FINAL
CITY OF SANTA CRUZ OPERATIONS AND MAINTENANCE HABITAT CONSERVATION PLAN

for the

ISSUANCE OF AN INCIDENTAL TAKE PERMIT UNDER SECTION 10(a)(1)(B) OF THE ENDANGERED SPECIES ACT

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City of Santa Cruz

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Photo: Laguna Creek California red-legged frog by Chris Berry

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Executive Summary

The City of Santa Cruz (City or Applicant) has applied for an incidental take permit (ITP) from the U.S. Fish and Wildlife Service (Service) pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973 (ESA) as amended (16 U.S.C. 1531 *et seq.*) to incidentally take the federally endangered Ohlone tiger beetle (*Cicindela ohlone*); the federally endangered Mount Hermon June beetle (*Polyphylla barbata*); the federally endangered tidewater goby (*Eucyclogobius newberryi*); the Pacific lamprey (*Lampetra tridentata*)(a species not currently listed under the ESA); the federally threatened California red-legged frog (*Rana draytonii*); and the western pond turtle (*Actinemys marmorata*), a federal species of concern. Additionally, the City is proposing to include four plant species in the Habitat Conservation Plan (HCP or Plan) and permit because of the benefits provided to such species as a result of the Plan's conservation strategy and to receive the "No Surprises" regulatory assurances. The four plant species are the federally endangered Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*); the federally endangered Robust spineflower (*Chorizanthe robusta* var. *robusta*); the federally threatened Santa Cruz tarplant (*Holocarpha macradenia*); and the State endangered San Francisco popcornflower (*Plagiobothrys diffuses*).

The Plan refers to the plant and wildlife species proposed for coverage under the plan as Covered Species. Any reference in this Plan to incidental take of Covered Species under the Plan shall, for the purpose of covered plant species, refer to loss or impacts to covered plant species identified in the Permit.

The potential taking of the covered wildlife species would occur as a result of activities permitted under the ITP (Covered Activities) and described in the Plan and include operation, maintenance and rehabilitation of the City's water supply and water system facilities; operation and maintenance of the City's municipal facilities; and management of City lands.

The area covered by the HCP (Plan Area) is located in Santa Cruz County on the Central Coast of California, approximately 70 miles south of San Francisco. The total watershed and water service/urban areas comprising the general Plan Area are approximately 176 square miles and include three geographically distinct areas: the North Coast watersheds, the San Lorenzo River watershed, and the Santa Cruz urban center.

The Plan discusses in detail the impacts to Covered Species and their habitats that are expected as a result of Covered Activities. As a result of these anticipated impacts, the Applicant has applied for a section 10(a)(1)(B) incidental take permit and proposes to implement the HCP as described herein, which provides measures for minimizing and mitigating adverse effects on the Covered Species. The Applicant requests that the permit be issued for a period of 30 years.

The HCP summarizes the Covered Activities and identifies the responsibilities of the City and the role of the Service under the Plan. The HCP describes measures that will be implemented by the Applicant to minimize and mitigate impacts of the project on the Covered Species and their habitats and to further the conservation of these species. The conservation strategy in the Plan includes measures to mitigate impacts to Covered Species and their habitats that are not avoided

through minimization measures. The City commits to fully fund the Plan and the Plan includes descriptions of costs for implementing the Plan and sources of funding to cover those costs.

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1.0 INTRODUCTION

The City of Santa Cruz (City or Applicant) has applied for an incidental take permit (ITP) from the U.S. Fish and Wildlife Service (Service) pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973 (ESA) as amended (16 U.S.C. 1531 *et seq.*) to incidentally take the federally endangered Ohlone tiger beetle (*Cicindela ohlone*; OTB); the federally endangered Mount Hermon June beetle (*Polyphylla barbata;* MHJB); the federally endangered tidewater goby (*Eucyclogobius newberryi*; goby); the Pacific lamprey (*Lampetra tridentata*)(a species not currently listed under the ESA); the federally threatened California red-legged frog (*Rana draytonii*; CRLF); and the western pond turtle (*Actinemys marmorata*; WPT), a federal species of concern. Listed plant species may be included on an incidental take permit in recognition of the conservation benefits provided to such species by the HCP. The City is proposing to include four plant species on the incidental take permit in recognition of the conservation benefits provided by the Plan and to receive the "No Surprises" regulatory assurances (50 CFR 17.22(b)(5)). The four plant species are the federally endangered Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*; BLS); the federally endangered Robust spineflower (*Chorizanthe robusta* var. *robusta*); the federally threatened Santa Cruz tarplant (*Holocarpha macradenia*); and the State endangered San Francisco popcornflower (*Plagiobothrys diffusus*). The incidental take of covered wildlife species and potential adverse effects to covered plant species are anticipated to occur as a result of City Covered Activities within the Habitat Conservation Plan (HCP) Area. The Santa Cruz HCP provides for permit coverage for a wide range of City activities. These activities include operation, maintenance and rehabilitation of the City's water supply and water system facilities; operation and maintenance of the City's municipal facilities; and management of City lands.

1.1 Purpose and Background

The City provides a wide range of essential public services for its citizens and visitors, such as the construction, operation and maintenance of water supply facilities, the construction and maintenance of roads, waste management activities, storm water management, and the operation and maintenance of recreation and open space areas. The City has determined that these activities and services may affect the life history and habitat of certain species listed as threatened or endangered under the ESA.

To ensure the City's continued ability to provide these essential public services, the City is seeking a permit from the Service under section 10(a)(1)(B) of the ESA for the incidental take of OTB, MHJB, goby, Pacific lamprey, CRLF, WPT, and "No Surprises" assurances for potential impacts to BLS, robust spineflower, Santa Cruz tarplant, and San Francisco popcornflower. This HCP provides the basis for the issuance of a permit under the ESA.

1.2 Plan Area

The area covered by this HCP ("Plan Area") is located in Santa Cruz County on the Central Coast of California (Figure 1), approximately 70 miles south of San Francisco. The Plan Area is

contained on the Davenport, Santa Cruz and Felton U.S. Geological Survey 7.5-minute quadrangles. The total watershed and water service/urban areas within the Plan Area are approximately 176 square miles and include three geographically distinct areas: the North Coast watersheds, the San Lorenzo River watershed, and the Santa Cruz urban center, as well as the water service areas outside of the City limits. The regional topography ranges from sea level to greater than 1,200 feet above sea level.

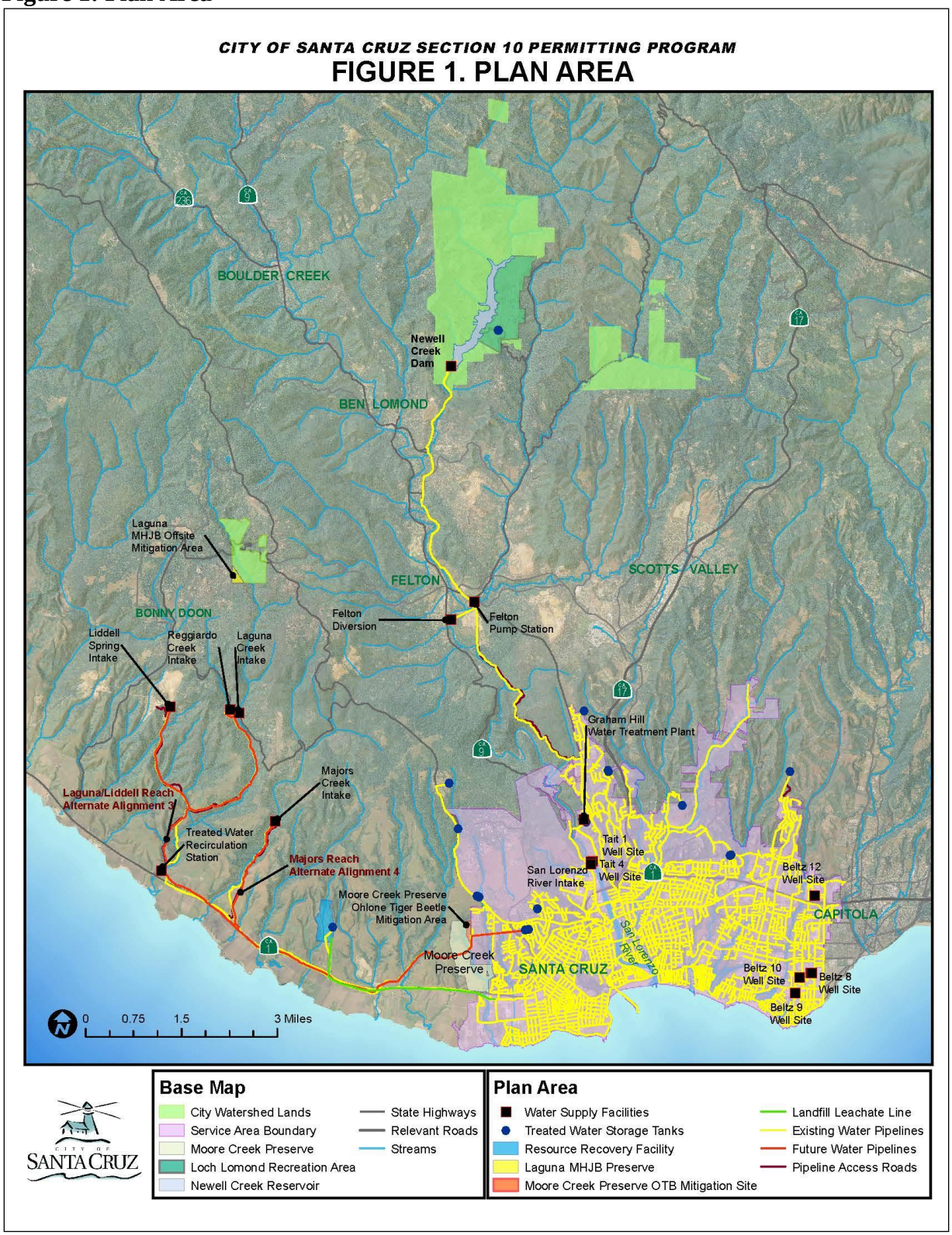
The 18 square-mile North Coast watersheds which serve as drinking water source watersheds for the City comprise a series of small coastal watersheds that drain the west and south-facing slopes of the Santa Cruz Mountains directly to the Pacific Ocean. In most cases, these watersheds include forested slopes in the upper reaches and canyon portions of the watershed, coastal foothill terraces, agricultural lands on the coastal plain, and streams that typically drain into seasonal lagoons. Through natural fluctuation, the seasonal lagoons are typically open to the ocean during the winter months (December to April) and closed during the dry season (May to November).

The 138 square-mile San Lorenzo River watershed is unique to the Plan Area. In addition to draining west-facing slopes, it drains east-facing slopes in the Santa Cruz Mountains that do not receive as much rain as their west-facing counterparts. The San Lorenzo River has a longer run to the ocean than other Plan Area streams and is fed by many tributaries. While many of the tributaries exhibit the physical characteristics of coastal streams (e.g., steep gradients, forested slopes), the San Lorenzo River runs through a comparably deep, wide canyon. Finally, the San Lorenzo River is densely developed throughout the floodplain and watershed.

The City's urban center encompasses approximately 12 square miles centered around the mouth of the San Lorenzo River with an additional 8 square miles of water service area outside of the City limits. The City is the largest city in Santa Cruz County, and is home to more than 53,000 residents. Major industries include tourism, manufacturing, food processing, and technology. The University of California, Santa Cruz (UCSC), a world-class university of approximately 14,000 students, is also located within the City.

The City does not have strict regulatory jurisdiction in much of the Plan Area in the San Lorenzo and North Coast watersheds, as those areas are outside of the incorporated City limits. However, areas outside City limits which are included in the Plan Area are either on property owned by the City of Santa Cruz (though not necessarily incorporated property) or the City has easements on those lands with standards governing operations and maintenance of its facilities. Finally, in addition to applying to activities within City limits, the City's municipal code also applies to drinking water source watershed lands at Loch Lomond and Laguna, Zayante, and Newell Creeks. As such, the City has sufficient control over the lands subject to Covered Activities to implement the provisions of this Plan.

Figure 1: Plan Area



1.3 HCP Planning Process

To develop the HCP, the City assigned staff and retained biological consultants to assemble an HCP team. The City's Water Department assumed lead responsibility for developing the HCP on behalf of the City. Members of the HCP team met with the Service in person or by teleconference from 2010 to 2019, to review and discuss the contents of the HCP.

1.4 Regulatory Framework

1.4.1 Endangered Species Act

The United States Congress passed the ESA in 1973 to provide a means for conserving the ecosystems that endangered and threatened species require in order to prevent species extinctions. The ESA has two major components relevant to this HCP, the Section 9 prohibition against "taking" listed animal species and the Section 10 provision for permitting the incidental take of listed animal species.

Section 9(a)(1)(B) of the ESA prohibits the "take" by any person of any endangered fish or wildlife species. The ESA authorizes the Service to prohibit the take of threatened wildlife species through regulation. The Service has prohibited the take of all threatened fish or wildlife species through a blanket regulation issued in 1978. "Take" is defined broadly to mean harass, harm, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.[1] "Harm" is defined by regulation to mean an act which actually kills or injures wildlife, including those activities that cause significant habitat modification or degradation resulting in the killing or injuring of wildlife by significantly impairing essential behavior patterns, including breeding, feeding, or sheltering. The protections for listed plant species under the ESA are more limited than for fish and wildlife.[2]

The Section 9 take prohibitions apply unless take is otherwise specifically exempted pursuant to Section 7 or authorized pursuant to Section 10 of the ESA. Private individuals, corporations, state and local government agencies, and other non-federal entities who wish to conduct otherwise lawful activities that might incidentally take a listed species must first obtain a Section 10 incidental take permit from the Service. The contents of an HCP must meet the application criteria provided under ESA Section 10(a)(2)(A):

- The impact which will likely result from such taking;

[1] 16 U.S.C. § 1532 (2010).

[2] Section 9(a)(2)(B) of the ESA prohibits removal, possession, or malicious damage or destruction of endangered plants in areas under federal jurisdiction, as well as actions that remove, cut, dig up, damage, or destroy endangered plants in areas outside of federal jurisdiction in violation of any state law or regulation, including state criminal trespass law. Protection for threatened plant species is limited to areas under federal jurisdiction. 50 C.F.R. § 17.71(a). The ESA Section 7(a)(2) prohibition against jeopardy applies to plants, wildlife, and fish equally, and the Service may not issue a Section 10(a)(1)(B) permit if the issuance of that permit would result in jeopardy to any listed species.

- What steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps;
- What alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and
- Such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan.[3]

Under Section 10(a)(2)(B) of the ESA, the Service may permit the incidental take of species only after finding that the HCP meets the following criteria:

- The taking will be incidental;
- The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking;
- The applicant will ensure that adequate funding for the Plan will be provided;
- The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and
- Other measures, if any, which the Service requires as being necessary or appropriate for purposes of the Plan will be met.[4]

The HCP is intended to meet regulatory requirements necessary for the Service to issue a Section 10 permit to allow incidental take of covered wildlife species as a result of Covered Activities undertaken by the permit applicant.

1.4.2 National Environmental Policy Act

The National Environmental Policy Act (NEPA) was enacted by Congress in 1969 to ensure that federal agencies consider the environmental impacts of their actions and decisions. NEPA requires the federal government to use all practicable means and measures to protect environmental values and makes environmental protection a part of the mandate of every federal agency and department. NEPA requires analysis and a detailed statement of the environmental impact of any proposed federal action that significantly affects the quality of the human environment. NEPA regulations require that the Service ensures that permits issued pursuant to an HCP have been evaluated consistent with NEPA requirements.

HCPs, such as this one, that qualify as "low-effect" according to the Service's 2016 HCP Handbook, are categorically excluded from NEPA analysis (Department of Interior Manual 516DM2, Appendix 1, and Manual 516DM6, Appendix 1).

[3] 16 U.S.C. § 1539(a)(2)(A)(2010).
[4] 16 U.S.C. § 1539(a)(2)(B)(2010).

2.0 ENVIRONMENTAL SETTING

2.1 Introduction

This section analyzes the environmental setting for the Plan within the three regions of the Plan Area. The three regions that constitute the Plan Area are: 1) the North Coast Unit, 2) the San Lorenzo River Watershed Unit, and 3) the City Urban Center Unit. The North Coast Unit is located north of the City along Highway 1 and includes Majors Creek, Laguna Creek, Reggiardo Creek, Liddell Creek, and Lombardi Gulch. Streams in the North Coast Unit flow off the west flank of Ben Lomond Mountain and drain directly into the Pacific Ocean. The San Lorenzo River Watershed Unit includes the San Lorenzo River and its major tributaries including Newell Creek and Zayante Creek. Streams within the City Urban Center Unit are the lower San Lorenzo River and tributaries, and the smaller urban drainages and aquatic resources potentially influenced by Covered Activities, including Neary Lagoon, Laurel Creek, Moore Creek, and Arana Creek. The streams listed under the City Urban Center Unit are located either partially or wholly within the City limits and are influenced by urban land management activities such as vegetation management, flood control and storm water management activities, rather than or in addition to surface water diversions. Therefore, the lower San Lorenzo River (from the City limits to the river mouth), Branciforte Creek, Carbonera Creek, and Pogonip Creek, although part of the San Lorenzo River watershed, are discussed under the City Urban Center Unit in this Plan.

