4.2 Watershed Characterization

4.2.1 Watershed Boundaries

The La Jolla Shores Coastal Watershed is located in La Jolla, California, within the limits of the City of San Diego. The watershed is 1,614 square acres and is roughly bounded by the Pacific Ocean shoreline to the west and La Jolla Scenic Drive to the east. The intersection of La Jolla Shores Drive and Torrey Pines Road marks the farthest northern point of the watershed and South Via Casa Alta the most southern point. The slope of the land rises from the coast up to about 800 feet at Mt. Soledad. Within the watershed boundaries there are 32 distinct sub-drainage areas (Figure 4-3).

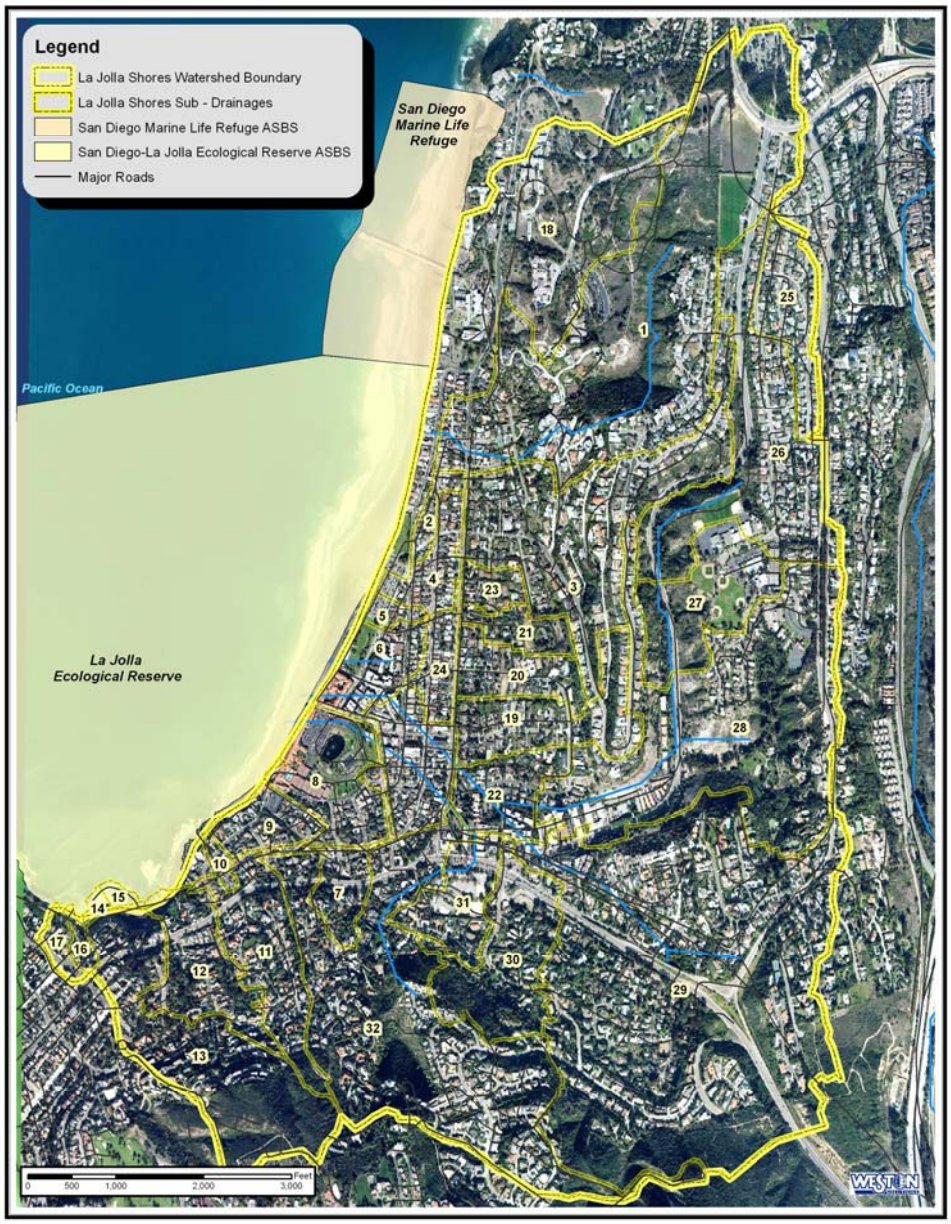

Figure 4-3. Sub-drainages within the La Jolla Shores Coastal Watershed.

