled by USEPA and the county of Los Angeles on November 16, 2009. Three of four samples were above the detection limit (1 µg/kg dry weight), with a maximum of 11.8 µg/kg dry weight (in excess of the consensus-based TEC for sediment of 4.16 µg/kg dry weight).

All lake stations were averaged to estimate an exposure concentration of 5.09 µg/kg dry weight total DDTs (with non-detects included at one-half the detection limit for each sample). Stations located near outfalls are taken as an estimate of the concentrations on incoming sediment. The lake-wide average of 5.09 µg/kg dry weight is slightly less than the consensus-based TEC of 5.28 µg/kg dry weight. A summary of the sediment data is shown in Table 4-32.

Table 4-32. Summary of Sediment Samples for Total DDTs in Peck Road Park Lake, 2008-2009

Station	Average Sediment Concentration (µg/kg dry weight)[1]	Number of Samples	Number of Samples above Detection Limits	Number of Samples between Detection and Reporting Limits
Near Sawpit Wash	10.22	1	1	0
Near Santa Anita Wash	[0.54]	3	1	1
North Basin	3.94	4	2	1
South Basin	4.32	3	1	0
North Inlet	(0.50)	1	0	0
South Inlet	11.0	1	1	0

Station	Average Sediment Concentration (µg/kg dry weight)[1]	Number of Samples	Number of Samples above Detection Limits	Number of Samples between Detection and Reporting Limits
In-Lake Average[2]	5.09			
Influent Average	5.57			
Consensus-based TEC	5.28			

[1] Total DDT in a sample represents the sum of all reported measurements for DDT, DDE, and DDD isomers, including results reported below the method reporting limit. If all components were non-detect, the total is represented as one-half the detection limit. Results of any laboratory duplicate analyses of the same sample were averaged. Results for each station represent the average of individual samples. Results in parentheses indicate that the sample average is based only on the detection limits of the samples and that no chlordane quantified in any of the collected samples. Sample averages based only on detected results below the reporting limit plus non-detects are shown in square brackets.

[2] Overall average is the average of individual station averages.

Fish tissue concentrations of DDT from Peck Road Park Lake have been analyzed in largemouth bass (by TSMP and SWAMP). Total DDT concentrations in fish tissue collected between 1986 and 1992 ranged up to 39 ppb, with an average of 26.5 ppb, in excess of the FCG of 21 ppb. Because DDT is no longer in use, fish tissue concentrations are likely to have declined since these samples were taken. Considering only data collected in the past 10 years, the average concentration of total DDTs in largemouth bass was 15.5 ppb, at an average lipid content of 0.54 percent. This average is based on two largemouth bass composite samples (each containing filets from five individual fish) collected by SWAMP in the summer of 2007 and an additional composite collected in April 2010. Based on the current data, average fish tissue levels of total DDTs are less than the FCG of 21 ppb (Table 4-33). Data from bottom-feeding fish (e.g., carp) are not available for Peck Road Park Lake.

Table 4-33. Summary of Recent Fish Tissue Samples for Total DDTs in Peck Road Park Lake

Sample Date	Fish Taxa	Total DDTs (ppb wet weight)[1]
6 June 2007	Largemouth Bass	24.4
6 June 2007	Largemouth Bass	9.0
19 April 2010	Largemouth Bass	13.109
2007 Average		15.5
FCG		21

[1] Composite sample of filets from five individuals.

In sum, the average of recent fish tissue samples collected from Peck Road Park Lake is approximately 25 percent lower than the FCG, although one of three composite samples exceeded the FCG. Measured concentrations in sediment are within 2 percent of the consensus-based TEC with several samples based on half of the detection limit. However, individual stations had concentrations well above the TEC, indicating that the lake continues to be impaired by DDT. Concentrations in water were less than the detection limits.

4.6.4 Source Assessment

Total DDTs present in Peck Road Park Lake are primarily due to historical loading and storage within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Stormwater loads from the watershed were estimated based on simulated sediment load and observed DDT concentrations on sediment data near inflows to the lake. Watershed loads of DDT may arise from past pesticide applications, improper disposal, and atmospheric deposition. Pesticide applications were most likely associated with agricultural, commercial, and residential areas. Improper disposal could have occurred at various locations, while atmospheric deposition occurs across the entire watershed.

There is no definitive information on specific sources of elevated DDT load within the watershed at this time. Therefore, an average concentration on sediment is applied to all contributing areas. The average concentration of total DDTs on incoming sediment was estimated to be 5.57 μg/kg dry weight (Table 4-32), and the annual sediment load to Peck Road Park Lake is 990.3 tons/yr, including sediment delivered through the water diversion (see Appendix D, Wet Weather Loading). The resulting estimated wet-weather load of total DDTs is approximately 5.0 g/yr (Table 4-34).

Table 4-34. Total DDTs Loads Estimated for Each Jurisdiction and Subwatershed in the Peck Road Park Lake Watershed (g/yr)

Subwatershed	Responsible Jurisdiction	Input	Sediment (tons/yr)	Total DDTs Load (g/yr)	Percent of Total Load
Eastern	Arcadia	MS4 Stormwater[1]	12.1	0.061	1.22%
Eastern	Bradbury	MS4 Stormwater[1]	44.4	0.224	4.48%
Eastern	Caltrans	State Highway Stormwater[1]	9.6	0.048	0.96%
Eastern	Duarte	MS4 Stormwater[1]	57.2	0.289	5.78%
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	0.8	0.004	0.08%
Eastern	Irwindale	MS4 Stormwater[1]	23.3	0.118	2.36%
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.6	0.008	0.16%
Eastern	County of Los Angeles	MS4 Stormwater[1]	28.6	0.145	2.89%
Eastern	Monrovia	MS4 Stormwater[1]	200	1.013	20.24%
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	16.3	0.061	1.22%
Eastern	Angeles National Forest	Stormwater[1]	12.1	1.917	38.31%
Diversion	Los Angeles County Department of Public Works	Water Diversion	379	0.038	0.77%
Near Lake	Arcadia	MS4 Stormwater[1]	7.6	0.009	0.17%
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.7	0.018	0.36%
Near Lake	El Monte	MS4 Stormwater[1]	3.5	0.009	0.17%
Near Lake	Irwindale	MS4 Stormwater[1]	1.7	0.020	0.41%
Near Lake	County of Los Angeles	MS4 Stormwater[1]	4.0	0.013	0.26%

Subwatershed	Responsible Jurisdiction	Input	Sediment (tons/yr)	Total DDTs Load (g/yr)	Percent of Total Load
Near Lake	Monrovia	MS4 Stormwater[1]	2.6	0.344	6.88%
Western	Arcadia	MS4 Stormwater[1]	68.1	0.191	3.82%
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	37.8	0.010	0.21%
Western	Caltrans	State Highway Stormwater[1]	2.1	0.074	1.49%
Western	County of Los Angeles	MS4 Stormwater[1]	14.7	0.047	0.94%
Western	Monrovia	MS4 Stormwater[1]	9.3	0.100	2.01%
Western	Sierra Madre	MS4 Stormwater[1]	19.9	0.159	3.18%
Western	Angeles National Forest	Stormwater[1]	31.4	0.061	1.22%
Total Load from Watershed			**990.3**	**5.00**	**100%**

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. The disturbed area associated with general construction and general industrial stormwater permittees (510 acres) was subtracted out of the appropriate city areas and allocated to these permits.

As described in Appendix E (Atmospheric Deposition), Section E.5, the net atmospheric deposition of DDTs directly to the lake surface is estimated to be close to zero, with deposited loads balanced by volatilization losses. Atmospheric deposition onto the watershed is implicitly included in the estimates of watershed load.

4.6.5 Linkage Analysis

The linkage analysis provides the quantitative basis for determining the loading capacity for DDTs in Peck Road Park Lake consistent with achieving water quality standards. The loading capacity is used to calculate the TMDL and corresponding allocations of that load to permitted point sources (wasteload allocations) and nonpoint sources (load allocations).

Lake sediments are often the predominant source of DDT in biota. The bottom sediment serves as a sink for organochlorine compounds that can be recycled through the aquatic life cycle. DDT is strongly sorbed to sediment and has a long half-life in sediment and water. Incoming loads of DDT will mainly be adsorbed to particulates from stormwater runoff (eroded sediments from legacy contamination sites or from atmospheric deposition).

The use of bioaccumulation models and the fish tissue data in Peck Road Park Lake are discussed in detail in Appendix H (Organochlorine Compounds TMDL Development) and Appendix G (Monitoring Data), respectively. A sediment target to achieve FCGs is calculated based on biota-sediment bioaccumulation (a BSAF approach), using the ratio of the FCG to existing fish tissue concentrations of 21/15.5 = 1.355. This ratio is applied to the estimated lake sediment concentration of 5.09 µg/kg dry weight to obtain the site-specific sediment target concentration to maintain fish tissue goals of 6.90 µg/kg dry weight. The BSAF-derived sediment target is greater than the estimated existing sediment concentration because the average recent fish tissue concentration does not exceed the fish tissue based target concentration.

The fish tissue-based target concentrations were calculated using only recent data (collected in the past 10 years) because the loads and exposure concentrations of total DDT are likely to have declined steadily since the cessation of production and use of the chemical. The resulting fish tissue-based target concentrations of DDT in sediment of Peck Road Park Lake are shown in Table 4-35.

Table 4-35. Fish Tissue-Based Total DDTs Concentration Targets for Sediment in Peck Road Park Lake

Total DDTs Concentration	Sediment (µg/kg dry weight)
Existing	5.09
BSAF-derived Target	6.90
Required Reduction	0%

The BSAF-derived sediment target is greater than the consensus-based TEC for total DDTs of 5.28 µg/kg dry weight. The consensus-based TEC of 5.28 µg/kg dry weight is therefore the most restrictive target and is used as the target in this TMDL. Selection of the consensus-based TEC target protects the benthic biota and ensures continued attainment of the fish tissue based target concentration. The estimated existing concentration in lake of 5.09 µg/kg is less than the TEC, which would imply that no reduction from existing in-lake sediment concentrations may be needed. However, the estimated influent concentration is greater than the TEC.

The toxicant loading model described in Appendix H (Organochlorine Compounds TMDL Development) can be used to estimate the loading rate that would be required to yield the existing sediment concentration under steady-state conditions. This yields an estimate that a load of 84 g/yr would be required to maintain observed sediment concentrations under steady-state conditions. The estimated current watershed loading rate is 5 g/yr, or 6 percent of this amount. Thus, concentrations of total DDTs in fish tissue in Peck Road Park Lake appear to be primarily due to the storage of historic loads of DDT in the lake sediment.

4.6.6 TMDL Summary

Because DDT impairment in Peck Road Park Lake is predominantly due to historic loads stored in the lake sediment, this impairment is not amenable to a standard, load-based TMDL analysis. Instead, allocations are first assigned on a concentration basis, with the goal of maintaining the existing concentrations identified above for water and sediment, as well as fish tissue. The concentration targets apply to water and sediment entering the lake and within the lake.

The DDT TMDL will be allocated to ensure achievement of the loading capacity. TMDLs are broken down into the wasteload allocations (WLAs), load allocations (LAs), and Margins of Safety (MOS) using the general TMDL equation.

$$TMDL = \sum WLA + LA + MOS$$

Note that since this TMDL is being expressed as a concentration in sediment, in this scenario, the loading capacity is equal to 5.28 µg/kg dry weight total DDTs. The wasteload allocations and load allocations are also equal to 5.28 µg/kg dry weight total DDTs in sediment. There is no explicit MOS. Allocations are assigned for this TMDL by requiring equal concentrations of all sources. Details associated with the WLAs, LAs, and MOS are presented in the following three sections.