2.2 Climate

The Santa Cruz Mountains, like most of central California, are marked by winter rains and summer drought. Rainy winter periods and dry summer months are typical of the Mediterranean climate in the central coastal areas of California, including the Santa Cruz Mountains. Mean annual precipitation along the coast is about 26 inches, but increases to about 50 inches at higher elevations near the headwaters of the project area streams.

Most precipitation falls between the months of November to April, with February typically being the wettest month of the year. Pacific frontal storms in combination with orographic lifting along the coastal range generate intense periods of precipitation. Streams in the project area tend to exhibit “flashy” (rapidly rising and falling) winter flows in response to these winter storms. During the dry season from May through October the region typically receives no precipitation, the surface soils dry out, and perennial streams are fed by seeps and springs. The coastal front range experiences mild temperatures during the dry season due to the off-shore marine breeze and summer fog.

2.3 Geology

The Plan Area is located in the Coast Ranges geomorphic province. This northwest-trending, 900-mile long province contains mountain ranges and associated intervening valleys that are

relatively comparable in age and share somewhat similar history, geologic composition, and structure. The Santa Cruz Mountains, in which the Plan Area exists, represents one of these ranges. This mountain range forms the mountainous spine of the San Francisco Peninsula and extends about 80 miles, from the vicinities of Daly City to Watsonville. The average summit height reaches 2,500 feet above sea level. The Coast Ranges are considered very seismically active due to the abundance of active faults. The San Andreas and San Gregorio fault zones represent the two principal active faults within the region (Hall et al. 1974; Hart and Bryant 1997).

2.3.1 North Coast Unit

The Coast Ranges typically exhibit strong northwest-southeast trends, induced by folds and faults of the same trend. The Coast Ranges generally consist of sedimentary rocks underlain by two unlike kinds of basement rocks, the Franciscan and Salinian complexes, mostly of middle Mesozoic age. The Franciscan complex, which is present east of the San Andreas Fault Zone and west of the Nacimiento Fault Zones, generally consists of an assemblage of oceanic crustal rocks (predominantly sandstone and shale) which have been intruded by ultramafic igneous rocks. This complex presumably formed as a result of the subduction of the western oceanic plate beneath the continental plate beginning in the Mesozoic Period. The Salinian complex (block), which is present between the San Andreas and Nacimiento fault zones, consists of metamorphic and igneous rocks; because of the similarities between the Salinian igneous rocks and those found in Sierra Nevada. It is believed that the Salinian block has moved hundreds of miles northward along the west side of the San Andreas Fault Zone. Besides the Franciscan and Salinian complexes, the only major pre-Cenezoic sedimentary rocks in the Coast Range belong to the Great Valley sequence. Sedimentary rocks that overly the Franciscan and Salinian complexes are Cenezoic in age and predominantly represent sediments deposited along the continental shelf.

2.3.2 San Lorenzo River Watershed Unit

In the San Lorenzo River Watershed Unit two primary fault systems define the geologic conditions: the Zayante fault and the Ben Lomond fault. The Zayante fault trends primarily east to west through the middle of the San Lorenzo River basin. The Ben Lomond fault trends primarily north to south on the west edge of the basin along Ben Lomond Mountain. The two faults intersect near Jamison Creek in the northwest area of the basin. The two faults divide the San Lorenzo Valley into three terrains: (1) north of the Zayante fault, (2) south of the Zayante fault and west of the Ben Lomond fault, and (3) south of the Zayante fault and east of the Ben Lomond fault. The following descriptions of these terrains are derived from Balance Hydrologics (Hecht and Kittleson 1998) report on streambed conditions and erosion control efforts in the San Lorenzo River watershed.

North of the Zayante fault, interbedded sandstones, shales, and mudstone predominate, with steeply inclined and folded strata. Complex mosaics of soils and vegetation have developed on these geologic structures, resulting in diverse and widespread sediment sources. Slopes tend to

be steep, prone to moderate to severe erosion. Principal watersheds are the upper San Lorenzo River (above Boulder Creek), Kings, Two Bar, and Bear Creeks, plus the northern portions of the Boulder Creek and Zayante Creek basins. The Butano fault, which runs parallel and to the north of Zayante fault, once brought hard sandstones upward, resulting in a very steep slope rising from the River and Bear Creek abruptly toward the Summit ridge. This zone between the Butano fault and the Summit is now a belt of often-serious erosional sources, as roads and clearings are cut through this oversteepened slope. Dry-season flows are generally lowest in this geologic terrain, with streams often drying to isolated pools during mid-summer.

South of the Zayante fault, and west of the Ben Lomond fault, the tectonically uplifted eastern side of Ben Lomond Mountain forms the southwestern edge of the San Lorenzo watershed. Principal watersheds are Fall, Alba, Clear and Sweetwater Creeks, Malosky, Peavine and Jamison Creeks, and the southern portion of the Boulder Creek basin. Crystalline bedrock types, principally granitics, schists, and marble, have developed residual soils which support steep small forested watersheds with low to moderate background erosion rates. Streams clear up quickly after storms. The lower portions of these watersheds have developed in downslope-dipping sandstones and mudstones, locally prone to landsliding, especially where disturbed. Summer flows are generally sufficient to support perennial stream threads and diverse aquatic habitat.

The third terrain is found south of the Zayante fault, and east of the Ben Lomond fault and the San Lorenzo River. It includes the Love Creek, Quail Hollow, Graham Hill Road, Mount Hermon and Scotts Valley areas, as well most of the Bean and Branciforte Creek basins, and the southern portions of the Zayante and Newell Creek watersheds. Here, sandstones and shales form erodible soils which tend to be either very sandy or clay rich. Much of the area was once vegetated with unusual associations of trees and shrubs that exploited niches made available by these atypical soils. By far the largest continuous units of sandy soils are found in this area, and these tend to be sandier than other sandstone-derived soils elsewhere in the watershed. Erosion rates are often high to extreme in this terrain, especially where sandy soils occur in headwater areas or near channels. The sandy soils, which were capable of absorbing nearly all rainfall under natural conditions, now form steep-walled gullies and gulches where runoff from paved or covered surfaces is concentrated.

2.3.3 City Urban Center Unit

The geologic description of the City Urban Center is based on the City-Wide Creeks and Management Plan prepared by the Biotic Resources Group (2002). The City of Santa Cruz can be divided fairly evenly into two geologic regimes split roughly at the San Lorenzo River where the Ben Lomond fault trends southeast to northwest. The geology on the west side of the San Lorenzo River is composed of a mix of granitic and metamorphic basement rocks overlain by a relatively thin layer of sedimentary rocks. The underlying geology on the east side of the San Lorenzo River, like the west side, is composed of a mix of granitic and metamorphic basement rocks. The east side basement rocks are overlain by a thick layer of sedimentary rocks and marine terraces up to hundreds of feet deep.

Most of the City of Santa Cruz sits primarily on marine sedimentary rocks, mainly sandstones and mudstones. These include the Purisima formation, which is a fine-grained sandstone formation that was deposited approximately two to six million years ago in a shallow marine environment. The slightly older Santa Cruz Mudstone formation is an even finer-grained silt/mud stone that was also deposited in a shallow marine or estuarine environment. Both of these formations underlie much of the City. Higher in elevation, particularly on the UCSC campus, other sedimentary formations such as limestone as well as the aforementioned metamorphic and igneous formations, begin to appear in outcroppings.

The San Lorenzo River and the other watercourses in the City incise the step-like series of marine terraces that typify the North Coast region. Much of the City sits upon the "first" marine terrace, typified by the flat areas that most of the westside and eastside neighborhoods sit upon. Above that is the "second" marine terrace, typified by the Westlake Pond area and the base of the UCSC campus, and also the DeLaveaga Park area on the eastside. Several additional marine terraces are discernable higher up on the UCSC campus. The downtown area of the City lies below the first marine terrace, within the floodplain of the San Lorenzo River, and is underlain by an approximately 40-foot deep layer of sediments that has been deposited by the San Lorenzo River over many centuries on top of another wave-cut marine terrace.

2.4 Soils

The soils information presented in this section is based on the soil survey of Santa Cruz County, California, conducted by the Soil Conservation Service (U.S. Department of Agriculture 1980). The types of soil within the Plan Area vary widely based primarily on slope and underlying parent material.

2.4.1 Ben Lomond-Felton-Lompico Soils

The Ben Lomond-Felton-Lompico soils form on mountains and hills predominantly under forest vegetation are deep to moderately deep and well drained or somewhat excessively drained. They have a surface layer of loam, sandy loam, or stony sandy loam. They formed in deposits derived from sandstone, shale, siltstone, and granitic rock. The soils are moderately sloping to extremely steep, ranging from 5 to 75 percent. The frost-free season ranges from 220 to 245 days. These soils compromise the majority of the Plan Area and are found along the mid and upper portions of the Majors, Laguna, Liddell, San Lorenzo River, Newell, Zayante, and Branciforte watersheds. The Ben-Lomond-Felton-Lompico Unit is about 35 percent Ben Lomond soils, 25 percent Felton soils, and 20 percent Lompico soils. The remaining 20 percent are soils and miscellaneous areas of minor extent.

2.4.2 Aptos-Los Osos-Fagan Soils

The Aptos-Los Osos-Fagan soils form on mountains and hills predominantly underbrush vegetation and are deep to shallow and well-drained or somewhat excessively drained. They

have a surface layer of loam, stony loam, gravelly sandy loam, or shaly clay loam. They formed in deposits derived from sandstone, siltstone, or shale. The soils are moderately sloping to extremely steep. These soils are found within the North Coast Unit and comprise the mid to lower portions of the Majors, Laguna, and Liddell watersheds. The Aptos-Los Osos-Fagan Unit is about 45 percent Aptos soils, about 25 percent Los Osos soils, and about 13 percent Fagan soils. The remaining 17 percent are soils of minor extent. The Los Osos and Fagan soils are limited for use as homesites mainly because of the high shrink-swell potential, low strength, slope, and depth to rock. The Aptos soils are limited for this use mainly because of the moderate shrink-swell potential, slope, and depth to rock.

2.4.3 Watsonville-Elkhorn-Pinto Soils

The Watsonville-Elkhorn-Pinto soils form on marine terraces, old alluvial fans, and adjacent hills (consisting of marine deposits, old alluvium, and weathered mudstone) are shallow to deep or very deep and well-drained to somewhat poorly drained. They have a surface layer of sandy loam, loam, or clay. The soils are nearly level to moderately steep. This map unit is about 45 percent Watsonville soils, 25 percent Elkhorn soils, 12 percent Pinto soils, and the remaining 18 percent are soils of minor extent. These soils are generally found in the lower portions of the Majors, Laguna, Liddell, San Lorenzo River, and Branciforte watersheds, as well as the majority of the Carbonera Creek watershed.

2.4.4 Zayante Soils

The Zayante unit extends from east of Ben Lomond and Felton to Scotts Valley and is about one-half mile south of Cowell Redwood State Park. The soils in this unit formed in material derived from sandstone or in marine deposits, are very deep, moderately sloping to very steep, somewhat excessively drained coarse sands on hills and mountains. Elevation ranges from about 250 to 1,500 feet. Within the Plan Area, the Zayante Unit is found in the lower portions of the Newell Creek and Zayante watersheds, as well as in the San Lorenzo River watershed from just downstream of Ben Lomond to the edge of the City Urban Center. This unit is about 75 percent Zayante soils and the remaining 25 percent are soils of minor extent.

2.5 Hydrology

2.5.1 North Coast Unit

2.5.1.1 Watersheds

The Plan Area traverses numerous coastal draining watersheds before reaching the Coast Pump Station on the San Lorenzo River. The City currently operates and maintains flow diversions on Reggiardo, Liddell, Laguna and Majors creeks. In addition, there are several non-City operated diversions present throughout these watersheds. The delineated watersheds can be divided into primary and secondary watersheds, and the watercourses can generally be divided into two main

stream types: perennial and intermittent. The primary watersheds consist of the larger watersheds and are named for the primary watercourse or landscape feature. These include Liddell, Yellow Bank, Laguna, Majors, Scaroni, Baldwin, Lombardi Gulch, Sandy Flat Gulch, Wilder, Moore, Arroyo Seco, Pogonip, Lower San Lorenzo, and Urban San Lorenzo. The secondary watersheds are distinguished by the primary tributaries of other landscape features. These include East Branch Liddell Creek, Y Creek, Old Dairy Gulch, Peasley Gulch, Adams Creek, Cave Gulch, and Powder Mill Creek.

There are nine perennial streams within the Plan Area: Liddell Creek, East Branch Liddell Creek, Laguna Creek, Majors Creek, Gordola Creek, Baldwin Creek, Wilder Creek, one branch of Moore Creek, and Arroyo Seco Creek. These streams have flowing water year-round under average rainfall conditions. There are nine intermittent streams: Yellow Bank Creek, Y Creek, Scaroni Creek, Lombardi Gulch, Sandy Flat Gulch, Old Dairy Gulch, Peasley Gulch, the east branch of Moore Creek, and Pogonip Creek. These streams dry up during portions of the dry season and have under average rainfall conditions (Biotic Resources Group 2002). Information on watershed conditions, geomorphology and hydrology for Majors Creek, Laguna Creek, and Liddell Creek is presented below. Detailed watershed descriptions and hydrology are not provided for streams where the project has a minor influence such as a single pipeline crossing.

Liddell Creek

Liddell Creek is a second order stream that flows into the Pacific Ocean at Bonny Doon Beach along the North Coast area of Santa Cruz County directly south of Davenport. Liddell Creek drains in a southwest direction off of Ben Lomond Mountain. The watershed area is approximately 4.0 mi^2. The elevation of the watershed ranges from 0 feet at the mouth to approximately 1,300 feet at its headwaters near Smith Grade Road. Liddell Creek consists of three distinct forks, the Middle, East, and West branches. The approximate stream channel length from the mouth of Liddell to the mainstem Liddell Creek headwaters is 3.2 miles. The City diversion on Liddell Creek is located at a springbox on a tributary to the East Branch of Liddell Creek near its headwaters, approximately 2.5 miles upstream from the mouth of Liddell Creek. The channel gradient from the diversion to the mouth is approximately 3 percent along the East Branch of Liddell Creek. Debris jams form multiple partial barriers and a complete anadromous fish migration barrier at a distance of 1.29 miles upstream from the creek mouth just downstream of the confluence of the Middle and East branches.

The Middle and East Branch Liddell watersheds are primarily (76 percent) composed of tertiary Marine sedimentary rocks. The Santa Cruz Mudstone makes up about 48 percent of the Middle and East Branch basins, and is composed primarily of silica-rich mudstones and sandy siltstones. About 26 percent of the watersheds are made up of the Santa Margarita sandstone, and the majority is concentrated in the upper East Branch watershed. The Santa Margarita formation consists of massive fine to coarse-grained arkosic sandstones with poor cementation of the sand grains. The Santa Margarita formation is weak and friable, and very erodible once the overlying soil layer is removed.

The channel on the East Branch contains large amounts of fine sediment, and bed particles have an average 85 percent embeddedness (Env. Science Assoc. 2001), which in part can be attributed to the large amount of highly erosive Santa Margarita sandstone.

Approximately 11 percent of the Middle and East Branch Liddell watersheds are composed of marble (metamorphosed limestone) outcrops. RMC Pacific Materials operates a marble quarry near the City's Liddell Spring Diversion near the headwaters of the East Branch Liddell Creek. Runoff from the marble quarry is routed through two sediment detention basins. The lower basin, which is the smaller of the two, failed in the winter of 1999-2000 and reportedly again in March 2001. The streambed below the basins is filled with fine sediment, potentially from the basins' failure or poor performance (Env. Science Assoc. 2001).

Laguna Creek

Laguna Creek is a second order stream that flows into the Pacific Ocean along the North Coast area of Santa Cruz County. Laguna Creek drains in a southwest direction off of Ben Lomond Mountain.

The watershed area is approximately 7.8 mi^2. The elevation of the watershed ranges from 0 feet at the mouth to approximately 2,420 feet at its headwaters near Empire Grade Road. The approximate stream channel length from the mouth of Laguna Creek to its headwaters is 8.5 miles. The City diversion on Laguna Creek is directly upstream (0.1 mile) of the Reggiardo Creek confluence, which is approximately 4.2 miles upstream from the mouth of Laguna Creek. The channel gradient from the diversion to the mouth is about 3 percent, and the channel gradient upstream of the diversion to the headwaters is approximately 6 percent.

The channel from the Laguna Creek mouth to about mile 1.43 is low gradient (≈ 1 percent) and moderately confined. At this point, a series of boulder cascades form a complete barrier to anadromous fish passage. In this reach, substrate is a mixture of sand, gravel, and cobbles, and aquatic instream cover is abundant and diverse. Above mile 1.43 to the City diversion, the channel gradient steepens to about 3.4 percent and the valley walls become more confined.

