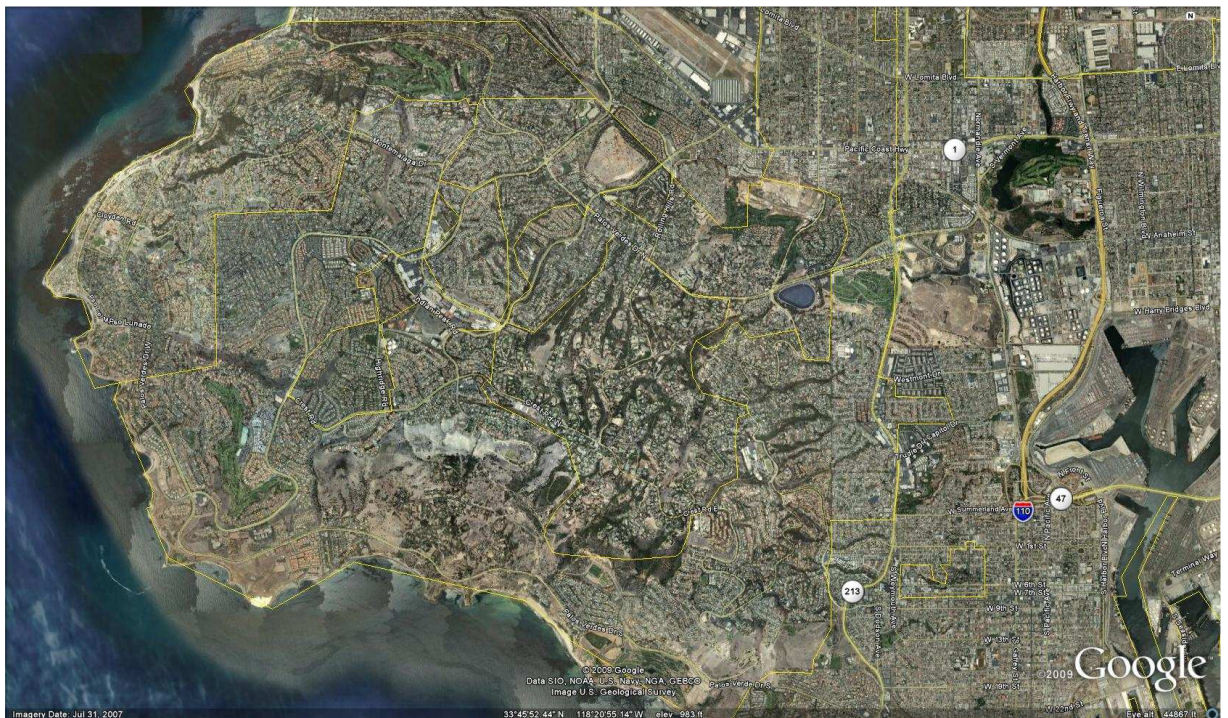


# PALOS VERDES PENINSULA SUBWATERSHED COORDINATED IMPLEMENTATION PLAN



3/11/2011

In Compliance with the Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) Total Maximum Daily Load (TMDL)

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# Palos Verdes Peninsula Subwatershed Coordinated Implementation Plan

## PALOS VERDES PENINSULA COORDINATED IMPLEMENTATION PLAN

### 1. EXECUTIVE SUMMARY

The Peninsula Coordinated Implementation Plan (Plan) was developed in compliance with the Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) Total Maximum Daily Load (TMDL) which was adopted by the State Water Resources Control Board, Los Angeles Region (Regional Board) on May 1, 2008. The TMDL was subsequently approved by the United States Environmental Protection Agency and became effective on March 11, 2009<sup>1</sup>. Among the responsible parties listed in the TMDL are the cities of Rancho Palos Verdes, Palos Verdes Estates, Rolling Hills, and Rolling Hills Estates, which together constitute the Palos Verdes Peninsula (Cities). The other parties listed in the TMDL including the Cities of Carson, Lomita, Los Angeles, Redondo Beach, and Torrance, Caltrans, and the unincorporated areas of Los Angeles County (County) are not participants in this Plan. They have chosen alternative approaches for compliance within their jurisdictions and will be submitting their plans separately.

The unique characteristics, similar demographics and isolated geographic setting of the Cities encourage a collaborative approach to TMDL compliance. This collaboration has been established in previous TMDLs and is also the approved method of compliance with the monitoring requirements of this TMDL. The Cities submitted a Coordinated Monitoring Plan to the Regional Board on March 11, 2010, which was conditionally approved on December 14, 2010. The cities have already begun the bidding process for the monitoring scope of work. This Implementation Plan is being developed prior to the collection of baseline data, therefore the approach is structured to allow for the data collected during the coordinated monitoring to inform the process during each phase of implementation.

The purpose of the Palos Verdes Peninsula Subwatershed Coordinated Implementation Plan is to outline the Peninsula cities' approach and implementation activities to address significant nutrient sources in the Machado Lake subwatershed. The Plan describes a proposed phased iterative adaptive program of coordinated outreach in conjunction with individual city specific source reduction projects which the Cities believe will be effective in addressing the major sources of nutrients in this subwatershed. This plan is meant to provide each agency the opportunity to tailor a city-specific program of nutrient source reduction projects which will work best within its jurisdiction while taking advantage of the opportunity to pool resources in the development of a joint outreach campaign to support these programs. In order to establish a roadmap to guide our implementation efforts, the group calculated estimates of significant sources of nutrients in the subwatershed. These estimates were calculated based on well

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<sup>1</sup> State Water Resources Control Board, Los Angeles Region Resolution No. R08-006, Amendment to the Water Quality Control Plan – Los Angeles Region to incorporate the Total Maximum Daily Load for Eutrophic, Algae, Ammonia, and Odors (Nutrient) in Machado Lake

documented sources of nutrient inputs to urban watersheds which we found in the literature and combined with historical knowledge of the area and land use data. We want to emphasize that these are simply rough order of magnitude estimates of nutrient inputs to the Peninsula Machado Lake subwatershed meant to direct our efforts in the absence of monitoring data and not an attempt to characterize discharge from the subwatershed. These order of magnitude estimates were used to inform the development of our implementation plan so that we could address sources based on their relative significance and feasibility of implementation activities. Comparison of these estimates indicates turf fertilizer and landscape debris, horse manure, and dry air deposition as the most significant sources of nutrients along similar orders of magnitude while pet waste inputs are somewhat lower. Some other key limitations to these estimates are the exclusion of birds and other wildlife sources as well as unknown nuisance sources which may be discovered through our monitoring efforts and will be addressed as they are discovered. Addressing dry air deposition of nitrogen presents a significant challenge for municipalities since addressing this source is clearly beyond the scope of the Cities' regulatory authority. In addition, these estimates of nutrient inputs do not reflect the natural assimilative capacity of the Peninsula which is characterized by extensive open space and natural canyon areas. Because of these unknowns and challenges, the Cities are focusing on an iterative adaptive source control program. This adaptive management approach will accommodate uncertainty and allow time to collect data which can be used to more directly target implementation efforts.

## 2. BACKGROUND

Machado Lake is located in the City of Los Angeles' Ken Malloy Harbor Regional Park. The park is situated to the west of the Harbor (110) Freeway and east of Vermont Avenue. The park is bounded by the Tosco refinery to the south and Pacific Coast Highway to the north. Machado Lake is approximately 40 acres in size and averages approximately 3 feet in depth. It supports a diverse range of wildlife including several threatened and endangered species. The Machado Lake Subwatershed is located within the harbor portion of the larger Dominguez Channel Watershed. Machado Lake receives urban and stormwater runoff from a subwatershed area of approximately 20 square miles consisting of nine incorporated cities, Caltrans highways and roads, and areas of unincorporated County land. Water from Machado Lake overflows a dam located at its southern end before entering the ocean through the Harbor Outflow.

Machado Lake is listed on the 1998, 2002, and 2006 Clean Water Act 303(d) lists of impaired water bodies due to eutrophic conditions, algae and odors. The listed impairments are caused by the overloading of nutrients, such as nitrogen and phosphorus, resulting in excessive algal growth which leads to increased turbidity, decreased levels of oxygen, and odor problems. These occurrences affect the recreational, aesthetic, and ecological functioning of Machado Lake. The Water Quality Control Plan for the Los Angeles Region (Basin Plan) identifies seven existing (E) or potential (P) beneficial uses for Machado Lake.

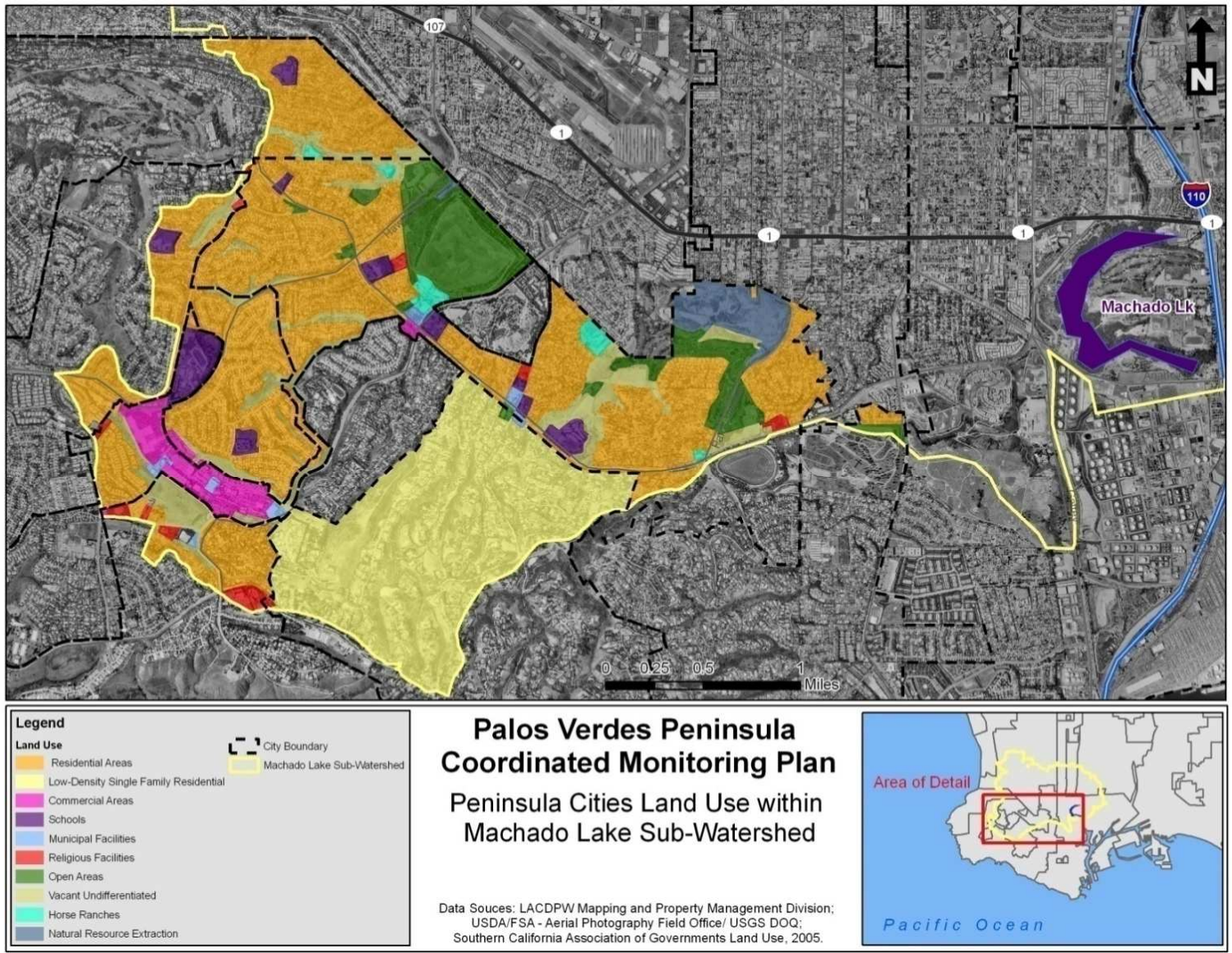
Waterbody	MUN (Municipal Water Supply)	REC1 (Water Contact Recreation)	REC2 (Non- Contact Water Recreation)	WARM (Warm Freshwater Habitat)	WILD (Rare, Threatened, or Endangered Species)	RARE (Endangered Species)	WET (Wetland Habitat)
<b>Machado Lake</b>	P	E	E	E	E	E	E

**TABLE 2.1. POTENTIAL AND EXISTING BENEFICIAL USES OF MACHADO LAKE AS OUTLINED IN THE BASIN PLAN**

The Clean Water Act section 303(d) requires the prioritization and development of TMDLs to address impairments and outline plans to restore the beneficial uses of listed water bodies. TMDLs require the reduction of pollutant loading by assigning waste load allocations, load allocations, and numeric targets to responsible parties which must be met at set interim and final compliance dates. The TMDL addressing the nutrient impairment of Machado Lake was adopted by the State Water Resources Control Board, Los Angeles Region (Regional Board) on May 1, 2008. It was subsequently approved by the United States Environmental Protection Agency and became effective on March 11, 2009. This TMDL sets forth stringent numerical limits for nitrogen and phosphorus, as well as numerical targets for ammonia, dissolved oxygen and chlorophyll a which will help assess the overall water quality in the lake.

### GEOGRAPHIC DESCRIPTION OF PALOS VERDES PENINSULA

The Palos Verdes Peninsula is situated in the southwestern portion of the Machado Lake Subwatershed atop the Palos Verdes Hills which are bounded to the north by Torrance, to the east by City of Los Angeles, and to the south and west by the Pacific Ocean. The Peninsula consists of the four incorporated cities of Rancho Palos Verdes, Palos Verdes Estates, Rolling Hills, and Rolling Hills Estates along with areas of unincorporated County land. The Peninsula Cities are all very similar in topography and land usage. The major land use designation on the Peninsula is residential. There are also significant portions of open space and soft bottom canyons. There is one commercial district and several areas of institutional land. There are also notable areas where horse uses exist. Figure 2.1 depicts the major land uses that characterize the Peninsula. There is a large drainage divide which dissects the Peninsula from the northeast to the southwest with the westerly portion draining into the Santa Monica Bay. The portion of the Peninsula which drains to Machado Lake consists of approximately 5.63 square miles, which is about 25% of the Machado Lake Subwatershed drainage area. This drainage flows in an easterly or northeasterly direction, contributing flow to three of the four major drainage systems entering Machado Lake (i.e. Wilmington Drain, Project 77 and Project 510). Drainage from the Peninsula Cities is conveyed via the natural soft bottom canyon systems in conjunction with structured storm drain systems. These systems are intertwined and cross-connected warranting a Peninsula-wide coordinated approach to monitoring and implementation efforts.