4.6.6.1 Wasteload Allocations

Federal regulations require that NPDES permits incorporate water quality based effluent limitations (WQBELs) consistent with the requirements and assumptions of any available wasteload allocations (WLAs). The entire watershed of Peck Road Park Lake is contained in MS4 jurisdictions, and watershed loads are therefore assigned WLAs. The Caltrans areas and facilities that operate under a general industrial stormwater permit also receive WLAs.

Relevant permit numbers are

- County of Los Angeles (including the cities of Arcadia, Bradbury, Duarte, Irwindale, Monrovia, and Sierra Madre): Board Order 01-182 (as amended by Order No. R4-2006-0074 and R4-2007-0042), CAS004001
- Caltrans: Order No 99-06-DWQ, CAS000003
- General Industrial Stormwater: Order No. 97-03-DWQ, CAS000001

DDT in water flowing into Peck Road Park Lake is below detection limits, and most DDT load is expected to move in association with sediment. Therefore, no separate wasteload allocation or reduction is explicitly assigned to the Colorado Well Aquifer (Order No. R4-2003-0108, CAG994005)as it is not expected to deliver sediment loads. On the other hand, the suspended sediment in water flowing into the lake is assigned wasteload allocations. Additionally, the TMDL establishes wasteload allocations for DDT in the water column equal to the CTR based water column target. The CTR based water column target includes both dissolved DDT and DDT associated with suspended sediment. Each wasteload allocation applies at the point of discharge. The existing concentration of sediment entering the lake is 5.57 µg/kg dry weight. Therefore, a reduction of 5.2 percent [(5.57 – 5.28)/5.57*100] is required on the sediment-associated load from the watershed.

The wasteload allocations are shown in Table 4-36 and each wasteload allocation must be met at the point of discharge.

Table 4-36. Wasteload Allocations for Total DDTs in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for DDT Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for 4-4' DDT in the Water Column (ng/L)[3,4]
Eastern	Arcadia	MS4 Stormwater[1]	5.28	0.59[3]
Eastern	Bradbury	MS4 Stormwater[1]	5.28	0.59
Eastern	Caltrans	State Highway Stormwater[1]	5.28	0.59
Eastern	Duarte	MS4 Stormwater[1]	5.28	0.59
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	5.28	0.59
Eastern	Irwindale	MS4 Stormwater[1]	5.28	0.59
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	5.28	0.59
Eastern	County of Los Angeles	MS4 Stormwater[1]	5.28	0.59
Eastern	Monrovia	MS4 Stormwater[1]	5.28	0.59

Subwatershed	Responsible Jurisdiction	Input	Wasteload Allocation for DDT Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for 4-4' DDT in the Water Column (ng/L)[3,4]
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	5.28	0.59
Eastern	Angeles National Forest	Stormwater[1]	5.28	0.59
Diversion	Los Angeles County Department of Public Works	Water Diversion	5.28	0.59
Near Lake	Arcadia	MS4 Stormwater[1]	5.28	0.59
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	5.28	0.59
Near Lake	El Monte	MS4 Stormwater[1]	5.28	0.59
Near Lake	Irwindale	MS4 Stormwater[1]	5.28	0.59
Near Lake	County of Los Angeles	MS4 Stormwater[1]	5.28	0.59
Near Lake	Monrovia	MS4 Stormwater[1]	5.28	0.59
Western	Arcadia	MS4 Stormwater[1]	5.28	0.59
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	5.28	0.59
Western	Caltrans	State Highway Stormwater[1]	5.28	0.59
Western	County of Los Angeles	MS4 Stormwater[1]	5.28	0.59
Western	Monrovia	MS4 Stormwater[1]	5.28	0.59
Western	Sierra Madre	MS4 Stormwater[1]	5.28	0.59
Western	Angeles National Forest	Stormwater[1]	5.28	0.59

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

[4] The target water column concentration of 0.59 ng/L specified in the CTR is for 4,4'-DDT. The CTR also specifies targets for DDE and DDD, but does not specify a target for total DDTs. The lowest DDT target is selected for the purposes of representing Total DDTs in this table. If analytical results that resolve individual DDT compounds are available, all of the CTR criteria should be applied individually.

4.6.6.2 Load Allocations

This TMDL establishes load allocations (LAs) at their point of discharge. No part of the Peck Road Park Lake watershed is outside MS4 jurisdiction; therefore no LAs are assigned to watershed loads. No load is allocated to atmospheric deposition of DDTs. The legacy DDT stored in lake sediment is the major cause of exposure to aquatic organisms and sport fish, and is assigned a load allocation. The in-lake allocation is in concentration terms: specifically, the responsible jurisdictions (County of Los Angeles) should achieve or maintain a total DDTs concentration of 5.28 µg/kg dry weight or less in lake bottom sediments (Table 4-37).

Table 4-37. Load Allocations for Total DDT in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	5.28

4.6.6.3 Margin of Safety

TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. The MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. This TMDL contains an implicit MOS based on conservative assumptions. The allocations are set based on the lower of either the BSAF-derived sediment target or the consensus-based TEC sediment target to ensure achievement of the OEHHA FCG target in fish tissue. The selected consensus-based TEC concentration in sediment is considerably lower than the BSAF-derived target.

4.6.6.4 Critical Conditions/Seasonality

TMDLs must include consideration of critical conditions and seasonal variation to ensure protection of the designated uses of the waterbody at all times. This TMDL protects beneficial uses by reducing fish tissue concentrations to the FCG target and protecting benthic biota in sediment. Because fish bioaccumulate DDT, concentrations in tissues of edible sized game fish integrate exposure over a number of years. As a result, overall average loading is more important for the attainment of standards than instantaneous or daily concentrations. WLAs and LAs in this TMDL are assigned as concentrations and protect during all seasons and in both high and low flow conditions. This TMDL therefore protects for critical conditions.

4.6.6.5 Daily Load Expression

USEPA recommends inclusion of a daily load expression for all TMDLs to comply with the 2006 D.C. Circuit Court of Appeals decision for the Anacostia River. This TMDL includes a maximum daily load estimated according to the guidelines provided by USEPA (2007).

Because the DDT WLAs are expressed as concentrations on sediment, the daily maximum allowable load is calculated from the maximum daily sediment load multiplied by the TMDL WLA concentration. The maximum daily sediment load is estimated from the 99^{th} percentile daily flow and the sediment event mean concentration that yields the estimated annual sediment load.

No USGS gage currently exists in the Peck Road Park Lake watershed. USGS Station 11101250, on the Rio Hondo River above the Whittier Narrows Dam, was selected as a surrogate for flow determination. The 99^{th} percentile flow was chosen to represent the peak flow for this drainage. Choosing the 99^{th} percentile flow eliminates errors due to outliers and is reasonable for development of a daily load expression.

The USGS StreamStats program was used to determine the 99^{th} percentile flow for the Rio Hondo (952 cfs) (Wolock, 2003). To estimate the peak flow to Peck Road Park Lake, the 99^{th} percentile flow for the Rio Hondo was scaled down by the ratio of drainage areas (23,564 acres/58,368 acres; Peck Road Park Lake watershed area/Rio Hondo watershed area at the gage). The resulting peak flow estimate for

Peck Road Park Lake is 384 cfs. The 99th percentile diverted flow from the San Gabriel River to Peck Road Park Lake is 328 cfs. Therefore, the total peak daily flow rate is 712 cfs.

The event mean concentration of sediment in stormwater (71.7 mg/L) was calculated from the estimated existing watershed sediment load of 990.3 tons/yr (Table 4-14) divided by the stormwater volume reaching the lake (10,158 ac-ft, Table 4-7). Multiplying the sediment event mean concentration by the 99th percentile peak daily flow (712 cfs) yields a daily maximum sediment load from stormwater of 137.7 tons/d. Applying the wasteload allocation concentration of 5.28 ng total DDT per dry g of sediment yields the stormwater daily maximum allowable load of 0.659 g/d of total DDT. This load is associated with the MS4 stormwater permittees and the water diversion. The maximum allowable daily load must be met on all days, and the concentration-based WLAs must be met to ensure compliance with the TMDL.

4.6.6.6 Future Growth

The manufacture and use of DDT is currently banned. Therefore, no additional allowance is made for future growth in the DDT TMDL.

If any sources currently assigned load allocations are later determined to be point sources requiring NPDES permits, those load allocations are to be treated as wasteload allocations for purposes of determining appropriate water quality-based effluent limitations pursuant to 40 CFR 122.44(d)(1).

4.7 Dieldrin Impairment

Dieldrin is a chlorinated insecticide originally developed as an alternative to DDT and was in wide use from the 1950s to the 1970s. Dieldrin in the environment also arises from use of the insecticide aldrin. Aldrin is not itself toxic to insects, but is metabolized to dieldrin in the insect body. The use of both dieldrin and aldrin was discontinued in the 1970s.

The dieldrin impairment of Peck Road Park Lake affects beneficial uses related to recreation, municipal water supply, wildlife health, and fish consumption. Dieldrin, like PCBs, chlordane and DDT, is an organochlorine compound that is strongly sorbed to sediment and lipids and is no longer in production. As such, the approach for dieldrin impairment is similar to that for PCBs, chlordane, and DDT.

4.7.1 Beneficial Uses

California state water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan, designed to be protective of the beneficial uses of each waterbody in the region. Peck Road Park Lake was not identified specifically in the Basin Plan; therefore, the beneficial uses associated with the downstream segment (Rio Hondo River below Spreading Grounds) apply: REC1, REC2, WARM, WILD, MUN, and GWR (personal communication, Regional Board, December 22, 2009). Descriptions of these uses are listed in Section 2 of this TMDL report. Elevated levels of dieldrin are currently impairing the REC1, REC2 and WARM uses by causing toxicity to aquatic organisms and raising fish tissue concentrations to levels that are unsafe for human consumption (which can result in fish consumption advisories) and impair sport fishing recreational uses. At high enough concentrations WILD and MUN uses could become impaired.

4.7.2 Numeric Targets

The Basin Plan designates water column concentrations associated with MUN and WARM beneficial uses. There are no numeric criteria specified for sediment or fish tissue concentrations of dieldrin in the Basin Plan. For the purposes of this TMDL, additional numeric targets for these endpoints are based on the consensus-based sediment quality guidelines defined in MacDonald et al. (2000) and the fish tissue concentration goal, referred to as the fish contaminant goal (FCG), defined by OEHHA (2008) for fish consumption. The numeric targets for dieldrin are listed below. The fish tissue concentration goal was also used to back calculate site-specific targets in sediment, with the most stringent target applying. See Section 2 of this TMDL report for additional details.

The water column criteria for dieldrin in the Basin Plan are associated with a specific beneficial use. The Basin Plan also contains a narrative criterion that toxic chemicals not be present at levels that are toxic or detrimental to aquatic life (LARWQCB, 1994). Acute and chronic criterion for the protection of aquatic life and wildlife in freshwater systems are included in the CTR for dieldrin as 0.24 µg/L and 0.056 µg/L, respectively (USEPA, 2000a). CTR criteria are considered protective of aquatic life. The CTR also provides a human health-based water quality criterion for the consumption of organisms only and the consumption of water and organisms as 0.00014 µg/L (0.14 ng/L). The human health criterion of 0.00014 µg/L (0.14 ng/L) is the most restrictive of the applicable criteria specified for water column concentrations and is selected as the water column target.