A significant portion of the Laguna Creek watershed is limestone and marble outcroppings, commonly referred to as karst topography. The karst topography has a significant influence on streamflow and summer baseflow by producing multiple springs within the watershed. The karst topography is also more resistant to erosion than other material in nearby watersheds, which results in reduced fine sediment loads. The Laguna watershed also has granitic formations that provide a good source of gravel and cobble. This is evident in the reaches downstream of the City's diversion where large cobble and gravel dominate the streambed substrate.

Majors Creek

Majors Creek is a second order stream that flows into the Pacific Ocean along the North Coast area of Santa Cruz County. Majors Creek drains in a southwest direction off of Ben Lomond Mountain. The elevation of the watershed ranges from 0 feet at the mouth to approximately 1800 feet at its headwaters near Felton peak. The approximate stream channel length from the mouth of Majors to its headwaters is 5.9 miles. The City diversion on Majors Creek is located approximately 2.2 miles upstream from the mouth of Majors Creek. The channel gradient from the diversion to the mouth is about 3 percent, and the channel gradient upstream of the diversion to the headwaters is approximately 6 percent.

Downstream of the diversion, the channel has a high gradient, as exemplified by a cascade and step pool bedform. The Rosgen channel type for the majority of the channel below the diversion is a B2/B5 (alternating between boulder and sand dominated). The channel has a low width-to-depth ratio, and is well-entrenched. (i.e., vertically contained within the valley), with little opportunity for over bank flows. About 0.7 mile upstream of the mouth, Majors enters a short reach (0.15 mile) of extremely steep (>10 percent gradient) bedrock and boulder cascades. This reach is an A1a+ Rosgen channel type and forms a complete barrier for fish passage at distance 0.71 mile upstream from the creek mouth. Downstream of the boulder cascade section, the channel gradient decreases and the channel becomes less entrenched as the valley walls widen. Majors Creek exhibits a moderate level of chronic and acute turbidity.

The dominating presence of sand in pools, high embeddedness of riffles, the sand deposition in the lee of boulders and large woody debris (LWD) is indicative of a transport-limited system, where the sediment supply is greater than the capacity of the stream to transport its sediment load (ENTRIX 2002). A large portion of the Majors Creek watershed is underlain by the Santa Margarita formation, which is composed of friable, fine to very coarse-grained sandstone (Brabb et al. 1997). The majority of the watershed upstream of the City's diversion is privately held and was historically logged for timber production. Old logging roads remain in several places in the watershed. These factors likely contribute to high fine sediment loads evident throughout the Majors Creek system. About 2000 feet below the City's diversion, Majors Creek begins flowing through a zone dominated by igneous, quartz diorite rock. The quartz diorite is more resistant to erosion relative to other rocks within the watershed, and leads to a more confined, steep valley wall section with a high gradient. It may also serve as a good source of gravel, which was evident in the anadromous reach during a habitat characterization conducted in 2003.

2.5.1.2 Water Quality

Little water quality data are available for the coastal streams. Turbidity and suspended sediment data were recently collected (Env. Science Assoc. 2001) on Yellow Bank, Liddell, and Laguna creeks. Turbidity is a measure of the optical property of water that scatters light and is directly related to the presence of dissolved and suspended particulate matter. Suspended sediment is carried in suspension by streamflow. Generally, as streamflow increases, turbidity and suspended sediment increase. The Env. Science Assoc. (2001) study found that Yellow Bank Creek had the highest turbidity of the three streams, Laguna Creek had the lowest turbidity, and Liddell Creek was between the two. The higher turbidity of Yellow Bank Creek is most likely related to the lithology of the watershed, which is dominated to a greater extent by sedimentary rock in comparison to Liddell and Laguna creeks, which are partially composed of metamorphic and igneous rock. The lower density sedimentary rocks, particularly Santa Cruz Mudstone, readily break down into silts and clays, which tend to have a disproportionately large influence on turbidity levels.

The amount and type of development in a watershed would also influence turbidity and suspended sediment levels. Liddell Creek was identified in the Env. Science Assoc. (2001) study as having experienced the most disturbance, manifest as very high acute turbidity and moderate chronic turbidity, in comparison to other coastal draining streams in the Davenport

area. Disturbance of the Santa Margarita Sandstone formation due to mining, roads, and the existing water pipeline are cited as sources of accelerated turbidity.

Yellow Bank Creek is also characterized as a disturbed watershed with high chronic and acute turbidity. The channel was observed to be incised (Env. Science Assoc. 2001), and an active knickpoint was identified 100 feet downstream of the City's water pipeline. The incision process is believed to be responsible for the high chronic and acute turbidity levels. Laguna Creek is described as having a moderate level of chronic and acute turbidity. Laguna Road along Y Creek (a tributary to Laguna Creek) and incision on Y Creek through the Santa Margarita Sandstone formation have been cited as accelerated sources of turbidity to Laguna Creek (Env. Science Assoc. 2001).

A key issue in both the Liddell and Majors creek watersheds is the substantial area in the upper watersheds composed of the erosive Santa Margarita formation and areas of historical or current ground disturbance (e.g., RMC Pacific Materials Quarry and historic logging on private lands). These streams receive a sediment load that is greater than the current managed hydrologic flow regime can adequately flush from the system. These factors in combination result in the deposition of substantial amounts of sediment in the non-anadromous reaches. Lack of gaged records to determine storm-flow and sediment transport dynamics is also an issue.

2.6 Terrestrial Habitat Types

2.6.1 North Coast Unit, San Lorenzo River Watershed Unit and Urban City Center Unit

2.6.1.1 Woodland and Forest Series

Redwood Forest

Redwood Forest is regionally abundant from southern San Mateo County through Santa Cruz County at elevations from sea level to 3,000 feet (Holland 1986). Secondary growth redwood forest occurs primarily on the lower slopes of drainages in Liddell Creek, Yellow Bank Creek, Laguna Creek and Majors Creek within the North Coast Unit. In other units, Redwood Forest occurs along the upper reaches of San Lorenzo River and its tributaries, portions of upper Branciforte Creek, Pogonip Creek, and upper tributaries of Arana Creek. Coast redwood (*Sequoia sempervirens*) is the dominant tree, with Douglas fir (*Pseudotsuga menziesii*) and tan oak (*Lithocarpus densiflorus*) as associates in many areas. In moister areas, bigleaf maple (*Acer macrophyllum*) and red alder (*Alnus rubra*) may also be present.

Characteristic understory species include redwood sorrel (*Oxalis oregana*), elk clover (*Aralia californica*), western sword fern (*Polystichum munitum*), and starflower (*Trientalis latifolia*).

Mixed Conifer Forest

Mixed Conifer Forest occurs primarily on the north-facing slopes of drainages in the upper parts of Liddell and Laguna Creeks (North Coast Unit), some upper tributaries of the San Lorenzo

River (San Lorenzo River Watershed Unit). Conifers in this plant community include Douglas fir, coast redwood, and knobcone pine (*Pinus attenuata*).

Mixed Evergreen Forest

Mixed Evergreen Forest occurs from Santa Cruz County northward through the outer Coast Ranges into Oregon, usually away from the immediate coast at elevations from 200 to 4,000 feet (Holland 1986).

In the Plan Area, mixed evergreen forest is found on moist, well-drained slopes, often above the redwood forest, such as the Liddell, Laguna, and Majors Creek watersheds. Broad-leaved trees generally range from 30 to 90 feet in height. Taller conifers may be interspersed. Community dominants include coast live oak (*Quercus agrifolia*), madrone (*Arbutus menziesii*), and California bay (*Umbellularia californica*). Associated species include California buckeye (*Aesculus californica*) and blue elderberry (*Sambucus mexicana*). Coast redwood, tan bark oak, Douglas fir, and canyon live oak (*Quercus chrysolepis*) may also occur within this community.

Central Coast Live Oak Woodland

Central Coast Live Oak Woodland is distributed from Sonoma County to Santa Barbara County, generally below 3,000 feet (Holland 1986). This woodland type occurs as an upland community on the hilltop edges of conifer communities in the Plan Area. Coast live oak (*Quercus agrifolia*) is the dominant tree intermixed with tan bark oak, California bay (*Umbellularia californica*), blue elderberry (*Sambucus mexicana*), California buckeye (*Aesculus californica*), and madrone (*Arbutus menziesii*). Understory species include bedstraw (*Galium aparine*), western poison oak (*Toxicodendron diversilobum*), California blackberry (*Rubus ursinus*), and coyote brush (*Baccharis pilularis*), and snowberry (*Symphoricarpos mollis*).

2.6.1.2 Riparian Forest

Central Coast Arroyo Willow Riparian Forest

Central Coast Arroyo Willow Riparian Forest is distributed from Monterey south to Santa Barbara (Holland 1986). In the Plan Area, this community if found in the smaller drainages along Highway 1 and at scattered locations along Liddell Creek, Laguna Creek, Majors Creek, Peasley Gulch, and Wilder Creek within the North Coast Unit and along Moore Creek and Arana Creek within the Urban City Central Unit. Central Coast arroyo willow riparian forest occurs in scattered locations along most drainages in the Plan Area. This community forms a dense thicket of arroyo willow (*Salix lasiolepis*), often associated with red alder (*Alnus rubra*), California blackberry, rush (*Juncus* spp.), and nettle (*Urtica dioica*).

Coast Live Oak Riparian Forest

Some riparian areas within the Plan Area are dominated by coast live oaks, such as along Moore Creek and tributaries (City Urban Center Unit). Coast live oaks intermix with California buckeye (*Aesculus californica)* and understory plants such as poison oak (*Toxicodendron diversilobum),* California blackberry (*Rubus ursinus),* and snowberry (*Symphoricarpos mollis).*

Red Alder Riparian Forest

Red Alder Riparian Forest is distributed on streambanks along the immediate coast from northernmost San Luis Obispo County to Cape Mendocino in Humboldt County (Holland 1986). This forest type occurs in patches along Liddell, Laguna, and Majors Creek in the Plan Area (North Coast Unit). Red alder (*Alnus rubra),* reaching heights of up to 80 feet, dominates this forest. Stands near streams may be almost entirely composed of red alder, while sites removed from frequent stream disturbance often have dense shrub layers. Red elderberry (*Sambucus racemosa var, racemosa)* and willow (*Salix spp.)* also occur in the community. In the Plan Area, this forest type occurs in the canyons and is often obscured from above by the upper canopy of coniferous trees.

2.6.1.3 Coastal Scrub and Coyote Brush Scrub

Coyote Brush Scrub

Coyote Brush Scrub is distributed from southern Oregon to San Mateo County and from Pacific Grove to Point Sur (Holland 1986). This early successional community occurs throughout the Plan Area along Highway 1 and on hillsides, often encroaching into historically grazed grasslands. Coyote brush scrub consists of a dense to moderately open shrub canopy with a sparse herbaceous understory. The dominant shrub in this community is coyote brush. Poison oak (*Toxicodendron diversilum)* is also common.

Coastal Scrub

Coastal scrub occupies the steep hillsides, often with thin soil profiles, along coastal arroyos within the Plan Area. Common shrub species include poison oak (*Toxicodendron diversilobum*), blue blossom (*Ceanothus thyrsiflorus*), coffeeberry (*Frangula californica*), coyote brush (*Baccharis pilularis),* and California sagebrush (*Artemisia californica*). Subshrubs and herbaceous species include California blackberry (*Rubus ursinus),* bracken fern (*Pteridium aquilinum),* naked stemmed buckwheat (*Eriogonum nudum),* soap plant (*Chlorogalum pomeridianum)* and California figwort (*Scrophularia californica* ssp. *californica*).

2.6.1.4 Grasslands and Artificial Ponds

Annual Grassland

Annual Grassland are distributed throughout the valleys and foothills of most of California, except for the north coastal and desert regions, usually below 3,000 feet and range from Oregon to northern Baja California (Holland 1986). In the Plan Area, annual grassland comprises a dense to sparse cover of non-native grasses often associated with numerous annual and perennial herbaceous forbs and occasional native grasses. Species in this community include numerous common non-native annual grasses, including, Italian ryegrass (*Lolium multiflorum*), bromes (*Bromus hordeaceus, B. diandrus,* and *B. madritensis* ssp. *rubens*), rattail fescue (*Vulpia myuros*), wild oat (*Avena barbata*), and rattlesnake grasses (*Briza major* and *B. minor*). Associated forbs include a mixture of native and non-native species, including Italian thistle (*Carduus pycnocephalus*), black mustard (*Brassica nigra*), California poppy (*Eschscholzia*

californica), tarweed *(Madia* sp.), clovers (*Trifolium* spp.), and filaree (*Erodium botrys*, *E. cicutarium*).

A rush meadow community occurs in patches along the existing pipeline on the marine terraces east of Majors Creek. This community occurs within annual grassland.

Native Grassland

Stands of native perennial grasses occur intermingled with annual grassland in the Plan Area in the Laguna Creek and Majors Creek watersheds (North Coast Unit). Within the City Urban Center Unit native grassland occurs on the slopes just west of the City of Santa Cruz in the Moore Creek Preserve, within portions of Pogonip, and within the Arana Gulch Greenbelt. Native grasses include purple needlegrass (*Stipa pulchra*), California oatgrass (*Danthonia californica*), and California brome (*Bromus carinatus*). Associated forbs are numerous and can include common species such as California poppy (*Eschscholzia californica*), California buttercup (*Ranunculus californica)*, blue-eyed grass (*Sisyrinchium bellum),* and checkerbloom (*Sidalcea malvaeflora*) as well as uncommon species, such as San Francisco popcornflower (*Plagiobothrys diffusus)*, Santa Cruz clover *(Trifolium buckwestiorum)*, purple star lily (*Calochortus uniflorus*), and Santa Cruz tarplant (*Holocarpha macradenia).*

Freshwater Ponds

Freshwater Ponds are present in the Plan Area along Highway 1. These artificial ponds support primarily California bulrush (*Scirpus californicus*) and *cattail (Typha latifolia).*

2.6.1.5 Disturbed Areas

Urban, Industrial, and Agriculture

Urban, Industrial, and Agriculture areas delineated as urban include residential housing, ornamental trees (including native species planted in rural areas), landscaping plants, and rural vegetable gardens. This category also includes some roads in non-urban parts of the Plan Area.

Disturbed areas are mostly bare of vegetation due to activities such as sand mining and row crop agriculture. Lands designated as agricultural include the farm fields on the lower marine terraces along Highway 1.

2.6.1.6 Wetlands

Specific wetland types identified in the Plan Area include riverine (rivers, creeks, and streams), palustrine (shallow ponds, marshes, swamps, sloughs), and lacustrine (lakes and deep ponds). Specific wetland and deepwater classes within the Plan Area are described below using the Cowardin classification system.

Riverine Upper Perennial

Riverine Upper Perennial habitat within the Plan Area includes the open and flowing water of East Branch of Liddell, Yellow Bank, Y, Laguna, and Majors creeks (North Coast Unit).

Additional small areas of riverine upper perennial habitat occur where the proposed north coast pipeline crosses other perennial streams along Highway 1. Other perennial streams in the Plan Area, such as the San Lorenzo River and Branciforte Creek also have open and flowing water. This habitat consists of the permanently flooded rock-, cobble-, or sand-bottom channel with little to no in stream vegetation. Occasional sandbars form within and at the channel edge and typically support willows and emergent (grasses and herbs) vegetation. These portions of the perennial streams in the Plan Area would be classified as wetland in the Cowardin classification system. Channel portions that lie at a depth of 2 meters below low water would be considered deepwater. No deep-water habitats occur in the immediate vicinity of the Plan Area. The channels of these creeks below the ordinary high water mark would likely be considered to be other waters of the United States by the U. S. Army Corps of Engineers (Corps), and would be subject to Corps jurisdiction.

Palustrine Emergent

Palustrine Emergent habitat includes grassland meadows and freshwater seeps. This habitat type is found at a few scattered locations in the Plan Area. Soils generally remain saturated year-round or on a seasonal basis. Vegetation is dominated by grasses, sedges, rushes, and perennial herbs. These communities are typically considered wetlands under the Cowardin classification system, but may be classified as either non-jurisdictional or jurisdictional wetlands by the Corps, depending on site-specific vegetation, soils, and hydrologic conditions.

Palustrine Forests

Palustrine Forests are found along most of the major creeks and their tributaries in the Plan Area. In the Plan Area, these are primarily red alder riparian forest and Central Coast arroyo willow riparian forest. Substrate under the palustrine forest community varies from rock, gravel, sand, clays, loams, and mud. Palustrine forests are classified as wetlands based on the Cowardin classification system. These areas may be classified as either non-jurisdictional or jurisdictional wetlands or as jurisdictional other waters of the United States by the Corps, depending on site-specific vegetation, soils, and hydrologic conditions.