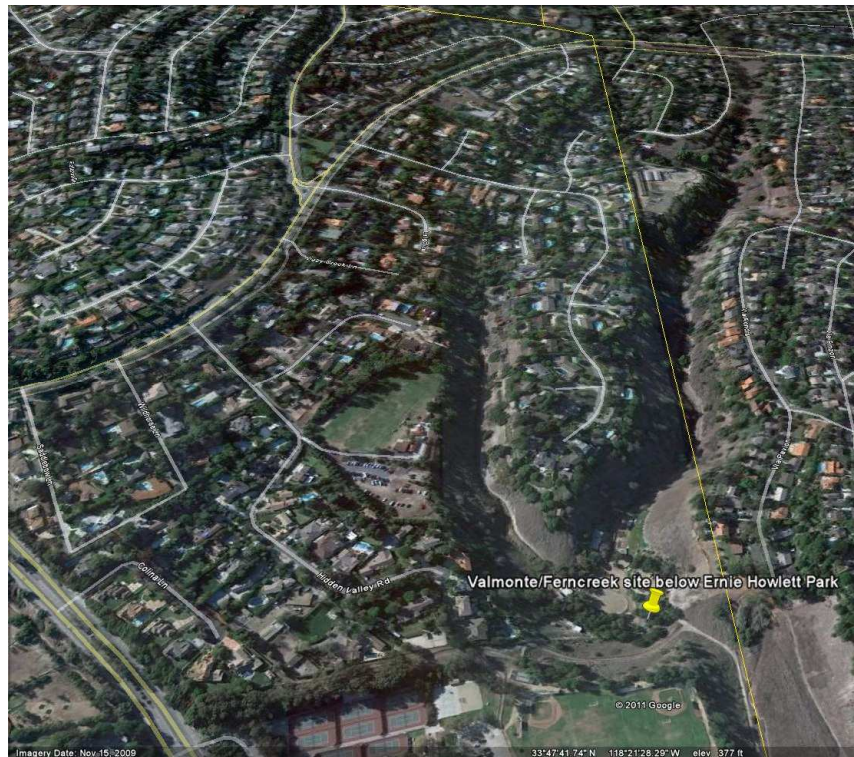


**FIGURE 2.1 MAJOR LAND USES CHARACTERIZING THE PALOS VERDES PENINSULA**





**FIGURE 2.2 NATURAL CANYONS CONVEY RUNOFF IN PALOS VERDES, ROLLING HILLS**



**FIGURE 2.3 TYPICAL PENINSULA RESIDENTIAL AREA, ROLLING HILLS ESTATES**



**FIGURE 2.4 BLACKWATER CANYON, A TYPICAL PENINSULA CANYON**



**FIGURE 2.5 RANCHVIEW CANYON IN ROLLING HILLS ESTATES**

## WASTE LOAD ALLOCATION COMPLIANCE

The Nutrient TMDL for Machado Lake outlines three options for compliance. It assigns waste load allocations, or limitations on pollutant discharges contained in storm drain discharges, to responsible parties which drain to Machado Lake. Interim and final waste load allocations [Table 2.2] can be demonstrated through one of the following methodologies:

- Concentration-based waste load allocations with in-lake monitoring
- Concentration-based waste load allocations with monitoring at the end of the responsible party’s drainage system (end-of-pipe)
- Mass-based waste load allocations with end-of-pipe monitoring

Compliance Date	Total Phosphorus	Total Nitrogen
<b>March 11, 2009</b>	1.25 mg/L	3.5 mg/L
<b>March 11, 2014</b>	1.25 mg/L	2.45 mg/L
<b>September 11, 2018</b>	0.1 mg/L	1 mg/L

**TABLE 2.2 INTERIM AND FINAL WASTE LOAD ALLOCATIONS SPECIFIED IN THE MACHADO LAKE NUTRIENT TMDL**

The Peninsula Cities met and determined that the best option for compliance was Option 2, concentration based waste load allocations with end-of-pipe monitoring. However, the systems which convey drainage from the Peninsula Cities are intertwined and cross-connected. Drainage from one city generally flows through at least one of the other three cities before exiting the Peninsula. It would be difficult and redundant for each city to monitor its own drainage independent of the other Peninsula Cities. For this reason, it was appropriate for the Peninsula Cities to coordinate efforts in order to comply with the Nutrient TMDL. The Peninsula Cities decided to determine compliance with concentration-based waste load allocations by choosing monitoring sites at the termini of the shared Peninsula drainage system. The Palos Verdes Peninsula Coordinated Monitoring Plan was conditionally approved in December 2010 and monitoring in accordance with this Plan will continue until the Peninsula Cities have established compliance with final waste load allocations. Once compliance with final waste load allocations is established, the results of the monitoring plan and other available information may be used to revise the amount of monitoring required to demonstrate continued TMDL compliance under a revised monitoring plan or other Regional Board order.

Following the established model for a coordinated Peninsula approach to TMDL compliance, this Implementation Plan takes advantage of the joint resources and similar demographics on the Peninsula cities. The strategy behind our implementation approach is to employ a phased iterative adaptive program of coordinated outreach in conjunction with individual city specific source reduction projects. While the cities do share a common drainage system and similar communities and target populations, there are differences among them in terms of degree of land use intensity, municipal codes and in house resources. Therefore, this plan is meant to provide each city an opportunity to tailor its own program of nutrient source reduction projects to work best within its individual jurisdiction while taking advantage of

the opportunity to pool resources to develop a joint outreach campaign which will support these programs.

Due to the fact that this plan is being developed without the aid of baseline data, the approach is structured to allow for the coordinated monitoring program data being collected by the cities to inform the process during each phase of implementation. This Plan satisfies the second deliverable requirement outlined in the compliance schedule for our selected approach as shown in Table 2.3 below.

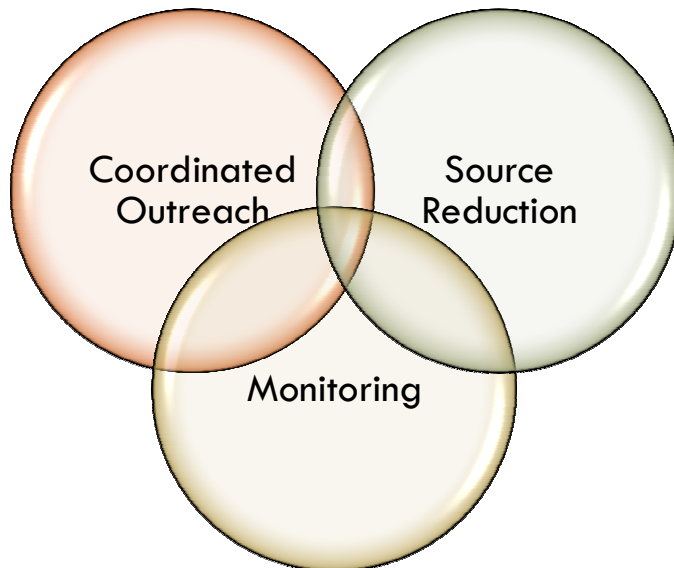
<b>Compliance Date</b>	<b>TMDL Requirement</b>
<b>March 11, 2009</b>	Meet 1 <sup>st</sup> interim waste load allocations (shown in Table 2)
<b>March 11, 2010</b>	Submit Monitoring and Reporting Plan (MRP) to the Regional Board for approval
<b>60 days from date of MRP approval</b>	Begin monitoring as outlined in MRP
<b>Annually from date of MRP approval</b>	Submit annual monitoring reports
<b>March 11, 2011</b>	Submit Implementation Plan (IP) to Regional Board for approval
<b>60 days from date of IP approval</b>	Begin implementation as outlined in IP
<b>March 11, 2014</b>	Meet 2 <sup>nd</sup> interim waste load allocations (shown in Table2)
<b>September 11, 2016</b>	TMDL re-opener period
<b>September 11, 2018</b>	Meet final waste load allocations and numeric targets (shown in Table 2)

**TABLE 2.3 COMPLIANCE SCHEDULE FOR END-OF-PIPE CONCENTRATION-BASED WASTE LOAD ALLOCATIONS**

### 3. APPROACH

Due to the implementation schedule mandated in the Machado Lake Nutrient TMDL, this Implementation Plan has been developed without the benefit of baseline monitoring data that will provide an understanding of the geographic and seasonal extent of compliance or non-compliance of stormwater discharges from the Peninsula subwatershed tributary to Machado Lake. As a consequence of the lack of baseline data, this plan proposes an iterative/adaptive approach to implementation that is phased. Once several years of monitoring data have been collected by the Peninsula cities in accordance with the Palos Verdes Peninsula Coordinated Monitoring Plan for Compliance with the Machado Lake Nutrient TMDL (Nutrient Monitoring Plan), additional phases of the plan will be developed in more detail in order to focus implementation efforts on measures that will best achieve compliance with the TMDL targets.

The Peninsula cities have developed a framework for this Implementation Plan built upon source control techniques as the most reliable, cost effective and environmentally sensitive means for controlling pollutants. While the Peninsula cities share a common drainage system and have similar communities and target populations, there are differences among the cities in terms of degree of intensity of land use, municipal codes and in-house staff resources. This Implementation Plan is therefore designed to provide each of the Peninsula cities the opportunity to develop nutrient source reduction projects that best address the significant nutrient sources within their jurisdictions. At the same time the Peninsula cities will collaborate and leverage resources in conducting a joint public outreach and education program to address nutrients sources across the subwatershed while supporting city-specific nutrient source reduction projects. Subsequent phases of both the coordinated outreach and the source reduction projects will be informed by the results of the coordinated monitoring program.



**FIGURE 3.1 CHART DEPICTING IMPLEMENTATION APPROACH**

## PHASE 1

Phase I Implementation has essentially already begun with the submittal of this plan in March 2011 and will continue through 2013 as shown in the schedule provided in Table 3-1. Phase I projects and activities are those which can be immediately implemented with little or no development time required. In some instances Phase I projects and activities are those which have been initiated within the past year or so and for which implementation has already begun in anticipation of the Machado Lake Nutrient TMDL or other state mandates. In other instances Phase I activities may be based on materials available from other jurisdictions that can be readily adapted or implemented by the Peninsula cities.

During Phase I the Peninsula cities have or will:

- Identify an initial list of anthropogenic nutrient sources based on known land use activities, watershed characteristics and available literature
- Evaluate the relative significance of anthropogenic nutrient sources within the Peninsula subwatershed
- Develop a joint public outreach program targeted at prioritized list of sources/land use activities/target audiences and key messages
- Develop a phased list of city-specific source reduction projects
- Implement the Phase 1 joint outreach and jurisdiction-specific source reduction projects
- Assess effectiveness of Phase I activities based on measurable outcomes
- Evaluate the results of first two years of monitoring and compare with initial estimates of significant sources to assess the validity of assumptions and/or develop watershed-specific attenuation factors for major source categories.

## PHASE 2

Phase II will begin following completion and review of the first two full years of monitoring as shown in the schedule. Phase II projects and activities are those which require development time and are likely to make substantial contributions in addressing the most significant sources of nutrients identified in this plan. During Phase II the Peninsula cities will:

- Develop and implement Phase II joint public outreach activities to address major sources of nutrients.
- Develop and implement city-specific Phase II source reduction projects as needed to address major sources of nutrients .
- Evaluate existing low impact development-type requirements in current individual city policies and ordinances and identify opportunities for enhancing them to achieve additional reductions in nutrient loads in stormwater discharges.
- Conduct source tracking in subdrainage areas tributary to monitoring locations that are not meeting the 2<sup>nd</sup> interim Compliance Deadlines for Total Nitrogen and identify any additional significant nutrient sources not previously identified.
- Evaluate the effectiveness of source reduction projects implemented to date.
- Prepare a report or presentation summarizing the effectiveness of Phase I and II Implementation activities in anticipation of reconsideration of Machado Lake Nutrient TMDL targets in March 2016.

### PHASE 3

Phase III projects and activities will be considered if necessary to fully attain compliance with the final TMDL targets. Phase III projects may require significant development time, public support and resources and therefore will not be undertaken until and unless compliance monitoring data indicates that they are warranted. Phase III projects may include the implementation of Low Impact Development approaches for the Palos Verdes Peninsula that are consistent with the new MS4 Permit requirements while considering the challenges of topography and geology on the Palos Verdes Peninsula to support multiple TMDLs for Machado Lake (trash and toxics as well as nutrients).

YEAR	COORDINATED MONITORING	IMPLEMENTATION PLAN	MACHADO LAKE NUTRIENT TMDL COMPLIANCE MILESTONES
2009	Develop PVP Coordinated Monitoring Plan		March 11, 2009 TMDL Effective, 1 <sup>st</sup> Interim Compliance Deadline
2010	Develop MOA to conduct monitoring	Develop PVP Coordinated Implementation Plan	Submit Monitoring Plan 03/11/2010
2011	Monitoring Plan Conditionally approved 12/14/2010 revised plan submitted 02/1/2011	Phase I Implementation	Submit Implementation Plan for review/approval 03/11/2011
2012	1 <sup>st</sup> full year of data available		
2013	2 <sup>nd</sup> year of data available	Evaluate effectiveness of Phase I	
2014	3 <sup>rd</sup> year of data available	Phase II Implementation	2 <sup>nd</sup> Interim Compliance Deadline 03/11/2014
2015	4 <sup>th</sup> year of data available		
2016		Prepare report/presentation on effectiveness of Phase I & II	TMDL Reconsideration 09/11/2016
2017		Phase III Implementation as needed	
2018			final compliance deadline 09/11/2018

TABLE 3.1 IMPLEMENTATION SCHEDULE

### SIGNIFICANT SOURCES OF NUTRIENTS

To establish a basis for focusing and prioritizing the Phase I and II activities described in this plan, order-of-magnitude estimates have been made of the known anthropogenic sources of nutrients within the Peninsula subwatershed. These estimates have been calculated based on land use information, city staffs familiarity with their communities, and available information in the literature. These estimates do not



attempt to consider the assimilative capacity of the subwatershed for nitrogen and phosphorous, rather they are analogous to nutrient land application rates and so should be considered representative of the relative pollutant potential of a source without considering active controls or natural assimilation which are already acting to mitigate the sources. These estimates are used as a means to prioritize potential sources for attention within the implementation plan. Once several years of data on stormwater/dry weather runoff quality from the Peninsula subwatershed have been collected, these order-of-magnitude estimates will be reevaluated in comparison with the water quality data to obtain an understanding of the Peninsula subwatershed's capacity for nutrient assimilation at baseline, and to further develop Phase III activities, if needed, to more precisely focus on the sources which require additional control.

Potentially significant anthropogenic sources (not including birds or other wildlife ) have been identified and evaluated based on estimated application rates within the watershed and include:

- **Fertilizers** applied to landscaped areas, especially areas of turf, and leaching of nutrients from **landscape debris** such as leaves and grass clippings that may accumulate in gutters and catch basins
- **Manure** from equestrian activities: private and public stables, residential horse keeping, trails and open space
- **Air deposition** of nitrogen due to air pollution, the predominate species being: HNO<sub>3</sub> (nitric acid), NO<sub>2</sub> (nitrogen dioxide) and NH<sub>3</sub> (ammonia)
- **Pet waste**, both urine and feces from cats and dogs

Additional localized nuisance and intermittent sources will be identified and evaluated during dry weather monitoring and source tracking and may include:

- Areas of chronic runoff from landscape irrigation
- Illicit discharges, residential car washing
- Site-specific commercial activity, e.g., outdoor waste storage areas, leaking grease interceptors in parking lots, chronic nuisance flows

Sources of no or low significance with respect to within the Palos Verdes Peninsula subwatershed include:

- Runoff/overspray of reclaimed/recycled water—although reclaimed water can contain elevated concentrations of nitrogen and phosphorus , the Palos Verdes Peninsula is not currently served by reclaimed/recycled water. If in the future West Basin Municipal Water District proposes to install reclaimed/recycled water service to the Palos Verdes Peninsula, the potential significance of this source will be reevaluated.
- Sanitary sewer overflows are closely regulated through State Waste Discharge Requirements. Responsible jurisdictions have already taken measures via sanitary sewer system management plans to reduce the incidence of these events so that additional measures as part of this plan would be duplicative.

### **Fertilizer and Landscape Debris**

Numerous reports document the linkages between excess nutrients in local water bodies and the augmentation of naturally occurring soil nutrients with nitrogen and phosphorus applied in commercial fertilizers, whether organic or synthetic. The desire for beautiful lush turf and the use of tropical or exotic

plants may lead to the overuse or the misapplication of nitrogen and phosphorus fertilizers. Because single-family residences are the predominant land use within the Palos Verdes Peninsula, the application of fertilizer to residential landscapes as well as ball fields and parks and to a lesser extent commercial landscapes is a potentially significant source of nutrients within the subwatershed. While the misapplication of fertilizers can cause pollution in urban and storm water runoff, proper application informed by soil testing will minimize the excess transport of nitrogen and phosphorus.

A recent nonpoint source loading analysis from a New Jersey study indicated that ten percent of the nitrogen and four percent of the phosphorus applied annually in a 193-square-mile area of landscaped residential development ended up in surface waters as a result of over-application. Another study (South Jersey Resource Conservation and Development Council, Inc.) found that more than 50 percent of the nitrogen in fertilizer leaches from lawns when improperly applied.<sup>2</sup> This range in potential nutrient loading illustrates the importance of an effective outreach program as a means of source control.

A publication distributed by the University of California Division of Agriculture and Natural Resources<sup>3</sup> recommends 2-4 pounds of nitrogen per 1000 square feet (0.02 acres) of turf annually applied in multiple divided applications. Assuming that 15% of the Palos Verdes Peninsula subwatershed is planted in turf, this would equate to an average annual application of 94,300 pounds per year of nitrogen. The UC Davis publication does not advise rates of phosphorus application, however according to King, Balogh, Hughes and Harmel<sup>4</sup>, the average ratio of phosphorus to nitrogen applied on golf fairways and tees is 20%, though the phosphorus ratio may be higher for new lawns or golf tees. Using this typical ratio of 20% phosphorus to nitrogen application, the annual application of phosphorus to turf in the subwatershed would be 18,900 pounds per year.