For sediment, the consensus-based sediment quality guidelines provided in MacDonald et al. (2000) for the threshold effects concentration (TEC) of dieldrin in sediment is 0.46 µg/kg. The consensus-based guidelines have been incorporated into the most recent set of NOAA Screening Quick Reference Tables (SQuiRT) (Buchman, 2008) and are recommended by the State Water Resources Control Board for interpretation of narrative sediment objectives under the 303(d) listing policy. This target is designed to protect benthic dwelling organisms and explicitly does not consider "the potential for bioaccumulation in aquatic organisms nor the associated hazards to the species that consume aquatic organisms (i.e., wildlife and humans)." The estimated existing sediment dieldrin concentrations in Peck Road Park Lake are lower than the consensus-based TEC target, and existing fish tissue concentrations are higher than the fish tissue target. Thus, a separate sediment target calculation based on a biota-sediment accumulation factor (BSAF) is carried out to ensure that fish tissue concentration goals are met.

The fish contaminant goal for dieldrin defined by the OEHHA (2008) is 0.46 ppb wet weight in muscle tissue (filets). Elevated fish tissue concentrations are largely attributable to foodweb bioaccumulation derived from contaminated sediment. A biota-sediment accumulation factor (BSAF) approach is appropriate to correlate sediment and fish tissue targets. For dieldrin, the corresponding sediment concentration target is estimated using the BSAF approach is 0.43 µg/kg dry weight, as described in detail in Section 4.7.5. All applicable targets are shown below in Table 4-38. For sediment, the lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target.

Table 4-38. Dieldrin Targets Applicable to Peck Road Park Lake

Medium	Source	Target
Fish (ppb wet weight)	OEHHA FCG	0.46
Sediment (µg/kg dry weight)	Consensus-based TEC	1.9
Sediment (µg/kg dry weight)	BSAF-derived target	0.43
Water (ng/L)	CTR	0.14

Note: Shaded cells represent the selected targets for this TMDL.

4.7.3 Summary of Monitoring Data

This section summarizes the monitoring data for Peck Road Park Lake related to the dieldrin impairment. Additional details regarding monitoring data are discussed in Appendix G (Monitoring Data).

Water column sampling was conducted as part of an organics study performed by UCLA (funded by a grant managed by the Regional Board) in the summer of 2008 at five locations (six samples) and again in the fall of 2008 at two locations (three samples) in Peck Road Park Lake. All samples collected as part of the UCLA study during the summer and fall, were less than the sample detection limit (3.0 ng/L to 3.3 ng/L; all greater than the water quality criterion of 0.14 ng/L). Additional water column sampling was conducted by the Regional Board on December 11, 2008 at four in-lake locations in Peck Road Park Lake. All four sites sampled had non-detectable concentrations of dieldrin (less than 1 ng/L, also greater than the water column criterion). A summary of the water column data is shown in Table 4-39.

Table 4-39. Summary of Water Column Samples for Dieldrin in Peck Road Park Lake

Station	Average Water Concentration (ng/L)[2]	Number of Samples	Number of Samples Above Detection Limits[1]
Sawpit Wash	(1.62)	2	0
Santa Anita Wash	(1.56)	3	0
North Basin Outfall	(1.52)	2	0
North Basin	(1.0)	2	0
South Basin	(1.0)	2	0
South Basin East	(0.50)	1	0
South Basin West Side	(0.50)	1	0
In-Lake Average[3]	(0.80)		
Water Column Target	0.17		

[1] Non-detect samples were included in reported averages at one-half of the sample detection limit.

[2] Numbers in parentheses indicate that sample is based only on the detection limits of the samples, and that no dieldrin was detected in any of the collected samples.

[3] Overall average is the average of individual station averages (excludes the tributary samples).

Concentrations of dieldrin on suspended sediment were also analyzed by UCLA in the summer and fall of 2008. One in-lake location was analyzed in the summer and two were sampled in the fall, all three samples were below detectable limits for dieldrin (4.73 µg/kg to 40.83 µg/kg dry weight). Porewater was sampled by UCLA in both the summer and fall of 2008. Specifically, dieldrin concentrations in the porewater sampled at four sites during the summer of 2008 were all less than the detection limit of 30 ng/L; three sites sampled during the fall of 2008 were also below the detection limit of 30 ng/L. All four porewater suspended sediments collected in the summer of 2008 were below detectable levels (4.51 µg/kg to 18.50 µg/kg dry weight).

UCLA also collected bed sediment samples at four locations in Peck Road Park Lake in summer and fall 2008 (Table 4-40). All nine sediment samples collected during 2008 resulted in dieldrin concentrations below the detection limit (which ranged from 0.69 µg/kg to 1.44 µg/kg dry weight). Four in-lake sediment locations were sampled by USEPA and the county of Los Angeles on November 16, 2009; all were below detection limit (1 µg/kg dry weight). The average of all samples with non-detects set equal to one-half of the individual sample detection limit is 0.49 µg/kg dry weight. Because dieldrin does appear in fish at levels greater than the FCG, and because these body burdens of dieldrin are believed to arise from the sediment, EPA decided to represent statistical estimates for the sediment concentrations of dieldrin by setting the concentration of non-detected samples to the detection limit. For an upper bound analysis the average with all samples set equal to the detection limit is 0.98 µg/kg dry weight. Stations located near outfalls are taken as an estimate of the concentrations on incoming sediment. The lake-wide average of <0.98 µg/kg dry weight for dieldrin is still less than the consensus-based TEC of 5.28 µg/kg dry weight.

Table 4-40. Summary of Sediment Samples for Dieldrin in Peck Road Park Lake, 2008-2009

Station	Average Sediment Concentration (µg/kg dry weight)[1]	Number of Samples	Number of Samples Above Detection Limits[1]
Near Sawpit Wash	(0.74)	1	0
Near Santa Anita Wash	(0.90)	3	0
North Basin	(1.13)	4	0
South Basin	(1.11)	3	0
North Inlet	(1.00)	1	0
South Inlet	(1.00)	1	0
In-Lake Average[2]	(0.98)		
Influent Average	(0.91)		
Consensus-based TEC	1.9		

[1] Non-detect samples are included in reported averages at the detection limit. Numbers in round parentheses indicate a result is based only on the detection limits of the samples, and that no dieldrin was detected in any of the samples collected at that station.

[2] Overall average is the average of individual station averages.

Fish tissue concentrations for dieldrin from Peck Road Park Lake have been analyzed in largemouth bass (TSMP and SWAMP). Dieldrin concentrations in the fish tissue ranged from non-detect to 0.97 ppb. Two of the four samples of largemouth bass were taken in 1991 and 1992 and both were below detection limits (value not stated). Considering only data collected in the past 10 years, the average concentration of dieldrin in largemouth bass was 1.06 ppb, in excess of the FCG of 0.46 ppb. This average is based on the two largemouth bass composite samples (each containing filet tissue from five individual fish) collected by SWAMP in the summer of 2007 and an additional composite sample collected in April 2010, with an average lipid fraction of 0.54 percent. Recent fish-tissue data for Peck Road Park Lake are summarized in Table 4-41. Data from bottom-feeding fish (e.g., carp) are not available for Peck Road Park Lake.

Table 4-41. Summary of Recent Fish Tissue Samples for Dieldrin in Peck Road Park Lake

Sample Date	Fish Taxa	Dieldrin (ppb wet weight)[1]
6 June 2007	Largemouth Bass	0.965
6 June 2007	Largemouth Bass	0.542
19 April 2010	Largemouth Bass	1.66
2007 - 2010 Average		1.06
FCG		0.46

[1] Composite sample of filets from five individuals.

In sum, recent fish tissue concentrations in Peck Road Park Lake are consistently above the FCG in largemouth bass composite samples. Sediment and water column concentrations have all been below detection limits.

4.7.4 Source Assessment

Dieldrin in Peck Road Park Lake is primarily due to historical loading and storage within the lake sediments, with some ongoing contribution by watershed wet weather loads. Dry weather loading is assumed to be negligible because hydrophobic contaminants primarily move with particulate matter that is mobilized by higher flows. Stormwater loads from the watershed could not be directly estimated because all sediment and water samples were below detection limits. Watershed loads of dieldrin may arise from past pesticide applications, improper disposal, and atmospheric deposition. Pesticide applications were most likely associated with agricultural, commercial, and residential areas. Improper disposal could have occurred at various locations.

There is no definitive information on specific sources within the watershed at this time. Therefore, an average concentration of sediment is applied to all contributing areas.

An upper-bound analysis for dieldrin is performed using the simulated sediment load and detection limit to determine the maximum potential loading rate of dieldrin from the watershed. The dieldrin sediment concentration is assigned as the upper bound estimate of concentration on influent sediment (0.91 μg/kg dry weight, calculated with non-detects set equal to the individual sample detection limits). The annual sediment load to Peck Road Park Lake, including sediment delivered through the water diversion (see Appendix D, Wet Weather Loading) is 990.3 tons/yr,. The resulting estimated upper bound on wet-weather load of dieldrin from the watershed is 0.82 g/yr or less (Table 4-42).

Table 4-42. Maximum Potential Dieldrin Loads for Each Jurisdiction and Subwatershed in the Peck Road Park Lake Watershed (g/yr)

Subwatershed	Responsible Jurisdiction	Input	Sediment (tons/yr)	Total Dieldrin Load (g/yr)	Percent of Total Load
Eastern	Arcadia	MS4 Stormwater[1]	12.1	<0.010	1.22%
Eastern	Bradbury	MS4 Stormwater[1]	44.4	<0.037	4.48%
Eastern	Caltrans	State Highway Stormwater[1]	9.6	<0.008	0.96%
Eastern	Duarte	MS4 Stormwater[1]	57.2	<0.047	5.78%
Eastern	General Industrial Stormwater Permittees[2]	General Industrial	0.8	<0.001	0.08%

Subwatershed	Responsible Jurisdiction	Input	Sediment (tons/yr)	Total Dieldrin Load (g/yr)	Percent of Total Load
	(in the city of Duarte)	Stormwater[1]			
Eastern	Irwindale	MS4 Stormwater[1]	23.3	<0.019	2.36%
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.6	<0.001	0.16%
Eastern	County of Los Angeles	MS4 Stormwater[1]	28.6	<0.024	2.89%
Eastern	Monrovia	MS4 Stormwater[1]	200.5	<0.165	20.24%
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	16.3	<0.013	1.65%
Eastern	Angeles National Forest	Stormwater[1]	12.1	<0.010	1.22%
Diversion	Los Angeles County Department of Public Works	Water Diversion	379	<0.313	38.31%
Near Lake	Arcadia	MS4 Stormwater[1]	7.6	<0.006	0.77%
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.7	<0.001	0.17%
Near Lake	El Monte	MS4 Stormwater[1]	3.5	<0.003	0.36%
Near Lake	Irwindale	MS4 Stormwater[1]	1.7	<0.001	0.17%
Near Lake	County of Los Angeles	MS4 Stormwater[1]	4.0	<0.003	0.41%
Near Lake	Monrovia	MS4 Stormwater[1]	2.6	<0.002	0.26%
Western	Arcadia	MS4 Stormwater[1]	68.2	<0.056	6.88%
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	37.8	<0.031	3.82%
Western	Caltrans	State Highway Stormwater[1]	2.1	<0.002	0.21%
Western	County of Los Angeles	MS4 Stormwater[1]	14.7	<0.012	1.49%
Western	Monrovia	MS4 Stormwater[1]	9.3	<0.008	0.94%
Western	Sierra Madre	MS4 Stormwater[1]	19.9	<0.016	2.01%
Eastern	Angeles National Forest	Stormwater[1]	31.4	<0.026	3.18%
Total Load from Watershed			**990.3**	**<0.818**	**100%**

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. The disturbed area associated with general construction and general industrial stormwater permittees (510 acres) was subtracted out of the appropriate city areas and allocated to these permits.

As described in Appendix E (Atmospheric Deposition), Section E.5, the net atmospheric deposition of dieldrin directly to the lake surface is estimated to be close to zero, with deposited loads balanced by volatilization losses. Atmospheric deposition onto the watershed is implicitly included in the estimates of watershed load.