Palustrine Scrub Shrub

Palustrine Scrub Shrub is found in the Plan Area along the lower reaches of Laguna Creek, as well as in several drainages along Highway 1. This habitat is regularly inundated by normal high-water or flood flows. In the Plan Area, habitat is primarily represented by Central Coast arroyo willow riparian vegetation and often intergrades with riparian (palustrine forest) communities. Central Coast arroyo willow riparian scrub vegetation may be classified as either non-jurisdictional or jurisdictional wetlands or as jurisdictional other waters of the United States by the Corps, depending on site-specific vegetation, soils, and hydrologic conditions.

2.7 Covered Species

2.7.1 Ben Lomond Spineflower (*Chorizanthe pungens* var. *hartwegiana*)

Status and Distribution

The BLS was listed as endangered by the Service in 1994. Threats include habitat destruction from residential and golf course development, agricultural land conversion, sand mining, and encroachment by invasive plant species (USFWS 1994a). BLS is restricted in distribution to Zayante sandhills. The central range of the species is generally bounded by the communities of Ben Lomond, Glenwood, Scotts Valley, and Felton, with outlying populations located near Bonny Doon, Boulder Creek, Big Basin Redwoods State Park, and Gray Whale Ranch State Park (USFWS 2007a). Two new occurrences and three new populations have been documented since the original listing; all of these occur within the known range of the species. The Service published a recovery plan for BLS in 1998 (USFWS 1998) and a 5-year review (USFWS 2007a).

Habitat Characteristics

In California, the spineflower genus (*Chorizanthe*) in the buckwheat family (*Polygonaceae*) comprises species of wiry annual herbs that inhabit dry sandy soils along the coast and inland. BLS is endemic to the sandhills of Santa Cruz County.

Experimental research has implicated shade intolerance as the primary cause for the restriction of the BLS to the sandhills. Though the spineflower can grow and reproduce in soils of the adjacent oak woodland and redwood forest, plants grew poorly and had much reduced fecundity under low light levels characteristics of this vegetation. Even within the sandhills, the distribution of the BLS is restricted due to light competition. Plants are found in most areas lacking overstory vegetation in both silverleaf manzanita chaparral and sand parkland communities. In silverleaf manzanita chaparral, which is dominated by shrubs (*Arctostaphylos silvicola, Ceanothus cuneatus,* and *Adenostoma fasiculatum*) and oak trees (*Quercus agrifolia, Q.wislizenii*), the BLS is found along trails and in other gaps in shrub canopy.

The sand parkland community supports the largest populations of BLS. The spineflower is abundant in the herbaceous layer except under trees and shrubs. Experiments examining the mechanism for this restricted distribution confirmed the effect of shade in reducing growth and fecundity, but also showed that tree litter on the soil surface almost completely prevented plant establishment and therefore has an over-riding negative effect on BLS population growth. In their preferred habitat away from trees and shrubs, populations of the BLS are reduced by dense non-native annual plants. Rat-tail fescue (*Vulpia myuros*), smooth cat's ears (*Hypochaeris glabra*), rip-gut brome (*Bromus diandrus*), and other European annual grasses and forbs are widespread in the sandhills and patchily abundant in the sand parkland community. A sampling study revealed that BLS abundance is negatively correlated with the density of exotic annual plants, while an experiment showed that exotic plants reduce the survivorship and fecundity of the spineflower. Research by McGraw found clearing of accumulated litter on the soil surface in the absence of fire is critical to maintain the open environment required by BLS and prevent encroachment by woody native species and non-native annual grasses which leads to habitat type conversion (USFWS 2007a).

In habitat lacking overstory vegetation, the BLS is preferentially found on soil disturbances in the sandhills including slides, trails, and gopher mounds. Slides or washes, which result from the erosion (gravity, wind, water) of loose soil on steep slopes (>35%) are common in sand parkland and comprise more than 16% of the habitat (Section 3.7). BLS density and cover is higher on slides than on the adjacent, undisturbed habitat. An experiment showed that slides increased the demographic performance of the BLS by removing accumulated leaf litter and reducing exotic plant competition. Covering an average of 9% of the sand parkland habitat, wildlife trails similarly enhance populations of the BLS. Plant size and total cover of BLS is greater on and immediately adjacent to trails than on the adjacent, undisturbed area. Experimental manipulations of trails revealed that it is the removal of leaf litter and reduction of exotic plant density that increases spineflower performance on trails. Gopher mounds, which cover an estimated 11% of the sand parkland habitat, similarly facilitated BLS demography. Interestingly, experimental manipulations showed that gopher mounds enhanced spineflower not only by removing litter and reducing non-native plant competition, but also by enhancing nutrient availability (McGraw et al. 2004).

Occurrences Within the Plan Area

As a sandhills endemic, the BLS is restricted to the Zayante soils of Santa Cruz County near the towns of Ben Lomond, Olympia, Scotts Valley, Felton, Bonny Doon, Zayante, and Boulder Creek. Because of the patchy and limited distribution of Zayante soils, many species of *Chorizanthe* tend to be highly localized in their distribution (McGraw et al. 2004). BLS is found throughout the areas of Santa Cruz County characterized by these soils. In particular, BLS is present on the Bonny Doon mitigation site on the City's Laguna Creek watershed property (Lyons 2011). Like other areas where BLS is found, this area is characterized by bare sandy soils conducive to BLS. BLS is also found on the adjacent DFG Reserve and potentially adjacent to City water pipeline rights of way in the Ben Lomond area (Berry, personal observation, 2009). These occurrences are located in the North Coast Unit. No occurrences are known from the San Lorenzo River Watershed Unit or the City Urban Center Unit.

2.7.2 Robust Spineflower (*Chorizanthe robusta* var. *robusta*)

Status and Distribution

The robust spineflower was listed as endangered by the Service in 1994 due to habitat destruction from residential and golf course development, agricultural land conversion, sand mining, military activities, and encroachment by invasive plant species. Robust spineflower is endemic to sandy soils of coastal and near coastal habitats in Santa Cruz County.

Robust spineflower was first described by Charles Parry in 1889 based on a collection made 6 years earlier "north of Aptos along Monterey Bay" (Parry 1889). Willis Jepson considered it to be a variety of *C. pungens* and combined the taxon under the name *C. pungens* var. *robusta* in his Flora of California in 1914 (Jepson 1914). In their revision of the genus in 1989, Reveal and Hardham (1989) recognized Parry's treatment and retained the taxon as *C. robusta*.

Occurrences of robust spineflower populations have been recorded since the late 1800's, occurring from sandy and gravelly soils as far north as San Francisco and Alameda Counties, and

south into Monterey County. Inland occurrences were documented in and around San Jose and Los Gatos in Santa Clara County. Coastal and near coastal occurrences have been documented in San Mateo County and Santa Cruz County where it is found today. Many of the areas from which collections were made in Alameda and San Mateo Counties were urbanized, and no new collections were made from there or from Monterey County for 30 years (Ertter 1990). As with *C. pungens* var. *pungens*, the coastal dune and scrub communities were affected by recreational use, urban development, and military activities, and the coastal plain vegetation of the Salinas Valley was converted to agricultural crops. At the time of listing in 1994, the only known extant populations occurred northeast of the city of Santa Cruz on property recently acquired by the city from the University of California and near Sunset and Manresa State Beaches, approximately 12 miles away. The total number of individuals of the plant was estimated to be less than 7,000 in 1990. In 1994, robust spineflower was found over a 12-mile range in Santa Cruz County. Currently there are 11 populations in Santa Cruz County over a range of approximately 21 miles.

In the listing decision, the Service added the entire species of *C. robusta* (inclusive of *C. robusta* var. *hartwegii* and *C. robusta* var. *robusta*) to the endangered species list.

Habitat Characteristics

Robust spineflower is associated with sandy, open microhabitats within a variety of plant communities, including coastal scrub, maritime chaparral, oak woodland, and annual grassland. Associated species vary from location to location, but plants consistently are found in sunny openings that are relatively sparsely vegetated by other herbs. In at least one location, spineflower plants occur among sparse nonnative grasses in an area regularly used unofficially as a bike park. Frequent disturbance may prevent the dense growth of grasses at this location, which would reduce or eliminate spineflower habitat (H.T. Harvey 2004). Robust spineflower is pollinated by a variety of insects and is also capable of self-pollination. A study by Murphy (2003) revealed that insect pollination significantly increased seed set for robust spineflower, suggesting that pollinators may enhance its overall fitness. In 2005, Baron and Bros published a study investigating the effects of insect herbivory on robust spineflower (Baron and Bros 2005). They concluded that insect herbivores (in this case, the larvae of an undescribed moth species of the genus *Aroga* (Gelechiidae)) reduced plant size and significantly decreased seed production of *C. robusta* var. *robusta*. Leaf removal by insects also compromises robust spineflower's ability to obtain resources potentially affecting the plant's ability to grow and reproduce. In addition, brush rabbits (*Sylvilagus bachmani*) browsing on robust spineflower removed mature seed heads from 11 percent of the study plants, eliminating their reproductive potential (USFWS 2010a). In 2003, a genetic study was initiated and funded by the Service to investigate two listed *Chorizanthe* taxa, *C. pungens* var. *pungens* and *C. robusta* var. *robusta*. One of the significant findings of the study revealed the homogeneity of ITS sequences between robust spineflower and *C. pungens* var. *pungens*, and significant sharing of their cpDNA haplotypes. The study determined that the two are indistinguishable from each other with any certainty, based on the ITS sequences alone. Furthermore, they documented an instance where a robust spineflower from the backdune of Sunset State Beach had an identical ITS sequence as a Monterey spineflower taken from the foredune. These data suggest that the *C. pungens*/*C. robusta* complex has only recently evolved and may not yet merit division into two separate species. The study results revealed a high degree of evolutionary adaptation and recent change for the

Pungentes subsection of *Chorizanthe*. They suggest that the minor morphological and genetic differences between plants are helpful in adapting to changing environments, emphasizing the importance of protecting multiple, small, and sometimes genetically diverse populations. Further deterioration of genetic composition through the loss of habitat or introduction of outside genetic material should be avoided (USFWS 2010a).

Occurrences Within the Plan Area

Two populations of robust spineflower are located with the City Urban Center Unit. These populations occur within the City of Santa Cruz (Pogonip Park population and Branciforte population). At Pogonip robust spineflower occurs in two colonies; along the Pogonip Creek Trail and along the Brayshaw Trail. The City Parks and Recreation Department conducts an annual census of the population and implements habitat management actions; primary management actions are the control of invasive, non-native species, control of non-native grasses, and creation of open sandy areas adjacent to the colonies to create additional habitat for the species to colonize. In 2011, 2,138 plants were documented from the Pogonip. In 2012, there were 757 plants. In 2013, there were 227 plants. In 2014 there were 501 plants. In 2015 there were 181 (Lyons, personal communication, 2016).

One population of robust spineflower occurs north of Wilder Ranch State Park on private land within the Laguna Creek watershed (North Coast Unit). No survey records are available for much of this watershed. Limited areas of sandy soils occur within remnant coastal terrace prairie and open coastal scrub habitats along the North Coast Pipeline alignment. These areas potentially support robust spineflower. The Zayante and Newell Creek Watershed Lands are out of the expected range of this species.

Approximately 152 acres of critical habitat for this species is located at Pogonip Park and an additional 4 acres of critical habitat is located on private land within City limits, at the Market Street site (USFWS Branciforte Unit) (H.T. Harvey 2004).

2.7.3 Santa Cruz Tarplant (*Holocarpha macradenia*)

Status and Distribution

Santa Cruz tarplant, an aromatic annual herb in the aster (Asteraceae) family, is one of only four species of *Holocarpha,* which are all geographically restricted to California.

Santa Cruz tarplant was listed as threatened by the Service in 2000 due to alteration and destruction of habitat from historic and ongoing urban and commercial development, historic habitat alteration due to grazing, changes in fire dynamics, limited success of seed transplant populations, and competition from nonnative plants (USFWS 2000; USFWS 2002a). Santa Cruz tarplant is currently known from coastal grasslands and prairies in Contra Costa, Santa Cruz, and Monterey Counties, California. Habitat for Santa Cruz tarplant historically consisted of grasslands and prairies found on coastal terraces below 100 meters (m) (330 feet (ft)) in elevation, from Monterey County, north to Marin County (H.T. Harvey and Associates and Entomological Consulting 2004). The current number of natural populations is 14. In Contra Costa County, habitat for the last naturally occurring population in the San Francisco Bay area was converted to a shopping center in 1993. Seeds taken from the population were transplanted

to 22 locations in suitable habitat located in Wildcat Canyon Regional Park in Contra Costa County. Eight of the 22 locations have supported persistent populations over the years. As of 2010 four to the eight populations have not contained any plants (USFWS 2014). In Monterey County, one population occurs on the Porter Ranch, south of the Santa Cruz County line and the City of Watsonville. In Santa Cruz County, 13 natural populations are known; seven occur in and around the City of Santa Cruz (Arana Gulch, DeLaveaga, Fairway Drive, Graham Hill Road, O'Neil/Tan. Twin Lakes, and Winkle) and six populations occur in and around the City of Watsonville (Apple Hill, Atkinson Lane, Harkins Slough, Spring Hills Golf Course, Struve Slough, and Watsonville Airport).

Habitat Characteristics

Historically a member of the coastal prairie community, Santa Cruz tarplant is now most frequently found within non-native annual grassland. Common associates include wild oat (*Avena barbata*), hare barley (*Hordeum murinum*), rattlesnake grasses (*Briza major* and *B. minor*), and other introduced grasses. Native associates include California oatgrass (*Danthonia californica*), rushes, and other tarplants in the genus *Hemizonia.* Populations occur on sandy or sandy-loam soils on marine terrace platforms that are often separated by steep gulches (H.T. Harvey 2004). Because the soils where *Holocarpha macradenia* occurs typically include this subsurface clay component, they hold moisture longer into the growing season compared to the surrounding sandy soils; moisture may also be perched over the sandstone/mudstone terrace deposit. As a summer-blooming species, *H. macradenia* may benefit from this late season moisture (USFWS 2002a).

Occurrences Within the Plan Area

In the City Urban Center Unit, Santa Cruz tarplant exists on flat to gently sloping marine terrace platforms that are often separated by steep-sided gulches. A series of populations occur on older marine terraces inland from the communities of Santa Cruz and Soquel; these terraces range in elevation from about 34 to 122 m (110 to 400 ft). Two populations (Arana Gulch and Twin Lakes) occur on a more recent marine terrace at lower elevations (12 to 18 m (40 to 60 ft)) and closer to the ocean. In the Watsonville area in Santa Cruz County, a series of Santa Cruz tarplant populations occur on a low-lying marine terrace (15 to 37 m (50 to 120 ft) in elevation) that is bisected by Harkins Slough, Hanson Slough, and Struve Slough; the close proximity of these populations suggest that they were once part of a larger population that has since been fragmented by changes in land use over the past 100 years. Approximately 6.4 km (4 mi) north of Watsonville, several Santa Cruz tarplant populations are located on a marine terrace 55 m (180 ft) in elevation (USFWS 2002a). Of the 13 populations of Santa Cruz tarplant occurring along Monterey Bay, one is located within the City of Santa Cruz. The Arana Gulch population occurs just north of the yacht harbor within the Arana Gulch Greenbelt area, on property acquired by the City in 1994. A former cattle pasture, the land has not been grazed since 1986 and currently supports a weedy annual community dominated by wild oat, wild radish (*Raphanus sativa*), and field mustard (*Brassica* spp., *Hirschfeldia incana*). Competition from these species resulted in severe declines in Santa Cruz tarplant population numbers in the early 1990's; active management of annual grasses has since allowed the population to rebound; however currently the number of plants is low (38 plants were documented in 2011) with plant distribution limited to just one of the four historic colonies (Lyons 2013).

The City of Santa Cruz Parks and Recreation Department implements an Interim Tarplant Management Program within the known and historic tarplant areas which currently consists of seasonal mowing and raking, and periodic ground disturbances to create suitable growing conditions for the species. The City is preparing a long-term Arana Gulch Master Plan, with an updated tarplant management program, and recently certified an EIR for a proposed bike path through the greenbelt. A 65-acre parcel at Arana Gulch was designated as Critical Habitat for Santa Cruz tarplant in October 2002. An additional population occurs at DeLaveaga Park, on lands managed by the California Air National Guard. A population on Graham Hill Road is present on 35 acres of privately owned coastal terrace prairie on the west side of Graham Hill Road, about one mile north of the city of Santa Cruz in Santa Cruz County. This Santa Cruz tarplant population represents the western limit of the cluster of populations that are found at the northern end of Monterey Bay. In 1994, this population numbered 12,000 individuals. By 2001, it had declined to about 500 individuals (USFWS 2002a). Suitable habitat for tarplant may also be present along pipeline rights of way in the North Coast unit (H.T. Harvey 2004).

2.7.4 San Francisco Popcornflower (*Plagiobothrys diffusus*)

Status and Distribution

San Francisco popcornflower is a small annual herb native to coastal prairies of central California. Once ranging north to San Francisco, this species is now restricted to approximately seven populations in Santa Cruz County and several unconfirmed occurrences in Alameda County. The species is known to occur on public and private lands in the City of Scotts Valley, on private lands in the western portion of the City of Santa Cruz (Meder Street area), UCSC, Moore Creek Preserve, and on private lands near Wilder Ranch State Park. Threats to popcornflower include grading, erosion and competition with non-native grass growth and invasive plants. San Francisco popcornflower was listed as Endangered under the state ESA in 1979 and is a federal Species of Concern.