A University of Minnesota Extension Study documents that another significant source of phosphorus in runoff is the result of lawn clippings and tree leaves left in streets and gutters. Phosphorus and nitrogen taken up by plants are incorporated into plant tissue as organic compounds. However plant residues such as lawn clippings and tree leaves, when exposed to wetting by rain or contact with runoff, release phosphorus and nitrogen in soluble form. A study by the University of Minnesota found that “when street gutters were swept weekly and kept free of plant residue, the phosphorus level was 30 to 40 percent less than in areas where no sweeping occurred.”<sup>5</sup> Thus leaves and other organic debris such as grass clippings which accumulate in gutters and storm drain catch basins between cleaning cycles and are subjected to intermittent wetting and leaching by dry weather runoff or storm water runoff have the potential to create a significant source of soluble phosphorus in runoff.

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<sup>2</sup> U.S EPA Source Water Protection Bulletin, July 2001. Managing Turfgrass and Garden Fertilizer Application to Prevent Contamination of Drinking Water

<sup>3</sup> Henry, J. Michael, Victor A Gibeault, Vincent F. Lazaneo, 2002. Publication 8065 – Practical Lawn Fertilization. University of California Agriculture and Natural Resources. <http://anrcatalog.ucdavis.edu>

<sup>4</sup> King, K.W., J.C. Balogh, K.L. Hughes and R.D. Harmel. Nutrient Load Generated by Storm Event Runoff from a Golf Course Watershed. Published online May 25, 2007 and reproduced from Journal of Environmental Quality

<sup>5</sup> C.J. Rosen and B.P. Horgan, University of Minnesota, 2010. Preventing Pollution Problems from Lawn and Garden Fertilizers.

### ***Equestrian Activities***

Although it is generally accepted among the equestrian community on the Palos Verdes Peninsula that the number of horses kept on the Peninsula has been declining in recent years, there is no requirement for licensing or registering horses in any of the Peninsula cities so official information is not available regarding the exact number of horses kept on the Peninsula. Nevertheless, reasonable estimates of the number of horses kept within the Machado Lake subwatershed of the Peninsula can be made that are adequate for the purposes of estimating the potential nutrient source represented by horse keeping. Horses are kept at one of three types of facilities on the Peninsula: at one of a limited number of public municipal stables, or at one of the licensed privately operated stable facilities that board horses, or on single-family residential properties.

The licensed public and private stable facilities include:

- Peter Weber Equestrian Center, the City of Rolling Hills Estates' municipal stables which has a capacity for 116 horses.
- Palos Verdes Estates municipal stables with a capacity for 80 horses.
- The Sea Horse Riding Club, a privately operated stable, has capacity for approximately 50 horses.
- The Empty Saddle Club, a private club, has the capacity for approximately 75 horses and also maintains approximately 60 young cattle for roping and western riding practice.

These facilities are licensed by Los Angeles County Department of Public Health which requires a license for any property with 5 or more horses, or a facility with 10 or more of a mixture of livestock (e.g., goats, chickens, etc). Licensed facilities are inspected every 6 months by a Registered Environmental Health Specialist.

The Community Emergency Response Team (CERT) on the Palos Verdes Peninsula has performed an informal voluntary survey and prepared a map of horse keeping locations to assist emergency responders in the event of a natural disaster. The CERT map is the best information currently available regarding the numbers and locations of horses kept at private residences on the Palos Verdes Peninsula. Based on CERT map, it is estimated that:

- approximately 220 horses are kept on single family residential properties within the areas tributary to Machado Lake in the City of Rolling Hills Estates
- approximately 70 horses are kept on single family residential properties within the City of Rolling Hills areas tributary to Machado Lake
- There are no horses kept on private residential properties tributary to Machado Lake in the cities of Rancho Palos Verdes or Palos Verdes Estates.

Based on the combined information on licensed facilities and estimates of horses kept on residential properties, it is estimated that there are approximately 550 horses and 60 cattle with the incorporated cities of the Palos Verdes Peninsula in areas tributary to Machado Lake, and to provide a margin of safety, the estimate of large animals will be rounded up to 650. For purposes of this plan it is assumed that cattle are similar to horses in terms of nutrient generation. The average 1000-pound horse produces

102 pounds of total nitrogen and 18.8 pounds of total phosphorous per year<sup>6</sup>, so the amount of total nitrogen and phosphorus produced by large animals within the Machado Lake subwatershed in the incorporated cities of the Palos Verdes Peninsula is estimated to be 66,300 pounds per year of total nitrogen and 12,215 pounds per year of total phosphorous. Thus horse manure if improperly managed has the potential to pose a significant source of nutrients in runoff from the Peninsula subwatershed and will be addressed in this implementation plan.

Based on the CERT map it appears that there may be an additional 50 or so horses kept on private residences in County unincorporated areas on the Peninsula, and while the impact of these horses may be detected in the results of monitoring conducted under the coordinated monitoring plan, those areas are outside the jurisdiction of the Peninsula cities and will only be addressed by this plan indirectly through the joint public outreach program.

### **Air Deposition**

Aerial deposition of nitrogen is a significant source of nutrients in urban watersheds. The Machado Lake Nutrient Total Maximum Daily Load (TMDL) lists atmospheric deposition as a significant source of nitrogen in the Machado Lake watershed<sup>[2]</sup>. Similarly, according to the Environmental Protection Agency (EPA) *Our Nations Air* report, 34 % of the annual nitrogen inputs to the Chesapeake Bay and its watershed come from atmospheric deposition<sup>[1]</sup>. A study conducted by researchers at the University of California, Los Angeles (UCLA), estimated that atmospheric deposition of nitrogen to the Dominguez Channel Watershed (which includes the Machado Lake sub-watershed) accounts for approximately 44 grams of nitrogen per hectare per day in the form of  $HNO_3$ ,  $NO_2$ , and  $NH_3$ . The South Coast Air Quality Management District (AQMD) estimates that approximately 54% of the emissions of these contaminants come from mobile sources such as cars, trucks, buses, and motorcycles, 34% come from area and off road sources such as gas stations and auto body shops, while the remaining sources can be attributed to point sources such as industrial facilities and power generating plants. The data from the UCLA study indicate that dry deposition [as opposed to wet] accounts for the majority of air pollutant loading to the watershed due to the infrequency of rain events in this region<sup>[3]</sup>.

The Palos Verdes Peninsula is situated in the southwestern portion of the Machado Lake Sub-watershed atop the Palos Verdes Hills which are bounded to the south and west by the Pacific Ocean. The prevailing onshore winds act as a barrier to landward pollutant sources which results in lower than characteristic deposition rates in these coastal cities. The Palos Verdes Peninsula (Peninsula) has a 1,458 hectare area draining to Machado Lake. Based on this catchment area and the deposition rate obtained from the UCLA study, the aerial deposition to the Peninsula is assumed to be 64,152 grams of nitrogen per day. This equates to a deposition rate of 51,514 pounds of nitrogen per year (23,366 kg N/year). The percentage of this load which eventually enters Machado Lake is unknown since quantification of the removal of this pollutant by terrestrial biota is unavailable. However, the TMDL estimates an average

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<sup>6</sup> Wheeler and Zajaczkowski. *Horse Stable Manure Management, Publication G-97*. Penn State College of Agricultural Sciences Cooperative Extension, Agricultural and Biological Engineering.

<sup>[2]</sup> Machado Lake Eutrophic, Algae, Ammonia, and Odors (Nutrient) TMDL Staff Report prepared by the California Regional Water Quality Control Board, Los Angeles Region.

<sup>[1]</sup> Retrieved from <http://www.epa.gov/airtrends/2010> on December 17, 2010.

<sup>[3]</sup> Lu, Schiff, Stolzenbach, 2003. Nitrogen deposition on coastal watersheds in the Los Angeles Region.

point source loading of total nitrogen from the entire Machado Lake watershed of 7,587 kg/year. This figure is significantly lower than the estimated atmospheric input for the Peninsula sub-watershed alone, so it can be assumed that a vast majority of nitrogen is being assimilated within the catchment area.

### **Pet Waste**

According to the United States 2000 census, there are approximately 24,560 homes on the Peninsula. The portion which drains to Machado Lake is 5.63 square miles, which is approximately 24% of the total area of the Peninsula. Based on this percentage, there are approximately 5,894 homes in the watershed. The Humane Society of the United States estimates that 33% of US households own cats. These pet owners average 2.45 cats per household<sup>7</sup>. Based on these numbers, the portion of the Peninsula draining to Machado Lake has 4,765 cats averaging 0.81 cats per home. A study published in the Journal of the American Veterinary Medical Association estimates that 36% of owned cats defecate outside all the time<sup>8</sup>. Therefore, the average cats per home contributing to nutrient loading would be reduced to 0.3. Because of the presence of coyotes in the City and on the Palos Verdes Peninsula in general, residents are warned to keep cats and other small pets indoors at all times so the nutrient loading from cats on the Peninsula is most likely even lower.

The Los Angeles County Department of Animal Care provided numbers of licensed dogs on the Peninsula. The total licensed dogs amounts to 3,688 and using the same percentage of Peninsula drainage area to Machado Lake (24%), there would be approximately 855 dogs in the catchment area, averaging 0.15 dogs per house.

In order to estimate the nutrient contribution from pets on the Peninsula, the average amount of nitrogen and phosphorus in dog and cat excrement was estimated. A study performed by Edith Cowan University in Australia estimated the nutrient load generated in pet waste. For the purposes of this implementation plan, the average dog (20 kg) and small dog/cat (4 kg) sizes were selected as representative estimates. According to this study, the composition of dog and cat feces is similar. The feces of these animals contains approximately 0.7% nitrogen and 0.25% phosphorus. Urine contains about 1.1% nitrogen and 0.01%  $P_2O_5$ . For an average dog weighing 20 kg, 4.59 g N per day and 0.15 g P per day is excreted. The study also used data for small size dogs to estimate the nutrient output of felines. According to the data, a cat weighing 4 kg would generate 1.23 g N per day and 0.03 g P per day<sup>9</sup>. This equates to 3,121 pounds of nitrogen per year from dogs, 1,694 pounds of nitrogen per year from cats, 86 pounds of phosphorus per year from dogs, and 41 pounds of phosphorus per year from cats. In total, pet waste generates 4,815 pounds of nitrogen per year and 127 pounds of phosphorus per year in the Palos Verdes Peninsula Machado Lake sub-watershed.

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<sup>7</sup> Data retrieved from [http://www.humanesociety.org/issues/pet\\_overpopulation/facts/pet\\_ownership\\_statistics.html](http://www.humanesociety.org/issues/pet_overpopulation/facts/pet_ownership_statistics.html) on 11/15/2010.

<sup>8</sup> Haydee, Atwill, Gardner, et al., 2006. Outdoor fecal deposition by free roaming cats and attitudes of cat owners and nonowners toward stray pets, wildlife, and water pollution.

<sup>9</sup> Surasithe Khwanboonbumpen, 2006. Sources of Nitrogen and Phosphorus in Stormwater Drainage from Established Residential Areas and Options for Improved Management. Retrieved from <http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1075&context=theses> on December 22, 2010.

**Relative Significance of Identified Anthropogenic Sources**

A comparison of the foregoing estimates of potential major sources of anthropogenic nitrogen and phosphorus within the Machado Lake Subdrainage area of the incorporated cities on the Palos Verdes Peninsula is summarized in Table 3-2. Comparison of these estimates indicates that fertilizer, horse manure and dry air deposition represent potential nitrogen sources of the same order of magnitude, while pet waste is lower, though still potentially significant. Significant sources of phosphorus are: fertilizer, leaves and grass clippings accumulated in gutters and catch basins, and manure/bedding waste from horse keeping. Dry air deposition and pet waste do not represent significant sources of phosphorus.

As an initial focus for Phase I and Phase II implementation activities, the Peninsula cities will address these significant anthropogenic sources via joint public outreach and individual source reduction projects. Section 4 of this plan describes the joint public outreach and education program, while Sections 5 through 8 describe the City-specific nutrient source reduction projects. Based on results of the Nutrient Monitoring Plan, additional projects will be undertaken, if needed, during Phase III.

SOURCE	ESTIMATED NITROGEN SOURCE IN WATERSHED FROM MOST SIGNIFICANT ANTHROPOGENIC SOURCES	ESTIAMTED PHOSPHORUS SOURCE IN WATERSHED FROM MOST SIGNIFICANT ANTHROPOGENIC SOURCES
	Pounds per Year	Pounds per Year
<b>Turf fertilizer</b>	94,300	18,900
<b>Equestrian Activities</b>	66,300	12,215
<b>Dry Air Deposition</b>	51,514	-
<b>Pets (dogs &amp; cats)</b>	4,815	130
<b>*does not consider fate via assimilation, attenuation, sequestration or removal processes</b>		

**TABLE 3.2 ESTIMATED RELATIVE SIGNIFICANCE OF ANTHROPOGENIC NUTRIENT SOURCES**

## 4. JOINT PUBLIC OUTREACH PROGRAM

### TURF FERTILIZER OUTREACH ACTIVITIES

The excessive fertilization of water bodies is recognized as one of the major causes of the impairment of the beneficial uses of Machado Lake through the growth of excessive growth of biota, phytoplankton and other aquatic plants<sup>10</sup>. The Cities within the Palos Verdes Peninsula recognize that the mis-use and over-use of fertilizers within the sub-watershed have contributed to the excessive fertilization of Machado Lake. The nutrients of primary concern are nitrogen and phosphorus compounds added through the application of inorganic and organic fertilizers. Additionally, studies suggest that plant matter in catch basins and storm drains may also play an important role in nutrient loading within the watershed.

Cities within the Palos Verdes Peninsula limit the amount of impervious surfaces to 10% - 65% of the total developed property for residential properties, which range in size from ¼ acre to greater than one acre in lot size. Assuming that 10% of the subwatershed area within the Palos Verdes Peninsula is planted in turf, the annual application of total nitrogen and total Phosphorus applied to turf is estimated at 62,800 pounds/year and 12,600 pounds/year respectively. Further, based on studies of J. Kluesener of the University of Wisconsin on the nutrient sources for Lake Wingra in Madison, Wisconsin, showing that urban land runoff transported 0.57 pounds of dissolved phosphorus per acre per year to Lake Wingra from the leaching of leaves and yard debris, it is reasonable to assume that here with a total of 1,046 acres (35% of the Palos Verdes subwatershed) consisting of turf, mature trees, natural canyons, parklands and natural areas, that a total of 597 pounds per year of dissolved phosphorus and 1,026 pounds per year of total phosphorus could be released to the watershed.<sup>11</sup>

#### ***Outreach Message and Target Audiences***

Turf is known to require higher rates of fertilizer application than most other types of landscaping and it can be the predominant feature of traditional yards, parks, ball fields and golf courses. There are approximately 225 landscape companies operating within the Palos Peninsula, it is important to target these companies for outreach focusing on: fertilizer application and soil testing; watering practices; plant selection and maintenance; and proper organic debris management. Cutting back on unnecessary fertilizer use is the first step toward preventing water pollution associated with lawn and garden maintenance through use of soils testing to establish the actual need and then following recommended application rate and frequency. Applying fertilizer according to need will greatly reduce the discharge of nitrogen and phosphorus into the Peninsula sub-watershed. In addition, Peninsula cities can help prevent nutrient loading by controlling the discharge of lawn clippings and plant debris into streets and catch basins.

The Peninsula cities intend to focus their public outreach efforts on the following target audiences :

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<sup>10</sup> Staff Report for Machado Lake Eutrophic, Algae, Ammonia and Odors (Nutrient) TMDL, Attachment A to Resolution No. R08-006, May 1, 2008.

