2. SITE BACKGROUND

An understanding of the location, historic and current land use, operational history, and environmental setting of the Rayonier Mill Site is pertinent to the RI. This section presents background information relevant to evaluating the nature and extent of COPCs at the Site. The information presented herein is not meant to be all-inclusive, but is intended to provide the context necessary to understanding the origin, extent, transport, and fate of chemicals associated with the Uplands Environment at the Site.

2.1 Site Setting

The former Rayonier Mill is located in the city of Port Angeles, in Clallam County, Washington, along the northern coast of the Olympic Peninsula (Figure 2-1). The mill property is situated on the southern shore of Port Angeles Harbor in the Strait of Juan de Fuca. The Site is located in the northwest quarter of Section 11, Township 30 north, Range 6 west, at latitude 48° 07' 00" north and longitude 123° 24' 25" west. The mill property, which occupies approximately 80 acres, is bounded on the south by a high bluff and gently slopes north toward Port Angeles Harbor. Residential and commercial properties occur south of the mill property. Ennis Creek flows from the Olympic Mountains through the mill property and empties into the Strait of Juan de Fuca.

2.2 Historic and Current Land Use

Historically, the Site area and surroundings—particularly the area at the mouth of Ennis Creek—were used by Native Americans of the Lower Elwha Klallam Tribe. From 1887 to 1904, the Site was used by the Puget Sound Cooperative Colony.

In compliance with the State Environmental Protection Act (SEPA) and with conditions of approval for the Port Angeles Planning Department Shoreline and Building permit application necessary for dismantling activities, Rayonier contracted Larson Anthropological/Archaeological Services (LAAS) to conduct a cultural resource assessment of the Site. The assessment consisted of an archival review, tribal consultation, field reconnaissance, and preparation of a cultural resources assessment report (LAAS 1997).

The report provides a detailed description of the environment and cultural background of the Site and describes a Klallam Indian village, called *Y'innis* (I-eh-nus), on the eastern bank of Ennis Creek that supported a population of hunter-fisher-gatherers before Euro-American contact. *Y'innis* was one of more than 30 known Klallam villages in the region. The total population of the tribe was as high as 10,000 in the early 1800s. In 1847, the settlement was known to be occupied by about 200 Klallams. After introduced diseases swept through the tribe in the 1850s, only a few residents of *Y'innis* remained. Some of the survivors continued to live on the beaches of Port Angeles Harbor until the 1930s. At that

time land was purchased for a tribal reservation on the Elwha River, and tribal members were relocated.

Site construction-related excavation in 1976 exposed archaeological deposits. The LAAS report indicates that additional deposits would likely be exposed in some areas east of Ennis Creek if further excavation was conducted. The Klallam village site was recorded and listed on the Washington Heritage Register (#45CA236H), although no archaeological deposits associated with the site were recorded.

The Site area was home to the Puget Sound Cooperative Colony from 1887 to 1904, which consisted of nearly 400 people at its peak. The community included homes, a sawmill, a meeting house, and a hotel. The sawmill served as the economic base of the colony and contributed to the development of Port Angeles. Klallam Indians still lived at the village site, east of Ennis Creek, during the colony period, but most of the former Rayonier Mill Site was occupied by colony members. The gradual absorption of many colony members into the town and disputes over the business profits led to abandonment of the site by 1893. The bankruptcy of the colony was adjudicated in 1894 and its assets dispersed. In 1917, the U.S. Government built a new sawmill on the colony site to mill spruce wood for the manufacture of aircraft. However, the success of wooden aircraft proved to be very limited. The mill sat idle until Olympic Forest Products purchased it in 1929.

From 1929 to 1930, the sawmill was renovated and a pulp mill constructed. This mill was operated by Olympic Forest Products from 1930 to 1937. In 1937, the name changed when the local mill was merged with two other independent Olympic Peninsula companies to form Rayonier, Inc. During the early years of operation, it appears the mill configuration and operation were relatively unchanged. However, during its later life, numerous alterations and improvements were made, as summarized below. Many of these were instituted to eliminate potential environmental impacts, as well as improve mill efficiency.