Habitat Characteristics

San Francisco popcornflower is an uncommon associate of the coastal prairie plant community. Plants are frequently found in association with California oat-grass (*Danthonia californica*), purple needle grass (*Stipa pulchra*), suncup (*Camissonia ovata*), western rush (*Juncus occidentalis*), and California blue-eyed grass (*Sisyrhinchium bellum*). This species is favored by moist conditions, preferring poorly-drained, sandy-loam soils, often growing in mesic zones at the edge of the coastal terrace. Populations of San Francisco popcornflower, like all annual species, fluctuate widely from year to year. Plants depend on an intact soil seedbank to weather years of unfavorable environmental conditions, including infestations of non-native grasses, which outcompete the short-statured popcornflower. Related species have known to persist in the seedbank for at least seven years. Habitat management actions at Moore Creek Preserve have found that San Francisco popcorn flower benefits from cattle grazing wherein grazing reduces the cover of non-native grasses and forbs. Observations at other locations have found browsing by other animals, such as horses and rabbits, also reduces the cover of annual grasses, thus creating open growing conditions suitable for the species (Lyons 2015). Many of the rarest plant species (including *P. diffusus*) in the coastal prairie exist mainly on land currently

being grazed by livestock; these species have been disappearing when land is set aside for conservation and the livestock are removed (Hayes and Holl 2003).

Occurrences Within the Plan Area
Within the City Urban Center Unit, one population is located within vernal pool-mima mound topography at UCSC Marshall Field; a colony also occurs amid a similar mima mound complex near Wilder Ranch State Park. Other populations occupy mesic zones along the edge of coastal terraces in the western portion of the City of Santa Cruz (Meder Street area and at Moore Creek Preserve).

Populations are also known to occur within the Laguna Creek watershed (North Coast Unit).

Two of the populations of San Francisco popcornflower within the City Urban Center Unit are located on protected lands. A large population, consisting of 26 colonies is located within the Moore Creek Preserve near the end of Meder Road and between Wilder and Moore Creeks. The population has ranged from a high of approximately 1,840 plants in 2005 to a low of 83 plants documented in 2011 (in 9 colonies). The grassland is managed by the City as an open space preserve and the site is grazed by cattle; however additional grazing within popcornflower areas is being recommended to the City to improve habitat conditions for the species. A second, smaller population averaging 200 individuals occurs at "Haunted Meadow", a meadow along the Fern Trail in Pogonip (Lyons 2015). The California Natural Diversity Database also documents an occurrence (last observed in 1941) near Empire Grade Road on private land north of the City (H.T. Harvey 2004).

2.7.5 Ohlone Tiger Beetle (*Cicindela ohlone*)

Status and Distribution
The Ohlone Tiger beetle (OTB) was recognized as an endangered species by the Service (2001a) in 2001 because of loss of habitat and threats to remaining sites known to support the beetle. The OTB inhabits remnants of coastal prairie habitats in coastal portions of Santa Cruz County.

The Ohlone Tiger beetle was described in 1993 by Freitag, Kavanaugh, and Morgan (1993). Their description of this new species was based on specimens collected from three sites in west central Santa Cruz County between 1987 and 1992. Subsequent to the authors' submission of their paper, the beetle has been found at about 17 locations, which may represent distinct populations, or because of the proximity of several sites, may actually represent only 5 or 6 distinct populations of the OTB. Today, the beetle is known from only 8 of these 17 locations.

Life History
Adult tiger beetles possess elongate, cylindrical bodies. They are usually brightly colored, often with a metallic or iridescent sheen. Their eyes and sickle-shaped mandibles (i.e., jaws) are very prominent. Together, their eyes and head are wider than the thorax. They possess long, cursorial legs that are characterized by numerous spines. Adults are typically about 15-25 mm. in length.

Cicindela ohlone is most closely related to *C. purpurea*, which is commonly known as the Cow Path Tiger beetle because it is found along cattle trails in meadows of the Sierra Nevada. The OTB can be distinguished from this and related species by its overall size, the color and maculation patterns on its thorax and elytra, and its genitalic features. The OTB's body color is a brilliant green, with gold maculations. Freitag, Kavanaugh, and Morgan (1993) illustrate the maculation pattern characteristic of *C. ohlone* and the diagnostic features of its genitalia. In addition, the winter-spring activity period of the OTB is distinctive, as most tiger beetles in coastal California are active in the spring and summer months (Nagano 1980).

Larvae of tiger beetles are much more uniform in appearance than adults. They have an eruciform (i.e., grub-like) appearance. The head and pronotum are strongly chitinized, and the fifth abdominal segment possesses a pair of medial hooks that are used as anchors to secure the larvae as they reach out from the tunnel to ambush prey.

The diurnally active adults and larvae of *C. ohlone* are associated with sunny areas of bare or sparsely vegetated ground. Adults run rapidly in and near the larval habitat. They are strong flyers for short distances. OTBs adults are active during the winter and spring months, and favor microhabitats that are sparsely vegetated. Temperatures can range from cool to quite warm during their activity period, so adults often spend a considerable portion of their daily activity thermoregulating.

Collection records indicate that most adult *C. ohlone* are active from mid-January through mid-May (Freitag, Kavanaugh, and Morgan 1993). Both adults and larvae of tiger beetles are opportunistic, preying on smaller, soft-bodied insects and invertebrates. Adults possess good visual acuity and are found on sunny glades of bare or sparsely vegetated soil, where they actively search for potential prey. In contrast, larvae remain in their tunnels, and in a jack-in-the-box manner, ambush prey that wander within their striking distance.

The larvae of most tiger beetles occur in a narrower range of microhabitats than their adult stages, probably because they tolerate less variation in many physical factors, especially soil moisture, soil composition, particle size, and temperature (Pearson 1988; Shelford 1907 and 1909). All known larvae construct a tunnel-like burrow at sites where eggs were laid by the mother beetle. Larvae of other tiger beetle species that live in grasslands typically build their burrows at the edges of the bare or sparsely vegetated portions of the grassland where adult beetles are most commonly observed. The OTB follows a similar pattern. Excavated burrows of mature OTB larvae were approximately 15-20 cm. in depth. OTB larval burrow diameters (measured at the burrow mouth) range in size from ca. 1.5 - 6.5 mm. OTB larvae can complete their development within one year if they are successful in finding sufficient food, but monitoring of marked burrows found that many larvae take two years to complete their development.

Pupation takes place in the larval burrows. The upper portion of the larval burrow is usually sealed off by the larva when it molts or prepares to pupate.

Habitat Characteristics

The OTB inhabits areas characterized by remnant stands of native grassland. California oatgrass (*Danthonia californica*) and Purple needlegrass (*Nasella pulchra*) are two native grasses known to occur at all sites. Within these grasslands, the beetle has been observed primarily on level ground, where the vegetation is sparse or bare ground is prevalent. Adults are less frequently observed in the dense grassland, but larval burrows have been observed in sparsely vegetated patches in otherwise dense grassland. The substrate at each known beetle location consists of shallow, poorly drained clay or sandy clay soils that have accumulated over a layer of bedrock known as Santa Cruz Mudstone (Freitag, Kavanaugh, and Morgan 1993). According to the county's soil survey (Bowman et al. 1980) and subsequent soil analyses conducted by the Natural Resources Conservation Service at selected OTB locations, all known beetle locations are mapped as Watsonville loams.

Occurrences Within the Plan Area

OTB life stages have been observed at the Moore Creek Open Space and Younger Ranch within the anticipated work area for the new North Coast Pipeline alignment. Surveys by Tim Hyland in 2011 documented 216 detections of OTB within the western portion of Moore Creek Preserve. OTB have not been observed within the Pogonip since 2005, despite yearly presence-absence surveys (Lyons 2015). 2011 surveys on other pipeline reaches where Watsonville loam soils are found yielded no detections of OTB life stages (Arnold, personal communication, 2016).

2.7.6 Mount Hermon June Beetle (*Polyphylla barbata)*

Status and Distribution

The MHJB is a federally listed endangered species. Although the scientific name *Polyphylla barbata* has been used since its original description, in the literature the beetle has commonly been referred to as the Mount Hermon June beetle or the Barbate June beetle.

Throughout most of its range, the primary threats to the beetle are sand mining and urbanization. In a few instances, other types of land uses, such as agricultural conversion, recreation activities, plus pesticide use, alteration of fire cycles, and possibly even collectors, have also threatened the beetle. For these reasons, the beetle was recognized as an endangered species by the Service in 1997 (USFWS 1997a) and a recovery plan was published by the Service in 1998 (USFWS 1998). Critical habitat has not yet been designated by the Service for the MHJB; however, the MHJB's geographic distribution largely coincides with the critical habitat for the endangered Zayante Band Winged grasshopper designated by the Service (USFWS 2001b).

The State of California does not recognize insects as endangered or threatened species pursuant to the State's Fish and Game Code. However, the MHJB does receive consideration under the California Environmental Quality Act (CEQA) since it satisfies the definition of a rare species under this statute. Habitat for the MHJB also receives consideration under the Sensitive Habitat Ordinance of the County of Santa Cruz.

The MHJB is restricted to the Zayante sandy soils that are found in the Scotts Valley-Mount Hermon-Felton-Ben Lomond-Santa Cruz area of the Santa Cruz Mountains. During the summer

of 2008 it was also observed at a couple of locations in the Bonny Doon area (Arnold, personal communication, 2016; McGraw 2008). Historically, MHJB localities were referred to as sandhills (Cazier 1938; Young 1988), but more recently this area has been called the Zayante Sandhills (USFWS 1998). Arnold (2004) reviewed museum specimens and other reported records for the beetle and determined that it had been observed at about 70 locations within this area.

Life History

Adult males measure about 0.75 inch in length and females are slightly longer. The adult male has a black head and dark brown elytra (leathery forewings) that are covered with brown hairs. The elytra also have stripes that are broken and irregular rather than continuous and well-defined as in related species of June beetles. Larvae are grub-shaped (scarabaeiform) and vary in color from cream to pale yellow for the body segments and darker brown for the head.

The MHJB is univoltine, i.e., it has only one generation per year. As its common name suggests, adult emergence and seasonal activity normally starts in May or June and continues through about mid-August; although, seasonal activity may vary from year to year depending on weather conditions. Adults are nocturnal, with most of their activity between about 8:45 and 9:30 pm. Adult males actively fly low to the ground in search of females, which are flightless. Presumably the female emits a pheromone for the males to find her.

Lifespan data from a brief capture-recapture study suggest that adult males live no longer than one week (Arnold 2000). Dispersal data from the same capture-recapture study indicate that most adult males are quite sedentary, with home ranges of no more than a few acres. Similar data on lifespan and dispersal of females is lacking at this time since they are less frequently observed.

Specific life history information for the MHJB is unknown, but can be inferred from related species. Presumably the entire life cycle (egg, larva, pupa, and adult) takes two to three years to complete. The majority of the life cycle is spent as a subterranean larval stage that feeds on plant roots (Furniss and Carolin 1977).

Habitat Characteristics

Habitats in the Zayante Sandhills where MHJB has been found include Northern Maritime Chaparral, Ponderosa Pine Forest, Sand Parkland (which is a mixture of the aforementioned habitats with a shrub/subshrub and grass/forb understory), and mixed Deciduous-Evergreen Forest. In addition, adults have been found in disturbed sandy areas where remnants of these habitats still occur. Ponderosa Pine grows at all known MHJB locations and for this reason was a presumed larval food plant of the beetle. However, recent analyses of partially-digested plant fragments in fecal pellets of MHJB larvae by Kirsten Hill (2005) indicate that larvae feed on other plant species. Even if Ponderosa Pine is not a food plant, it is a useful indicator of suitable habitat for the MHJB.

Occurrences Within the Plan Area

Presence-absence surveys for MHJB were conducted in the summer of 2011 by Richard Arnold. The surveys concentrated on areas within the Plan Area containing a mixture of plant species

native to the Zayante Sandhills as well as disturbed areas with sandy soils near remnants of Zayante Sandhill habitat. The results of the survey indicate that Mount Hermon June Beetles are present on the City's Laguna Creek watershed property. On June 14, 2011, Arnold surveyed the 5.4-acre sandhills portion in the southwestern corner of the parcel. Six adult males were observed at four trap locations.

2.7.7 Tidewater Goby (*Eucyclogobius newberryi*)

Status and Distribution

Tidewater gobies (*Eucyclogobius newberryi*) are a small, short-lived California endemic species that inhabits coastal brackish water habitats entirely within California, ranging from Tillas Slough (mouth of the Smith River, Del Norte County) near the Oregon border south to Agua Hedionda Lagoon (northern San Diego County). This species was listed as endangered in 1994 (USFWS 1994b). The 5-year review conducted in 2007 recommended downlisting to threatened status (USFWS 2007b). This species is considered to be one with moderate threats and a high potential for recovery (USFWS 2005). Tidewater goby has had fully protected status from the State of California since 1987. Tidewater gobies are known to inhabit or recently inhabited the coastal lagoons of several streams in the HCP Area.

Life History

Tidewater gobies are uniquely adapted to coastal lagoons and the uppermost brackish zone of larger estuaries, rarely invading marine or freshwater habitats (USFWS 2005). Tidewater gobies are small fish (rarely exceeding two inches in length) that generally live for only 1 year, with few individuals living longer than a year (Moyle 2002 cited in USFWS 2005). Reproduction occurs at all times of the year, as indicated by female tidewater gobies in various stages of ovarian development (Swenson 1999 cited in USFWS 2005). The peak of spawning activity occurs during the spring and then again in the late summer. Fluctuations in reproduction are probably due to death of breeding adults in early summer and colder temperatures or hydrological disruptions in winter (Swift et al. 1989 cited in USFWS 2005). Reproduction takes place in water between 9 to 25 degrees Celsius (48 to 77 degrees Fahrenheit) and at salinities of 2 to 27 parts per thousand (Swenson 1999 cited in USFWS 2005).

Male tidewater gobies begin digging breeding burrows in relatively unconsolidated, clean, coarse sand (averaging 0.5 millimeter [0.02 inch] in diameter), in April or May after lagoons close to the ocean (Swift et al. 1989; Swenson 1995 cited in USFWS 2005). Swenson (1995 cited in USFWS 2005) has shown that tidewater gobies also prefer this substrate in the laboratory. Burrows are at least 70 to 100 millimeters (3 to 4 inches) from each other. After hatching, the larval tidewater gobies, measuring 4 to 5 millimeters (mm) in SL, emerge from the burrow and swim upward to join the plankton (Wang 1986; Swift et al. 1989). Juvenile tidewater gobies become benthic dwellers at 16 to 18 mm SL (Moyle 2002).

Habitat Characteristics

The tidewater goby favors the calm conditions that prevail when the lagoons are cut off from the ocean by beach sandbars. They are bottom dwellers and are typically found at water depths of less than 3 feet. Tidewater gobies typically inhabit areas of slow-moving water, avoiding strong

wave action or currents. Particularly important to the persistence of the species in lagoons is the presence of backwater, marshy habitats, which provide refuge habitat during winter flood flows (J. Smith, personal communication, 1999 as referenced in Env. Science Assoc. 2001). Optimal lagoon habitats are shallow, sandy-bottomed areas 20 to 10 cm deep, surrounded by beds of emergent vegetation. Open areas are critical for breeding, while vegetation is critical for overwintering survival (providing refuge from high flows) and probably for feeding as well (Moyle 2002).

Tidewater gobies are known to be preyed upon by native species such as small steelhead (*Oncorhynchus mykiss*), prickly sculpin (*Cottus asper*), and staghorn sculpin (*Leptocottus armatus*) (Swift et al. 1989 cited in USFWS 2005).

Occurrences Within the Plan Area

Tidewater gobies are known to inhabit, or recently inhabited, the coastal lagoons of several streams in the HCP Area including Laguna Creek, Baldwin Creek, Lombardi Gulch, Old Dairy Gulch, Wilder Creek, Younger Lagoon, Moore creek, the San Lorenzo River, Corcoran Lagoon, and Moran Lake (USFWS 2005). Suitable habitat for the goby has also been identified in the lagoons of Majors (Smith 2001) and Arana creeks (City of Santa Cruz Parks and Recreation Department 1997; Habitat Restoration Group (HRG) 1996). The critical habitat designation lists Laguna Creek, Baldwin Creek, and Corcoran Lagoon but not the San Lorenzo River, or any of the other streams (USFWS 2008).

Tidewater goby abundance fluctuates spatially and seasonally, due in part to their predominantly annual life cycle (Swenson 1999). Tidewater goby populations also vary greatly with the varying environmental conditions (e.g., drought, El Niño) among years (USFWS 2007b). This environmental variation is a normal phenomenon, but one that makes the determination of trends in population size difficult. For example, tidewater goby populations decrease during the rainy season when lagoons are open and influenced by flood events, and then recover during the following summer (USFWS 2007b). Swift et al. (1989) estimated that individual tidewater gobies within a population at Aliso Creek Lagoon ranged from 1,000 to 1,500 in the late winter-early spring and 10,000 to 15,000 tidewater gobies in the late summer-early fall.