<sup>11</sup> Kluesener, J. "Nutrient Transport and Transformation in Lake Wingra, Madison." Report Water Chemistry Program, University of Wisconsin, Madison. 1971

- Homeowners
- Landscape/Garden Maintenance Firms
- Municipal Landscape Maintenance Activities
- Garden Clubs
- Homeowners Associations
- Landscape Designers
- Commercial Property Management Companies
- Schools & institutions:
  - Palos Verdes Unified School District (PVPUSD) Maintenance
  - Private schools and preschools
  - Churches

### **Phase 1**

During Phase One of the Fertilizer Outreach Program, the Peninsula cities intend to utilize existing outreach materials, workshops and community programs. During this Phase the Peninsula cities will review previously developed outreach materials and work to enhance outreach materials as necessary. In addition, the cities intend to work more closely with community groups and businesses to reach target audiences. The following is a summary of existing programs:

#### **1. Landscaping and Gardening workshops**

- a. The Los Angeles County Smart Gardening Program- Los Angeles County started the Smart Gardening Program in 1994 as a tool to help divert green waste from local landfills. Today, the program hosts a number of Smart Gardening workshops throughout the County including a number of workshops within the Machado Lake Watershed. In addition to these workshops, Smart Gardening information is also available through the LA County Smart Gardening website-[www.smartgarden.com](http://www.smartgarden.com). Information provided includes:
  - Grass Recycling
  - Water Wise Gardening
  - Backyard Composting
  - Native Drought Tolerant Plants
  - Instructional Videos
- b. South Cost Botanic Garden- The Botanic Gardens located on the Palos Verdes Peninsula features Water Wise, Cactus, and Mediterranean Gardens. The Botanic Gardens hosts a number of workshops and guest speakers that focus on Smart Gardening principles and water conservation.
- c. Surfrider Ocean Friendly Garden Workshops – The Surfrider Foundation hosts a number of regular classes featuring basic Ocean Friendly Garden (OFG) principles, which include the following:
  - Understanding the Watershed
  - Creating Healthy Soil
  - Capturing and Using Rain Water
  - Using Native and Climate Appropriate Plants



- d. South Bay Environmental Services Center/West Basin- feature Water Conservation Workshops, Home Energy and Water Surveys and offer Water Conservation Landscape rebates.
2. Traditionally the Peninsula cities sponsor joint newspaper advertisements in Palos Verdes Peninsula News as part of Municipal Stormwater Permit Public Outreach program. As part of this effort, the Peninsula cities will—consider whether to use the series of photos from Puget Sound series or other design concepts and whether to alternate fertilizer outreach with pet waste outreach in the ads and/or other materials developed to address nutrient pollution.
3. Direct outreach via community events:
  - a. Earth Day at Promenade (RHE/RH)
  - b. RHE City Celebration
  - c. RPV Community Events
  - d. PVE Beach Clean-up Day

## **Phase 2**

The second phase of the Fertilizer Outreach program will require additional lead-time to develop and implement. The Peninsula cities intend to utilize data collected during Phase 1 to direct program enhancements. Below are additional outreach activities that will be considered for incorporation into the program:

1. The Peninsula cities will consider sponsoring Public Service Announcements on RPV-TV.
2. Enhance individual city web pages to include Smart Gardening and Ocean Friendly Gardening tips and links to websites.
3. Joint Website for Peninsula Cities Outreach possibly through featuring content developed by local high school students.
4. Host Gardener/Landscape firm workshops, focusing on:
  - a. Soil testing
  - b. Fertilizer application
  - c. Plant selection- drought tolerant plant selection
  - d. Irrigation system design, water efficient systems
  - e. General Storm Water pollution prevention best management practices
5. Develop a map of “driving tour of model landscapes” including native plant gardens and model landscaped areas on Peninsula.
  - a. George F Canyon
  - b. RPV median at Golden Cove
  - c. Palos Verdes Estates City Hall and medians

## **Phase 3**

Phase 3 program enhancements will be developed following the review of the first 4-5 years of monitoring and Phase 1 and Phase 2 program activities. The third phase of outreach activities will be developed in conjunction with on-going source reduction projects undertaken by individual cities.

## **EQUESTRIAN ACTIVITIES OUTREACH**

As described in Section 3, the estimated amount of total nitrogen and phosphorus produced by large animals (horses and cattle) within the incorporated cities of the Peninsula Machado Lake subwatershed is

estimated to be 66,300 pounds per year of total nitrogen and 12,215 pounds per year of total phosphorous, placing it within the top three most significant sources of nitrogen identified within the watershed and within the top two sources of phosphorous. Source control through the implementation of best management practices has the potential to mitigate a majority of the equestrian source load of nitrogen and phosphorous. Such a level of control was observed in a study of cattle feedlot runoff discussed in an article from University of Nebraska wherein it is stated that runoff from cattle feedlots was less than 5% of excreted phosphorous<sup>12</sup>. In order to achieve such control an effective and comprehensive program of outreach to the equestrian community is necessary since approximately half of the horses kept in areas tributary to Machado Lake are on private residential properties.

### ***Outreach Message and Target Audiences***

Public outreach and education to the equestrian community will focus on the following best management practices:

1. Proper manure management: collection, storage, handling and recycling or composting.
2. Zero discharge from horse wash racks—reuse in landscape irrigation or cover and divert to sewer.
3. Equestrian facility drainage design and/or retrofit to divert run on/runoff away from horsekeeping and manure storage areas.
4. Design or retrofit horsekeeping areas with vegetated buffers and/or bioswales to filter runoff.

A variety of equestrian organizations exist on the Palos Verdes Peninsula. These organizations represent both target audiences and a means for the distribution of educational information and materials and include:

- Rolling Hills Estates Equestrian Committee
- Rancho Palos Verdes Equestrian Committee
- Los Caballeros
- Palos Verdes Horsemen's Association
- Palos Verdes Pony Club
- Palos Verdes Peninsula High School Equestrian Team
- Palos Verdes High School Equestrian Team Pony camps operated at the Peter Weber Equestrian Center and the Palos Verdes Stables provide an opportunity to educate young equestrians in the making, as well as their parents. Trainers and stable operators are also a key audience as well as a means for delivering educational information.

### ***Phase I***

During Phase I the Peninsula cities will develop contacts with and outreach to the various equestrian organizations on the Peninsula to identify the best means to disseminate information to their members regarding equestrian BMPs. These means may include providing articles for newsletters, distributing information via email blasts, or providing speakers at meetings.

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<sup>12</sup> Bremer, Buckner, Erickson and Klopfenstein, 2008. Total and Water Soluble Phosphorus Content of Feedlot Cattle Feces and Manure. Animal Science Department, Nebraska Beef Cattle Reports, University of Nebraska - Lincoln.

The Peninsula cities have already developed some equestrian outreach materials and venues that can be adapted and implemented by the group as a whole. Existing materials and venues include:

- **Equestrian BMPs Brochures and Fliers:** The cities have developed brochures which discuss stormwater pollution prevention BMPs for equestrian facilities including manure management, facilities design, and integrated pest management. County of Los Angeles has a one-page flier on BMPs for stable facilities in English and Spanish.
- **Equestrian BMPs website material:** A horse keeping practices web page covers more detailed information than the equestrian brochures and also provides links to additional information.
- **Direct Outreach:** for the past ten years environmental outreach to the equestrian community has been conducted at the annual Rolling Hills Estates City Celebration which is a community and equestrian event open to the public held at the Empty Saddle Club. The event centers on equestrian activities with riding demonstrations and competitions along with community outreach booths. The event draws participants from across the Peninsula and beyond. An environmental booth using the Enviroscope model and youth volunteers from 4-H or Girl Scouts provide hands-on demonstrations of pollution prevention. The Equestrian BMPs brochure is distributed along with other environmental informational materials. This venue will continue to provide an opportunity to distribute new materials and information to the equestrian community.

#### List of Plants for Canyon Buffers

Stable facilities on private residential properties are often sited adjacent to canyons as this often affords ready access to the network of equestrian trails and also may be necessary to meet zoning and building standards for setback from residential dwellings. Native plant buffers that are fire-resistant can be used as part of low impact development techniques to prevent and control soil erosion and the discharge of nutrient-bearing sediment from horse keeping facilities into natural canyons. In response to the Palos Verdes fires of 2009, the City of Rolling Hills has developed a list of plants and outreach materials that are suitable for slope stabilization, are fire safe, and drought tolerant. These materials will be adapted to eliminate plants which may not be horse-safe and then disseminated to developers and the public for use in establishing fire-safe horse-safe buffers.

#### **Phase 2**

During Phase II the Peninsula cities will develop and disseminate information regarding equestrian BMPs that are specifically adapted for the target audiences and means of delivery identified in Phase I. These may include writing articles for newsletters, email blasts, or providing speakers at meetings. For youth groups, such as the Pony Club or equestrian teams, this may include assistance in the delivery of hands on activities or other sorts of educational materials incorporated into regular curriculum.

#### Develop Materials for Use in Pony Camps

Educational materials for environmentally sustainable horse-keeping practices will be developed for incorporation into the educational curriculum of pony camps. The two municipal stables on the Peninsula host regularly scheduled pony camps open to the community at large. These camps provide an opportunity not only to reach budding young equestrians, but also their parents. The pony camp at the Peter Weber Equestrian Center, alone, draws approximately 250 participants per year.

### Water Quality Guidelines for Stable Design

Guidelines for the development of new stable facilities and retrofitting existing stable facilities are needed in order to establish design expectations for water quality mitigation of equestrian facilities for distribution to the equestrian community, residential developers and municipal planning staff . A collaborative process will be initiated and implemented to develop design guidelines to be utilized throughout the Palos Verdes Peninsula in the siting and design of stable facilities on residential property. This process will involve:

- Assembling a representative set of such materials developed in other areas of California and the nation
- Establishing a group of stakeholders to be involved in the development and review of the guidelines, including: municipal planning staff, the Palos Verdes Horsemen's Association, Municipal Equestrian Committees, and other interested parties
- Identifying the objectives of such materials in terms of both water quality and related environmental issues such as water conservation, dust and erosion control, odor control, and integrated pest management for vector control.

### Model Equestrian Center

The Model Equestrian Center project proposes to create an educational demonstration site for the equestrian community regarding environmentally optimal design features and management techniques such as: site design, manure management, water conservation, mud and dust control, integrated pest management and the creation of equine-safe native habitat buffers. No such facility is currently available in the south Santa Monica Bay. The project is dependent on anticipated grant funding and is part of a thirteen-project grant proposal submitted by the Greater Los Angeles County Region to the California Department of Water Resources in January 2011 under the Prop 84 IRWMP Implementation Grant Program.

The first part of the project will utilize the proposed construction of a new 15,000 square-foot barn and associated improvements on a portion of the existing Peter Weber Equestrian Center to demonstrate how a new facility can be designed to minimize water quality impacts. Key water quality features of the new portion of the project will include a covered horse wash area with the wash water diverted to the sanitary sewer or alternatively wash water may be captured and reused for dust control in arenas or for subsurface irrigation to maintain appearance of habitat buffers and treatment bioswales. A cistern or rainbarrels are proposed to collect rainfall from the barn roof for use in dust control. In addition, the facility will utilize Low Impact Development (LID) and green building techniques, integrated pest management, and equine-safe native and drought-proof plant buffers. The second part of this project will involve retrofitting the remaining areas of the existing facility to improve drainage and stormwater runoff quality. These retrofits may include downspout redirection, drainage correction, installation of a bioswale or similar water quality treatment system, and drainage improvements for the riding arenas.

To fulfill its role as a model equestrian center for outreach to the equestrian community, the project will need to demonstrate and interpret BMPs targeting typical pollutants in runoff from residential stables: nutrients, bacteria and pathogens in manure, urine and bedding material; dust and sediment from stalls and corrals; and pesticides from vector control. Both parts of the project, the new facility and the retrofit, should demonstrate best management practices (BMPs) that can be replicated at private stables.

Interpretive signage will be installed to educate horse boarders and visitors on the specific BMPs integrated into the facilities and on the site.

### **Phase 3**

Phase 3 Equestrian Outreach Activities will be developed to work hand-in-hand with Phase 3 Source Reduction Projects. These may include:

- Providing tours of the RHE Model Equestrian Center (once complete) to equestrian groups
- Outreach to the equestrian community at national and local horse shows held on the Palos Verdes Peninsula. This will involve identifying which shows include the greatest involvement from local equestrians, and what is the most effective means of outreach via the shows.

## **AIR DEPOSITION OUTREACH ACTIVITIES**

As mentioned in Section 3, atmospheric deposition is a significant source of nitrogen to the Peninsula Machado Lake subwatershed. The Peninsula cities estimate a total load of 51,514 pounds of nitrogen per year from this source. The majority of this source is generated from mobile sources. The Peninsula cities have little control over emissions generated by mobile or stationary sources of nitrogen oxide air emissions, therefore, the control of nutrients introduced to the watershed through atmospheric deposition is a significant challenge for municipalities. In order to address this significant source, the Peninsula cities plan to implement a joint source control campaign targeting significant nutrient sources through existing and improved non-structural BMP programs.

### **Outreach Message and Target Audiences**

In order to control the discharge of nitrogen associated with atmospheric deposition, the public outreach campaign will focus on the following messages:

- The consumption of fossil fuel is a major source of nitrogen emissions to the atmosphere<sup>13</sup>. The burning of fossil fuel contributes to water pollution when air pollution settles on roads, roofs, sidewalks, and other impervious surfaces and is washed into storm drains when it rains.
- Reduce fossil fuel consumption by walking, riding a bike and using public transportation when possible.
- Carpooling and using hybrid vehicles are great ways to cut down on fossil fuel consumption.
- A vehicle idling for just 10 minutes a day burns more than 25 gallons of fossil fuel a year. If you are going to be idle for more than 30 seconds, EPA recommends turning off your vehicle to save on gas and protect the environment<sup>14</sup>.
- Follow your car's manufacturer recommended maintenance guidelines to enhance its performance and reduce emissions.
- Low impact development, where feasible, can reduce runoff of aerally deposited pollution from impervious surfaces such as residential roofs and patios.

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<sup>13</sup> Information retrieved from [http://www.aqmd.gov/smog/historical/smog\\_and\\_health.htm](http://www.aqmd.gov/smog/historical/smog_and_health.htm) on December 17, 2010.

<sup>14</sup> Retrieved from <http://www.epa.gov/oms/consumer/18-youdo.pdf> January 31, 2011.

In order to maximize the effectiveness of the outreach messages, target audiences will be identified during Phase 1 of this plan. Auto related businesses and organizations as well as residential community groups will provide a forum for defining and addressing the target audience.

The campaign will be implemented in three phases outlined below.

### **Phase 1**

The first phase of the atmospheric deposition outreach campaign will utilize existing opportunities to disseminate the campaign message. During this phase, the Peninsula cities will also explore further opportunities to reach the target audience. This phase may include cultivating relationships with auto related businesses to identify target audiences that may not be addressed through the current outreach efforts. The following summary discusses existing programs and identifies future enhancements that will be considered.

#### Community Events

Many community events take place on the Palos Verdes Peninsula. Some of these events are currently being utilized to disseminate information about stormwater pollution and urban runoff. During Phase 1 further opportunities for participation in community events will be identified. The information discussed and printed on distributed materials can also be adapted by the cities to include information on energy efficiency. Below is a description of the current community events being utilized.

- The annual Earth Day Event at the Peninsula Shopping Center uses the Enviroscape model to teach children about watersheds and stormwater pollution. Tip cards, tri-fold brochures, and other outreach materials are distributed at this event.
- The annual Palos Verdes Street Fair offers an opportunity for the Peninsula cities to disseminate outreach information and materials. During Phase 1, the cities will explore opportunities to disseminate outreach materials at this event.
- The cities will also coordinate with Southern California Edison to assess the feasibility of inviting their participation in community events.
- The Peninsula currently hosts an annual Concours de Elegance car show and the cities contribute a joint advertisement in the event program which focuses on used oil recycling and pollution prevention. This ad can be updated during Phase 2 to include information on alternative transportation options.

#### Outreach Materials

The Peninsula cities have already developed stormwater outreach materials in compliance with their MS4 permit public outreach requirements. During Phase 1, materials which can be adapted to include the outreach message will be identified. Existing materials and methods of distribution are described below.

- The Palos Verdes Peninsula Newspaper currently runs numerous articles and editorials related to water quality and stormwater pollution prevention. Future ads can be updated to address fossil fuel consumption.
- Each of the four Peninsula cities features stormwater related content on its website. This information can be updated to promote energy efficiency.

- Each city on the Peninsula currently sends out a newsletter to residents featuring environmental issues of concern. Such topics as recycling and solid waste collection, proper pool maintenance, household hazardous waste and electronic waste collection events, and used oil recycling are discussed. Future newsletters can feature information on energy efficiency and low impact development.
- The cities can explore the feasibility of working with the non-profit Norris Theater on the Peninsula to include an environmental ad in its theatrical programs. This ad can focus on topics such as alternative methods of transportation, energy efficiency and other environmental messages. This ad may target those residents who service their vehicles outside of the Peninsula and may not be reached through traditional outreach efforts.
- The Palos Verdes Chamber of Commerce currently encourages the support of local businesses through its website. This site can be upgraded to include additional environmental incentives for shopping, dining, and thinking locally.

#### Other Efforts

- The Palos Verdes Transit serves as a bus service for residents including middle and high school students and is partly funded by the four Peninsula cities. This service also offers its Dial-a-Ride program which provides transportation to elderly residents to medical facilities outside of the Peninsula for a small fee.
- The South Bay Environmental Center currently provides outreach on energy efficiency, water conservation and other environmental issues to many local businesses on the Peninsula. This program can be expanded to include all businesses in the future.
- The feasibility of developing a program in coordination with the water company on the Peninsula to upgrade appliances in Palos Verdes schools and provide energy efficiency and water conservation will be assessed.
- The Peninsula cities will develop the framework for a Peninsula-specific Low Impact Development (LID) Guidelines.