4.2.2 Key Drainage Infrastructure

The La Jolla Shores Coastal Watershed discharges into the two ASBS areas in several ways: the municipal separate storm sewer system (MS4), direct discharges, and natural streams and gullies. The majority of the urban runoff within the watershed is discharged through the MS4. Figure 4-5 depicts MS4 outfalls and other discharges into the ASBS.

Most of the urban runoff within the watershed is transported through MS4. There are a total of 17 MS4 outfalls located along the Pacific Ocean shoreline within the two ASBS. The annual volume of runoff entering the La Jolla Shores Coastal Watershed was calculated to be slightly greater than 22 million cubic feet of water. Over 75% of that runoff (16.8 million cubic feet) was discharged by two storm drain outfalls (D1 and D2, see Figure 4-2) within the watershed. The annual volume of runoff entering the La Jolla ASBS through the D1 storm drain outfall was 12.8 million cubic feet of water, while runoff entering the ASBS through the D2 storm drain outfall was approximately 4 million cubic feet of water. D1 and D2 were sampled during the 2005-2006 wet weather monitoring season and are depicted in Figure 4-2. Discharge volumes were calculated using ArcGIS based upon the percentage of impervious surface area within the land area.

Much of the central portion of the La Jolla Coastal Shores Watershed generally drains to a storm drain catch basin located directly on the beach at Avenida de la Playa, which then which discharges runoff directly to the ASBS (Figure 4-4).

Figure 4-4. A storm water catchment basin located on the beach at Avenida de la Playa. Direct discharge to beach visible in lower left corner.

There are currently 92 direct discharges into the ASBS (Figure 4-5). The vast majority of these discharges originate from privately owned homes, mostly from pipes and weep holes through sea walls. Scripps Institution of Oceanography (SIO) also discharges waste seawater, pursuant to their NPDES permit (No. CA0107239), directly into the ocean at two outfalls. This waste seawater is seawater which has been pumped directly from the Pacific Ocean at Scripps Pier, filtered, and then circulated through the laboratories and aquaria of SIO, Stephen Birch Aquarium-Museum, and National Marine Fisheries Service aquaria. After circulation, the waste seawater is then discharged across the beach and directly into the San Diego Marine Life Refuge ASBS. The system discharged into the municipal separate storm water system (MS4) until 2004.

Several natural streams and gullies also discharge urban runoff within the watershed directly onto beaches and off of cliffs. These systems are ephemeral in nature and transport urban runoff only during storm events.