4.7.5 Linkage Analysis

The linkage analysis provides the quantitative basis for determining the loading capacity of dieldrin into Peck Road Park Lake consistent with achieving water quality standards. The loading capacity is used to calculate the TMDL and corresponding allocations of that load to permitted point sources (wasteload allocations) and nonpoint sources (load allocations).

Lake sediments are often the predominant source of dieldrin in biota. The bottom sediment serves as a sink for organochlorine compounds that can be recycled through the aquatic life cycle. Dieldrin is strongly sorbed to sediments and has a long half-life in sediment and water. Incoming loads of dieldrin will mainly be adsorbed to particulates from stormwater runoff (eroded sediments from legacy contamination sites or from atmospheric deposition).

The use of bioaccumulation models and the fish tissue data in Peck Road Park Lake are discussed in detail in Appendix H (Organochlorine Compounds TMDL Development) and Appendix G (Monitoring Data), respectively. The estimated existing sediment dieldrin concentrations in Peck Road Park Lake are lower than the consensus-based TEC target, and existing fish tissue concentrations are higher than the fish tissue target. Therefore, a sediment target based on biota-sediment bioaccumulation (a BSAF approach) is calculated using ratio of the FCG to existing fish tissue concentrations in largemouth bass of 0.46/1.06 = 0.434. Sediment concentrations of dieldrin in Peck Road Park Lake are reported as below detection limits ranging from 0.7 to 1.44 µg/kg dry weight. However, dieldrin is highly bioaccumulative, and low sediment concentrations can lead to unacceptable fish tissue concentrations (see Appendix H, Organochlorine Compounds TMDL Development). Using an estimated concentration of 0.98 µg/kg dry weight based on the average of the sample detection limits, the resulting target concentration would be 0.43 µg/kg dry weight to obtain FCGs. Calculation with a literature-based BSAF (Appendix G, Monitoring Data) suggests that even lower concentrations might be needed. However, the literature-based BSAF is highly uncertain and may not be directly applicable to conditions in Peck Road Park Lake. Therefore, the target based on the detection limits is used, with acknowledgment that the estimate may need to be refined if additional data are collected at lower detection limits. The resulting fish tissue-based target concentration of dieldrin in the sediment of Peck Road Park Lake is shown in Table 4-43.

Table 4-43. Fish Tissue-Based Dieldrin Concentration Targets for Sediment in Peck Road Park Lake

Total Dieldrin Concentration	Sediment (µg/kg dry weight)
Existing	< 0.98
BSAF-derived Target	0.43
Required Reduction	< 56.1%

The BSAF-derived sediment target is less than the consensus-based sediment quality guideline of 1.9 µg/kg dry weight. (The consensus-based sediment quality guideline is for the protection of benthic organisms, and explicitly does not address bioaccumulation and human-health risks from the consumption of contaminated fish.) The lower value of the consensus-based TEC target or the BSAF-derived target is selected as the final sediment target. In addition, the CTR criterion for human health (0.14 ng/L) is the selected numeric target for the water column and protects both aquatic life and human health.

4.7.6 TMDL Summary

Dieldrin was below detection limits in both water and sediment samples of Peck Road Park Lake and its tributaries. The concentration observed in fish is most likely due to historic loads stored in the lake sediment, which is not amenable to a standard, load-based TMDL analysis. Instead, allocations are first assigned on a concentration basis, with the goal of attaining the concentrations identified above for water and sediment, as well as fish tissue concentrations. The concentration targets apply to water and sediment entering the lake and within the lake.

The dieldrin TMDL will be allocated to ensure achievement of the loading capacity. TMDLs are broken down into the wasteload allocations (WLAs), load allocations (LAs), and Margins of Safety (MOS) using the general TMDL equation.

$$TMDL = \sum WLA + LA + MOS$$

Note that since this TMDL is being expressed as a concentration in sediment, in this scenario, the loading capacity is equal to 0.43 µg/kg dry weight dieldrin. The wasteload allocations and load allocations are also equal to 0.43 µg/kg dry weight dieldrin in sediment. There is no explicit MOS. Allocations are assigned for this TMDL by requiring equal concentrations of all sources. Details associated with the WLAs, LAs, and MOS are presented in the following three sections.

4.7.6.1 Wasteload Allocations

Federal regulations require that NPDES permits incorporate water quality based effluent limitations (WQBELs) consistent with the requirements and assumptions of any available wasteload allocations (WLAs). This TMDL establishes WLAs at their point of discharge. This TMDL also establishes alternative wasteload allocations for dieldrin ("Alternative WLAs if the Fish Tissue Target is Met") described in Section 4.7.6.1.2. The alternative wasteload allocations will supersede the wasteload allocations in Section 4.7.6.1.1 if the conditions described in Section 4.7.6.1.2 are met.

4.7.6.1.1 Wasteload Allocations

The entire watershed of Peck Road Park Lake is contained in MS4 jurisdictions, and watershed loads are therefore assigned WLAs. The Caltrans areas and facilities that operate under a general industrial stormwater permit also receive WLAs.

Relevant permit numbers are

- County of Los Angeles (including the cities of Arcadia, Bradbury, Duarte, Irwindale, Monrovia, and Sierra Madre): Board Order 01-182 (as amended by Order No. R4-2006-0074 and R4-2007-0042), CAS004001
- Caltrans: Order No 99-06-DWQ, CAS000003
- General Industrial Stormwater: Order No. 97-03-DWQ, CAS000001

Measurements of dieldrin in sediment and water flowing into Peck Road Park Lake are below detection limits, but most dieldrin load is expected to move in association with sediment. Therefore no separate wasteload allocation or reduction is assigned to the Colorado Well Aquifer (Order No. R4-2003-0108, CAG994005) as it is not expected to deliver sediment loads. On the other hand, the suspended sediment in water flowing into the lake is assigned wasteload allocations. Additionally, the TMDL establishes wasteload allocations for dieldrin in the water column equal to the CTR based water column target. The CTR based water column target includes both dissolved dieldrin and dieldrin associated with suspended sediment. Comparing the sediment concentration target to the average detection limit for the influent samples of 0.91 µg/kg dry weight suggests that a reduction of approximately 53 percent in dieldrin loads is needed.

The wasteload allocations are shown in Table 4-44 and each wasteload allocation must be met at the point of discharge.

Table 4-44. Wasteload Allocations for Dieldrin in Peck Road Park Lake

Sub-watershed	Responsible Jurisdiction	Input	Wasteload Allocation for Dieldrin Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Dieldrin in the Water Column[3] (ng/L)
Eastern	Arcadia	MS4 Stormwater[1]	0.43	0.14
Eastern	Bradbury	MS4 Stormwater[1]	0.43	0.14
Eastern	Caltrans	State Highway Stormwater[1]	0.43	0.14
Eastern	Duarte	MS4 Stormwater[1]	0.43	0.14
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	0.43	0.14
Eastern	Irwindale	MS4 Stormwater[1]	0.43	0.14
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	0.43	0.14
Eastern	County of Los Angeles	MS4 Stormwater[1]	0.43	0.14
Eastern	Monrovia	MS4 Stormwater[1]	0.43	0.14
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	0.43	0.14
Eastern	Angeles National Forest	Stormwater[1]	0.43	0.14
Diversion	Los Angeles County Department of Public Works	Water Diversion	0.43	0.14
Near Lake	Arcadia	MS4 Stormwater[1]	0.43	0.14
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	0.43	0.14
Near Lake	El Monte	MS4 Stormwater[1]	0.43	0.14
Near Lake	Irwindale	MS4 Stormwater[1]	0.43	0.14
Near Lake	County of Los Angeles	MS4 Stormwater[1]	0.43	0.14
Near Lake	Monrovia	MS4 Stormwater[1]	0.43	0.14
Western	Arcadia	MS4 Stormwater[1]	0.43	0.14
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	0.43	0.14
Western	Caltrans	State Highway Stormwater[1]	0.43	0.14
Western	County of Los Angeles	MS4 Stormwater[1]	0.43	0.14
Western	Monrovia	MS4 Stormwater[1]	0.43	0.14

Sub-watershed	Responsible Jurisdiction	Input	Wasteload Allocation for Dieldrin Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Dieldrin in the Water Column[3] (ng/L)
Western	Sierra Madre	MS4 Stormwater[1]	0.43	0.14
Western	Angeles National Forest	Stormwater[1]	0.43	0.14

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

4.7.6.1.2 Alternative Wasteload Allocations if the Fish Tissue Target is Met

The wasteload allocations listed in Table 4-44 will be superseded, and the wasteload allocations in Table 4-45 will apply, if:

1. The responsible jurisdictions submit to USEPA and the Regional Board material describing that the fish tissue target of 0.46 ppb wet weight has been met for the preceding three or more years. A demonstration that the fish tissue target has been met in any given year must at minimum include a composite sample of skin off fillets from at least five largemouth bass each measuring at least 350mm in length,
2. The Regional Board Executive Officer approves the request and applies the alternative wasteload allocations in Table 4-45, and
3. USEPA does not object to the Regional Board's determination within 60 days of receiving notice of it.

Each wasteload allocation must be met at the point of discharge.

Table 4-45. Alternative Wasteload Allocations for Dieldrin in Peck Road Park Lake if the Fish Tissue Target is Met

Sub-watershed	Responsible Jurisdiction	Input	Wasteload Allocation for Dieldrin Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Dieldrin in the Water Column[3] (ng/L)
Eastern	Arcadia	MS4 Stormwater[1]	1.90	0.14
Eastern	Bradbury	MS4 Stormwater[1]	1.90	0.14
Eastern	Caltrans	State Highway Stormwater[1]	1.90	0.14
Eastern	Duarte	MS4 Stormwater[1]	1.90	0.14
Eastern	General Industrial Stormwater Permittees[2] (in the city of Duarte)	General Industrial Stormwater[1]	1.90	0.14
Eastern	Irwindale	MS4 Stormwater[1]	1.90	0.14
Eastern	General Industrial Stormwater Permittees (in the city of Irwindale)	General Industrial Stormwater[1]	1.90	0.14

Sub-watershed	Responsible Jurisdiction	Input	Wasteload Allocation for Dieldrin Associated with Suspended Sediment[3] (µg/kg dry weight)	Wasteload Allocation for Dieldrin in the Water Column[3] (ng/L)
Eastern	County of Los Angeles	MS4 Stormwater[1]	1.90	0.14
Eastern	Monrovia	MS4 Stormwater[1]	1.90	0.14
Eastern	General Industrial Stormwater Permittees (in the city of Monrovia)	General Industrial Stormwater[1]	1.90	0.14
Eastern	Angeles National Forest	Stormwater[1]	1.90	0.14
Diversion	Los Angeles County Department of Public Works	Water Diversion	1.90	0.14
Near Lake	Arcadia	MS4 Stormwater[1]	1.90	0.14
Near Lake	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.90	0.14
Near Lake	El Monte	MS4 Stormwater[1]	1.90	0.14
Near Lake	Irwindale	MS4 Stormwater[1]	1.90	0.14
Near Lake	County of Los Angeles	MS4 Stormwater[1]	1.90	0.14
Near Lake	Monrovia	MS4 Stormwater[1]	1.90	0.14
Western	Arcadia	MS4 Stormwater[1]	1.90	0.14
Western	General Industrial Stormwater Permittees (in the city of Arcadia)	General Industrial Stormwater[1]	1.90	0.14
Western	Caltrans	State Highway Stormwater[1]	1.90	0.14
Western	County of Los Angeles	MS4 Stormwater[1]	1.90	0.14
Western	Monrovia	MS4 Stormwater[1]	1.90	0.14
Western	Sierra Madre	MS4 Stormwater[1]	1.90	0.14
Western	Angeles National Forest	Stormwater[1]	1.90	0.14

[1] This input includes effluent from storm drain systems during both wet and dry weather.