#### **Phase 2**

The second phase of outreach will require more coordination and time to implement. In addition to enhancing the existing programs described above, the activities described below can be developed to reach target audiences identified during Phase 1.

#### Community Events

- The cities will work with the farmers market on the Peninsula to distribute outreach materials at its weekly event. These materials can encourage attendants to shop, dine, and think locally to reduce fossil fuel consumption.

#### Outreach Materials

- Information encouraging residents to redirect downspouts and direct runoff to pervious surfaces can be developed and distributed at the Smart Gardening workshops which are hosted by LA County.

- The cities will work jointly with the Palos Verdes Peninsula School District to implement a K-12 outreach program during Phase 2. K-12 outreach implemented jointly in partnership with Peninsula schools could provide opportunities to coordinate with educators to include stormwater related content in their curriculums as well as presentation opportunities utilizing the Envrioscape model.
- The four Peninsula cities will develop a joint public service announcement on RPV-TV. This PSA can encourage the use of public transportation, walking and biking, as well as broadcast information on energy efficiency.
- The Peninsula will explore the feasibility of developing a Peninsula-wide trail map with pet related information in partnership with the Palos Verdes Land Conservancy.
- Point of Purchase outreach will be implemented at all auto service facilities on the Peninsula. These facilities could provide customers with outreach materials touting the environmental benefits of regular car maintenance.
- The advertisement in the Concours de Elegance car show program will be adapted to include information on alternative transportation options on the Peninsula and good automobile maintenance.

#### Other Programs

- During Phase 2, the cities will work with Southern California Edison's Direct Install program to assess qualified small businesses for free energy efficiency upgrades.
- The cities will implement programs to encourage LID and publicize information regarding new LID guidelines. City Planning and Development departments, Smart Gardening workshops, and HOA presentations may be some forums for disseminating this information to residents.

#### **Phase 3**

Phase 3 of the joint outreach campaign will be developed after the first 4-5 years of monitoring. Based on the results of monitoring and evaluation of Phase 1 and 2 activities, the third phase will determine whether, and to what extent, further outreach activities need to be implemented. These activities will be developed in conjunction with source reduction projects implemented by the cities and may include the following:

- The Peninsula cities may encourage new LID guidelines through the development and adoption of environmental ordinances which would provide incentives to developers and homeowners for green building practices.

#### **PET WASTE OUTREACH ACTIVITIES**

As discussed in Section 3, pet waste contributes an estimated 4,815 pounds of nitrogen and 127 pounds of phosphorus to the Peninsula Machado Lake subwatershed each year. The assumed inputs of nitrogen and phosphorus attributed to pet waste are relatively insignificant sources of nutrients in the watershed. However, taking into account the cumulative load from all sources, the Peninsula cities thought it prudent to implement source control Best Management Practices (BMPs) to address this source.



### **Outreach Message and Target Audiences**

In order to control the discharge of nitrogen and phosphorus associated with pet waste, a public outreach campaign will be targeted at pet owners on the Peninsula and will focus on the following messages:

- Leaving pet waste on the ground is littering and can be punishable by fines
- Pick up after your pet and put the waste into a trash receptacle and/or flush it down the toilet (without the bag of course)
- When walking pets, encourage elimination on pervious surfaces or vegetation where it can soak in and be utilized by plants as fertilizer
- Always obey leash laws to ensure elimination occurs where it can be easily cleaned up

The campaign will be implemented in three phases outlined below.

#### **Phase 1**

The first phase of the pet waste outreach campaign will utilize existing opportunities to disseminate the campaign message. During this phase, the Peninsula cities will also explore previously untapped opportunities to reach the pet owner community. This phase may include cultivating relationships with pet related businesses to identify target audiences that may not be addressed through the current outreach efforts. The following summary discusses existing programs and identifies future enhancements that will be considered.

#### Community Events

Many community events take place on the Palos Verdes Peninsula. Some of these events are currently being utilized to disseminate information about stormwater pollution and urban runoff. During Phase 1 further opportunities for participation in community events will be identified and explored. Below is a description of the current community events being utilized.

- The annual Earth Day Event at the Peninsula Shopping Center uses the enviroscape model to teach children about watersheds and stormwater pollution. Tip cards, brochures, and biodegradable dog waste bags are distributed at this event as well.
- The annual Palos Verdes Street Fair offers an opportunity for the Peninsula cities to disseminate outreach information and materials. During Phase 1, the cities will explore opportunities to disseminate pet waste outreach materials at this event.

#### Outreach Materials

The Peninsula cities have already developed pet related materials in compliance with their MS4 permit public outreach requirements. These materials can be adapted and implemented by the group in a consistent manner to increase the effectiveness of the message. Existing materials and their methods of distribution are described below.

- Pet waste tri-fold brochures, tip cards and biodegradable doggie bags are currently distributed to many pet related business on the Peninsula annually. During Phase 1, businesses that are not currently targeted will be identified for inclusion in the program.

- The Palos Verdes Peninsula Newspaper currently runs numerous jointly developed articles and editorials related to water quality and stormwater pollution prevention. During Phase 1, ads can be updated to address pet waste concerns.
- Each of the four Peninsula cities features stormwater related content on its website. During Phase 1 the cities will discuss the possibility of developing a joint ad to run on palosverdes.com, the Peninsula cities' joint website.
- Each city on the Peninsula sends out a newsletter to its respective residents featuring environmental issues of concern. Such topics as recycling and solid waste collection, proper pool maintenance, household hazardous waste and electronic waste collection events, and used oil recycling are discussed. During Phase 1, outreach materials featuring information on proper pet waste disposal can be circulated in the newsletters.

## **Phase 2**

The second phase of outreach will require more coordination and time to implement. In addition to enhancing the existing programs described above, the activities described below can be developed to reach target audiences identified during Phase 1.

### Community Events

During Phase 2, the Peninsula cities will adapt existing and develop new materials for dissemination at community events identified in Phase 1. Below is a description of some areas that will be explored for addition.

- The cities can explore the feasibility of working with the non-profit Norris Theater on the Peninsula to include an environmental ad in its theatrical programs. This ad can focus on topics such as pet waste concerns as well as other environmental messages. This ad will target audiences that may not shop for pet related items on the Peninsula as well as elderly populations who may not do their own shopping.
- The cities can work with the farmers market on the Peninsula to distribute outreach materials at its weekly event. These materials can encourage attendants to pick up after pets, carry biodegradable dog bags, and encourage elimination on pervious surfaces. This will provide an opportunity to target residents who do not shop for pet related items on the Peninsula.
- Regular pet adoption events at parks and pet stores on the Peninsula could provide educational opportunities which will target new pet owners.

### Outreach Materials

- The cities will work jointly with the Palos Verdes Peninsula School District to implement a K-12 outreach program during Phase 2. K-12 outreach implemented jointly in partnership with Peninsula schools could provide opportunities to coordinate with educators to include stormwater related content in their curriculums as well as presentation opportunities utilizing the Envrioscape model. This would provide an opportunity to target children and teenagers who may not shop for pet related items yet are active in the care of these animals.
- Outreach targeting middle and high school clubs and Scout troops could disseminate pet waste information and train these young men and women to be environmental leaders. This would provide an opportunity to target children and teenagers who may not shop for pet related items yet are active in the care of these animals.

- A joint public service announcement will be developed for airing on RPV-TV during Phase 2.
- The four Peninsula cities will develop a joint ad for inclusion in the current Palos Verdes on the Net website (palosverdes.com). This ad will provide stormwater related information and links to other environmental information on the web.
- The Peninsula will explore the feasibility of developing a Peninsula-wide trail map with pet related information in partnership with the Palos Verdes Land Conservancy.

### **Phase 3**

Phase 3 of the joint outreach campaign will be developed after the first 4-5 years of monitoring. Based on the results of monitoring and evaluation of Phase 1 and 2 activities, the third phase will determine whether, and to what extent, further outreach activities need to be implemented. These activities will be developed in conjunction with source reduction projects implemented by the cities. Some preliminary activities for consideration may include the following:

- Additional signage may be developed for new pet waste stations which will be installed in high traffic areas.
- Outreach information targeted at residents to inform them of new ordinances initiating fines for improper pet waste disposal will be developed and disseminated.

## 5. ROLLING HILLS ESTATES SOURCE REDUCTION PROJECTS

The City of Rolling Hills Estates is a small city of approximately 8,000 residents with a small full-time staff. The City, which is located on the Palos Verdes Peninsula in southwest Los Angeles County, encompasses 4.2 square miles of predominantly residential land use with a modest central commercial district, and no industrial zoning. There are approximately 8,000 residents and a significant amount of dedicated open space including six parks, 25 miles of trails and much natural drainage in the form of soft bottom canyons. The City of Rolling Hills Estates is a pristine community with strong policies and ordinances that mandate clean streets, residences, and commercial areas.

### FERTILIZER AND LANDSCAPE DEBRIS

The City of Rolling Hills Estates is dedicated to preserving open space, public trails and native habitat and the community has a high level of environmental awareness. The City along with the rest of the Palos Verdes Peninsula is verdant with a significant tree canopy. The City has dedicated the George F Canyon Nature Center and Stein-Hale Nature Trail as a riparian preserve for public enjoyment with both passive and active education programs. The City has partnered with the Palos Verdes Peninsula Land Conservancy in the preservation and restoration of coastal sage habitat and the endangered Palos Verdes Blue Butterfly at the Linden S. Chandler Preserve and at George F Canyon Nature Preserve.

#### ***Phase 1 Fertilizer and Landscape Source Reduction Projects***

The following Source Reduction Projects have either already been implemented or can be implemented with little lead time to effect immediate reductions in nutrient loading to Machado Lake.

#### Institutional Controls

- The City contracts for street sweeping at least twice per month throughout the entire city. This serves to remove leaves and landscape debris. Street sweeping has been demonstrated to be an effective means of reducing nutrient loading in runoff, and is particularly effective for reducing phosphorus loading<sup>15</sup>. The prompt removal of accumulated leaves and landscape debris serves to minimize the potential for leaching of nitrogen and phosphorus from accumulated vegetation by runoff which can mobilize the nitrogen and phosphorus contained in leaves and grass clippings.
- Street trees are pruned on a 4- or 5-year cycle, however more frequent pruning occurs in areas where view preservation is at issue. Pruning of street trees reduces the amount of leaf litter which accumulates along the curb-and-gutter and in catch basins and thus the associated leaching of nitrogen and phosphorus in runoff.
- Unlimited curbside green waste collection is provided to residents at no extra charge through the solid waste franchise contract.
- Maintenance practices with respect to fertilizer application practices on parks and ball fields will be reviewed to identify and implement appropriate modifications in the application rates, frequency, timing or type of fertilizer applied to minimize nutrient loading to Machado Lake. Particular attention will be given to limiting phosphorus application on turf except when new turf is being established or unless soil testing indicates the need.

<sup>15</sup> C.J. Rosen and B.P. Horgan, University of Minnesota, 2010. Preventing Pollution Problems from Lawn and Garden Fertilizers.

- City contracts for landscape maintenance will be reviewed to identify and implement appropriate modifications in the application rates, frequency, timing or type of fertilizer applied to achieve reductions in nutrient loading to Machado Lake. Particular attention will be given to limiting phosphorus application.
- During fiscal year 2011-12 the City plans to install certified full capture catch basin inserts for trash in high priority areas including the downtown commercial area. Depending on available fiscal resources, the City may also equip these catch basins with automatic retractable screens (ARS) units across the catch basin openings, which will have the added benefit of excluding leaves and landscape debris from being pushed into catch basins during street sweeping allowing for more thorough removal and preventing the accumulation of leaves and debris as well as trash in catch basins where nitrogen and phosphorus can be leached by runoff.

#### New Development/Redevelopment

In 2010 the City adopted a local water efficient landscape ordinance and guidelines consistent with the State's model ordinance applicable to all new or altered developments with proposed new or altered landscapes of 5,000 square feet or more that are subject to discretionary review by the City. As properties are redeveloped, this ordinance will serve to reduce the area of landscaped areas in turf and ornamental landscaping as well as the amount of dry weather runoff, thereby reducing water quality impacts from fertilizer application. Among the many provisions of the ordinance are the following measures which will limit nutrient loads in runoff from landscaped areas:

- Turf and non-water wise plants are limited to less than 40% of landscaped areas
- Turf is not to be used on slopes of 20% or greater
- Narrow landscaped areas less than 8 feet in width must be irrigated with subsurface or low volume irrigation systems
- Overhead spray irrigation is not permitted within 24 inches of impermeable surfaces
- Landscaped areas are required to be mulched to a depth of three inches
- Irrigations systems must be designed to minimize overspray and runoff and must utilize weather-based irrigation control systems with automatic rain shutoff sensors

The City will assess the effectiveness of this ordinance by tracking the number of new and redeveloped landscapes that are subject to the ordinance and the square footage of high water landscape areas installed in these landscapes.

#### Illicit Discharges in Existing Developments

The City has adopted a water conservation ordinance applicable to existing and new development of all land use types. The anti-waste provisions of this ordinance not only conserve water but also reduce dry weather runoff from landscapes where fertilizer has been applied, for example:

- Leaks, breaks and malfunctions must be repaired upon discovery and no later than 72 hours from notification
- Residential car washing is prohibited unless a hose with a positive action quick release shutoff valve or nozzle is utilized.
- Excessive watering of lawns and landscapes and runoff of lawns or landscape areas onto gutters, streets and alleys is not permitted.

Reduction in dry weather runoff will reduce the leaching of nitrogen and phosphorus from leaf litter accumulated in catch basins or along curb-and-gutters as well as the transport of fertilizer from excessive application.

The City will develop and implement a public outreach plan to better inform residents and businesses of the requirements of the water conservation ordinance.

### ***Phase 2 Fertilizer and Landscape Source Reduction Projects***

Phase II source reduction projects will be implemented following completion of Phase I source reduction projects in accordance with the schedule shown in Table 3-1.

#### Institutional Controls

The City will conduct a field review of City-maintained landscaped areas and develop a prioritized list of areas for retrofit consistent with the water-efficient landscape ordinance. Subject to funding availability, the City will undertake one landscape retrofit project to minimize nutrient loading in dry weather and wet weather runoff consistent with City's water efficient landscape ordinance.

#### Illicit Discharges in Existing Development

Following the implementation during Phase I of a public outreach plan to inform residents and business of the requirements of the water conservation ordinance, City staff will develop and implement an enforcement policy for the water conservation ordinance.

### ***Phase 3 Fertilizer and Landscape Source Reduction Projects***

Based on results of the nutrient monitoring evaluated in comparison with the interim and final TMDL targets, additional source reduction projects will be developed if needed to reduce nutrient loading associated with landscaped areas. Among the measures that may be considered for Phase III are:

- Adoption of an ordinance addressing the proper use of fertilizers in conjunction with a fertilizer application training program for residents and landscape companies
- Evaluate whether increasing street sweeping frequency either throughout the entire city or in specific areas will result in a net decrease in nutrient concentrations in runoff when balanced against the environmental impacts of additional greenhouse gas emissions and noise associated with operation of street sweepers .
- Installing additional screens over catch basin openings in areas where significant quantities of leaves are observed to accumulate in catch basins as a means of increasing the effectiveness of street sweeping in removing fallen leaves and reducing nutrient loading. This measure will be considered as part of compliance measures being implemented for the Machado Lake Trash TMDL.

As funds become available, implement additional landscape retrofit plans for parks or other City-maintained landscaping areas to minimize nutrient loading and to be consistent with water efficient landscape ordinance.

## EQUESTRIAN ACTIVITIES

Although it is generally accepted among the equestrian community that the number of horses kept on the Palos Verdes Peninsula has been declining in recent years, there is no requirement for licensing or registering horses in any of the Peninsula cities, so official information is not available. The Community Emergency Response Team (CERT) on the Palos Verdes Peninsula has performed an informal voluntary survey and prepared a map of horse keeping locations to assist emergency responders in the event of a natural disaster. The CERT map is the best information currently available regarding the numbers and locations of horses on the Palos Verdes Peninsula.

Horses are kept in the City of Rolling Hills Estates at one of three types of facilities: at the public Peter Weber Equestrian Center operated by the City of Rolling Hills Estates, at privately operated stable facilities, or on single-family residential properties within the Equestrian overlay area. The Peter Weber Equestrian Center has a capacity for 116 horses but is operating at somewhat less than capacity. The Sea Horse Riding Club has a capacity for approximately 50 horses. The Empty Saddle Club has the capacity for approximately 75 horses and also maintains approximately 60 cattle for roping and western riding practice. Based on CERT map, it appears that approximately 220 horses are kept on single family residential properties in equestrian overlay areas in the City tributary to Machado Lake. In summary, it is estimated that there are approximately 410 horses and 60 cattle within the City of Rolling Hills Estates drainage area to Machado Lake.