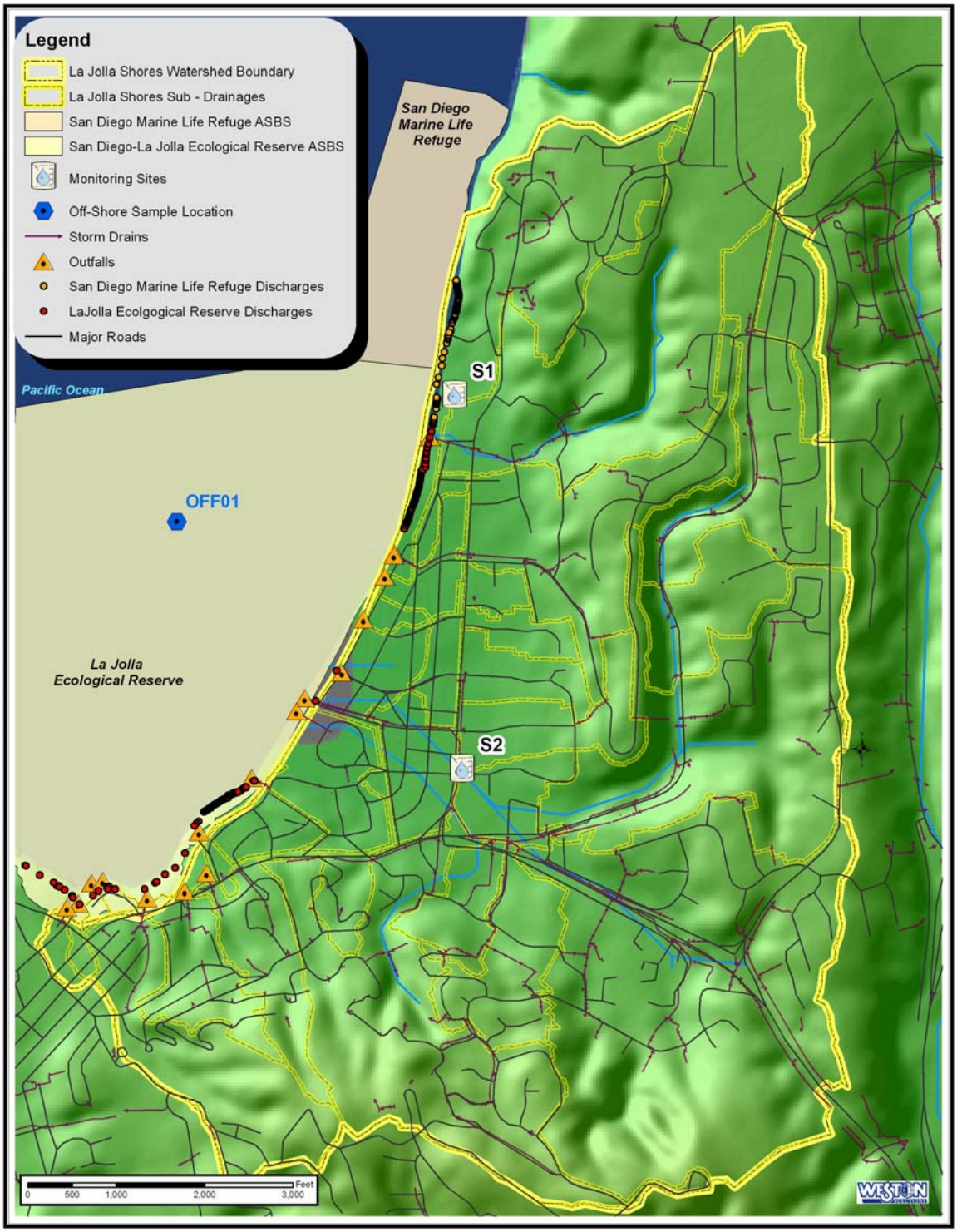

Figure 4-5. Discharges within La Jolla Shores Coastal Watershed.

4.2.3 Constituents of Concern

The chemical and biological results presented in Section 4.1 indicate that the primary constituents of concern (COC) contained in storm water runoff from the La Jolla Shores watershed are turbidity, copper, and fecal indicator bacteria. In three wet season sampling events conducted over a one year time period, these were the only constituents found to be in exceedance of current San Diego Basin Plan water quality objectives (WQO).

Pesticides, including chlorinated and OP pesticides and synthetic pyrethroids, are emerging contaminants that are being considered a potential long-term issue within the City of San Diego and a future COC in the La Jolla Shores Coastal Watershed. Previous monitoring performed in the Chollas Prism by the City of San Diego found pesticides in areas of urban and residential use such as the La Jolla Shores Coastal Watershed (Prism report, need reference).

4.2.3.1 Land Use

Within the La Jolla Shores Coastal Watershed drainage area, land use is largely residential, transportation related, or parks and public facilities (Table 4-9). Land use is about 50% residential. Transportation uses such as roads, streets, highways, and parking facilities comprise about 18% of the land use. Parks and public facilities comprise about 28% of the land use within the watershed. The remaining portion of the watershed is vacant or used commercially for restaurants and shopping. A very small percentage (<1%) of the watershed is under construction. Land use is depicted graphically in Figure 4-6.

Table 4-9. Land use within La Jolla Shores Coastal Watershed.