The USFWS characterizes tidewater goby populations (i.e., localities) along the California coast as metapopulations (a group of distinct populations that are genetically interconnected through occasional exchange of animals) (USFWS 2007b). While individual populations may be periodically extirpated under natural conditions, a metapopulation is likely to persist through colonization or recolonization events that establish new populations (USFWS 2007b). Local populations of tidewater gobies occupy coastal lagoons and estuaries that in most cases are separated from each other by the open ocean. Very few tidewater gobies have ever been captured in the marine environment (Swift et al. 1989), which suggests this species rarely occurs in the open ocean (USFWS 2007b). Some tidewater goby populations persist on a consistent basis (potential sources of individuals for recolonization), while other tidewater goby populations appear to experience intermittent extirpations. Local extirpations may result from one or a series of factors, such as the drying up of some small streams during prolonged droughts, water diversions, and estuarine habitat modifications (USFWS 2007b). Some localities where tidewater gobies have been extirpated apparently have been recolonized when extant populations

were present within a relatively short distance of the extirpated population (i.e., less than 6 mi (10 km). More recently, another tidewater goby researcher has suggested that recolonizations have typically been between populations separated by no more than 10 mi (16 km) (Swift 2007 cited in USFWS 2007b). Flooding during winter rains can contribute to recolonization of estuarine habitats where tidewater goby populations have previously been extirpated.

Currently, the majority of the most stable and largest tidewater goby populations consist of lagoons and estuaries of intermediate sizes (5 to 125 ac (2 to 50 ha)) that have remained relatively unaffected by human activities (USFWS 2005). Many of the localities where tidewater gobies are regularly present may be "source" populations for localities that intermittently lose their tidewater goby populations. Large wetlands are likely to have lower rates of extirpation than small wetlands, and there is some evidence that recolonization rates are higher with less distance to the nearest northerly source population. In addition, populations at small sites were sensitive to drought, presumably because droughts can eliminate suitable habitat at small wetlands (USFWS 2007b).

Smith, (cited in USFWS 2007b), believes only two likely metapopulations continue to exist in Santa Cruz County, a cluster of six populations from Baldwin Creek south to Moore Creek (including Lombardi, Dairy, Wilder, and Younger creeks) and Corcoran and Moran Lagoons (and Soquel Creek) (USFWS 2007b). A small population of tidewater gobies was found in the San Lorenzo River Lagoon on May 11, 2004 (USFWS 2007b). Surveys for the species were conducted here by Smith in the 1980s, but produced negative results (USFWS 2007b). Smith believes that the small tidewater goby population discovered at the San Lorenzo River Lagoon was likely the result of a colonization event from Moore Creek; however, genetic testing has not been conducted to test this theory (USFWS 2007b). Furthermore, Smith believes that tidewater gobies are likely to be lost from the San Lorenzo system during a high flow event due to the lower San Lorenzo River's channelized hydromorphology and lack of refugia from storm flows. Smith goes on to report that elsewhere in Santa Cruz County and in San Mateo and Monterey counties, there is little evidence of metapopulation structures, stating that extirpated populations at Salinas River and Waddell Creek have been vacant for 25 to 40 years (USFWS 2007b). Tidewater gobies appear to be relatively abundant in the lower reaches of Laguna, Baldwin, Wilder, and Moore creeks (Smith and Welch 1996; Smith 2001) and presumed to occur in Arana Creek (City of Santa Cruz Parks and Recreation Department 1997; HRG 1996). No studies have been conducted in the Majors Creek lagoon for tidewater gobies, however, observed conditions suggest the lagoon provides favorable habitat for tidewater gobies (Smith 2001).

The available tidewater goby habitat in the Laguna Creek lagoon encompasses approximately 1.0 to 1.5 hectares (2.5 to 3.75 acres) (USFWS 2005). The property surrounding the lagoon is owned and managed by the California Department of Parks and Recreation (State Parks). State Parks also owns the creek on the east side of Highway 1, upstream of the estuary. Limited farming occurs on adjacent land. Laguna Creek was nearly dry during the 1988-92 droughts and the tidewater goby population here may have survived the drought. Tidewater gobies were found here in 1996, 2000, 2004, 2005, 2008, 2009, and 2010 (J. Smith, personal communication, 2004 cited in USFWS 2005; Hagar 2005; 2NDNature 2006; HES 2009a; HES 2010; HES in prep.). The Laguna Creek lagoon has been somewhat altered by construction of the Highway 1 and UPRR causeway in the early 1900s (HES 2009b) but is in relatively undisturbed condition

otherwise. Freshwater inflow to the lagoon is influenced by the City of Santa Cruz diversion upstream.

C. Swift and G. Kittleson observed tidewater gobies in the San Lorenzo Lagoon for the first time on May 11, 2004, during seining for a fish relocation effort associated with a Corps project (Riverbend Project) (G. Kittleson, personal communication, 2004 cited in USFWS 2005). The available tidewater goby habitat in the San Lorenzo River lagoon encompasses approximately 26.7 hectares (66 acres) (USFWS 2005). The lagoon and river mouth have been significantly altered from natural conditions due to many factors, including both local and watershed modifications (HES 2009b). Direct modifications to the San Lorenzo lagoon include urban encroachment, marsh filling, railroad and road crossings, channelization and levee construction, all resulting in significant reduction in the areal extent of the lagoon (2NDNature 2006; HES 2009b). San Lorenzo lagoon habitat has been highly altered and is missing components favorable to tidewater goby such as fringing marsh vegetation and quiescent backwaters. The areal extent of the San Lorenzo Lagoon has been reduced by 80% through mudflat filling and levee construction (2NDNATURE 2006). These physical modifications have changed the tidal prism[5], the timing and duration of sandbar closure, flow velocities during winter high flows, the aquatic vegetation communities, and likely, many biotic processes. The urban development and other modifications within the contributing catchment of the San Lorenzo Lagoon have increased nutrient loading, altered sediment delivery, and altered hydrologic patterns. Artificial summer sandbar breaching for flood-control alters water quality parameters, and may influence goby habitat by dewatering burrows and bordering vegetation. Direct mortality of gobies, including tidewater goby, through stranding has been observed during sandbar breaching in October 2008 (Hagar, personal communication, 2010). Water withdrawals have also altered the seasonal hydrologic conditions of the lagoon (HES 2009b; 2NDNature 2006).

In Baldwin Creek, tidewater gobies are common in the portion of the lagoon downstream of the marsh, and some have been found in the freshwater on-channel/off-channel pond to the north (Smith and Welch 1996). In Wilder Creek, gobies have been observed downstream of the marsh near the sandbar (Smith and Welch 1996). In Moore Creek, gobies have been found downstream of Antonelli Pond (Smith and Welch 1996). According to the Arana Gulch Biotic Assessment (HRG 1996) the tidewater goby is presumed to occur in Arana Creek from the harbor mouth to approximately 1 mile upstream (CNDDB 2010). The goby was last observed in this area in 1984 (City of Santa Cruz Parks and Recreation Department 1997; HRG 1996). Potential tidewater goby habitat includes the freshwater portions of Arana Creek and the tidally influenced, backwater portions of Woods Lagoon at the mouth of Arana Creek.

2.7.8 Pacific Lamprey (*Lampetra tridentata*)

Status and Distribution

The Pacific lamprey eel (*Lampetra tridentata*) is an anadromous species known to inhabit portions of the Plan Area. It is not currently listed as threatened or endangered by FWS or by the State of California but is a species of special concern within the state.

[5] The volume of water that flows into a tidal channel and out again during a complete tidal cycle.

Pacific lampreys are found in Pacific coast streams from Japan, through Alaska, and down to Rio Santo Domingo in Baja California. Malibu Creek seems to be the southern-most point of regular occurrence in California, despite some records from the Santa Ana River and a single ammocoete taken from the San Luis Rey River (Moyle 2002). In general, lampreys have a scattered distribution south of San Luis Obispo County, although there are regular runs in the Santa Clara River.

Anadromous Pacific lamprey are still present in much of their native range although large runs that historically occurred in many streams have largely disappeared (Moyle 2002). They have been eliminated from many streams in the urbanized southern end of their range but can be very persistent (Moyle 2002). They are usually absent from highly altered or polluted streams (Moyle 2002).

Life History

Pacific lamprey build nests in gravel and rock substrates where current is fairly swift and depth ranges from 30 to 150 cm (Moyle 2002). Spawning is repeated on the same nest a number of times until both sexes are spent (Moyle 2002). Both adults generally die after spawning however, some survive and spawn again (Moyle 2002). The embryos hatch in approximately 19 days at 15°C. After hatching, ammocoetes spend a short time in the nest gravel and eventually they swim up into the current and move downstream to a suitable area of soft sand and mud. Ammocoetes burrow tail first into the sand or mud and begin their lives as filter feeders, sucking organic matter and algae off the substrate surface (Moyle 2002). Ammocoetes move from one area to another and remain in the stream for an uncertain length of time, likely 5-7 years. At a size of 14 to 16 cm they metamorphose from detritus-feeding larvae to parasitic adults, developing large eyes, a sucking disc, and changes in physiology such as ability to live in seawater (Moyle 2002). After this transformation they migrate downstream, certainly in the spring but possibly also in the winter during high-flow events. Adult lamprey (14 to 16 cm in total length) are parasitic on larger fish, although their attacks are seldom fatal (Wang 1986). Pacific lampreys, with the exception of land-locked populations, spend the predatory phase of their life in the ocean attacking a wide variety of fishes, including various salmon and flatfishes (Moyle 2002). Adult lamprey in the ocean are thought to remain near their natal streams (Moyle 2002).

Habitat Characteristics

Pacific lamprey are anadromous, spending four to seven years in freshwater and one to two years in the ocean. Spawning lamprey, like steelhead, are dependent on winter storms providing sufficient streamflow to open the mouth of the lagoon to the ocean, and to provide adequate streamflow to allow for upstream migration. Adults usually move up into spawning streams between early March and late June. However, upstream movements in January and February have also been observed in some streams (Moyle 2002). Most upstream migration takes place at night and tends to occur in surges, although small numbers may move upstream more or less continuously over a two- to four-month period (Moyle 2002). Adult Pacific lamprey are known to ascend some obstacles that are barriers to other fish by alternately swimming and using their sucker mouths to attach and rest (Moyle 2002).

Occurrences Within the Plan Area

Pacific lampreys are present in several areas of the San Lorenzo River watershed, but are not reported present in any of the other streams within the HCP Area. Lampreys were caught or observed in twelve of the sixteen mainstem reaches and sixteen of nineteen of the tributary reaches of the San Lorenzo River sampled in 2002 (H.T. Harvey and Associates and Entomological Consulting Services 2003). These reaches include 0 through 10 of the San Lorenzo River from the estuary to the confluence with Kings Creek, and reaches in Zayante Creek (reaches 13a, b, c, and d), Bean Creek (14b), Fall Creek (15), Boulder Creek (17c, 17d), Bear Creek (18a, 18b) and Branciforte Creek (21a, 21b). Several Pacific lamprey ammocoetes were captured during electrofishing surveys in Newell Creek downstream of Loch Lomond in August 2007 (HES 2007). Electro-fishing on Wilder Creek, Peasley Gulch and Majors Creek on the North Coast Unit did not capture any lampreys and no observations of lampreys were reported. Lampreys were not mentioned as a species present in the streams associated with the Coast Dairies' property, which includes Liddell, Laguna, Y, and Yellow Bank creeks.

2.7.9 California Red-legged Frog (*Rana draytonii*)

Status and Distribution

The California red-legged frog (*Rana draytonii*) was listed as threatened under the ESA on May 23, 1996 (USFWS 1996), and a recovery plan was approved in May 2002 (USFWS 2002b). In 2010, the USFWS revised the Designated Critical Habitat for California red-legged frog, and it now includes central coast watersheds from Wilder Creek north into San Mateo County (Unit SCZ-1) (USFWS 2010b). California red-legged frogs historically occurred in coastal mountains from Sonoma County, California, south to northern Baja California, and along the Sierra Nevada foothills from Shasta County to Kern County (Jennings and Hayes 1994). This species is apparently extirpated from much of the southern portions of its historical range and now occurs mainly in coastal areas and in a few isolated populations in the Sierra Nevada foothills (USFWS 2002b).

Life History

A comprehensive summary of California red-legged frog biology is included in the Recovery Plan (USFWS 2002b), but several research reports are now available that update some of this information. Perhaps most significantly is the use of terrestrial habitats by adults (see material below), which has important management implications.

Breeding must occur in water, which is usually pooled or slow moving and includes coastal lagoons, marshes, springs, permanent and semi-permanent natural ponds, irrigation ponds, siltation ponds, water treatment ponds, creek backwaters, and any other freshwater pool. Although breeding sites are sometimes characterized by dense bordering and emergent vegetation cover (willows, cattails, tules, sedges), stock ponds that are essentially devoid of emergent and riparian vegetation can also be highly productive sites. One of the most important aspects of breeding habitat is warm water. This usually occurs along the shallow edges of ponds and creeks where vegetation does not shade the sun, which warms the water. Often, deeper water is nearby, which provides larvae and frogs some protection from predators, such as raccoons, egrets, and herons (Hayes and Jennings 1989; Reis 1999). Water that is rich in

nutrients, that has areas of moderately deep water (2.3 to 3.9 ft), a complex biological community, and which is characterized by forage base for all life history stages is important. The typical forage base includes extensive aquatic vegetation for cover and tadpole forage, and a complex invertebrate fauna and small vertebrate (e.g. mice) populations as prey for adults (Hayes and Tennan 1986; Hayes et al. 2006).

California red-legged frogs breed in the winter (in synchrony with the Mediterranean climate pattern of wet winters and dry summers). Egg laying takes place between late November and April, with the peak season occurring in February (USFWS 1996; Scott and Rathbun 2001), although timing seems to be closely tied to local conditions. Fertilized egg masses are usually attached to an emergent prop (including dead and live twigs and stems) just under the surface of the water; changes in water depth can be fatal for the developing embryos. Egg masses average 500-2,000 embryos, although up to 6,000 have been recorded (Jennings and Hayes 1994). Eggs hatch within 6 to 14 days, depending on water temperature (warm water promotes faster embryo development). Tadpoles transform or metamorphose to sub-adult frogs usually by July to September (Storer 1925; Jennings and Hayes 1994), although in some sites overwintering larvae have been documented (Fellers et al. 2001).

Habitat Characteristics

Young California red-legged frogs (metamorphs) are typically found in slow-moving, shallow riffle habitats in creeks, and along the margins of ponds, where they often can be seen during the day (as opposed to adults, which are mostly nocturnal). It is believed that metamorphs are the life stage that is most prone to dispersal.

Adults often are associated with emergent vegetation or dense riparian vegetation and associated deep (approximately 2 to 3 feet), slow-moving water (Jennings and Hayes 1994). Creek habitats usually are characterized by an open canopy, plentiful basking surfaces (e.g., exposed rocks, logs, or sand), and readily accessible riparian cover (Reis 1999). Exotic predators such as bullfrogs (*Rana catesbeiana*) and centrarchid fish (bass and sunfish) are usually absent where California red-legged frogs occur (Alvarez et al. 2004; Christopher 2004; D'Amore et al. 2009). Adults reach sexual maturity in approximately 2 to 3 years, and most adults only live for one breeding season, although some individuals are believed to live 8 to 10 years (Scott and Rathbun 2001).

There are several studies of radio-tagged adult *Rana draytonii* (Scott and Rathbun 2001; Bulger et al. 2003; Fellers and Kleeman 2007; Tatarian 2008). Because these studies were carried out in different habitats, and during different periods of the year, it is important to consider the details of each study before applying information to a different site for management purposes. However, in summary, most frogs move very little within or between seasons. If there is dense upland undergrowth (blackberries and poison oak) associated with a creek or pond, some adults will move up to 100 meters inland for periods of several days, probably to forage. However, during the dry summer months, they periodically return to the water, probably to rehydrate. If water conditions become adverse during any time, due to drying, flooding, or salinity, frogs will leave the water and take refuge in deep riparian leaf litter or in rodent burrows near the aquatic habitat. Some adults may travel several kilometers to more suitable aquatic habitat. Depending on the site, some adults will move seasonally between breeding habitats and more suitable

summer habitats, often based on water persistence, quality, and temperatures. It is believed that these seasonal movements are relatively inflexible, which sometimes makes the inadvertent alteration of natural water regimes or the construction of barriers to their terrestrial movements lethal (Rathbun et al. 1997).

It is believed that once a frog learns a seasonal migratory routine, or establishes a home range within a perennial and stable aquatic habitat, it will try and re-establish itself if moved. It is thus thought that translocations are largely not beneficial to individual frogs or local populations of frog (Rathbun and Schneider 2001; Bland 2006).