Currently, the former Rayonier Mill Site is located within the Port Angeles city limits, in an area of mixed industrial, commercial, recreational, and residential land uses. The Site's immediate neighbors include the City of Port Angeles Publicly Owned Treatment Works (POTW), the Olympic Memorial Hospital, several businesses, and numerous residences. Figure 2-2 presents the zoning of the Site based on the City of Port Angeles Zoning Code and Comprehensive Plan. The uplands portion is primarily zoned heavy industrial, with the exception of the area associated with the steep bluffs and ravine along the southern margin of the Site, which is zoned for public buildings and parks. Two small areas along the bluff, south and southeast of the main process area, are zoned low-density residential. A small area at the extreme southern end of the Site is zoned commercial arterial.

2.3 History of Site Operations

The mill operated between 1930 and 1997, using an acid sulfite process to produce dissolving grade pulps from wood chips. In 1937, the mill was merged with two other independent Olympic Peninsula companies to form Rayonier, Inc. In 1968, International

Telephone and Telegraph (ITT) Corporation acquired Rayonier, Inc., and the name changed to ITT Rayonier. In 1994, the mill operation was spun off from ITT Corporation, and the name changed back to Rayonier, Inc.

Operations were conducted in various process areas throughout the former Rayonier Mill property. Figure 2-3 shows the locations of the primary Site facilities during active operation. Operations ceased in 1997, and dismantling activities were completed in October 1999. Figure 2-4 shows aerial photographs of the mill during operation in 1987 and following dismantling in 1999. Currently, there are few structures remaining, and the process area is covered by crushed concrete and gravel roads.

Mill design and operation are detailed in the ESI report (E&E 1998) and the Current Situation/Site Conceptual Model Report (CS/SCM) (Foster Wheeler 1997). Figure 2-5 presents a process flow diagram of the operations conducted at the mill. A description of the typical mill operations is provided below.

- Logs were delivered to the mill by raft or truck and staged in its log pond or log yard area before being processed in the wood mill. Up to about 50 percent of the mill's chip supply was purchased directly from sawmills and delivered by truck or a chip barge that docked on the west side of the former Rayonier Mill site's pier. The dock area was periodically inspected and dredged; the dredged material was then hauled and deposited in Rayonier's offsite landfills.
- Bark removed from the logs and rejected wood chips and debris were transported to the hog fuel pile to be subsequently burned in the hog fuel boilers. The hog fuel boilers and the recovery boiler generated process steam. When necessary, Bunker C fuel oil was used to supplement fuel demands.
- Water, ammonia, and sulfur dioxide were combined in the acid plant to produce a fortified ammonium bisulfite cooking liquor, which was combined with the wood chips and treated at high pressure and temperature in nine large pressure vessels called digesters. This reduced the wood chips to cellulose fibers (pulp) and water-soluble, non-cellulose wood residuals. Once digestion was complete, pressure was reduced in the digesters by venting steam and gases into condensers. The stored condensate was then fed back to the acid plant and recycled into the cooking liquor.
- Residual pressure in the digesters was used to blow the pulp into the blowpit tanks associated with each digester. Before the blow event, each blowpit was prepared to receive the pulp slurry by being partially filled with a cushioning liquor of digestion chemicals such as spent sulfite liquor (SSL). This reduced the release of gases during the transfer process. The mechanical agitation resulting from being blown against a metal plate in the blowpits separated the digested wood into individual fibers. Process gases released during the blow event were recovered, reprocessed, and reused. The pulp slurry was then transferred from the blowpits to the red stock washers, where the digestion chemicals were washed from the pulp. The pulp was screened to remove knots and other undigested wood residue and forwarded to the bleach plant.
- The SSL consisted of approximately 10 percent solids upon leaving the red stock washers. The SSL was filtered and stripped of sulfur dioxide, and the solids content

was increased by vapor recompression and multi-effect evaporators. This allowed approximately 95 percent of the SSL to be burned in the recovery boiler to generate steam for the digestion process. The sulfur dioxide was recovered in the boiler flue gas using aqueous ammonia in a large absorber to produce the cooking liquor precursor.

- The SSL was temporarily stored in the SSL lagoon, located on the easternmost portion of the former Rayonier Mill site, before it was burned in the recovery boiler. The lagoon had a 1- to 2-ft-thick layer of clay (10^{-5} permeability) and a 60-mm, high-density polypropylene (HDPE) floating cover was placed over the liquid.
- In the bleach plant, the bleaching process generally consisted of sequential treatments using chlorine, caustic soda, sodium hypochlorite, and chlorine dioxide; and multiple washing stages. Both chlorine dioxide and sodium hypochlorite were produced on site. The bleached pulp was then transported to the drying machine where water was removed. The pulp was then pressed and dried, and the material was made into large rolls. These rolls were then processed into smaller rolls or bales before being transported from the mill to the customer.