[2] Discharges governed by the general construction and general industrial stormwater permits are currently located in the Cities of Arcadia, Duarte, Irwindale and Monrovia. Any future discharges governed by the general construction and general industrial stormwater permits will receive the same concentration-based wasteload allocations.

[3] Each wasteload allocation must be met at the point of discharge.

4.7.6.2 Load Allocations

This TMDL establishes load allocations (LAs) at their point of discharge. This TMDL also establishes alternative load allocations for dieldrin ("Alternative LAs if the Fish Tissue Target is Met") described in Section 4.7.6.2.2. The alternative load allocations will supersede the load allocations in Section 4.7.6.2.1 if the conditions described in Section 4.7.6.2.2 are met.

4.7.6.2.1 Load Allocations

No part of the watershed of Peck Road Park Lake is outside MS4 jurisdiction; therefore no LAs are assigned to watershed loads. No load is allocated to atmospheric deposition of dieldrin. The legacy dieldrin stored in lake sediment is the major cause of impairment associated with elevated fish tissue concentrations, and is assigned a load allocation. The in-lake allocation is in concentration terms: specifically, the responsible jurisdictions (County of Los Angeles) should achieve a dieldrin concentration of 0.43 µg/kg dry weight in lake bottom sediments (Table 4-46).

Table 4-46. Load Allocations for Dieldrin in Peck Road Park Lake

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	0.43

4.7.6.2.2 Alternative Load Allocations if the Fish Tissue Target is Met

The load allocations listed in Table 4-46 will be superseded, and the load allocations in Table 4-47 will apply, if:

1. The responsible jurisdiction submits to USEPA and the Regional Board material describing that the fish tissue target of 0.46 ppb wet weight has been met for the preceding three or more years. A demonstration that the fish tissue target has been met in any given year must at minimum include a composite sample of skin off fillets from at least five largemouth bass each measuring at least 350mm in length,
2. The Regional Board Executive Officer approves the request and applies the alternative load allocations in Table 4-47, and
3. USEPA does not object to the Regional Board's determination within 60 days of receiving notice of it.

Table 4-47. Alternative Load Allocations for Dieldrin in Peck Road Park Lake if the Fish Tissue Target is Met

Subwatershed	Responsible Jurisdiction	Input	Load Allocation (µg/kg dry weight)
Lake Surface	County of Los Angeles	Lake bottom sediments	1.90

4.7.6.3 Margin of Safety

TMDLs must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality. The MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. This TMDL contains an implicit MOS based on conservative assumptions. The allocations are set based on the lower of either the BSAF-derived sediment target or the consensus-based TEC sediment target to ensure achievement of the OEHHA FCG target in fish tissue. The selected BSAF-derived target concentration in sediment is considerably lower than the consensus-based TEC target.

4.7.6.4 Critical Conditions/Seasonality

TMDLs must include consideration of critical conditions and seasonal variation to ensure protection of the designated uses of the waterbody at all times. This TMDL protects beneficial uses by reducing fish tissue concentrations to the FCG target and protecting benthic biota in sediment. Because fish bioaccumulate dieldrin, concentrations in tissues of edible sized game fish integrate exposure over a number of years. As a result, overall average loading is more important for the attainment of standards than instantaneous or daily concentrations. WLAs and LAs in this TMDL are assigned as concentrations and protect during all seasons and in both high and low flow conditions. This TMDL therefore protects for critical conditions.

4.7.6.5 Daily Load Expression

USEPA recommends inclusion of a daily load expression for all TMDLs to comply with the 2006 D.C. Circuit Court of Appeals decision for the Anacostia River. This TMDL includes a maximum daily load estimated according to the guidelines provided by USEPA (2007).

Because the dieldrin WLAs are expressed as concentrations on sediment, the daily maximum allowable load is calculated from the maximum daily sediment load multiplied by the TMDL WLA concentration. The maximum daily sediment load is estimated from the 99th percentile daily flow and the sediment event mean concentration that yields the estimated annual sediment load.

No USGS gage currently exists in the Peck Road Park Lake watershed. USGS Station 11101250, on the Rio Hondo River above the Whittier Narrows Dam, was selected as a surrogate for flow determination. The 99th percentile flow was chosen to represent the peak flow for this drainage. Choosing the 99th percentile flow eliminates errors due to outliers and is reasonable for development of a daily load expression.

The USGS StreamStats program was used to determine the 99th percentile flow for the Rio Hondo (952 cfs) (Wolock, 2003). To estimate the peak flow to Peck Road Park Lake, the 99th percentile flow for the Rio Hondo was scaled down by the ratio of drainage areas (23,564 acres/58,368 acres; Peck Road Park Lake watershed area/Rio Hondo watershed area at the gage). The resulting peak flow estimate for Peck Road Park Lake is 384 cfs. The 99th percentile diverted flow from the San Gabriel River to Peck Road Park Lake is 328 cfs. Therefore, the total peak daily flow rate is 712 cfs.

The event mean concentration of sediment in stormwater (71.7 mg/L) was calculated from the estimated existing watershed sediment load of 990.3 tons/yr (Table 4-14) divided by the total stormflow volume reaching the lake (10,158 ac-ft, Table 4-7). Multiplying the sediment event mean concentration by the 99th percentile peak daily flow (712 cfs) yields a daily maximum sediment load from stormwater of 137.7 tons/d. Applying the wasteload allocation concentration of 0.43 ng dieldrin per dry g of sediment yields the stormwater daily maximum allowable load of 0.054 g/d of dieldrin. This load is associated with the MS4 stormwater permittees and the water diversion. The maximum allowable daily load must be met on all days, and the concentration-based WLAs must be met to ensure compliance with the TMDL.

4.7.6.6 Future Growth

The manufacture and use of dieldrin is currently banned. Therefore, no additional allowance is made for future growth in the dieldrin TMDL.

If any sources currently assigned load allocations are later determined to be point sources requiring NPDES permits, those load allocations are to be treated as wasteload allocations for purposes of determining appropriate water quality-based effluent limitations pursuant to 40 CFR 122.44(d)(1).

4.8 TRASH IMPAIRMENT

4.8.1 Beneficial Uses

California state water quality standards consist of the following elements: 1) beneficial uses, 2) narrative and/or numeric water quality objectives, and 3) an antidegradation policy. In California, beneficial uses are defined by the Regional Water Quality Control Boards (Regional Boards) in the Water Quality Control Plans (Basin Plans). Numeric and narrative objectives are specified in each region's Basin Plan, designed to be protective of the beneficial uses of each waterbody in the region. Peck Road Park Lake was not identified specifically in the Basin Plan; therefore, the beneficial uses associated with the downstream segment (Rio Hondo below Spreading Grounds) apply: REC1, REC2, WARM, WILD, MUN, and GWR (personal communication, Regional Board, December 22, 2009). Descriptions of these uses are listed in Section 2 of this TMDL report. Trash can potentially impair the REC1, REC2, and WARM in a variety of ways, including causing toxicity to aquatic organisms, damaging habitat, impairing aesthetics, and impeding recreation.

4.8.2 Numeric Targets

The numeric target is derived from the narrative water quality objective in the Los Angeles Basin Plan (LARWQCB, 1994) for floating material:

> *"Waters shall not contain floating materials, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses"*

and for solid, suspended, or settleable materials:

> *"Waters shall not contain suspended or settleable material in concentrations that cause nuisance or adversely affect beneficial uses."*

The numeric target for the Peck Road Park Lake Trash TMDL is 0 (zero) trash in or on the water and on the shoreline. Zero trash is defined as no allowable trash discharged into the waterbody of concern, shoreline, and channels. No information has been found to justify any value other than zero that would fully support the designated beneficial uses. Furthermore, court rulings have found that a numeric target of zero trash is legally valid (*City of Arcadia et al. v. Los Angeles Regional Water Quality Control Board et al. (2006) 135 Cal.App.4th 1392*). The numeric target was used to calculate the waste load allocations for point sources and load allocations for nonpoint sources, as described in the following sections of this report.

4.8.3 Summary of Monitoring Data

The existing beneficial uses are impaired by the accumulation of suspended and settled debris. Common items that were observed include plastic bags, plastic pieces, paper items, plastic and glass bottles, Styrofoam, bottle caps, and cigarette butts. Heavier debris has also been transported during storms or dumped on the shoreline or in the lake.

According to California's 2006 303(d) Impaired Waterbodies List, trash is causing water quality problems in Peck Road Park Lake. USEPA and Regional Water Quality Control Board staff confirmed the trash impairment during a site visit to Peck Road Park Lake on March 9, 2009. Staff conducted quantitative trash assessments and documented the trash impairment with photographs. Trash was observed in the lake, along shores and fences surrounding the lake, and at the outlet of storm drains discharging into the lake. Trash of major concern, found on March 9, 2009, included a chicken carcass with numerous egg shells (a biohazard) near the industrial facilities, furniture in the water, a large tattered blanket near the park, and a decomposing animal near Sawpit Wash.

Three quantitative trash assessments were conducted according to the Rapid Trash Assessment protocol which gives each shoreline a numeric score out of a possible 120 points (SWAMP, 2007). Higher scores correspond to cleaner areas, with 120 points representing a clean area. The severity of the trash problem was scored based upon the condition of the following parameters: level of trash, actual number of trash items found, threat to aquatic life, threat to human health, illegal dumping and littering, and accumulation of trash. Trash assessments were conducted within a 100 ft long by 10 ft wide area. If the shoreline was too steep, trash was observed from a distance. Any piece of trash visible from greater than 10 ft away was considered a large piece of trash. The site visit evaluated different land use types surrounding Peck Road Park Lake, including recreational use, industrial businesses, and urban runoff.

4.8.3.1 Peck Road Park

In the park area near the parking lot were roughly 20 picnic tables with barbeque grills and four trash cans. More trash cans were placed near the bathroom but none were observed near the trail. These uncovered trash cans can be a source of trash because animals or wind may transport trash from the cans to the shoreline or lake. People were observed to be fishing, walking around the lake, sitting at picnic tables, and recreating near the water. Approximately 50 birds were observed in the park portion of Peck Road Park Lake. A 100-foot trash assessment was conducted on the beach near the bathroom and parking lot. The area scored a 48/120 with some trash items found in the water. Because this area is more accessible to the public, it might lead to greater picnicking activities and trash littering (Figure 4-10).

Figure 4-10. **Picnic Area near Quantitative Assessment Location #1**

4.8.3.2 Industrial Area

Between 50-300 large pieces of trash were observed along 100 ft of shoreline in the industrial area surrounding Peck Road Park Lake. The area was too steep to appropriately conduct a quantitative trash assessment, but items observed from a distance included plastic bags, milk jugs, a tire, a cooler, metal cable, and industrial scraps. Figure 4-11 shows an example of the trash impairment along the northeastern shore of the lake. A chain link fence surrounds the industrial facilities, which acts as a buffer to trash entering the park. The trash accumulated near the fence does not appear to have been removed for a long period. Many dumpsters at the industrial sites were uncovered or overflowing with debris.

Some companies were notably tidier than others. A transient tarp shelter with over 100 pieces of large visible trash within 100 ft of the shelter was also noted.

Figure 4-11. **Evidence of Dumping near the Industrial Facilities**

4.8.3.3 Sawpit Wash

The second quantitative trash assessment was conducted near the inlet of Sawpit Wash. This area scored a 12/120 due to a heavy accumulation of trash, evidence of trash dumping, and much trash debris found in the water. Water levels in the past were probably higher (i.e., during storm events) as evidenced by trash being stuck higher in branches (Figure 4-12). Specific items found included a semiconductor, pepper spray, a spray paint can, cigarette butts, furniture, and Styrofoam and plastic pieces.