Occurrences Within the Plan Area

Information on known California red-legged frog occurrences within the Plan Area covered by this HCP was gathered from focused surveys along the North Coast creeks (Bryan Mori Biological Consulting Services 2010, Dana Bland & Associates 2002, ENTRIX 2002, and Environmental Science Associates 2001), literature reviews, records in the California Natural Diversity Database (for the Santa Cruz, Davenport, and Felton 7.5-minute quadrangles) and discussions with local consulting biologists and agency personnel.

California red-legged frogs occur in all the coastal creeks north of Santa Cruz within the Plan Area, including the following creeks listed from the south to north: Moore Creek, Wilder Creek, Old Dairy Gulch Creek, Lombardi Creek, Baldwin Creek, Majors Creek, Laguna Creek, Yellow Bank Creek, and Liddell Creek. Although focused surveys for frogs along those creeks were last conducted in 2001 (Env. Science Assoc. 2001), conditions have not changed since then along the creek sections within the Plan Area and nearby vicinity, and therefore, frog populations are expected to be similar to that observed in 2001. Very few California red-legged frog records exist from the San Lorenzo River basin, and no records exist for California red-legged frogs in City Urban Center Unit aquatic habitat (i.e. San Lorenzo River mouth, Neary Lagoon, Arana Creek).

Habitat Conditions

California red-legged frog habitat conditions for each of the three units within the HCP region (i.e., north coast creeks, City urban center, and the San Lorenzo River basin which includes Loch Lomond Reservoir) are detailed below. A concise evaluation of the specific habitat components are described for each unit, along with known records of the frog. Generally, the north coast unit creeks do not provide breeding habitat for this frog because there are swift winter creek flows and a lack of secondary or off-channel areas with still water during the frog's winter breeding period. However, several creeks have lagoons at the ocean mouth, and numerous ponds adjacent to the creeks do provide suitable breeding habitat for the California red-legged frog.

The Urban Center Unit lacks red-legged frog records and habitat is marginal at best.

The San Lorenzo River unit also lacks records of red-legged frogs within the Plan Area, but there are a few records of this frog in tributary creeks.

NORTH COAST UNIT

LIDDELL CREEK

The Env. Science Assoc. (2001) Existing Conditions report and the ENTRIX (2004) 2003 habitat characterization reports indicate that portions of Liddell Creek provide suitable sheltering or dispersal habitat for California red-legged frogs. The ESA surveys yielded multiple California red-legged frog observations along the middle branch of Liddell Creek and elsewhere on the Coast Dairies properties (Env. Science Assoc. 2001). Pool and flatwater habitat account for 73 percent of the habitat from the creek mouth to 1.29 miles upstream of the lagoon. The pool units in this reach provide summer cover and foraging habitat that ranges from poor to fair summer foraging habitat depending on localized conditions of water depth and extent of in-stream vegetative cover. The channel becomes more confined from river mile (RM) 1.29 to the diversion dam (2.54 miles upstream of the lagoon) (ENTRIX 2004). Pool and flatwater habitat account for 89 percent of the habitat units in this reach, but instream cover is less complex and extensive than in the lower reach. The habitat units present in this reach provide suitable sheltering or dispersal habitat for California red-legged frogs.

California red-legged frogs are known to breed in several sediment ponds constructed for the currently idle cement quarry adjacent to the upper reaches of Liddell Creek (Dana Bland & Associates 2009). The quarry was permanently closed in 2010, but the ponds are currently still monitored for frogs (EcoSystems West 2010, 2011).

YELLOW BANK CREEK

The 2001 Env. Science Assoc. (2001) Coast Dairies existing Conditions Report indicates that most of Yellow Bank Creek and adjacent farm ponds within the property boundaries offers excellent breeding and summer foraging habitat for California red-legged frog. The report cites numerous observations of California red-legged frogs along Yellow Bank Creek.

LAGUNA CREEK

The June 2001 habitat characterization indicates that portions of Laguna Creek and its lagoon provide suitable summer foraging and dispersal habitat and marginal breeding habitat for California red-legged frogs (ENTRIX 2002). A total of 86 adult red-legged frogs were observed in Laguna Creek during the June 2001 study (ENTRIX 2002).

***Lagoon*:** The lagoon is deep but the perimeter of emergent bulrush and spikerush provide breeding habitat (egg mass deposition sites) for this species, particularly in the southeast corner, which is well protected from high-water flows from the creek and heavy surf (ENTRIX 2002). California State Parks began a major restoration project at the Laguna Creek lagoon in 2010 to enhance habitat for California red-legged frogs and tidewater goby (Halbert 2010).

Creek: Most of the suitable summer habitat for California red-legged frogs in Laguna Creek occurs from the creek mouth to 1.43 miles upstream of the lagoon (ENTRIX 2004). The pools in this reach have low canopy cover, many open sites for basking, and several backwater pools with complex cover. The vast majority (83) of the red-legged frogs observed during the ENTRIX (2002) survey were observed in this reach in 2001.

Little suitable summer habitat for red-legged frogs was observed in the upper reaches of Laguna Creek (ENTRIX 2002). Only three adult red-legged frogs were observed. The frog observations and suitable habitat were limited to the few sunlit pools where fallen trees created gaps in the canopy, thus providing basking habitat.

Diversion pond: Most of the diversion pond is filled with sediment and lacks overhanging or emergent vegetation. Therefore, in its current condition, the diversion pond probably does not provide suitable breeding or summer habitat for California red-legged frogs (ENTRIX 2002).

Other Laguna Creek Watershed aquatic habitat: There are three upland ponds on private land in the Laguna Creek watershed, two of which are within a 1-mile radius of the diversion (ENTRIX 1997). One of the two ponds in the one-mile radius survey area was dry during the 1997 survey. Suitable breeding habitat seemingly exists at the other pond, which is used for recreation.

MAJORS CREEK

Twenty California red-legged frogs were observed along Majors Creek during the June 2001 habitat survey (ENTRIX 2002). The habitat characterization indicates that Majors Creek offers summer foraging and dispersal habitat for California red-legged frogs and limited potential breeding habitat, primarily along the lower reach.

Lagoon: Due to stream modifications, Majors Creek now lacks a well-defined lagoon (Berry, personal communication, 2004). All that remains is a shallow pool devoid of perimeter emergent vegetation with no potential as breeding habitat for California red-legged frogs (ENTRIX 2002).

Sixteen of the 20 Majors Creek red-legged frog observations occurred along the lower reach of Majors Creek (creek mouth to 0.71 miles upstream) (ENTRIX 2002). Scattered backwater pools with small patches of emergent vegetation characteristic of California red-legged frog breeding habitat also exist along this reach. The entire reach appears to offer fair to good summer foraging habitat.

Breeding and summer foraging habitat seem nearly absent from the upper reaches, most of which lacks sunlit backwater or quiet pools. Only four of the 20 frogs observed during the 2001 study were found along this reach.

Diversion pond: Dense vegetation borders most of the diversion pond, but swift flows during the winter make it unlikely that frogs breed here (ENTRIX 2002). California red-legged frogs have been observed at the diversion dam occasionally over the years by City staff (Berry, personal communication, 2012) and during focused surveys as recently as September 2010 (Bryan Mori Biological Consulting Services 2010).

BALDWIN CREEK

Baldwin Creek offers excellent California red-legged frog habitat. During the habitat assessments conducted in May 2001 (Kawamoto Environmental Services (KES) 2001), at least four California red-legged frogs were seen in the lowest section of Baldwin Creek in the area between the impoundments and the railroad tunnel culvert. In this section, the creek flows

through a defined stream channel with a riparian overstory of willow and alder. California red-legged frogs were also observed between the culvert and private residence in an area with large alders and many pools. In addition, a large, deep potentially suitable pool has been formed at the residence on the east bank (KES 2001). California State Parks conducted frog surveys in 2002 and found egg masses, juveniles and adults, and has since implemented a restoration plan (Halbert 2001).

LOMBARDI CREEK

Within the Dimeo Lane Landfill (City of Santa Cruz), California red-legged frogs occur along Lombardi Creek in the North Canyon bypass pond and West Canyon bypass pond (where egg masses were observed in 1999) and in the South Outlet (Dana Bland & Associates 2002). The 2002 study also found red-legged frogs downstream of the landfill along Lombardi Creek. Habitat values along Lombardi Creek include breeding/rearing habitat (bypass ponds), summer foraging habitat (bypass ponds and Lombardi Creek channel), and dispersal corridors (Lombardi Creek channel). More recent monitoring of activities at the Dimeo Lane Landfill also documented red-legged frogs along this stretch of Lombardi Creek and the landfill ponds (G. Kittleson, personal communication, 2010). In 2005, California State Parks restored the lower portions of Lombardi Creek with native vegetation and created pools to enhance habitat for frogs and goby (Spohrer 2000).

OLD DAIRY GULCH

Old Dairy Gulch originates on Wilder Ranch State Park, flows through the Santa Cruz Sand Plant, under Highway 1 and the railroad tracks, and into a small lagoon at its mouth with the Pacific Ocean. The creek has dense willow riparian vegetation with no slow water areas in the winter. The lagoon is densely vegetated with tules. The creek provides seasonal foraging habitat and dispersal corridors, and the lagoon provides breeding habitat. California red-legged have been observed along the creek, in the lagoon, and are known to breed in all the adjacent ponds on the Santa Cruz Sand Plant property (Dana Bland & Assoc. 2010).

WILDER CREEK

For much of its length within Wilder Ranch State Park, Wilder Creek provides all California red-legged frog habitat types and components. Jennings and Hayes (1994) identified this creek habitat as optimal, as reflected by the large resident frog population. The KES (2001) Wilder Creek surveys recorded California red-legged frogs from the lagoon habitat to upstream small tributary pools. In the lagoon, California red-legged frogs were found in the dense marsh vegetation several feet from the water and on the overgrown silty banks near the water's edge. In the redwood forest area, they were basking on bedrock outcrops up to 4 feet above the water surface and on cobble substrate a few feet from the stream (KES 2001). The potential for occurrence of breeding sites along this creek is high where off-channel ponds or still water occur. Wilder Creek restoration (dam removal) occurred in the fall of 2000 and involved monitoring for CRLF prior to and during the work (Hernandez 2001).

MOORE CREEK

The City of Santa Cruz Moore Creek Preserve provides summer and potential breeding habitat for California red-legged frogs. Juveniles produced at nearby ponds (University of California at Santa Cruz Arboretum and to the west of the Preserve) may also migrate to Moore Creek soon

after metamorphosis. The creek also offers potential dispersal corridor habitat (Bulger 1999). California red-legged frogs have been observed in seasonal ponds at the headwaters of Moore Creek and at Antonelli Pond near the mouth of the creek (CNDDB 2010).

SAN LORENZO RIVER BASIN UNIT

SAN LORENZO RIVER

Very few records for California red-legged frogs exist for the San Lorenzo basin. The only two recorded historical San Lorenzo basin occurrences are specimens from Love Creek near Ben Lomond (Los Angeles County Natural History Museum, collection date unknown) and from a pond near Granite Creek, Scotts Valley (Museum of Vertebrate Zoology, UC Berkeley, collected in 1959) (Barry, personal communication, 2004). California red-legged frogs have also been reported recently from Mountain Charlie Gulch, a tributary in the Felton area of the San Lorenzo River basin (CNDDB 2010), Bean Creek north of Scotts Valley (Kittleson, pers. obs. 2005 and 2015) and possibly from Quail Hollow County Park near Zayante Creek (Berry, personal communication, 2004). As noted above for the north coast creeks unit, the creeks in the San Lorenzo watershed provide little or no breeding habitat for the California red-legged frog because swift winter flows preclude successful egg hatching and larval rearing. Because much of the property surrounding these creeks is privately owned, few surveys have been conducted. Mountain Charlie Gulch and Bean Creek are likely occasional summer foraging habitat in localized areas adjacent to ponds on private property. Red-legged frogs are likely absent from the main stem of the San Lorenzo, which is generally too wide, deep, and swift to support red-legged frog breeding or foraging activity. Small tributaries and secondary channels are more likely to support red-legged frogs (Hayes and Jennings 1989).

CITY URBAN CENTER UNIT

This unit includes the mouth of the San Lorenzo River, Neary Lagoon and Arana Creek. No records for California red-legged frog exist within this unit (CNDDB 2010). Numerous fish surveys and monitoring surveys for fish have occurred over the last decade or more along the lower reaches of the San Lorenzo River in association with vegetation management and levee upgrades, but no red-legged frogs have been observed there. The River no longer forms a natural lagoon at its mouth, and thus no suitable amphibian habitat exists there.

Neary Lagoon is now a man-made feature that does not have natural flow to/from an ocean connection. Tributary streams and urban runoff flow to the lagoon through an extensive culvert storm drain system. Neary lagoon outlets to the Pacific Ocean through a flood control pump station with a 900 linear foot outlet culvert that drains across Cowell Beach. It is surrounded by urban development, and annual maintenance is performed to remove sediment and emergent vegetation. Habitat management goals and objectives at Neary lagoon are documented in the 1992 Neary Lagoon Management Plan. Surveys for wildlife have been conducted at the Neary Lagoon since the 1990s, but no red-legged frogs have ever been observed. (G. Kittleson, personal communication, 2010).

2.7.10 Western Pond Turtle (*Actinemys marmorata*)

Status and Distribution

The WPT (*Actinemys marmorata*) is listed as a California species of special concern by the Department of Fish and Game, and is the only native aquatic turtle in the state (Zeiner et al. 1988; Jennings and Hayes 1994; Germano and Rathbun 2008). Historically, it occurred in most Pacific slope drainages from Washington State to Baja California in Mexico, but is now considered endangered in Washington State and rare in the southern end of its range (Bury and Germano 2008). Fragmentation of WPT habitat by agriculture, urban development, and habitat loss are the primary causes of its regional decline (Bury and Germano 2008), although in many areas turtle populations probably have not declined due to their use of man-made aquatic habitats.

Life History

In central coastal California, mating spans from late April to mid-July (Rathbun et al. 2002; Scott et al. 2008), depending on local conditions. Some females produce two clutches per year. The eggs hatch in about 3 months and some nestlings will remain in the nest through the following winter (Rathbun et al. 2002). Hatchlings typically are found in water less than about one foot in depth with adjacent dense submergent or emergent vegetation for refuge (Jennings and Hayes 1994). Female WPTs in one central California population were found to reach reproductive maturity in as little as four years, and this was attributed to the mild climate, which contributes to a faster growth rate (Germano and Rathbun 2008). WPT are presumed to be long-lived (Germano and Rathbun 2008), perhaps to at least 42 years of age (Holland 1994).

WPTs are omnivorous. Food consists mostly of small to moderate-sized aquatic and terrestrial invertebrates (especially insects and crustaceans), but vegetation and carrion may also be consumed (Holland 1994). It is believed that they only feed in water (Bury 1986). Hatchlings prey mainly on nekton (zooplankton) and the larvae of small aquatic insects and other invertebrates.

Nesting females, eggs, and hatchlings are probably prone to high predation rates, especially by abnormally high raccoon populations associated with urban areas (Rathbun et al. 2002). In addition to water regimes altered by human activities, other possible adverse impacts on WPT populations include predation by, or competition from, introduced species such as bullfrogs and non-native fish (Holland 1994; Jennings and Hayes 1994).

Habitat Characteristics

WPTs occupy rivers, streams, lakes, ponds, seasonal wetlands, and intermittent streams where permanent and extended seasonal pools exist. They also use similarly structured man-made aquatic habitats, such as reservoirs, water treatment ponds, and stock ponds. Although they prefer fresh water, they also tolerate slightly brackish water, such as coastal lagoons. Adult turtles are often found in still or slow-moving water in sunlit waterways, but they also swim easily in swiftly moving water. When active, WPTs spend much of their time basking (Cook and Martini-Lamb 2004). When active, they typically bask fully exposed on logs, rocks, or exposed banks, although this behavior may be less common in the coastal fog zone. They will also bask at the water surface, often in floating algae mats, where they are much more difficult to locate,

even in favorable habitat. Unless habituated to people, basking turtles are exceptionally wary and dive rapidly into deep water if threatened or approached.

WPTs use terrestrial habitat for nesting, refuge during times of year when creeks dry or flood, and basking. Some individuals may refuge in upland habitats for up to 191 days, usually between October and February (Rathbun et al. 2002). Female turtles usually leave water to nest in late afternoon and travel to sparsely vegetated grasslands and coastal scrub areas with compacted and dry soils (Rathbun et al. 2002). In this study in central coastal California, nests averaged 28 m from the nearest water, but were found as far as 80 m from water. A radio-tracking study at Loch Lomond Reservoir in Santa Cruz County documented three female turtles that nested four times, with an average distance to water of 23 m (Allterra Environmental 2009). All the turtles in a population may not use terrestrial habitats equally, or at all, and distances from water can vary considerably depending on local conditions (Rathbun et al. 2002). Turtles can move seasonally up to 2-3 km in streams (Rathbun et al. 1992).