Category	Total	% Total
Residential	797.13	**49.46%**
➢ Single Family Residence	709.69	44.03%
➢ Multi-Family Residence	82.15	5.10%
➢ Dormitories	3.35	0.21%
➢ Other Group Quarters	1.94	0.12%
Transportation	292.94	**18.18%**
Parks	263.95	**16.38%**
Public Facility	190.37	**11.81%**
Vacant	34.13	**2.12%**
Commercial	32.43	**2.01%**
➢ Commercial	8.81	0.55%
➢ Commercial Recreation	23.62	1.47%
Under Construction	0.78	**0.05%**
Grand Total	1611.73	100%

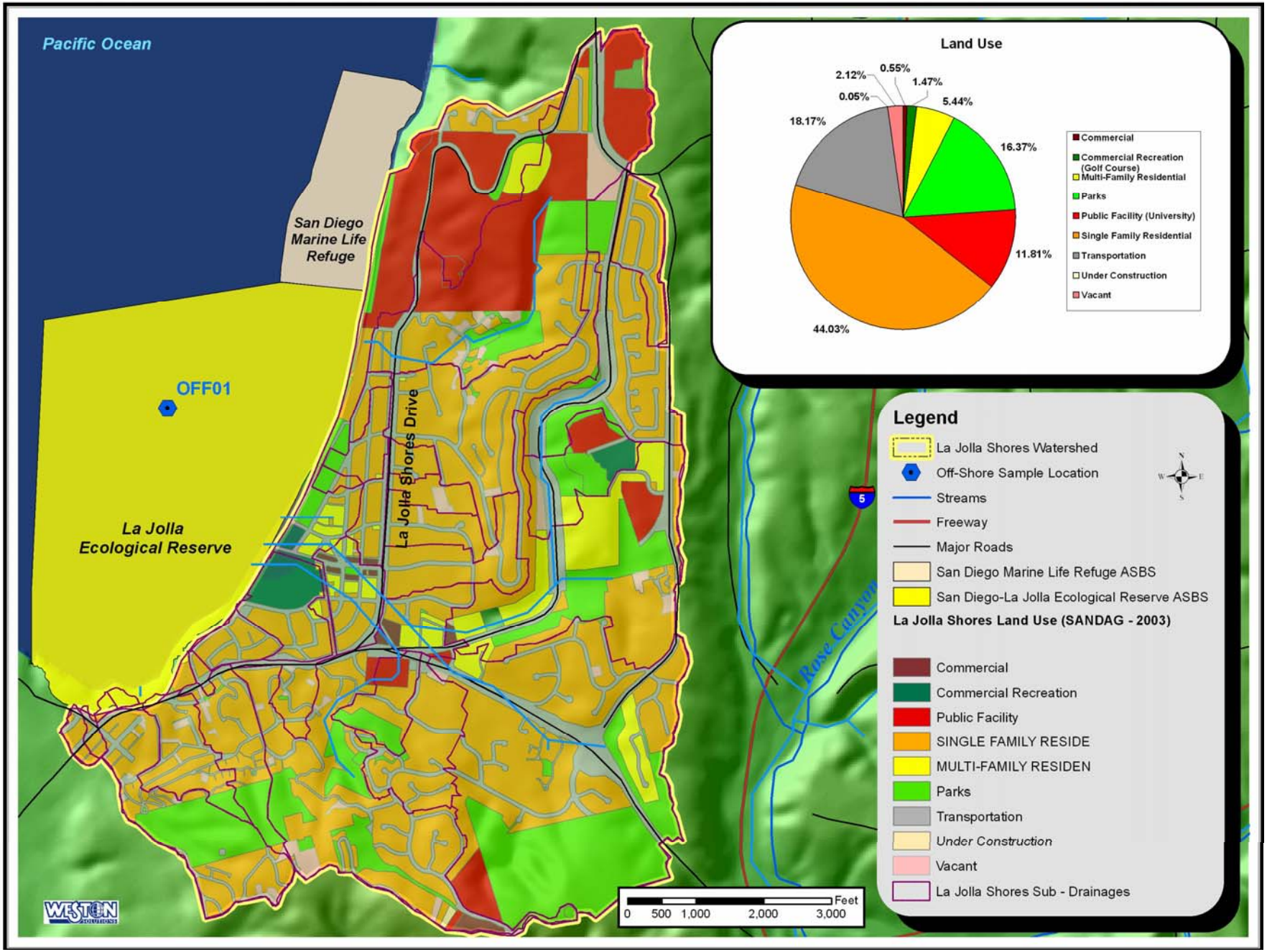

Figure 4-6. Land use within the La Jolla Shores Coastal Watershed.

4.2.3.2 Potential COC Sources

The primary contaminants of concern contained in storm water runoff from the La Jolla Shores Coastal Watershed are turbidity, copper, and fecal indicator bacteria. Pesticides are a COC based on their emergent nature and findings in other parts of the City of San Diego. Potential sources of each of these COCs are depicted in Figure 4-7.