### ***Phase 1 Horse Keeping Source Reduction Projects***

The following Source Reduction Projects have either already been implemented or can be implemented with little lead time to effect immediate reductions in nutrient loading to Machado Lake.

#### Manure Management

Rolling Hills Estates requires by City ordinance that manure be stored in an enclosed container designed for such purpose and that manure that is not used for composting must be removed completely from individual properties at least once per week. The City offers manure collection and recycling service through its franchise hauler to residents that keep horses. The City has been tracking manure hauling records through the franchise hauler for several years and has been gratified that despite the flat or declining number of horses, manure hauling rates have increased by 38% since FY2006-07 due to outreach efforts. The City's contract for manure hauling specifies that manure must be taken to facilities that will compost 100% of the manure and provide documentation for AB 939 reporting.

The City's BMP brochure for the Equestrian Community includes information on the City's manure management requirements. This brochure is distributed at public events, at the public counter and City field personnel carry them with them to distribute as appropriate. The City's zoning and code administrator responds promptly to complaints from residents or maintenance staff regarding any illegal management of manure by residents.

#### Institutional Controls

At the City's own municipal Peter Weber Equestrian Center, the stalls, arenas and walkways are cleaned on a daily basis and manure is hauled away for offsite composting every other day--this is an aggressive manure management practice that is optimal for water quality protection as well as integrated pest management of flies thereby minimizing the need for chemical control. City ordinance requires that manure be composted or hauled away weekly, so by going above and beyond the

minimum standard at its own municipal stables, the City has leverage in enforcing the weekly minimum at private stables. Horse wash racks are diverted to the sanitary sewer and there is zero dry weather runoff from the facility.

The City maintains over 25 miles of scenic bridle trails that are open to the public and accessible to the equestrian community, both residents and non-residents of the City alike. Bridle trails are mulched with wood chips for dust control and as a best management practice to prevent erosion and control sediment in stormwater runoff.

#### Public Health Licenses

Los Angeles County Department of Public Health requires a license for any property with 5 or more horses, or a facility with 10 or more of a mixture of livestock (e.g., goats, chickens, etc). These facilities are inspected every six months by a Registered Environmental Health Specialist. If such facilities are proposed as part of a new development or redevelopment project, such a license must be obtained prior to issuing a grading or building permit. The Public Health License requires that manure be removed from the premises at least once per week and that pens and stalls are cleaned daily, which is also what the City's code requires of all properties that keep horses of any number.

#### Stable Design

Information on the design of stables to minimize stormwater pollution is provided on the City's website through links on the equestrian page and the "Taking the Greener Path" page.

#### Illicit Discharges in Existing Development

The City will implement the following additional Phase I source reduction measures to assess the effectiveness of current nutrient management practices associated with horse keeping:

- Begin inspecting privately operated stables with more than four horses for compliance with city manure management ordinance and proper equestrian BMPs
- Continue to enforce manure ordinance in response to complaints and City staff observations
- Continue to monitor manure hauling records to track manure recycling offsite through its franchise hauler and to assess the effectiveness of the joint outreach program in encouraging residents to manage manure in accordance with best management practices.

#### ***Phase 2 Horse Keeping Source Reduction Projects***

Based on results of first two years of monitoring and manure hauling records as well as any source tracking studies, the City will develop additional source reductions projects to address equestrian sources. Some of the Phase II source reduction projects that are envisioned are described below.

#### Manure Management

City staff will work with its franchise hauler and the equestrian community to identify and address barriers that need to be overcome to encourage offsite hauling/recycling of manure from private properties keeping horses.



### Institutional Controls

Provided that the Los Angeles Integrated Regional Water Management Planning group is successful in securing Round 2 Prop 84 IRWMP Implementation funding, the City of Rolling Hills Estates' Model Equestrian Center project will be able to retrofit the existing municipal Peter Weber Equestrian Center to create a public demonstration site for environmentally sustainable horse-keeping practices while improving the quality of storm water runoff from the facility. The existing Peter Weber Equestrian Center facilities will be retrofitted to improve drainage and stormwater runoff quality by redirecting downspouts, correcting drainage from existing horse stalls, installing bioswales or similar water quality treatment systems.

A new 15,000 square-foot barn and associated improvements will be constructed on the 2.5 acre northwest portion of the site as a model for how new facilities should be designed. Key water quality features will include: a covered horse wash area with wash water captured and reused for dust control in arenas and/or subsurface irrigation to maintain appearance of habitat buffers and treatment bioswales, and a cistern or rainbarrels to collect rainfall from the barn roof for beneficial use. In addition, the facility will utilize Low Impact Development (LID) and green building techniques such as integrated pest management through structural design, and equine-safe native and drought-proof plant buffers. The project goals include:

- Beneficial use of rainfall and reduction in stormwater runoff.
- Improve water quality of stormwater runoff from equestrian activity in support of water quality objectives.
- Reduce reliance on imported water by harvesting rainwater and reusing wash water for irrigation.
- Maintain open space and use native plants for landscaping and as buffers.
- Increase watershed friendly recreational space for the community.

A project effectiveness assessment and evaluation plan will be developed with grant funding to measure the water quality improvements achieved by the project and will inform this implementation plan in evaluating the extent to which an optimally designed new equestrian facility or an existing facility retrofit with BMPs can achieve the Machado Lake Nutrient TMDL objectives.

### Stable Design

The City of Rolling Hills Estates will coordinate the joint development of water quality design guidelines for the development of new stable facilities and retrofitting existing stable facilities as discussed in the Section 4.2 Equestrian Outreach Activities.

### ***Phase 3 Horse Keeping Source Reduction Projects***

Based on results of four years of wet weather monitoring data as well as any source tracking studies, and the results of effectiveness monitoring of the Model Equestrian Center, the City will consider the need for additional source reductions projects to address equestrian sources. Phase III projects may include review of new development and redevelopment on residential properties with proposed stable facilities for consistency with design guidelines for stables to be developed during Phase II under the joint public outreach program.

## AIR DEPOSITION

Much of the stormwater runoff in the City passes through soft bottom natural canyons which provide some measure of natural treatment and infiltration of low flow wet weather events. The extent to which these natural drainage systems along with the significant areas of open space, landscaping and the tree canopy on the Peninsula mitigate the effects of air deposition of nitrogen will become clearer once several years of wet weather data have been collected.

The City's general plan and zoning code has long established conditions conducive to limiting the impacts on water quality associated with air deposition of pollutants, including:

- The City's Zoning Code limits impervious surfaces. The Zoning Code permits that only 20-35% of a residential lot may be covered by buildings, structures, and/or paved areas.
- Residential roof runoff from hillside homes must be diverted to vegetated areas or passed through an energy dissipater before discharging to natural canyons.

The City of Rolling Hills Estates is a hillside community on the flanks of the Palos Verdes Peninsula. Some areas of the City are prone to unstable geology which may limit onsite retention and active infiltration of stormwater beyond that which can be achieved by preserving pervious areas and natural topography and vegetation. With such limitations in mind, the City proposes the following program of source reduction projects to mitigate the impacts of air deposition of nitrogen from air pollution.

### ***Phase 1 Air Deposition Source Reduction Projects***

The following Source Reduction Projects have already been implemented or are in progress with respect to air deposition of nitrogen on impervious surfaces:

- Street sweeping is conducted using low emission vehicles which serves to remove deposited pollutants
- The City recently purchased two (GMC and Ford ) converted propane-fueled dump trucks using the City's allocation of AB 2766 grant funds which are used to purchase equipment that reduces air pollution from vehicles.
- Dapplegray walking school bus program encourages children to walk to school and reduces the number of cars on the road dropping off children at school each morning
- The City maintains ten miles of bike lanes
- The Palos Verdes Transit Authority is operated by a Board of Directors comprised of City Council representatives from Rolling Hills Estates, Rancho Palos Verdes and Palos Verdes Estates. PV Transit provides local transportation throughout the Palos Verdes Peninsula on seven routes, with stops at public intermediate and high schools, public libraries and commercial areas. Since the public school system does not provide school bus service, PV Transit routes and schedules are timed to provide transit for middle and high school students to and from school. PV Transit owns and operates a total of 27 buses that use a mix of CNG, Propane (LPG) and gasoline. By September 2011, PV Transit expects that none of its buses will be powered by gasoline.
- Areas within the Chandler sub-drainage area of the City result in no discharge of storm water for rainfall events up to the 25-50 year storm.

New development and redevelopment projects subject to the City's discretionary review, particularly those requiring CEQA review, are being requested to implement active or passive infiltration where technically feasible as a preferred method of treatment for the SUSMP design storm and, in addition, are being asked to preserve hydrologic functionality of existing retention/infiltration systems during redevelopment.

### **Phase 2 Air Deposition Source Reduction Projects**

- Evaluate existing low impact development-type requirements within the City's current individual city policies and ordinances and identify opportunities for enhancing them to achieve additional nutrient load reductions.
- By 2014 the City will complete the installation of a new bike lane along Palos Verdes Drive North between Crenshaw Boulevard and the western city boundary to encourage local alternative transit use.
- The City is working with the South Bay Council of Governments to assess sources of greenhouse gas emissions in accordance with SB375. Based on the findings and recommendations of the assessment, the City will consider additional measures to reduce greenhouse gas sources. Such measures will also serve to reduce the deposition of nitrogen which is generated during the combustion of fossil fuel.

### **Phase 3 Air Deposition Reduction Projects**

Based on results of first four years of monitoring the City will consider whether additional source reduction projects are necessary and could be effective in further reducing the impacts from air deposition of nitrogen on storm water discharge from the City. Phase III projects and activities will be considered if necessary to fully attain compliance with the final TMDL targets. Phase III projects may require significant development time, public support and resources and therefore will not be undertaken until and unless compliance monitoring data indicates that they are warranted. Among the additional measures that may be considered are:

- Evaluate whether increasing street sweeping frequency will effectively increase the removal of deposited air pollutants and result in a net decrease in nutrient concentrations in runoff when balanced against the environmental impacts of additional greenhouse gas emissions (including oxides of nitrogen) and noise associated with operation of street sweepers.
- Consider the implementation of additional Low Impact Development approaches for the Palos Verdes Peninsula that are consistent with the new MS4 Permit requirements while considering the challenges of topography and geology on the Palos Verdes Peninsula to support multiple TMDLs for Machado Lake (trash and toxics as well as nutrients).

## **PETS**

Nutrient loading associated with pets kept in the City of Rolling Hills Estes is not anticipated to contribute to exceedances of TMDL targets. There are approximately 530 licensed dogs in the City and the estimated nutrient load from this number of dogs is more than an order of magnitude lower than the other potentially significant sources discussed in this report. The impacts from cats are expected to be even less than for dogs since more than 50% of cats are kept indoors, and those that do spend time outdoors are not walked on leashes like dogs are, so that outdoor defecation by cats would typically be in pervious areas where the nitrogen and phosphorus would be readily assimilated. Furthermore, because

of the presence of coyotes in the City and on the Palos Verdes Peninsula in general, residents are warned to keep cats and other small pets indoors at all times.

***Phase 1 Pet Waste Source Reduction Projects***

There are already a number of measures in place to reduce impacts from pets on water quality, including:

- City parks are equipped with pet waste collection stations.
- The City leash law is strictly enforced in municipal parks.

***Phase 2 and 3 Pet Waste Source Reduction Projects***

At this time no additional source reduction projects are proposed for pet sources within the City of Rolling Hills Estates beyond the joint public outreach activities to be conducted by the Peninsula Cities as a group.

## 6. ROLLING HILLS SOURCE REDUCTION PROJECTS

Rolling Hills, as a municipality and in its geography, is unique. The City is by design a low density, low impact, rural residential community with primary drainage conveyed via natural canyons. Dry weather flows and small rainfall events are infiltrated within the natural soft-bottom canyons which are the primary drainage system. Storm water from private property drains into largely undisturbed heavily vegetated natural soft bottom canyons; there is no continuous improved storm drain system throughout the City. Source control is the primary means available to the City for maintaining and improving water quality; structural control/treatment devices are not technically feasible or environmentally appropriate in natural canyons nor does the City have easements in the canyons.

The City has a very small population of 1, 972 residents in a city of 3 square miles. There are just 684 single-family one-story homes, only 16 undeveloped lots remain with an additional 13 undevelopable lots in the landslide area. Minimum lot size is 1 acre; the average lot size is 2.7 acres. There is no public infrastructure: no City-owned or maintained storm drains, roads, sewers, sidewalks or curb-and-gutter.

### FERTILIZER AND LANDSCAPE DEBRIS

The City's Zoning Code strictly limits grading and disturbance of natural landscape; 60% of lot areas must remain undisturbed. The City imposes strict landscaping requirements including the use of native, drought resistant vegetation and preservation of established native flora and natural features of the lots. The City limits lot disturbance to 40% and the remaining area of the lot must remain in its natural state. Because the entire City is within the County Fire Department Very High Fire Hazard Severity Zone, vegetation choices and placement associated with new construction are also closely regulated and monitored. The Landscape Committee of the Rolling Hills Community Association is a key stakeholder and partner in providing outreach to residents on information and resources relating to landscaping. City staff has met and consulted with the RHCA Landscape Committee in preparing this plan and will draw on their assistance to inform residents of the importance of minimizing impacts on water quality through proper application of fertilizer and management of landscape debris.

#### ***Phase 1 Fertilizer and Landscape Source Reduction Projects***

The following Source Reduction Projects have either already been implemented or will be implemented to effect immediate reductions in nutrient loading to Machado Lake.

##### Municipal Landscape Maintenance

The City is responsible for the relatively small landscaping at the main entry to the City and around the City Hall campus area (inclusive of the area around the tennis courts). Within this scope, City contract for landscape maintenance will be reviewed to identify and implement appropriate modifications in the application rates, frequency, timing or type of fertilizer applied to achieve reductions in nutrient loading to Machado Lake with particular attention given to limiting phosphorus application.

##### Water Efficient Landscape Ordinance

In 2010 the City of Rolling Hills adopted a local water efficient landscape ordinance applicable to all new or altered developments subject to discretionary review with proposed new or altered landscapes of 5,000 square feet or more. As properties are redeveloped, this ordinance will serve to limit the impact from fertilizer applied to turf and ornamental landscapes.

- The ordinance limits turf and non-water wise plants to less than 40% of landscaped areas, however since only 40% of the total lot may be disturbed including the building footprint, this effectively limits the allowable area of turf to less than 20% of the lot
- Turf is not to be used on slopes of 20% or greater
- Landscaped areas are required to be mulched to a depth of three inches
- Irrigations systems must be designed to minimize overspray and runoff and must utilize weather-based irrigation control systems with automatic rain shutoff sensors

The City will assess the effectiveness of this ordinance by tracking the number of new and redeveloped landscapes that are installed subject to this ordinance, including the number of square feet of turf installed.

#### Residential Green Waste and Landscape Debris Collection

The City has no system of curb-and-gutter along roadways, so there is little propensity for the transport of leaves and landscape debris into catch basins where leaching can occur. The City provides unlimited green waste collection to its residents through the solid waste franchise contract. The prompt removal of accumulated leaves and landscape debris is encouraged for prevention of brush fires but also serves to minimize the potential for leaching of phosphorus from accumulated vegetation.

Due to a history of brush fires in Rolling Hills, the City has expended significant effort to educate residents and landscape contractors of the importance of managing vegetation and brush for fire control. The City with the assistance of Los Angeles County Fire Department has developed handouts and guidelines and held workshops for residents and landscape contractors to disseminate this information. The information is also posted on the City's website and will be shared with the Peninsula cities as part of the joint outreach program discussed in Section 4.

#### ***Phase 2 and 3 Fertilizer and Landscape Source Reduction Projects***

Based on results of first several years of monitoring, and the assessment of effectiveness of the Water Efficient Landscape Ordinance, the City will consider whether additional source reduction projects directed at fertilizer use and/or landscape maintenance are necessary and could be effective in further reducing any remaining impacts on storm water discharge from the City. If necessary, such additional measures will be implemented beginning in fiscal year 2013-14.