Figure 4-12. **A Bird Lives amongst Trash near the Sawpit Wash Inlet to Peck Road Park Lake**

4.8.3.4 Santa Anita Wash and Adjacent Area to the South

In general, the Santa Anita Wash area has a terraced grading. Visual assessment showed less than five larger pieces of trash per 100 ft. Residential homes, a school, and golf course were tidy and had fences enclosing their property. Dog excrement was observed along the bike trail. Although a large sediment buildup was observed next to a shopping cart, the amount of large visible trash was low near the lake inlet.

The third quantitative trash assessment was completed near Santa Anita Wash, which scored a 49/120. Grading was similar along most of the western shore except for a short beach area which was included in this assessment. Along this portion of the shore, a tree provided a physical space for trash to become entangled (Figure 4-13). Shorelines without any physical obstruction allowed trash to blow directly into the lake. Some trash items were observed in the water.

Locations of the three quantitative trash assessments are shown in Figure 4-14.

Note: Trash accumulates where physical space for entanglement such as branches are present, but likely blows directly into the lake along barren portions of the eastern shore of Peck Road Park Lake.

Figure 4-13. **Trash Accumulates near Santa Anita Wash**

Figure 4-14. **Quantitative Monitoring Locations at Peck Road Park Lake**

During a follow-up visit to Peck Road Park Lake on August 5, 2009, trash was similarly observed in the lake and on the shore. No quantitative surveys were conducted.

In summary, trash was present in and along the shore of Peck Road Park Lake during all visits. The main trash problems were near the park, industrial facilities, and storm drain outfalls.

4.8.4 Source Assessment

The major source of trash in Peck Road Park Lake is due to litter, which is intentionally or accidentally discarded in the lake and watershed. Potential sources can be categorized as point sources and nonpoint sources depending on the transport mechanisms. For example:

1. Storm drains: trash is deposited throughout the watershed and carried to various sections of the lake during and after rainstorms via storm drains. This is a point source.
2. Wind action: trash blown into the lake directly. This is a nonpoint source.
3. Direct disposal: direct dumping or littering into the lake. This is a nonpoint source.

Since the Peck Road Park Lake watershed includes residential areas, open space, parks, roads, and storm drains, both point and nonpoint sources contribute trash to the lake.

4.8.4.1 Point Sources

Trash conveyed by stormwater through storm drains to Peck Road Park Lake is evidenced by trash accumulation at the end of storm drains discharging to the lake.

Based on reports from similar watersheds, the amount and type of trash transported is a function of the surrounding land use. The city of Long Beach recorded trash quantity collected at the mouth of the Los Angeles River; the results suggest total trash amount is linearly correlated with precipitation (Figure 4-15, R^2=0.90, Signal Hill, 2006). A similar study found that the amount of gross pollutants entering the stormwater system is rainfall dependent but does not necessarily depend on the source (Walker and Wong, 1999). The amount of trash entering the stormwater system depends on the energy available to re-mobilize and transport deposited gross pollutants on street surfaces, rather than the amount of available gross pollutants deposited on street surfaces. Where gross pollutants exist, a clear relationship is established between the gross pollutant load in the stormwater system and the magnitude of the storm event. The limiting mechanism affecting the transport of gross pollutants, in the majority of cases, appears to be re-mobilization and transport processes (i.e., stormwater rates and velocities).

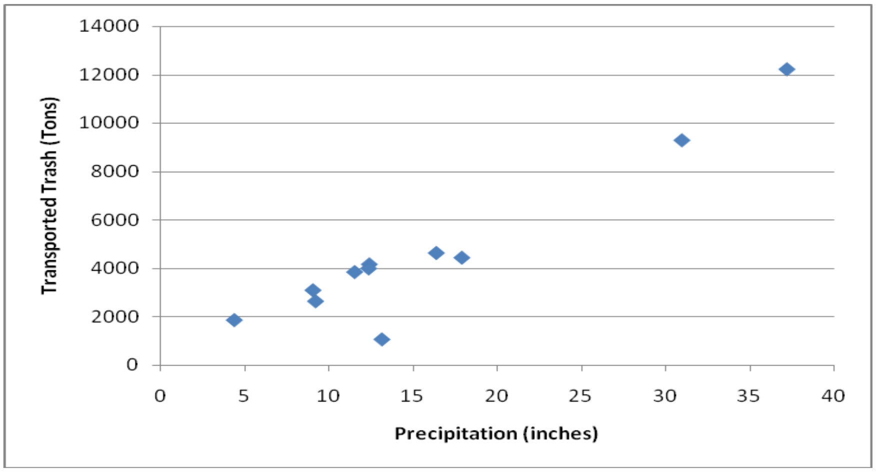

Figure 4-15. **Storm Debris Collection Summary for Long Beach (Signal Hill, 2006)**

In order to estimate trash generation rates, data from a comparable watershed were analyzed. The city of Calabasas completed a study on a Continuous Deflective Separation (CDS) unit installed to catch runoff from Calabasas Park Hills to Las Virgenes. The CDS unit is a hydrodynamic separator that uses vortex settling to remove sediment, trap debris and trash, and separate floatables such as oil and grease. It is assumed that this CDS unit prevented all trash from passing through. The calculated area drained by this CDS Unit is approximately 12.8 square miles. Regional Board staff estimated the waterbody's urbanized area to be 0.10 square miles. The results of this clean-out, which represents approximately half of the 1998-1999 rainy season, were 2,000 gallons of sludgy water and a 64-gallon bag two-thirds full of plastic food wrappers. Part of the trash accumulated in this CDS unit for over half of the rainy season is assumed to have decomposed due to the absence of paper products. Since the CDS unit was cleaned out after slightly more than nine months of use, it was assumed that this 0.10 square mile urbanized area produced a volume of 64 gallons of trash. Therefore, 640 gallons of trash were generated per square mile per year. This estimate is used to determine trash loads.

During the 1998/1999 and 1999/2000 rainy seasons, a Litter Management Pilot Study (LMPS) was conducted by Caltrans to evaluate the effectiveness of several litter management practices in reducing litter discharged from Caltrans stormwater conveyance systems. The LMPS employed four field study sites, each of which was measured with the amount of trash produced when separate BMPs were applied. The average total load for each site normalized by the total area of control catchments was 6,677 gallons/mi^2/yr. Other trash generation rates and studies exist, but the LMPS study is the most applicable to Peck Road Park Lake because of similar land use, population density, and average daily traffic conditions. Therefore, this analysis will use 6,677 gallons/mi^2/yr as the baseline estimate of trash for Caltrans roads.

Table 4-48 shows the current estimated volume of trash deposited within each of the responsible jurisdictions, in gallons per year, assuming a trash generation rate of 6,677 gallons of uncompressed trash/mi^2/yr for Caltrans and a trash generation rate of 640 gallons of uncompressed trash per square mile per year for other jurisdictions. For responsible jurisdictions that are only partially located in the watershed, the square mileage indicated is for the portion in the watershed only. The current loads need to be reduced 100 percent to meet the TMDL target of zero trash.

Table 4-48. Peck Road Park Lake Estimated Point Source Trash Loads

Responsible Jurisdictions	Point Source Area (mi^2)	Current Point Source Trash Load (gal/yr)
Arcadia	3.5	2300
Bradbury	0.79	500
CA DOT (Caltrans)	0.14	950
Duarte	1.7	1100
El Monte	0.077	49
Irwindale	0.78	500
County of Los Angeles	16	10000
Monrovia	13	8000
Sierra Madre	1.1	680

Note: For Caltrans: Current Point Source Trash Load (gal/yr) = Point Source Area (mi^2) * 6,677 (gal/ mi^2/yr). For all other jurisdictions: Current Point Source Trash Load (gal/yr) = Point Source Area (mi^2) * 640 (gal/ mi^2/yr)

4.8.4.2 Nonpoint Sources

Nonpoint source pollution is a source of trash in Peck Road Park Lake. Trash deposited in the lake from nonpoint sources is a function of transport via wind, wildlife, overland flow, and direct dumping.

Few studies have evaluated the relationship between wind strength and movement of trash from land surfaces to a waterbody. Lighter trash with a sufficient surface area to be blown in the wind, such as plastic bags, beverage containers, and paper or plastic food containers, are easily lifted and carried to waterbodies. Also, overland flow carries trash from the shoreline to waterbodies. Transportation of pollutants from one location to another is determined by the energy of both wind and overland stormwater flow.

Existing trash surrounding the lake is the fundamental cause of nonpoint source trash loading. Land use directly surrounding Peck Road Park Lake is low density single-family residential, industrial, and open space and recreational areas. Visitors may intentionally or accidentally discard trash to grass or trails in the park, which initiate the journey of trash to waterbodies via wind or overland water flow. Industrial facilities can contribute nonpoint sources of trash especially if dumpsters are overflowing and trash is not confined within a given area. Varying uses of the park are responsible for different degrees of trash impairment. For example, areas with picnic tables generate more trash than parking lots. Visitation rates are also likely linked to the amount of trash from nonpoint sources.

Table 4-49 summarizes the nonpoint source area and current estimate of nonpoint source trash loads for responsible jurisdictions (the park area and responsible jurisdictions are illustrated in Figure 4-16), assuming a trash generation rate of 640 gallons of uncompressed trash per square mile per year. The current loads need to be reduced 100 percent to meet the TMDL target of zero trash.

Table 4-49. Peck Road Park Lake Estimated Nonpoint Source Trash Loads

Responsible Jurisdictions	Nonpoint Source Area (mi^2)	Current Nonpoint Source Trash Load (gal/year)
Arcadia	0.18	118.0
El Monte	0.0048	3.1
Irwindale	0.00031	0.2
County of Los Angeles	0.00031	0.2
Monrovia	0.048	31

Note: Current Nonpoint Source Trash Load (gal/yr) = Nonpoint Source Area (mi^2) * 640 ($gal/mi^2/yr$)