Turbidity was measured at levels above the Basin Plan water quality objective (WQO) in both of the sub-drainages sampled during the 2005-2006 wet weather monitoring season and in each of the storms sampled. Potential sources of turbidity within the watershed's urban runoff include urban and residential use and transportation use such as roads, highways, and parking facilities. These land uses are all common throughout the watershed. The nursery in sub-drainage 18 and the golf course in sub-drainages 8 and 9 may also potential sources of sediment.

Total and dissolved copper concentrations were detected at levels higher then their respective hardness-based Basin Plan WQO in both sub-drainage areas sampled during the 2005-2006 wet weather monitoring season. High transportation use and restaurants within the watershed are potential sources of total and dissolved copper within both the northern and southern sub-drainages. The nursery in sub-drainage 18 may be another potential source. The slightly higher levels of both total and dissolved copper detected in the samples from the southern drainage may be related to the cluster of restaurants around sub-drainage 34 as well as the fuel station located at the junction of sub-drainages 22, 32, and 34.

Fecal coliform was measured above the Basin Plan WQO in samples from both the northern and southern sub-drainages sampled within the watershed. Potential sources of bacteria within the watershed's urban runoff include urban and residential use and transportation use such as roads, highways, and parking facilities. Slightly higher levels were detected in the northern sub-drainage, where a nursery is located, than in the southern sub-drainage. Other potential sources of fecal coliform include the cluster of restaurants around sub-drainage 34, the golf course, and transportation use.

Although no pesticides (synthetic pyrethroids, OP pesticides, or organocholorine pesticides) were detected in any samples collected during the 2005-2006 wet weather monitoring period, potential sources for such pesticides do exist throughout the watershed. Parks, nurseries, golf courses, and cemeteries may use pesticides for maintaining their landscaping. A nursery is located within sub-drainage 18. There is a golf course in sub-drainages 8 and 9. Roads, highways, and parking facilities, which are located throughout the watershed, are also considered to be potential sources of pesticides.