## **EQUESTRIAN ACTIVITIES**

Horses in the City of Rolling Hills are few—the last informal survey conducted in 2001 identified approximately 80 to 100 horses in the City, which is a density of less than one horse for every 15 acres. The City does not have or allow commercial stables or public stables. The City also does not permit the rental of stables for private uses so there are no public stable facilities within the City. Based on the Community Emergency Response Team unofficial map, it appears that approximately 70 horses are kept on private property within the area of the City tributary to Machado Lake, and approximately 30 of them are kept within the Chandler subdrainage area which functions as a recharge basin and does not discharge to Machado Lake unless a rainfall event exceeds the 25-50 year storm.

Los Caballeros, the equestrian club of the Rolling Hills Community Association, is a key stakeholder and partner in providing outreach to the City's equestrian community. City staff has met and consulted with

Los Caballeros in preparing this plan and will draw on their assistance, newsletter and email communication to inform and update the members on the importance of minimizing impacts on water quality through proper horse keeping practices.

### ***Phase 1 Equestrian Source Reduction Projects***

#### Manure Management

Rolling Hills requires by City ordinance that animal shelters be kept clean and sanitary and that manure be removed from horse keeping areas on a daily basis. Unless it is spread as a fertilizer for vegetation or used for composting, manure must be stored in a box, bin or receptacle designed to prevent flies, and such stored manure must be removed completely from individual properties at least once per week.

Residents are encouraged to compost green waste, wood ashes, vegetable kitchen scraps or manure so long as the following conditions are met:

- Compost piles or bins shall not be visible from the street or neighboring properties;
- The compost piles or bins shall not be located next to a stream or drainage course;
- Compost piles and bins are maintained so that they do not generate an offensive odor or harbor rodents;
- The compost is enclosed, screened or otherwise maintained to minimize insects and pests; and
- The pile or container shall not permit surface run-off or leachate to other property or to drainage courses, waterways or streams.

The City's franchise solid waste hauler collects manure that is placed in separate containers weighing no more than sixty pounds as green waste at no extra charge to residents. Alternatively if the number of horses involved necessitates a larger bin for manure storage and hauling, the solid waste franchise provides a special bin for such purpose for a separate fee to residents. Manure collection is also available to residents from other service providers.

City staff responds promptly to complaints from residents or RHCA maintenance staff regarding the illegal or inappropriate management of manure by residents. City staff will track code enforcement activities with respect to manure management as part of effectiveness assessment.

#### Stable Design

The City requires that stable access-ways have permeable surface and are not paved; this promotes infiltration while controlling the discharge of sediment.

#### Public Health Licenses

Los Angeles County Department of Public Health requires a license for any property with 5 or more horses, or a facility with 10 or more of a mixture of livestock (e.g., goats, chickens, etc). There are currently no properties in the City of Rolling Hills with a Public Health License for horses or livestock, however if such facilities are proposed as part of a new development or redevelopment project, a clearance from LA County Dept. of Public Health is required prior to grading plan or building permit approval. Such licensed facilities are inspected every six months by a Registered Environmental Health Specialist. The Public Health License requires that manure be removed from the premises at least once

per week and that pens and stalls are cleaned daily, which is also what the City's code requires of all properties that keep horses of any number.

### ***Phase 2 Equestrian Source Reduction Projects***

City staff will work with the franchise hauler to identify and address any barriers that need to be overcome to encourage offsite hauling/recycling of manure. Green waste and manure hauling records from the franchise hauler will be tracked in concert with outreach made to residents regarding manure management in order to assess the effectiveness of Phase I and II source reduction and outreach activities.

### ***Phase 3 Equestrian Source Reduction Projects***

Based on results of monitoring as well as any source tracking studies, the City will consider the need for additional source reduction projects to address equestrian sources. These may include:

- Review residential development and redevelopment projects with proposed stable facilities for consistency with design guidelines to be developed jointly by the Peninsula Cities during Phase II as discussed in Section 4.
- Consider revisions to City code to prohibit the use of manure as fertilizer unless it is composted prior to spreading

## **AIR DEPOSITION**

The City is heavily vegetated with trees in landscaped areas and native habitat in natural undeveloped areas. This vegetation provides a significant assimilative capacity for air deposited nitrogen. In addition, most stormwater runoff in the City passes through soft bottom natural canyons which provide natural treatment and infiltration of low flow wet weather events.

### ***Phase 1 Air Deposition Source Reduction Projects***

The City's general plan and zoning code has long established conditions conducive to limiting the impacts on water quality associated with air deposition of pollutants. The following Source Reduction Projects have already been implemented with respect to air deposition of nitrogen on impervious surfaces:

- The City's Zoning Code precludes large impervious surfaces. Only 35% of the net lot area may be developed with impervious surfaces, including all structures, patios and other paved areas. Driveways may not cover more than 20% of the area of the yard in which they are located; uncovered motor courts/parking pads may not cover more than 10% of the yard in which they are located. Tennis and sports courts are encouraged to have pervious surfaces.
- Residential roof runoff must be diverted to vegetated areas or passed through an energy dissipater before discharge to natural canyons.
- The City encourages residents to install pervious surfaces when landscaping or installing/reconstructing driveways. Many residents have resurfaced their driveways with grass-concrete and other porous material.
- Entry and exit to the City is gated and restricted to residents and guests only, or to contractors with a specific purpose and permission to enter; thus the roads are not heavily trafficked which reduces the generation of air pollutants from vehicles.



- Roads are private and are not equipped with curb-and-gutter. Runoff generally surface flows and only in limited locations are constructed catch basins and energy dissipaters utilized to direct runoff into natural canyons.
- Areas within the Chandler sub-drainage area of the City result in no discharge of storm water for rainfall events up to the 25-50 year storm.
- Only single family residential development exists so the scope of development and redevelopment within the City is limited thereby reducing short-term air emissions associated with construction vehicles.

The City of Rolling Hills is a hillside community and some areas of the City are prone to unstable geology which may limit onsite retention of stormwater beyond that which can be achieved by preserving pervious area and natural topography and vegetation.

The City is working with the South Bay Council of Governments to assess sources of greenhouse gas emissions in accordance with SB375. Based on the findings and recommendations of the assessment, the City will consider additional measures to reduce greenhouse gas sources. Such measures will also serve to reduce the deposition of nitrogen which is generated during the combustion of fossil fuel.

#### ***Phase 2 and 3 Air Deposition Source Reduction Projects***

Based on results of first several years of monitoring the City will consider whether additional source reduction projects are necessary, feasible and could be effective in further reducing the impacts from air deposition of nitrogen on storm water discharge from the City.

#### **PETS**

Nutrient loading associated with pets kept in the City of Rolling Hills is not anticipated to contribute to exceedances of TMDL targets. Indeed the contribution associated with pets is likely to be significantly lower than the contribution from birds and wildlife. Due to the low density residential nature of the City there are only 129 licensed dogs in the City according to the Los Angeles County Department of Animal Care and Control—that is a density of only one dog for every 15 acres. Because of the presence of coyotes in the City and on the Palos Verdes Peninsula in general, residents are warned to keep cats and other small pets indoors at all times.

There are no public parks or sidewalks and no leash laws within the City of Rolling Hills; hence most deposition associated with pets occurs in vegetated areas on private property where it is readily assimilated. Municipal code requires that pet owners remove accumulated feces from their property on a daily basis.

At this time no source reduction projects are proposed for pet sources within the City of Rolling Hills beyond those already in place.

## 7. PALOS VERDES ESTATES SOURCE REDUCTION PROJECTS

The City of Palos Verdes Estates, founded in 1939, is the oldest of the four Palos Verdes Peninsula cities. This City of approximately 13,600 residents is predominately residential and features gentle winding roadways, green hillsides, walking, and riding paths, and established stands of eucalyptus, pepper, and coral trees. The City has dedicated approximately 29% of the land area as permanent open space. This early planning and dedication of parklands gives the City its unique rural character and has resulted in its international reputation for scenic beauty.

The Palos Verdes Homes Association and Art Jury assists the City in ensuring that development within the City is done in accordance with the City's design standards- enforcing deed restrictions established in the early planning and development of the City. These restrictions determine building setbacks within each lot as well as the type of architecture allowed. The Art Jury, comprised of local architects and engineers, reviews all projects within Palos Verdes Estates to determine if the design meets the criteria set forth in the restrictions. Any project that modifies the exterior of a building, i.e., additional square footage, window/door changes, roof material change, paint color, etc., or modifies landscaping, requires Art Jury review and approval.<sup>16</sup>

### FERTILIZER AND LANDSCAPE DEBRIS

#### *Phase 1 Fertilizer and Landscape Debris Source Reduction Projects*

##### Institutional Controls

The City of Palos Verdes Estate has in place institutional controls and municipal codes and ordinances that work to achieve the goals of this plan. The following items are those that highlight the actions that the City has implemented to ensure compliance:

- The City of Palos Verdes Estates, along with the other cities within the Palos Verdes Peninsula, developed and has submitted the Machado Lake Trash TMDL Implementation Plan to the Regional Board. As part of this plan, the City of Palos Verdes Estates will be implementing a phased installation of approved "full capture" trash systems on catch basins within the Machado Lake Watershed. The trash and debris full capture devices will prevent trash from entering the storm drain system and also will prevent organic materials from entering the storm drain systems. The City will begin installing the full capture devices on at least 20% of the catch basins and inlets beginning in 2012, with 100% of the effected catch basins completed within five (5) years.
- The City Code, in Zoning Ordinance 18.04.101 (Lot coverage), provides that R-1 single-family residence zone, shall, in no case, be more than thirty (30) percent of any lot or building site be covered by buildings. It also provides that in no case shall more than sixty-five (65) percent of any lot be covered by permanent structures and pavement, including buildings as well as driveways and walkways or other similar features.
- By enacting a Water Conservation Landscaping ordinance, the City has taken active steps to ensure that public, private, and residential developments limit or eliminate the use of turf and exotic plants requiring nutrient enriched fertilizers and to prevent irrigation overspray onto City streets. The City's Landscape Ordinance, Chapter 18.50 of the Municipal Code was adopted on

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<sup>16</sup> See City of Palos Verdes Estates website: <http://www.pvestates.org>.

September 28, 2010 and establishes a mechanism to promote water conservation through water efficient landscapes. This code section prohibits irrigation overspray and runoff to public streets and rights-of-way. The Ordinance applies to all new development of two thousand five hundred (2,500) square feet (s.f.), single family residential projects five thousand (5,000 s.f.), and all existing landscaping installed prior to January 1, 2010 that are greater than one acre. In establishing this Ordinance, the City is addressing two significant sources of nutrients: fertilizers application by limiting the plant of turf grass and non-native plants; and the transport of nutrients in irrigation runoff.

- The City's Stormwater Ordinance, Chapter 13.08.020 of the Municipal Code, prohibits the disposal of leaves, dirt, or other landscape debris into the storm drain system. City Code Enforcement and Public Works staff routinely directs landscape maintenance/gardening firms to direct leaves and lawn clippings away from catch basins and City streets. City staff routinely issue "correction notices" to violators of the City's Stormwater Ordinance.
- To help ensure that fertilizers are only used when required, the City has instituted an internal policy that fertilizers can only be applied two times annually and only if soil testing is performed prior to fertilizer application.
- All entrances to the City and landscaping adjacent to City Hall utilize drought tolerant/native vegetation, reducing/eliminating the use of nitrogen and phosphorous fertilizer applications. In addition, all new plantings on City owned/maintained lands will be with drought tolerant or native plants.
- In an effort to eliminate overwatering and runoff in City parklands, the City is replacing pop-up sprinkler systems with laser line drip irrigation systems.

#### Public Outreach Activities

During first phase of the City's joint outreach campaign, the City will utilize existing opportunities and materials to disseminate the fertilizer/landscape message. The attached outreach brochure is an example of the existing materials and programs that the City intends to utilize. Upon evaluation of monitoring data collected during Phase I of the joint monitoring program, the City will evaluate materials and programs for future enhancements. The City will continue to promote the Ocean Friendly Gardening program sponsored by Surfrider Foundation.<sup>17</sup>

#### ***Phase 2 and 3 Fertilizer and Landscape Debris Source Reduction Projects***

There are approximately 130 landscape companies that operate throughout Palos Verdes Peninsula. The City believes that it will be important that the Peninsula cities work together to target these companies for targeted outreach and education. Such programs will focus on fertilizer application and soil testing, watering practices, plant selection and maintenance, and proper organic debris management and control. The City will identify those landscape and gardening firms operating within the City and hold a workshop, mandatory if permissible, focusing on these and similar issues. Further, the City will meet with the Homes Association and develop in-house training with the City Forester. The Homes Association is responsible for the establishing landscaping standards within the City. The City will encourage the Homes Association to adopt Native and Drought Tolerant Plants as it's approved planting pallet. Where results necessitate, the City may develop direct mail pieces for resident's that focus on Water Efficient (Wise) Irrigation Practices.

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<sup>17</sup> See <http://www.surfrider.org/ofg.asp>.

## EQUESTRIAN ACTIVITIES

The City has approximately 80 horses boarded within the City's owned Palos Verdes Estates Stables (PVE Stables). The City's stables are operated through a Concession Agreement (Agreement). In accordance with the Agreement, the Concessionaire maintains the stable property including all landscaping and is responsible for the proper management of manure and other pollutant source. All equestrian boarding is limited to the PVE Stables; the City prohibits the boarding equestrian boarding in residential areas.

The primary source of nitrogen and phosphorus that may be associated with horses is therefore only found at the PVE Stables in its on-site storage of manure and other wastes. The City, in performing its municipal industrial and commercial stormwater inspections, conducts regular inspections of stable operations and its grounds. The City verifies that the Concessionaire maintains good housekeeping and animal care, in accordance the Best Management Practices (BMP) being employed. As part of the this plan, the City intends on developing a phased public outreach approach to address nutrients associated with equestrian activities where necessary.

### ***Phase 1 Equestrian Source Reduction Projects***

During Phase I of the equestrian outreach program, the City will review existing BMP materials disseminated by the City to the Stable and others. The City has already developed and distributed in, both English and Spanish, a BMP brochure entitled, "*Horse Owners, Urban Horse Owners, Equestrian Facilities, and Boarding Stables.*" This information will be re-evaluated and revised as necessary in the future. Additionally, the City will make copies of these materials available at the PVE Stables and on the City's website for others owning or contemplating horse ownership.

### ***Phase 2 and 3 Equestrian Source Reduction Projects***

Should additional measures prove necessary after reviewing the monitoring data obtained from during 2011 – 2013 Palos Verdes Peninsula Coordinated Monitoring Program, the City will work with the PVE Stable Committee to enhance the BMP program materials, review manure-handling units, and enhance operational procedures. In addition, the City will monitor the City of Rolling Hills Estates (RHE) efforts to develop a Low Impact Design Guide for Stable Facilities and work to promote the RHE Model Equestrian Center. Phase III activities will focus on the redesign of the PVE Stables, implementing design principles developed for as part of the Low Impact Design Guide for Stable Facilities and the Model Equestrian Center.

## AIR DEPOSITION

While it is recognized that some nutrient loading in Palos Verdes Watershed is the result of atmospheric deposition, the unique natural design of the cities, specifically Palos Verdes Estates, provides natural treatment opportunities that do not occur in more urbanized cities in the Los Angeles area. The City has reserved 29% of the City's lands as permanent open space and limits impervious surfaces to not more than 30% of the project site. The City efforts in addressing nutrient loading associated with aerial deposition will focus on the existing efforts, with the additional program enhancements to be considered through our the life of this TMDL.

### **Phase 1 Air Deposition Source Reduction Projects**

The City impresses the following deed restrictions to ensure that the City remains largely undeveloped:

- 29% parkland;
- 29% right of ways; and
- 42% private and public development.

Further, the City is in the process of transitioning its City fleet of vehicles to either Hybrid or Natural Gas. There are currently six (6) alternative fuel vehicles in the City's fleet, including the City's street sweeping contractor that utilizes compressed natural gas (CNG) vehicles. The City has also developed and adopted the 2010 Green Building Code. The City has also initiated a greenhouse gas inventory to access the greenhouse gases produced in residential areas.

### **Phase 2 and 3 Air Deposition Source Reduction Projects**

In Phase II the City will work to modify its municipal franchise trash hauler agreement to require the use of CNG vehicles for all residential trash service. Further, the City will evaluate Low Impact Development (LID) designs to determine which design principles that will not contribute to soil destabilization-the primary barrier to implementing the standards for infiltrating runoff from impervious areas. Lastly, in Phase III, the City will evaluate the monitoring results collected during the first four years of the monitoring program and determine if additional program enhancements are required.