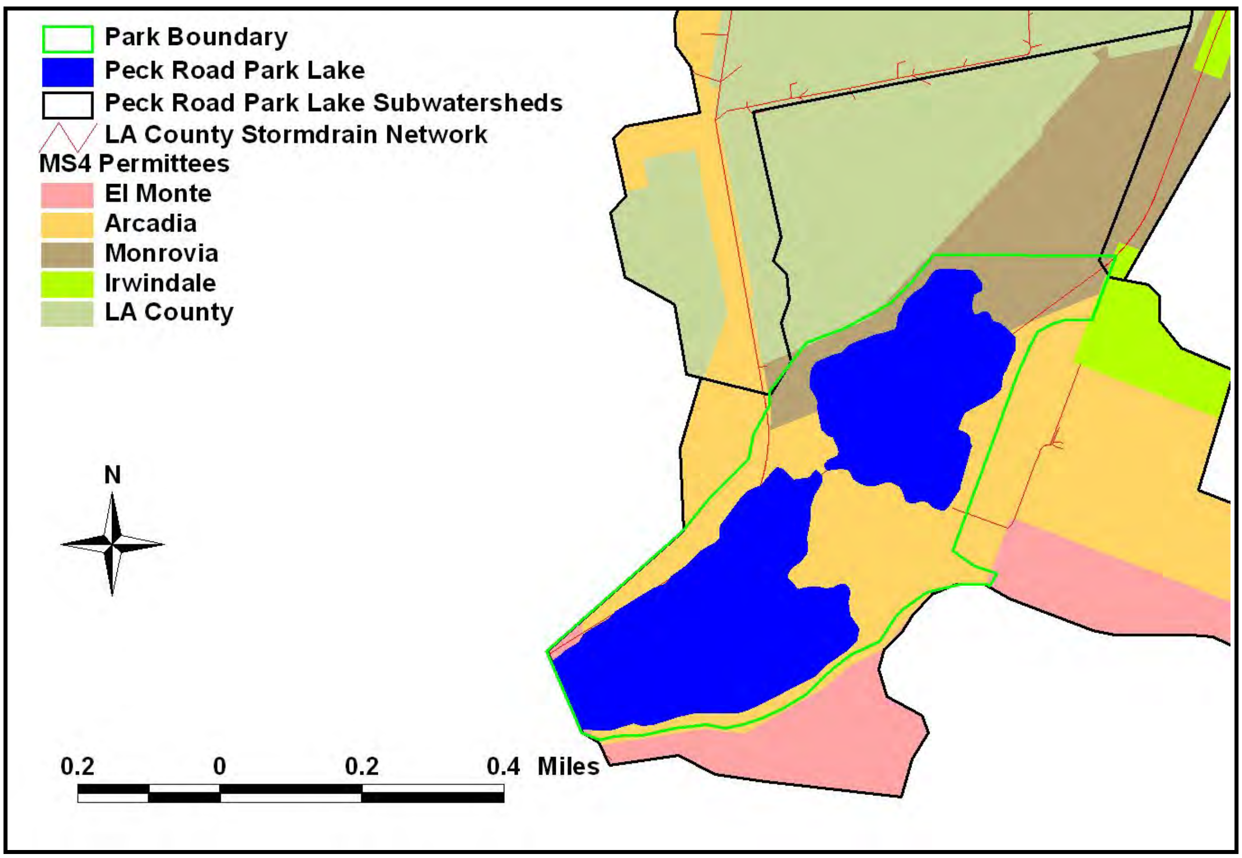

Figure 4-16. **Park Area Associated with Peck Road Park Lake**

4.8.5 Linkage Analysis

These TMDLs are based on numeric targets derived from narrative water quality objectives in the Los Angeles Basin Plan (LARWQCB, 1994) for floating materials and solid, suspended, or settleable materials. The narrative objectives state that waters shall not contain these materials in concentrations that cause nuisance or adversely affect beneficial uses. Since any amount of trash impairs beneficial uses, the loading capacity of Peck Road Park Lake is set to zero allowable trash.

4.8.6 TMDL Summary

Both point sources and nonpoint sources are identified as sources of trash in Peck Road Park Lake. For point sources, water quality standards are attained by assigning waste load allocations (WLAs) to permittees of the Los Angeles County Municipal Separate Storm Sewer System (MS4) Permit and Caltrans (hereinafter referred to as responsible jurisdictions); these WLAs will be implemented through permit requirements. For nonpoint sources, water quality standards are attained by assigning load allocations (LAs) to municipalities and agencies having jurisdictions over Peck Road Park Lake and its subwatershed. These LAs may be implemented through regulatory mechanisms that implement the State Board's 2004 Nonpoint Source Policy such as conditional waivers, waste discharge requirements, or prohibitions.

The TMDL of zero trash requires that current loads are reduced by 100%. Final WLAs and LAs are zero trash (Table 4-50).

Table 4-50. Peck Road Park Lake Trash WLAs and LAs

Peck Road Park Lake	Allocation
Trash WLA	0
Trash LA	0

4.8.6.1 Wasteload Allocations

The geographical boundary contributing to point sources is defined by watershed areas which contain conveyances discharging to the waterbodies of concern. Conveyances include, but are not limited to, natural and channelized tributaries, and stormwater drains and conveyances. Federal regulations require that NPDES permits incorporate water quality based effluent limitations (WQBELs) consistent with the requirements and assumptions of any available wasteload allocations (WLAs).

Wasteload allocations are set to zero allowable trash.

The permits affected are

- County of Los Angeles (includes all cities in Los Angeles County except Long Beach): Board Order 01-182 (as amended by Board Orders R4-2006-0074 and R4-2007-0042), CAS004001
- Caltrans: Order No 99-06-DWQ, CAS000003
- General Industrial Stormwater: Order No 97-03-DWQ, CAS000001

4.8.6.2 Load Allocations

Nonpoint source areas refer to locations where trash may be carried by overland flow, wildlife, or wind to waterbodies. Due to the transportation mechanism by wind, wildlife, and overland flow to relocate trash from land to waterbodies, the nonpoint source area may be smaller than the watershed. In addition, trash loadings frequently occur immediately around or directly into the lake making the load allocation a significant source of trash. According to the study by the city of Calabasas, the trash generation rate is 640 gallons per square mile per year from nonpoint sources areas (including, but not limited to, schools, commercial areas, residential areas, public services, roads, and open space and parks areas). Current trash rates were calculated in the nonpoint source section.

Load allocations (LAs) for nonpoint sources are zero trash. Zero is defined as no allowable trash found in and on the lake, and along the shoreline. According to the Porter-Cologne Act, load allocations may be addressed by the conditional waivers of WDRs, or WDRs. Responsible jurisdictions should monitor the trash quantity deposited in the vicinities of the waterbodies of concern as well as on the waterbody to comply with the load allocation.

The area adjacent to Peck Road Park Lake or defined as nonpoint sources includes parking lots, recreational areas, picnic areas, hiking trails, residential, commercial, industrial, roads, public facilities, and open space areas. Assuming that trash within a reasonable distance from Peck Road Park Lake has a high potential to reach the waterbody, the nonpoint source jurisdictions are Arcadia, El Monte, Irwindale, the county of Los Angeles, and Monrovia. All load allocations are set to zero allowable trash.

4.8.6.3 Margin of Safety

A margin of safety (MOS) accounts for uncertainties in the TMDL analysis. The MOS can be expressed as an explicit mass load, or included implicitly in the WLAs and LAs that are allocated. Because this TMDL sets WLAs and LAs as zero trash, the TMDL includes an implicit MOS. Therefore, an explicit MOS is not necessary.

4.8.6.4 Critical Conditions/Seasonality

Critical conditions for Peck Road Park Lake are based on three conditions that correlate with loading conditions:

- Major storms
- Wind advisories issued by the National Weather Service
- High visitation – On weekends and holidays from May 15 to October 15.

Critical conditions do not affect wasteload or load allocations because zero trash is a conservative target. However, implementation efforts should be heightened during critical conditions in order to ensure that no trash enters the waterbody.

4.8.6.5 Future Growth

If any sources currently assigned load allocations are later determined to be point sources requiring NPDES permits, those load allocations are to be treated as wasteload allocations for purposes of determining appropriate water quality-based effluent limitations pursuant to 40 CFR 122.44(d)(1).

4.9 IMPLEMENTATION RECOMMENDATIONS

Implementation measures may be developed in the future by the Regional Board through an implementation plan, NPDES permits, or non-point source enforcement. This section describes USEPA's recommendations to the Regional Board as to the implementation procedures and regulatory mechanisms that could be used to provide reasonable assurances that water quality standards will be met. General information about various lake management strategies can be found in a USEPA document titled *Managing Lakes and Reservoirs (EPA 841-B-01-006)*. Lake management options that can reduce pollutant loading to lakes include but are not limited to: increasing the volume of the lake that is aerated; installing hydroponic islands to remove nutrients; increasing flow volume or circulation in the lake; reducing stormwater discharges by improved infiltration; treating stormwater or supplemental water inputs with a wetland system; alum treatment to immobilize nutrients in sediments; dredging in lake sediments; and/or fisheries management actions to reduce nutrient availability from sediments.

Additionally, responsible jurisdictions implementing these TMDLs are encouraged to utilize Los Angeles County's Structural Best Management Practice (BMP) Prioritization Methodology which helps identify priority areas for constructing BMP projects. The tool is able to prioritize based on multiple pollutants. The pollutants that it can prioritize includes bacteria, nutrients, trash, metals and sediment. Reducing sediment loads would reduce OC pesticides and PCBs delivery to the lake in many instances. More information about this prioritization tool is available at: labmpmethod.org.

If necessary, these TMDLs may be revised as the result of new information (See Section 4.10 Monitoring Recommendations).

4.9.1 Nonpoint Sources and the Implementation of Load Allocations

Regional Board may regulate nonpoint pollutant sources through the authority contained in sections 13263 and 13269 of the California Water Code, in conformance with the State Water Resources Control Board's Nonpoint Source Implementation and Enforcement Policy. Additionally, South Coast Air Quality Management District has authority to regulate air emissions throughout the basin that affect air deposition. Load allocations are expressed in Table 4-9, Table 4-18, Table 4-28, Table 4-37, Table 4-46, and Table 4-50 for nutrients, PCBs, chlordane, DDT, dieldrin, and trash, respectively.

4.9.2 Point Sources and the Implementation of Wasteload Allocations

Wasteload allocations apply to MS4, Caltrans, and General Industrial Stormwater permits as well as the San Gabriel River Water Diversion. Wasteload allocations are expressed in Table 4-8, Table 4-16, Table 4-26, Table 4-36, Table 4-44, and Table 4-50 for nutrients, PCBs, chlordane, DDT, dieldrin, and trash, respectively. The concentration and mass-based wasteload allocations will be incorporated into the Caltrans and Los Angeles County MS4 permits. Concentration-based wasteload allocations will be incorporated into the General Industrial Stormwater permit.

4.9.3 Source Control Alternatives

Responsible jurisdictions are encouraged to consider the construction of wetland systems and bioswales (or other retention or treatment options) to treat the stormwater and supplemental water flows entering the lake, as well as stormwater diversion and infiltration using methods such as porous pavements and rain gardens. Implementing these options can reduce the lake's nutrient loads and, in the case of recirculation through constructed wetlands, reduce in-lake nutrient concentrations. The City of Los Angeles has modeled expected nutrient concentration reductions to stormwater flows to Echo Park Lake from constructed wetlands, and construction is currently underway. Information about this and other City of Los Angeles water quality improvement projects are available on Proposition O website: http://www.lapropo.org/sitefiles/lariver.htm.

Peck Road Park Lake has nutrient-related, chlordane, dieldrin, DDT, PCBs, and trash impairments. While there are some management strategies that would address multiple impairments (i.e., sediment removal BMPs in upland areas), their differences warrant separate implementation and monitoring discussions.

4.9.3.1 Nutrient-Related Impairments

To prevent degradation of this waterbody due to nutrient loading that may be associated with future land use changes, source reduction and pollutant removal BMPs, designed to reduce sediment loading, could be implemented throughout the watershed as these management practices will also reduce the nutrient loading associated with sediments. Dissolved loading associated with dry and wet weather runoff also contributes nutrient loading to Peck Road Park Lake. Some of the sediment reduction BMPs may also result in decreased concentrations of nitrogen and phosphorus in the runoff water. Storage of storm flows in wet or dry ponds may allow for adsorption and settling of nutrients from the water column. BMPs that provide filtration, infiltration, and vegetative uptake and removal processes may retain nutrient loads in the upland areas.

Education of park maintenance staff regarding the proper placement, timing, and rates of fertilizer application will also result in reduced nutrient loading to the lake. Staff should be advised to follow product guidelines regarding fertilizer amounts and to spread fertilizer when the chance of heavy precipitation in the following days is low. Encouraging pet owners to properly dispose of pet wastes will also reduce nutrient loading associated with fecal material that may wash directly into the lake or into storm drains that eventually discharge to the lake. Discouraging feeding of birds at the lake will reduce nutrient loading associated with excessive bird populations.

In order to meet the fine particulate ($PM_{2.5}$) and ozone (O_3) national ambient air quality standards by their respective attainment dates of 2015 and 2024, the South Coast Air Quality Management District and the California Air Resources Board have prepared an air quality management plan that commits to reducing nitrogen oxides (NOx, a precursor to both $PM_{2.5}$ and ozone) by over 85 percent by 2024. These reductions will come largely from the control of mobile sources of air pollution such as trucks, buses, passenger vehicles, construction equipment, locomotives, and marine engines. These reductions in NOx emissions will result in reductions of ambient NOx levels and atmospheric deposition of nitrogen to the lake surface.