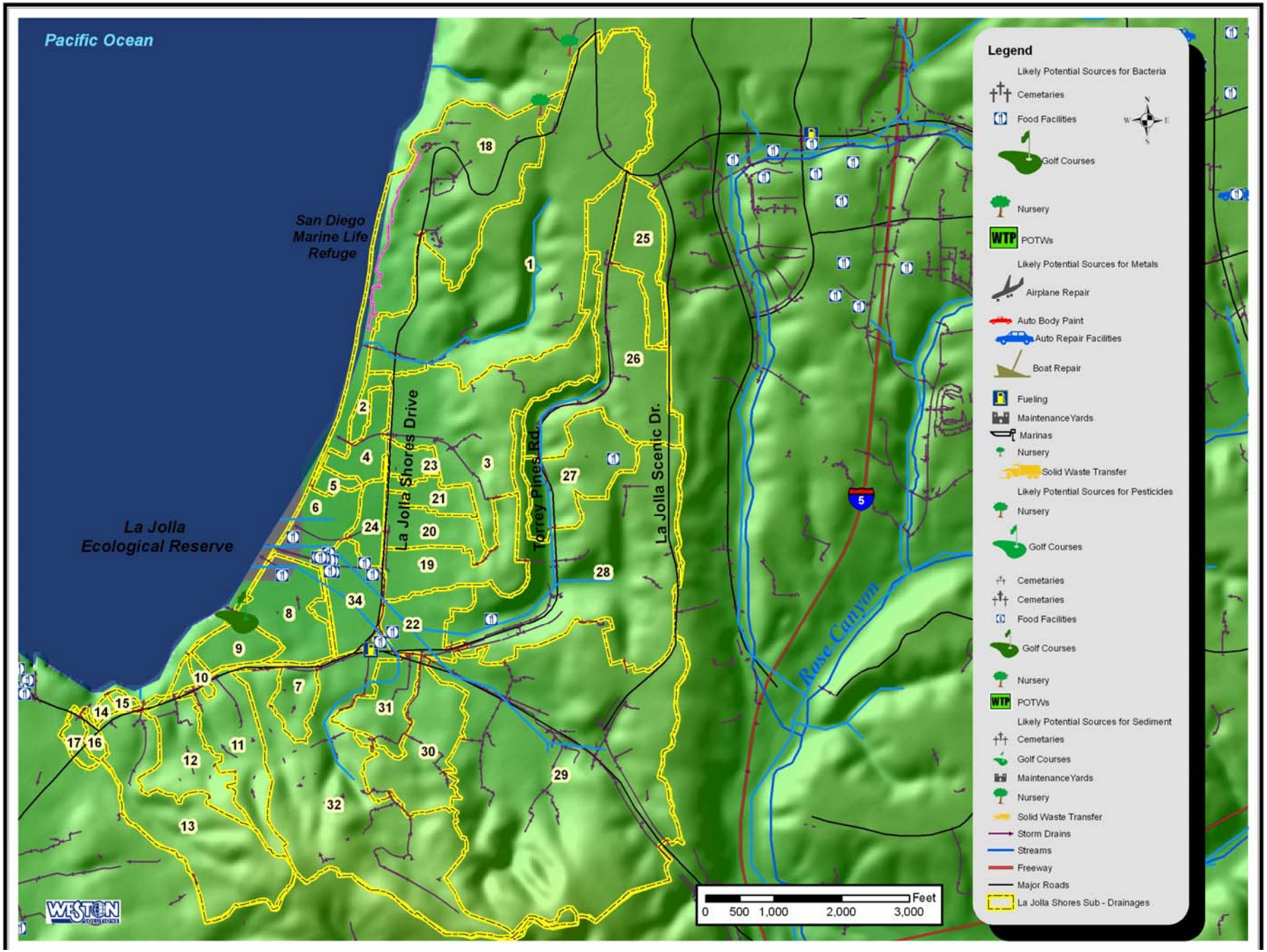

Figure 4-7. Potential sources of COCs within La Jolla Shores Coastal Watershed.

4.2.3.3 Potential COC Impacts to the ASBS

Turbidity, total and dissolved copper, fecal indicator bacteria, and pesticides may all be affecting the two ASBS within the La Jolla Shores Coastal Watershed. These COCs are presented in order of their perceived impacts to the ASBS, with the highest priority COC presented first.

The high turbidity levels detected in exceedance of the Basin Plan WQO in both sub-drainages sampled may impact the ASBS by significantly reducing light penetration necessary for phytoplankton and macroalgal growth. The transport of significant amounts of sediment through the storm drain system occurred during each rain event, as evidenced by repeated burial of sampling equipment mounted in the storm drains from sediment loading at both the northern and southern sub-drainage sample locations. Toxicity was also observed in the chronic kelp test, which targeted the growth endpoint in embryos exposed to storm drain samples.

The high total and dissolved copper concentrations detected in both sub-drainages may affect the ASBS by direct toxic effects on algae as well as through bioaccumulation. Copper is both a micronutrient and toxin that is known to strongly adsorb to organic matter as well as to carbonates and clay. Although its sorption to particulates significantly reduces its bioavailability, copper remains highly toxic in aquatic environments and has the capacity to bioconcentrate in the organs of both fish and mollusks (Owen 1981). It also effectively acts as an algaecide when combined with sulfate, chloride or other compounds. Single-cell and filamentous algae and cyanobacteria are particularly susceptible to acute effects of copper, resulting in reductions in photosynthesis and growth, loss of photosynthetic pigments, disruption of potassium regulation, and mortality (USEPA 2006).

The high fecal coliform levels detected in exceedance of the Basin Plan WQO in both sub-drainages sampled may indicate an increased health risk to recreational users of the ASBS. Fecal indicator bacteria are used to identify waters that may be at risk for disease-causing pathogens. If relatively high numbers of fecal indicator bacteria are measured in an environment, an increased likelihood of pathogens being present is assumed. It should be mentioned that the Pacific Ocean shoreline in the Scripps Hydrologic Sub Unit is on the 2002 SWRCB 303(d) list for impaired water quality due to the presence of bacterial indicators. It has been deleted from the draft version of the 2006 303(d) list.

Pesticide runoff into the ASBS has the potential to affect algal growth as well as the health of vertebrate and invertebrate populations.

4.2.4 Watershed-Specific Pollutants of Concern

1. Turbidity

2. Total and dissolved copper
3. Fecal coliform indicator bacteria
4. Pesticides (synthetic pyrethroids, OP pesticides, chlorinated pesticides)