An important component of operations at the former Rayonier Mill was the management of process wastewater and stormwater. Prior to 1972, these waters were discharged directly into Port Angeles Harbor through nearshore outfalls (Figure 2-6). In 1972, a primary treatment plant was constructed to treat process wastewater prior to discharge to the harbor through a new, offshore outfall (Figure 2-6). In 1979, a secondary treatment system was constructed, and non-process stormwater was collected for treatment. Currently, stormwater at the Site is managed under a stormwater management plan (Rayonier 2003). The plan describes the facilities and procedures for managing stormwater, including structural controls (berms, trenches, curbing, etc.), open area infiltration, and the routing of stormwater discharge through various outfall locations into Ennis Creek.

The EPA identified storm drains as one of the potential receptors of chemicals from suspected source areas on the Site, specifically identifying a drainage ditch located on the east side of the mill (E&E 1998). This ditch collected stormwater from the asphalt-covered areas as well as occasionally received biological solids from the secondary effluent treatment system during periodic maintenance. Water that collected in the ditch flowed to the southwestern end of the ditch and was pumped to the mill's treatment system. The ditch was periodically cleaned and the material taken to an offsite landfill. Since shutdown of the mill, the ditch has received only stormwater from the asphalt-covered area. As part of routine maintenance activities in 2001, Rayonier removed approximately 15 cubic yards of sediments from the ditch. Clean fill material was then placed into the ditch and graded, and the ditch was hydroseeded with a native grass mixture.

2.4 Environmental Setting

This section describes the topography, climate, geology, hydrogeology, and ecology of the Uplands Environment of the Site. The Site is located within the Port Angeles city limits and is bordered to the south by residential and commercial areas on the high bluff and to

the west and east by a pedestrian pathway following the old railway right-of-way and additional commercial/residential areas. Port Angeles Harbor has a high level of urban, commercial, industrial, and recreational use. Ennis Creek flows through the former Rayonier Mill property and discharges to the marine waters.

2.4.1 Topography

A significant portion of the Site rests on historically filled shallows, beach material, and the former alluvial fan of Ennis Creek. Surface elevations range from sea level to approximately 75 ft above the National Geodetic Vertical Datum (NGVD) (Figure 2-7; HLA 1993). The terrain rises to approximately 200, 265, and 150 ft above NGVD within approximately 1.0 mile southeast, south, and southwest of the Site, respectively. The northern portion of the Site is generally flat, with relatively steep bluffs rising rapidly to approximately 75 ft above NGVD immediately to the southeast and southwest. Hills farther to the southeast and southwest of the Site gradually rise toward the foothills of the Olympic Mountains (HLA 1993).

The closest surface water bodies are Port Angeles Harbor, which borders the Site, and White and Ennis creeks, which converge near the mill property's southern boundary. A rather steep ravine is formed where Ennis Creek cuts through the bluff on the southern end of the property and beyond. A Site access road extends along the western side of this ravine, dropping in elevation from approximately 75 ft to just above sea level.

2.4.2 Climate

The climate on the northern coastline of the Olympic Peninsula is influenced by winds from the Pacific Ocean. Based on data gathered between 1951 and 1980 (Foster Wheeler 1997), average temperatures in the area range from 39°F in January to 59°F in July and August. Total annual precipitation (mostly occurring as rain in the lower elevations) is approximately 25.4 inches, ranging from 0.5 inch in July to 4.4 inches in January.

Winds in the area vary seasonally and are influenced by weather patterns approaching the coast. During dismantling and cleanup activities between October 1997 and October 1999, onsite winds were monitored as part of the air quality monitoring program (Foster Wheeler 1998). Meteorological conditions during each sampling event and monthly composites were presented in the form of windrose figures. Onsite winds during the monitoring program were generally light to moderate, blowing primarily from the northwest. A detailed evaluation of meteorological data and wind speed is provided as part of the particulate deposition model in the appendices.

2.4.3 Geology

The regional geology of the Olympic Peninsula is characterized by accretionary tectonics and can be divided into two geologic domains: the Olympic Core Terrane and the peripheral Crescent Terrane. The Olympic Core Terrane is comprised of complex deformed packages of Eocene to Miocene age sedimentary rocks with interbedded

volcanic rocks. The terrane forms an accretionary prism thrust under the peripheral Crescent Terrane. The Crescent Terrane forms a horseshoe shape around the Olympic Core Terrane and is comprised of the Crescent Formation, an Early to Middle Eocene oceanic tholeiitic basalt with associated interbedded marine sedimentary rocks (Rauch 1985; Tabor and Cady 1978; HLA 1993).