4.9.3.2 Organochlorine Pesticides and PCBs Impairments

The manufacture and use of chlordane, DDT, dieldrin, and PCBs are currently banned in the U.S. except for certain limited uses of PCBs authorized by USEPA. Therefore, no additional allowances for future growth are needed in the TMDLs. Source control BMPs and pollutant removal are the most suitable courses of action to reduce OC pesticides and PCBs in Peck Road Park Lake. The TMDL calculations performed for each pollutant (described above in their individual sections) indicated internal lake storage as the greatest contributing source and driving factor affecting fish tissue concentrations. Additionally, the current watershed loads are a small fraction of the total loading that would be required to maintain the current sediment concentrations in the lake under steady-state conditions. This indicates that historic loading is causing the elevated fish tissue concentrations. It also suggests that concentrations in fish will decline over time. The most effective remedial actions and/or implementation efforts will focus on addressing the internal lake storage, such as capping or removal of contaminated lake sediments. For chlordane and dieldrin, the current watershed loads may not need any further reduction from current levels.

When properly conducted, removal of contaminated lake sediments, or dredging, can be an effective remediation option. The object of sediment dredging is to eliminate the pollutants that have accumulated in sediments at the lake bottom. Dredging is optimal in waterbodies with known spatial distribution of contamination because sediment removal can focus on problem areas. However, no spatial pattern of pollutant contamination was apparent in Peck Road Park Lake. Removal of the contaminated sediments reduces the pollutants available to in-lake cycling by discontinuing exposure to benthic organisms and reducing water column loading, resulting in reduced bioaccumulation in higher trophic level fish. Potential negative effects of dredging include increased turbidity and lowered dissolved oxygen concentrations in the short term, and disturbance to the benthic community and reactivation of buried sediment and any associated pollutants.

In some cases, sediment capping may be appropriate to sequester contaminated sediments below an uncontaminated layer of sediment, clay, gravel, or media material. Capping is effective in restricting the mobility of OC pesticides and PCBs; however, it is most useful in deep lakes and is likely not a viable solution for some parts of Peck Road Park Lake. Capping implementation should be restricted to areas with sediments that can support the weight of a capped layer, and to areas where hydrologic conditions of the waterbody will not disturb the cap.

The in-lake options for remediation are costly, but would be the only way to achieve full use support in a short timeframe. It is, however, also true that the OC pesticides and PCBs in question are no longer manufactured and will tend to decline in concentration due to dilution by clean sediment and natural attenuation. Natural attenuation includes the chemical, biological, and physical processes that degrade compounds, or remove them from lake sediments in contact with the food chain, and reduce the concentrations and bioavailability of contaminants. These processes occur naturally within the environment and do not require additional remediation efforts; however, the half-lives of OC pesticides and PCBs in the environment are long, and natural attenuation often requires decades before observing significant improvement.

Loading from the watershed can also be expected to decline over time due to natural attenuation and gradual reduction in atmospheric deposition rates. While reductions are called for in watershed loads, these loads are a small fraction of the historic loads already stored in the lakes. Limited sampling has not identified any hotspots of elevated loading under current conditions. It may, however, be necessary to further investigate potential sources of OC pesticides and PCBs loading in the watershed, such as active and abandoned industrial sites, waste disposal areas, former chemical storage areas, and other potential hotspots.

4.9.3.3 Trash Impairment

WLA may be complied with via full capture systems, partial capture systems, nonstructural BMPs, or any other lawful method which meets the target of zero trash. USEPA recommends the installation of full capture systems throughout the watershed. The Linear Radial, Inclined Screen, Baffle Box, and Catch Basin Insert are examples of full capture systems that fulfill the criteria of capturing all trash greater than 5 mm during flow less than the 1-year 1-hour storm. The Linear Radial utilizes a casing with louvers to serve as screens or mesh screen. Flows are routed through the louvers and into a vault. The Inclined Screen uses wedge-wire screen with the slotting perpendicular or parallel to the direction of flow. This device is configured with an influent trough to allow solids to settle. The Baffle Box applies a two-chamber concept: the first chamber utilizes an underflow weir to trap floatable solids, and the second chamber uses a bar rack to capture material. The catch basin has an opening cover screen which is a coarse mesh screen at street level that is paired with a catch basin insert, a 5 mm screen inside the catch basin which filters out smaller trash. USEPA recommends implementation plans be consistent with the Los Angeles River trash TMDL. A monitoring plan should be developed in order to understand the effectiveness of the implementation efforts.

LA may be complied with through the implementation of nonstructural BMPs or any other lawful methods which meet the target of zero trash. A minimum frequency of trash collection and assessment should be established at an interval that prevents trash from accumulating in deleterious amounts in between collections.

Trash should be prevented by providing effective public education about littering impacts. Signs dissuading littering and wildlife feeding along roadways and around the lake are recommended.

A city ban, tax, or incentive program reducing single-use plastic bags, Styrofoam containers, and other commonly discarded items which cannot decompose is recommended (Los Angeles County Department of Public Works, 2007).

Peck Road Park’s grounds and facilities are maintained by the Los Angeles County Department of Parks and Recreation. Trash is currently collected and removed from the park twice a week. However, trash is not collected in locations unsafe to reach with court referral labor, such as steep slopes. The Los Angeles County Department of Parks and Recreation should continue to expand the current trash pickup program.

In particular, trash should be collected from all areas of the lake including shorelines with steeper slopes (e.g., northeastern region).

The Los Angeles County Flood Control District is responsible for the trash in the lake. Currently, no method exists to remove trash from the middle of the lake. Therefore, a regular in-lake trash pickup schedule should be implemented, in addition to reporting and scheduling immediate trash collection of dangerous items.

The prevention and removal of trash in Peck Road Park Lake will lead to enhanced aesthetics, improved water quality, and the protection of habitat.

4.10 MONITORING RECOMMENDATIONS

Although estimates of the loading capacity and allocations are based on best available data and incorporate a MOS, these estimates may potentially need to be revised as additional data are obtained. The mass-based loading capacity will be affected by changes in flow volumes; therefore, loading capacities may be reconsidered if significant volume reductions or additions occur.

To provide reasonable assurances that the assigned allocations will result in compliance with the chlorophyll *a*, fish tissue and trash targets, a commitment to continued monitoring and assessment is warranted. The purposes of such monitoring will be: 1) to determine compliance with wasteload and load allocations, 2) to determine if numeric targets are being attained, 3) to evaluate whether numeric targets and allocations need to be adjusted to attain beneficial uses, 4) to evaluate the efficacy of control measures instituted to achieve the needed load reductions, and 5) to document trends over time in algal densities and bloom frequencies, fish tissue organochlorine compounds concentrations and trash levels.

4.10.1 Nutrient Related Impairments

To assess compliance with the nutrient TMDLs, monitoring for nutrients and chlorophyll *a* should occur at least twice during the summer months and once in the winter. At a minimum, compliance monitoring should measure the following in-lake water quality parameters: ammonia, TKN or organic nitrogen, nitrate plus nitrite, orthophosphate, total phosphorus, total suspended solids, total dissolved solids and chlorophyll *a*. Measurements of the temperature, dissolved oxygen, pH and electrical conductivity should also be taken throughout the water column with a water quality probe along with Secchi depth measurement. All parameters must meet target levels at half the Secchi depth. Deep lakes, such as Peck Road Park Lake, must meet the DO and pH targets in the water column from the surface to 0.3 meters above the bottom of the lake when the lake is not stratified. However, when stratification occurs (i.e., a thermocline is present) then the DO and pH targets must be met in the epilimnion, the portion of the water column above the thermocline. Additionally, in order to accurately calculate compliance with wasteload allocations to the lake expressed in yearly loads, monitoring should include flow estimation or monitoring as well as the water quality concentration measurements. Wasteload allocations are assigned to stormwater inputs and the San Gabriel River Water Diversion. These sources should be measured near the point where they enter the lakes twice a year for at minimum: ammonia, TKN or organic nitrogen, nitrate plus nitrite, orthophosphate, total phosphorus, total suspended solids and total dissolved solids.

The nutrient-response analysis for Peck Road Park Lake indicates that existing levels of nitrogen and phosphorus loading are resulting in attainment of the summer average chlorophyll *a* target concentration of 20 µg/L and are not significantly impacting DO levels in the waterbody. As an antidegradation measure, nitrogen and phosphorus TMDLs are allocated based on existing loading. As an example of concentrations that responsible jurisdiction may need to target in order to meet and comply with the mass-based WLAs and LAs, this discussion provides concentrations calculated based on existing flow volumes (a recalculation is needed if flow volumes change). Assuming flow volumes remain at existing levels

(Table 4-7), the targeted concentrations of total phosphorus and total nitrogen may be 0.62 mg-P/L and 4.04 mg-N/L at the outlet of the eastern subwatershed and 0.54 mg-P/L and 3.85 mg-N/L at the outlet of the western subwatershed. Targeted concentrations in the runoff from the near lake subwatershed may be 0.62 mg-P/L and 4.13 mg-N/L. The targeted concentration for San Gabriel River diversion waters may be 0.12 mg-P/L and 3.24 mg-N/L. Assuming average precipitation depths, the targeted concentration of nitrogen in precipitation may be 0.182 mg-N/L. As stated above, these concentrations are provided as guidelines; however, mass-based WLAs must be achieved.

4.10.2 Organochlorine Pesticides and PCB Impairments

To assess compliance with the organochlorine compounds TMDLs, monitoring should include monitoring of fish tissue at least every three years as well as once yearly sediment and water column sampling. For the OC pesticides and PCBs TMDLs a demonstration that fish tissue targets have been met in any given year must at minimum include a composite sample of skin off fillets from at least five common carp each measuring at least 350mm in length. At a minimum, compliance monitoring should measure the following in-lake water quality parameters: total suspended sediments, total PCBs, total chlordane, total DDTs, and dieldrin; as well as the following in-lake sediment parameters: total organic carbon, total PCBs, total chlordane, total DDTs and dieldrin. Environmentally relevant detection limits should be used (i.e. detection limits lower than applicable target), if available at a commercial laboratory. Measurements of the temperature, dissolved oxygen, pH and electrical conductivity should also be taken throughout the water column with a water quality probe along with Secchi depth measurement. Wasteload allocations are assigned to stormwater inputs and the San Gabriel River Water Diversion. These sources should be measured near the point where they enter the lakes once a year during a wet weather event. Sampling should be designed to collect sufficient volumes of suspended solids to allow for the analysis of at minimum: total organic carbon, total suspended solids, total PCBs, total chlordane, total DDTs and dieldrin. Measurements of the temperature, dissolved oxygen, pH and electrical conductivity should also be taken.

WLAs and LAs for each pollutant were assigned to the sediment-associated load from the watershed as well as the lake sediments. The concentration-based WLAs and LAs for chlordane, total DDTs, dieldrin, and total PCBs are 4.14 μg/kg dry weight, 5.28 g/dry g, 0.43 g/dry g, and 1.29 μg/kg dry weight, respectively. The associated reductions from the watershed load needed to meet the WLAs are 45.1 percent for total chlordane, 5.2 percent for total DDTs, and 91.6 percent for total PCBs. A quantitative percent reduction cannot be estimated for dieldrin because all sediment samples were below detection limits (which are greater than the TMDL target concentration); however, the needed reduction appears to be on the order of 53 percent.

4.10.3 Trash

Responsible jurisdictions should monitor the trash quantity deposited in the vicinity of Peck Road Park Lake as well as on the waterbody to comply with the load allocation and to understand the effectiveness of various implementation efforts. Quarterly monitoring using the Rapid Trash Assessment Method is recommended. The trash TMDL target is zero trash; a 100 percent reduction is required.