## **P E T S**

While not specifically identified in the Machado Lake TMDL, the City of Palos Verdes States recognizes that domestic dogs and cats may represent some minor contribution to nutrient loading in the Palos Verde subwatershed. There are approximately 821 licensed dogs within the City with the number of cats unknown (anticipated to be less than the dogs due to many being indoor pets). The City as part of the Los Angeles Municipal Stormwater NPDES Permit, and the Santa Monica Bay Bacteria TMDL, has already developed pet waste outreach materials for public and private avenues and events.

### **Phase 1 Pet Waste Source Reduction Projects**

The City is currently implementing the following measures to address pet waste and pet care activities:

- Mobile Pet groomers are required to obtain the business license from the City and City Code Enforcement staff monitor mobile operations for evidence of illegal discharges of wash waters.
- The City has developed and distributes outreach materials through City Hall and on the City's website to address best management practices for owners of pets.
- The City provides pet waste disposal bags along the City's walking trails.

### **Phase 2 and 3 Pet Waste Source Reduction Projects**

The City will review data collected during the first four years of monitoring and may suggest modifications to its existing programs. At this time however, there are no additional measures that the City has identified for pet sources.

## 8. RANCHO PALOS VERDES SOURCE REDUCTION PROJECTS

Rancho Palos Verdes is located on the Palos Verdes Peninsula which is located in southwestern Los Angeles County. The 1.09 square mile area of Rancho Palos Verdes (City) draining to Machado Lake is situated along the western boundary of the Peninsula sub-watershed. The City constitutes approximately 4.8% of the Machado Lake watershed and 19% of the Peninsula sub-watershed. Drainage from the City is conveyed via natural soft bottom canyon systems in conjunction with structured storm drain pipes. The predominant land use in the City's tributary area is residential with minor areas of institutional usage and substantial open space areas interspersed. There is no industrial zoning within City limits. Major portions of the City are characterized by unstable geology and steep slopes making such structural BMPs as active retention and infiltration basins infeasible, if not detrimental, in these areas. Therefore, a phased program of primarily source reduction projects is proposed to address nutrients in stormwater runoff coming from the City.

The City has not had the opportunity to collect data on the nutrient concentration of its runoff to date and as such is developing the framework for this implementation strategy based on assumptions of significant nutrient sources within its jurisdiction. These assumptions were made based on a review of current literature on nutrient input to urban watersheds taking into account the unique characteristics of the City. The most cost-effective and reliable method of addressing nutrient inputs to the City at this time will be to implement City specific source reduction projects in conjunction with the Joint Peninsula Public Outreach campaign described earlier in this plan. The City will assess the following assumed nutrient sources described below and employ a phased iterative adaptive approach to source reduction based on the results of monitoring data collected per the approved Peninsula Cities Coordinated Monitoring Plan which will commence this year (2011).

### FERTILIZER AND LANDSCAPE DEBRIS

According to the Center for Watershed Protection, over-fertilization of turf can result in significant nutrient loading to watersheds. Turf requires higher rates of fertilizer application than other types of landscaping and is a predominant feature of City residences and parks. There are approximately 19 acres of municipal turf area in the portion of the City which drains to Machado Lake. In addition, approximately 80% of US homes have turf areas averaging 0.2 acres in size<sup>18</sup>. However, according to the US Census Bureau, the average lot size in the Western portion of the country is approximately 0.2 acres, therefore for the purposes of this study an average lawn area of 0.1 acres will be assumed. If the percentage area of the City draining to Machado Lake is used to estimate the number of homes in this portion of the city, the number is 1,220, with 80% of these or 976 having turf area. Assuming that each home contains an average 0.1 acre lawn, there are approximately 97 acres of residential turf in the City tributary to Machado Lake. When combined with municipal turf area an estimated 116 acres, or 16% of the City's tributary area has turf coverage. This number is assumed to be high due to the fact that aerial photography and GIS were used to calculate the data and there is some difficulty distinguishing turf landscaping from other types such as ivy and ice plant which are prevalent on the Peninsula and typically not fertilized to the degree that turf is.

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<sup>18</sup> Retrieved from

[http://yosemite.epa.gov/sab/SABPRODUCT.nsf/CEC08ECAC91005FD8525731600639904/\\$File/inc\\_members\\_two\\_pager\\_on\\_turf.pdf](http://yosemite.epa.gov/sab/SABPRODUCT.nsf/CEC08ECAC91005FD8525731600639904/$File/inc_members_two_pager_on_turf.pdf) on January 31, 2011.

A study performed by the University of California, Davis recommends 2-4 pounds of nitrogen per 1000 square feet (0.02 acres) of turf applied annually in multiple applications<sup>19</sup>. Assuming the estimation of turf area calculated above, this would equate to an average annual input of 20, 212 pounds of nitrogen from fertilizer application in the City. According to King, Balogh, Hughes and Harmel, the average ratio of phosphorus to nitrogen applied on golf fairways and tees is 20%<sup>20</sup>. Using this percentage for City applications, the annual input of phosphorus to the sub watershed would be 4, 042 pounds.

#### **Phase 1 Fertilizer and Landscape Source Reduction Projects**

- The City has adopted a Water Efficient Landscaping ordinance which, among other measures, prohibits turf on slopes greater than twenty-five percent where the toe of the slope is adjacent to an impermeable hardscape and prohibits waste water resulting from inefficient landscape irrigation. The City can track the number of new and redeveloped properties that are subject to this ordinance as well as enforcement measures against inefficient landscaping.
- The City has adopted a Green Building ordinance which provides incentives for installing permeable landscaping in new developments. The Community Development Department tracks permit issuance and this information can be used to monitor the area of permeable landscaping that is installed.
- The City currently promotes the Ocean Friendly Garden Workshops and Smart Gardening workshops in coordination with SBESC/Surfrider and LA County. The City can work with these groups to monitor attendance at these workshops.
- All City streets are swept regularly which removes leaves and landscape debris. Street sweeping is a proven method for removing the nutrient load of stormwater runoff<sup>21</sup>. In addition, City crews regularly remove pine needle fall after rain and wind events.
- The City's waste hauler provides green waste collection bins to residents at no charge and coordinates green waste pick up with comingled recycling and trash pickup days. In addition, the hauler provides free bi-annual excess green waste collection days for residents and hosts a website solely for residents' use which provides information regarding greenwaste disposal. The City can coordinate with the waste hauler to track green waste collection by weight.
- By the end of Fiscal Year 2012, the City plans to complete installation of certified full capture connector pipe screens in all its catch basins draining to Machado Lake.

#### **Phase 2 Fertilizer and Landscape Source Reduction Projects**

- The City will consider developing fertilizer application guidelines for all municipal applications (parks and ballfields) and work with major landscaping contractors to conduct annual or semi-annual training.
- The City can conduct an audit of the Green Hills Memorial cemetery in the Machado Lake watershed to ensure proper turf maintenance and encourage the use of low phosphorus fertilizer.

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<sup>19</sup> Henry, Gibeault, Lazaneo. Practical Lawn Fertilization. University of California Agriculture and Natural Resources

<sup>20</sup> King, Balogh, Hughes and Harmel. Nutrient Load Generated by Storm Event Runoff from a Golf Course Watershed. From Journal of Environmental Quality.

<sup>21</sup> C.J Rosen and B.P. Horgan, University of Minnesota, 2010. Preventing Pollution Problems from Lawn and Garden Fertilizers.

- The City will conduct a field inspections of City maintained landscape areas and develop a list of priority sites for retrofit consistent with the water efficient landscaping ordinance.

### **Phase 3 Fertilizer and Landscape Source Reduction Projects**

- During Phase 3, the City will consider the adoption of an ordinance recommending proper use of fertilizers in conjunctions with a fertilizer application training and certification program for residents and major landscaping companies operating under City business licenses.
- The City will participate in the joint development of a Low Impact Development approach for the Peninsula accounting for its unique geologic conditions and other natural restrictions such as significant slopes in many areas.
- The City will consider the feasibility of replacing turf in medians with gravel or vegetated swales and the elimination of spray irrigation within 3 feet of municipal right-of-way curb and gutter or paved surfaces at time of replacement/ redevelopment. The City will track the installation of these BMPs to demonstrate an increasing trend over time.
- Dependent on funding and need, the City will retrofit City maintained landscaped areas in accordance with its Water Efficient Landscaping ordinance based on the prioritization compiled during Phase 2.

## **EQUESTRIAN ACTIVITIES**

The City does not contain any public municipal equestrian stables or privately operated stable facilities. In addition, the Community Emergency Response Team (CERT) has developed a map of horse keeping locations on the Peninsula . Based on this map, which is the most accurate information currently available, there are no residential equestrian boarding properties within the Machado Lake sub-drainage area. The City plans to continue the enforcement of existing equestrian ordinances which require manure management BMPs and to work with its waste hauler to more closely track manure collection data.

## **AIR DEPOSITION**

As discussed earlier, atmospheric deposition is a significant source of nitrogen to urban watersheds. Although the amount of nitrogen removed within the system by the biota is unknown, the City of Rancho Palos Verdes has estimated the loading to its catchment area using average values of annual total nitrogen flux to the Dominguez Channel Watershed (which encompasses the Machado Lake sub-watershed ) described in the literature. A study performed at UCLA by Lu et al. estimates an annual mean flux of 44g of nitrogen per hectare per day. Rancho Palos Verdes has approximately 282 hectares contributing drainage to Machado Lake. This would equate to 12, 408 g of nitrogen per day which is equivalent to 9,984.5 pounds of nitrogen loading to the City from atmospheric deposition per year. As noted previously, the City is situated at the western portion of the watershed and is adjacent to the Pacific Ocean. Prevailing onshore winds and a lack of point source discharges of nitrogen to the atmosphere (i.e. industrial plants and power generating facilities)implies that this estimation is high. The aforementioned study also indicated that the most significant contribution of nitrogen to the atmosphere is from mobile sources such as cars, trucks, buses, and motorcycles.

The control of nutrients introduced to the watershed through atmospheric deposition is a significant challenge for Rancho Palos Verdes. The City has little control over emissions generated by mobile and stationary sources of nitrogen oxides, and there are no point source industrial or power generating



facilities within its jurisdiction. In order to address the significant sources for which the City does have authority, the following source reduction strategies will be implemented as described below.

***Phase 1 Air Deposition Source Reduction Projects***

- A substantial portion of the City's drainage system consists of soft bottom canyon and natural vegetative areas which aids in the natural attenuation of nitrogen that is deposited from the atmosphere. The extent of this attenuation is unknown and will require several years of data collection to fully characterize the significance of this natural BMP.
- All City streets are swept regularly using low emissions sweeping vehicles. This practice removes pollutants deposited on streets through aerial deposition and serves to reduce new pollutants from being introduced to the atmosphere.
- The City's development requirements mandate residential properties to retain 25-52% pervious area onsite, and the portion of the City which drains to Machado Lake is predominantly characterized by residential land uses requiring of 40 to 50% pervious area.
- The City has adopted a Green Building ordinance which provides incentives for the use of renewable energy in new development projects. The Community Development Department tracks permit issuance, which can be used to evidence an increasing trend over time.
- The City's trash hauler is required to use vehicles fueled by liquefied natural gas or compressed natural gas by July 1, 2011. Additional contract requirements stipulate that all collection vehicles comply with applicable air pollution control laws including SCAQMD CARB emission standards for solid waste collection vehicles. Annual compliance documentation is required as well as applicable smog check certificates.
- The Palos Verdes Transit Authority described in Section 3 provides bus service on to City residents.
- Close to half of the City vehicles have been replaced by high efficiency hybrid vehicles.
- The City maintains 24 miles of bike routes.

***Phase 2 Air Deposition Source Reduction Projects***

- The City will assess the effectiveness of the existing Green Building ordinance and determine areas for enhancement. Possible enhancements may include implementing stronger incentives to encourage the
- use of elements of low impact development in areas where feasible.
- Stronger incentives for the redirection of downspouts to pervious areas, maximization of porous areas, and use of rain collection and reuse will be considered.
- The City will phase out all City vehicles and consider their replacement by high efficiency hybrid vehicles.

***Phase 3 Air Deposition Source Reduction Projects***

- The City will consider replacement of street sweeping equipment with high efficiency sweepers after the initial 4-5 years of monitoring and consider increasing street sweeping frequency after conducting an environmental assessment.
- The City will participate in the joint development of a Low Impact Development approach for the Peninsula accounting for its unique geologic conditions and other natural restrictions such as significant slopes in many areas.

- The Peninsula will consider the expansion of its bike routes along major roads to encourage alternative modes of transportation.

## PETS

According to Los Angeles County Department of Animal Care and Control, there are 2, 215 licensed dogs in Rancho Palos Verdes. The portion of the city draining to Machado Lake is 8% of the total area of the city. Based on this percentage, there are approximately 177 dogs in the Machado Lake watershed portion of Rancho Palos Verdes. The Humane Society of the United States estimates that 33% of households own cats. These pet owners average 2.45 cats per household<sup>22</sup>. According to the Census Bureau, there are 15, 256 households in the City. If the percentage area of the City draining to Machado Lake is used to estimate the number of homes in this portion of the city, the number is 1,220 homes. Based on these numbers, the portion of the Peninsula draining to Machado Lake has 986 cats. A study published in the *Journal of the American Veterinary Medical Association* estimates that 36% of owned cats defecate outside all the time<sup>23</sup>. In order to leave an inherent margin of safety, this plan assumes 50% of owned cats regularly defecate outdoors. Therefore, the average cats in the City contributing to nutrient loading would be reduced to 493.

In order to estimate the nutrient contribution from pets on the Peninsula, the average amount of nitrogen and phosphorus in dog and cat excrement was estimated. A study performed by Edith Cowan University in Australia estimated the nutrient input load from pet waste. For the purposes of this implementation plan, the average dog and small dog/cat figures were selected as representative. According to this study, the composition of dog and cat feces is similar. The feces of these animals contains approximately 0.7% nitrogen and 0.25% phosphorus. Urine contains about 1.1% nitrogen and 0.01%  $P_2O_5$ . For an average dog weighing 20 kg, 4.59 g N per day and 0.15 g P per day is excreted. The study also used data for small size dogs to estimate the nutrient output of felines. According to the data, a cat weighing 4 kg would generate 1.23 g N per day and 0.003 g P per day<sup>24</sup>. In total, pet waste generates approximately 655 pounds of nitrogen per year and 22.5 pounds of phosphorus per year in the portion of Rancho Palos Verdes draining to Machado Lake.

### Phase 1 Pet Waste Source Reduction Projects

- The City currently has pet waste disposal stations in all of its parks. The frequency with which these stations need to be refilled can be tracked to usage and demonstrate an increasing trend over time.
- Current leash laws will continue to be enforced and violations punishable by fine. Code enforcement violations issued can be tracked to determine problem areas and demonstrate a decreasing trend over time.

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<sup>22</sup> Data retrieved from [http://www.humanesociety.org/issues/pet\\_overpopulation/facts/pet\\_ownership\\_statistics.html](http://www.humanesociety.org/issues/pet_overpopulation/facts/pet_ownership_statistics.html) on 11/15/2010.

<sup>23</sup> Haydee, Atwill, Gardner, et al., 2006. Outdoor fecal deposition by free roaming cats and attitudes of cat owners and nonowners toward stray pets, wildlife, and water pollution.

<sup>24</sup> Surasithe Khwanboonbumpen, 2006. Sources of Nitrogen and Phosphorus in Stormwater Drainage from Established Residential Areas and Options for Improved Management. Retrieved from <http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1075&context=theses> on December 22, 2010.

**Phase 2 Pet Waste Source Reduction Projects**

- The City will consider the installation of additional pet waste disposal stations at high use areas and track the utilization of these stations as described above.
- The City will consider installing additional signage at parks and trails encouraging pet owners to pick up after pets.

**Phase 3 Pet Waste Source Reduction Projects**

The City will consider the adoption of an ordinance requiring the removal of pet waste from public places. A measurement of pet waste in a particularly highly volume area can be collected before and after adoption of this ordinance to demonstrate a decreasing trend over time.

**OTHER LESS SIGNIFICANT SOURCES**

**Construction**

The City requires construction projects of all sizes to implement BMPs to mitigate the discharge of sediment from the site. These sites are inspected to ensure compliance.

**Solvents**

Phosphates in solvents is assumed to be a very minor source of nutrient input to the watershed. The City currently implements the Clean Bay Restaurant Program in coordination with the Santa Monica Bay Restoration Commission, which rewards restaurants that meet a rigorous checklist of BMPs to mitigate stormwater pollution. The current checklist addresses washing practices to ensure that no outdoor washing of equipment or materials occurs. During Phase 2, the City will assess the need for additional outreach to automobile facilities in order to ensure the washing of vehicles is being done in a proper manner.

## APPENDIX

### EXAMPLES OF PENINSULA OUTREACH MATERIALS