The Site geology is characterized by Tertiary bedrock overlain by Pleistocene-age deposits and recent alluvium deposit. The Site lies in an area composed of fill material, alluvium deposited by Ennis Creek, and beach deposits related to the Strait of Juan de Fuca. Most of these glacial deposits are related to continental glaciation from the north, with minor amounts related to glaciation in the Olympic Mountains to the south. Depth to bedrock beneath the Site is unknown, but is likely variable in the Port Angeles area, based on local isolated outcrops of the Tertiary Twin River Formation (Tabor and Cady 1978; HLA 1993).

Soil types identified at the Site include beach and fill material along the northern margin, Dystric Xerorthents (coarse-textured soils) along the coastal bluffs, and Neilton very gravelly loamy sand (30 to 70 percent slopes) and Puget silt loam (0 to 3 percent slopes) along Ennis Creek to the south (SCS 1987; HLA 1993). The beach and fill deposits consist of sand, gravel, and cobble-size material reworked by wave action combined with materials used for fill at the Site. Physical characteristics depend on the nature of the deposits and, as a result, are highly variable across the Site (HLA 1993). The Neilton very gravelly loamy sand and Puget silt loam are both associated with land features related to Ennis Creek. Puget silt loam is present on the relatively flat terraces of Ennis Creek and is a very deep, poorly drained soil, while the Neilton very gravelly loamy sand is excessively drained and found on the terrace escarpments of Ennis Creek. Both soils are found in the southern portion of the Site (SCS 1987; HLA 1993).

Materials in many portions of the Site most likely consist of soils modified through grading, dredging, filling, or facility operations, and may vary considerably between locations. In addition to sand and gravel, wood waste, ash, and demolition debris were used as fill materials (HLA 1993). During the Site dismantling (1997 through 1999), crushed concrete rubble was distributed across the western portion of the Site. In 1999, fill material consisting of gravel, rock, and riprap was imported to reconstruct and prevent further beach and Site erosion along the former log pond area beach wall.

In the northwest portion of the Site, previous investigations encountered gravels, sands, and silts with fragments of shells, wood, brick, metal, and other debris to depths 20 to 25 ft bgs underlain by till to about 44 ft bgs, the maximum depth explored (Foster Wheeler 1997). Groundwater was encountered at approximately 4 to 8 ft bgs during the investigations (HLA 1993). In the northern portion of the Site near the mouth of Ennis Creek, the subsurface material encountered during investigations consisted of fill and alluvium underlain by glacial till (Landau 1991). The fill was comprised of sand, gravel, cellulose material, and riprap rock along Ennis Creek and was generally less than 6 ft thick. Beneath the fill, 2 to 4 ft of sand, gravel, and silt alluvium was encountered which, in turn, was underlain by till. The maximum depth explored during the investigation was approximately 20 ft bgs, and groundwater was present at approximately 5 to 6 ft bgs (HLA 1993).

2.4.4 Hydrogeology

Site-specific hydrogeology is based primarily on groundwater data obtained during previous investigations conducted by HLA (1993), Landau (1997; 1998a,b; 2001a; 2002; 2003a), E&E (1998), and the data collected during the recent 2003 RI characterization efforts.

Groundwater conditions observed during this and previous investigations indicate the presence of unconfined groundwater beneath the Site in a shallow water-bearing zone consisting of near-surface fill and alluvial deposits. The shallow water-bearing zone is variable in thickness; the base (generally defined by the top of the Vashon Till unit) varies from 12 ft bgs to greater than 30 ft bgs (Foster Wheeler 1997).

In 1941, Rayonier installed a well (434 ft deep) to extract groundwater for process purposes. The yield of the well ranged from 100 to 250 gallons per minute, but was abandoned in 1947 after rising chloride concentrations of unknown origin made the water unusable (Landau 1998a).

Onsite monitoring wells are screened in the shallowmost water-bearing zone beneath the Site. The groundwater occurs under unconfined conditions in the fill and alluvium materials. The depth to shallow groundwater in monitoring wells has ranged from approximately 2.5 ft to 17 ft bgs. Groundwater elevations are influenced by elevation, tides (HLA 1993; E&E 1998), and, to a lesser degree, by surface water fluctuations in Ennis Creek.

Groundwater elevations measured in monitoring wells indicate that shallow groundwater movement is northerly toward the shoreline, with a locally variable lateral component toward Ennis Creek. Groundwater flow gradients range from approximately 0.01 ft/ft in the upper, southern portions of the Site to 0.001 ft/ft in the lower, northern portions. Gradients in the lower portion of the Site are influenced by tidal fluctuations, but diurnal differences in gradient are typically within the same order of magnitude.

Additional characterization of Site hydrogeology, including temporal elevation variations, spatial distribution of groundwater elevations, hydraulic properties of the aquifer, and tidal influences, is provided in Section 5.2.

2.4.5 Ecology

The uplands portion of the Site is primarily zoned heavy industrial. The Ennis Creek riparian area and marine bluffs contain disturbed forest habitat that provide a corridor of upland wildlife habitat. Typical species that could occur within an urbanized/ industrialized area such as this Site are listed in Table 2-1 (Link 2001, pers. comm.). This list is not meant to be all-inclusive, but is designed to provide background for some wildlife species that tend to be common within this type of urban/industrial setting.

Information regarding federal- and state-listed sensitive and candidate Endangered Species Act (ESA) species was sought from U.S. Fish and Wildlife Service (USFWS), National

Marine Fisheries Service (NMFS), Washington Department of Natural Resources (WDNR) Natural Heritage Program, and the Washington Department of Fish and Wildlife (WDFW) Priority Habitat Species (PHS) List data. No federally listed endangered species were identified in the upland portion of the project area (Table 2-2). Only the bald eagle, which is listed as threatened, may be found near the Site. No nesting bald eagles are located on or near the project; however, they are known to forage along this stretch of shoreline. The closest nesting territory (Morse Creek #258) is located approximately 1 mile east of the Site (Ament 2001, pers. comm.). There is also a nesting territory (Angels Point #649) west of the Site.

Wintering bald eagles require perch trees for day use and mature/old-growth forest stands for night roosts. Perch trees are typically dominant live or dead trees situated near a shoreline where a nest or defendable territory is evident or a prey source is abundant. Prey items are primarily fish and waterfowl. Bald eagles do forage along this stretch of shoreline and within the harbor area during the winter months; however, there are no major concentrations or winter night roosts located near the project.

The marbled murrelet is listed as threatened on both federal and state lists and may forage within the bay, but their numbers documented during the Puget Sound Avian Monitoring Project (PSAMP) flights are low. Marbled murrelets forage primarily for small fish and invertebrates in the nearshore environment and may forage near the Site on occasion. In western Washington, marbled murrelets nest in large conifer trees and may travel up to 50 miles or more inland to nest (Nelson and Hamer 1995). The closest known occupied nesting stands are within the Olympic National Forest, located approximately 6 miles south of the Site. No suitable nesting habitat occurs within the Site or its surroundings.

Other avifauna that may forage within the harbor are various shorebirds, waterfowl, and sea birds. No species listed as endangered, either by USFWS or WDFW, occur near the Site. The common murre is a State of Washington candidate species. Small groups of murres may forage within the harbor. Other sea birds that may be found near the Site, primarily during the winter months, are pigeon guillemots and surf scoters as well as various waterfowl and shorebird species.

Certain marine mammals may also be expected to use the area surrounding the Site. Harbor seals have been seen actively swimming and apparently foraging in the marine environment near the mill, but no haul-out locations are currently available. River otters are also commonly observed near the Site. Sea otters have not been documented east of Pilar Point, located about 30 miles west of Port Angeles Harbor (Jameson and Jefferies 2001).

Information regarding listed and candidate ESA fish species in the project area was sought from USFWS, NMFS, WDFW, and the Tribe. There are no federally listed endangered fish species identified in the project area (Table 2-2). Federally listed threatened species (also noted as State candidate species) that may be found in the Puget Sound evolutionary significant unit (ESU) within the nearshore environment of the project include the Puget Sound chinook salmon (*Oncorhynchus tshawytcha)* and the Hood Canal summer-run chum salmon (*O. keta*), which may migrate through the area during certain periods of the year.

In addition, bull trout (*Salvelinus confluentus*), which may be found in the general area of the project, are listed as threatened in the coastal-Puget Sound Distinctive Segment (PSDS).

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