Elsewhere in Santa Cruz County (*outside of the Plan Area*), western pond turtle behavior and habitat preferences in coastal streams have been studied through mark/ recapture and radio-telemetry studies. The relatively large, reproducing pond turtle populations on the north coast in Waddell Creek lagoon and in south county in the lower Pajaro River provide pertinent regional information. Davis (1998) studied winter habitat use by turtles in Waddell Creek and lagoon. Davis found the overwhelming majority of the Waddell turtle population are concentrated in the lagoon-associated ponded areas. Few turtles make use of the remaining upstream watershed. Davis noted that upland overwintering turtles primarily used riparian forest with dense native understory where they were buried in leaf litter or soil. Both upland basking in warm weather and hibernation during the coldest periods were observed.

Crump (2001) found that in lower Waddell Creek, turtles nested 30 m -100 m upland from aquatic habitat at sites with a low risk of winter inundation. Crump also found that all pond turtle nesting during the study period occurred in adjacent active agricultural fields and horse pasture, despite to availability of other potentially suitable undeveloped grasslands within range. Abel (2010) documented that in Waddell Creek, the majority of active-season, summer turtle observations were made of basking turtles in aquatic habitats. Abel noted that summer season upland turtle observations were limited to females seeking nesting sites and short upland forays by both sexes between stream and pond habitats

Ongoing western pond turtle studies in the lower Pajaro River in South Santa Cruz County documented the extensive range and use of the river corridor. Of particular note was a single adult male's movement from the Pajaro lagoon to over 12 km upstream between June 2009 and September 2010. Overwintering turtles were observed both instream in partially submerged woody debris piles and within leaf litter and rodent burrows in willow-cottonwood riparian habitat. Upland nesting was documented within grassland habitat 50 m – 60 m from aquatic habitat. (Biosearch and Kittleson, 2017). Nest mortalities by predators were also documented in 2012 as a result of damage to the nests caused by maintenance mowing and off-road vehicle disturbance. (Alvarez, et. al. 2017)

Occurrences Within the Plan Area

The streams and associated terrestrial habitat within the North Coast watersheds provide breeding, aquatic, and wintering habitat for WPTs. However, the North Coast creek surveys recorded WPTs only from Wilder Creek and single occurrences from isolated ponds in the Yellow Bank and Moore Creek watersheds. During the KES (2001) habitat assessment of Wilder State Park, only one turtle was observed (in the Wilder Creek Lagoon) and one empty shell was found in the Wilder Creek restoration reach. The reasons for WPT scarcity from seemingly high quality aquatic habitat in the North Coast watersheds are unknown, but may include a shortage of suitable undisturbed egg deposition sites in associated terrestrial habitat, predation, scarcity of nekton forage for juvenile turtles or absence of sufficient cover at aquatic habitats.

The San Lorenzo River watershed seemingly offers moderate quality breeding, foraging, and overwintering habitat for the turtles. For example, Sycamore Grove along the San Lorenzo River provides potentially suitable nesting habitat for this species, based on the 1995-reconnaissance survey (City of Santa Cruz Department of Public Works et al. 1979). Turtles have been recorded from Highlands Park near Ben Lomond (CNDDB 2010), Quail Hollow County Park (Kittleson, pers. obs.), the Glenwood Open Space Preserve in Scotts Valley (Largay, 2018, pers. comm.), and from Newell Creek and Loch Lomond Reservoir in the San Lorenzo basin (Allterra Environmental 2009). The Highlands County Park population is clearly reproductively successful, as the CDFG record indicates that children were seen collecting juvenile turtles at the Highlands Park pond (CNDDB 2010).

WPTs are declining in Neary Lagoon, from a high of 10 adults in 2007 to 3 adults for the last two years. All WPT that have been studied in Neary Lagoon have been mature adults. No hatchling or juvenile WPT have been trapped and marked at Neary. Only one (1) juvenile turtle has ever been positively documented at Neary Lagoon, and that was limited to a photograph of a juvenile basking next to a known, marked adult. Potential negative impacts on the Neary Lagoon WPT population include inadvertent mortality during machine tule removal, operation of the Neary Lagoon pump station, and competition from introduced red-eared slider turtles (*Trachemys scripta*) and largemouth bass (*Micropterus salmoides*). At least one slider mortality has been documented during active tule-removal operations. No tule removal-related WPT mortalities have been documented, to date.

Raccoons are common at Neary Lagoon Preserve and predation of adult red-eared sliders has been documented. Based on these observations the assumption must be made that Neary Lagoon's pond turtles are also subject to raccoon predation pressure. Neary Lagoon's location in an area totally surrounded by urbanization also likely negatively affects WPT reproduction, because terrestrial habitat has reduced suitable oviposition sites accessible from the lagoon. If continued over time, the lack of reproductive recruitment will likely result in WPT extirpation in Neary Lagoon.

A 1996 assessment of Arana Creek in the eastern part of the City of Santa Cruz (HRG 1996) indicated that the aquatic habitat within Arana Creek is potentially suitable for WPTs, but none were found during those surveys. This portion of Arana Gulch is also surrounded by urban development and lacks suitable nesting habitat. The lower reaches of Arana Gulch have brackish

water, unsuitable for freshwater amphibians and reptiles. The mouth of Arana Gulch was modified into the current Santa Cruz Harbor many decades ago.

Habitat Conditions

Each of the three units is briefly discussed below with regard to WPT habitat and known occurrences within the Plan Area.

NORTH COAST UNIT

LIDDELL CREEK

WPTs were not observed during the 2003 Liddell Creek survey (ENTRIX 2004). Liddell Creek pools that were rated as marginal for California red-legged frogs in the lower reach (because of lack of appropriate water depth and basking sites) were marginal to unsuitable for turtles for the same reasons and because suitable nearby terrestrial oviposition sites were absent. Appropriate accessible terrestrial and aquatic basking sites for turtles were also scarce in the reach from RM 1.29 to the diversion dam.

YELLOW BANK CREEK

Descriptions of the in-channel agricultural ponds on Yellow Bank Creek (Env. Science Assoc. 2001) suggest that the aquatic habitat is well suited to WPTs. However, no observations of WPTs were reported for these ponds.

LAGUNA CREEK

The coastal lagoon and associated terrestrial habitat to the south appears to have the greatest potential basking, foraging, and oviposition habitat for WPTs in Laguna Creek (ENTRIX 2002). Elsewhere in the reach extending to 1.43 miles upstream of the lagoon, some pools appeared to be deep enough for basking and foraging, but suitable terrestrial oviposition habitat is not apparent. Potential foraging and basking sites are also absent from river mile 1.43 to the diversion dam. The Laguna Creek diversion pond is too shallow and unvegetated to support WPT foraging and basking (ENTRIX 2002).

MAJORS CREEK

The Majors Creek "lagoon" (discussed above) is not suitable for WPTs, but pools and backwaters along the lower reaches of Majors Creek were rated moderate to favorable aquatic habitat for WPTs because the sites have open canopy, complex cover, abundant forage, and appropriate depth. The diversion pond seems to offer high quality cover and basking and foraging habitat for WPTs (ENTRIX 2002). However, winter and spring operations for sediment management associated with runoff from storm events can cause the diversion pond to fluctuate from one to ten feet in depth, which may destabilize the aquatic habitat enough to discourage WPT colonization and recolonization.

LOMBARDI CREEK

WPT are not known to occupy the freshwater bypass ponds at the City of Santa Cruz Resource which are surveyed annually for CRF (Kittleson, pers. obs). No WPT observations have been recorded downstream of the landfill in Lombardi Creek, or downstream of Highway 1 in the willow riparian zone and lagoon.

MOORE CREEK

The Bulger (1999) red-legged frog survey did not evaluate WPT occurrence and habitat along Moore Creek, but Bryan Mori recorded a single occurrence in an ephemeral step pool near the headwaters (CNDDB 2010). Moore Creek Preserve includes substantial meadow habitat that offers many potential oviposition sites. Ephemeral aquatic habitats similar to that sampled by Mori can function as "nursery" habitat for WPTs if water remains through June and alternate foraging habitat exists within about 1,640 ft (Barry, personal communication, 2004).

NEARY LAGOON

WPTs are well-documented from Neary Lagoon, although the population is not considered a self-supporting breeding population. Surrounding upland areas were developed into condominiums and apartments after 1972 with conditions that the developers would restore the lagoon through dredging, assist in creating park facilities and dedicate a 10-foot-wide easement for public access and maintenance along the lagoon edge. The lagoon was dredged in the mid 1970's and recreational facilities were developed gradually between 1975 and 1986. Current management practices are based on the approved 1992 Neary Lagoon Management Plan (Jones and Stokes, 1992). Much of the program involves removal of excessive tule (*Scirpus*), cattail (*Typha*), and yellow flag iris (*Iris*) growth with the general goal of keeping approximately 7 acres of open water and 7 acres of freshwater marsh for habitat diversity, flood control, improved water circulation and aesthetics. "Basking platforms" have also been placed in the lagoon to increase the number and variety of secure basking sites, a critical habitat requirement for WPTs. The current CDFW Lake and Streambed Alteration Agreement requires removal of non-native red-eared sliders encountered during WPT trapping efforts.

SAN LORENZO RIVER BASIN UNIT

SAN LORENZO RIVER

Slower flowing sections of the San Lorenzo River with good sunlight penetration are potentially suitable for WPTs, but suitable oviposition habitat, which is limited by the availability of open south-facing meadows with appropriate soil, may be scarce in forested or developed reaches of the river. Turtles have been recorded from Highlands Park near Ben Lomond (CNDDB 2010), Quail Hollow County Park (Kittleson, 2013 pers. obs.), and the Glenwood Open Space Preserve in Scotts Valley (Largay, 2018, pers. comm.). Anecdotal accounts of WPT from the 1970's in impoundments at San Lorenzo River summer dams above Boulder Creek have been recorded (Stroud, 2007, pers. comm.) There are no recorded WPT observations within Henry Cowell State Park, although suitable habitat exists throughout the middle main stem of the San Lorenzo.

Despite the lack of recent pond turtle observations in the mainstem San Lorenzo River, single adult pond turtles were identified in the levee-confined lower reach of the river in summer/fall 2014-2016. There are no documented records of juvenile or hatchling WPT in the lower San Lorenzo River and lagoon.

A recent study of the Newell Creek and Loch Lomond Reservoir WPT population captured 12 large adult turtles and observed only one hatchling (Allterra Environmental 2009). The authors

concluded that recruitment was very low for this population because the lack of juveniles and small adults.

3.0 COVERED ACTIVITIES

3.1 Introduction

This section describes the "Covered Activities" under the Plan including new construction as well as those activities that the City routinely performs, including operation, maintenance and rehabilitation of the City's water supply and water system facilities; operation and maintenance of the City's municipal facilities; and management of City lands. These activities are necessary to allow the City to provide safe and reliable services, and most of these activities have been ongoing for many years.

3.2 Construction of the North Coast Pipeline and Rehabilitation of Diversion Structures

The entire North Coast System (NCS) is located within the Coastal Zone of Santa Cruz County (Figure 1). The NCS includes five distinct pipeline reaches (Liddell, Laguna, Laguna/Liddell, Majors and the North Coast Pipeline Reach [NCP Reach]). The system extends above ground and underground through developed and undeveloped areas, and traverses along or beneath roadways.

Rehabilitation work on the NCS would include replacement of the supply pipelines and rehabilitation of the diversion structures. The pipeline replacement work would include replacement of the pipelines in their current alignments or the construction of new alternative alignments, designed to avoid sensitive habitats (e.g., potentially sensitive riparian areas). Due to the size of the NCS and funding limitations, work on each of the five pipeline reaches would likely occur independent of each other and could include a mix of existing and new alignments. It is also possible that the pipeline routing may require a change from the present "gravity-flow" system to a "pumped" system for the Laguna or Majors reaches.

Under the proposed Project, rehabilitation of the 120-year old diversion structures also would occur. Modifications to these structures, which are located above the anadromous reaches on the creeks, would include the installation of a cofferdam and a temporary bypass system, dewatering, earthwork, reinforced concrete demolition and construction, metal work fabrication and installation, stone protection, and miscellaneous electrical and mechanical services, including a pneumatically operated spillway gate. This work would enable the diversion structures to facilitate passage of suspended sediment and bed load downstream in a more natural manner, minimizing the need for manual clearing of these materials and deposition in downstream habitat.

The City of Santa Cruz maintains an 8- to 10-foot right-of-way (ROW) along the existing pipeline route in most areas. The 18-mile NCS includes:

- approximately 5.5 miles of the system located within developed areas (mountain residential and City of Santa Cruz)
- approximately 1.5 miles of the system extending beneath City surface streets from the Meder Street extension to High Street
- approximately 4 miles of the system running along Highway 1 from Laguna Creek on the west to Wilder Ranch State Park entrance on the east (Jones & Stokes 2000)
- the remaining 12.5 miles of the system running through undeveloped areas (Coast Dairies Property, Wilder Ranch State Park, and Moore Creek Preserve)

3.2.1 General Construction Actions

The following activities would be involved in construction of replacement pipeline.

3.2.1.1 Trenching

In most instances, the new pipeline would be placed in trenches, approximately 3 feet deep (minimum depth). The trenching operation would be carried out with a chain trencher, a tracked or wheeled excavator, or backhoe. If solid rock is encountered during the trenching process, a rock saw or other heavy equipment (e.g., excavator) would be used. Trench widths would be a minimum of 3 feet wide. This width would help to reduce the amount of soil displaced and to minimize land disturbance. Excreted material would be placed adjacent to the trench. Following placement of the pipe, the trench would be backfilled and compacted. The ground surface would be restored as closely as possible to its original condition.

3.2.1.2 Directional Drilling

Directional drilling would be used in areas where trenching would need to be avoided (i.e., across wetlands and flowing watercourses). Through the control of a directional drill head, a boring can be made horizontally, or in an arc, to install the water pipe. Once a boring is completed, it is reamed to a desired diameter, and then the assembled piping system is pulled through the boring. Directional drills can operate over distances ranging from 100 to 5,000 feet, depending on size. Directional drilling requires installation of sending and receiving pits to allow the drilling fluid to be collected and reclaimed. For this project, drill pits would be located at both ends of the drilled segment and would range in width from approximately 34 to 55 feet. This approach avoids creating open trenches; however, due to the potential of inadvertent drilling fluid return (aka frac-out), directional drilling will not be used unless a frac-out contingency plan has been approved by the Service. At a minimum, the plan will prescribe the measures to ensure protection of water quality and related biological resources (e.g., aquatic resources, and special-status plants and wildlife) including: a) Procedures to minimize the potential for frac-out associated with directional drilling activity; b) Procedures for timely detection of frac-outs c)

Procedures for timely response and remediation in the event a frac-out; and d) Monitoring of drilling and frac-out response activities by a qualified biologist.

3.2.1.3 Sliplining

Sliplining is another construction technique that avoids creating open trenches and that could possibly be used for pipeline construction. The sliplining method involves accessing the existing pipeline at strategic points to insert polyethylene pipe lengths that are joined into a continuous tube.

3.2.1.4 Jack and Bore

Jack and bore construction would be used to complete relatively short (100 to 200 feet), trenchless crossings of the railway and Highway 1. Access pits would be excavated on either side of the feature to be crossed, and then an augur would be used to bore underneath the rail line. As the augur advances, a casing or carrier pipe would be pushed (jacked) behind the augur head. Jack and bore drill pits would be approximately 67 feet wide.

3.2.1.5 Pipeline Suspension or Attachment

At stream crossings with deeply incised banks and/or inadequate banks for directional drilling or trenching, the pipeline may be attached to an existing bridge or overpass. In addition, a cantilever type structure could be constructed to support the pipe above the stream channel.

3.2.1.6 Construction Access

Access for construction is an important consideration for this project, due to the various types of terrain and habitats within the Project area. Most access would occur using ½-ton and ¾-ton trucks.

Construction activity would be restricted to easements obtained for the construction and operation of the pipeline. A summary of potential construction access for each reach is included below as well as whether the pipeline would be installed above or below ground.

- **Liddell –** General access to this reach is generally good and would likely occur via the Dirst access road from Laguna Creek to the south, and the RMC Pacific Materials Quarry (formerly RMC-Lonestar Quarry) access road to the north. The pipeline construction in this area would likely consist of all aboveground installation, most of it adjacent to the access road. There would be a couple of pipeline stretches along this reach (immediately downstream of the diversion structure and the crossing through the Rattlesnake Ridge area) that would not be placed immediately adjacent to the road, but would likely be above ground as well.

- **Laguna/Liddell –** Access downstream of the Y area varies from good to poor, with wetlands and a riparian corridor occurring downstream of the "Big Oak." Access to this area would likely occur via the Dirst access road. While both aboveground and buried piping are options in this reach area, above ground pipe construction may be necessary due to the presence of wetlands and riparian habitat.

- **Laguna –** Access immediately downstream of the diversion structure (along Smith Grade Road) is good and access would occur via Smith Grade Road. Downstream, there are two small stream crossings as well as a larger stream crossing at the "Laguna Gorge." Access in this area is extremely limited because it is heavily wooded and contains steep slopes. General access on the west-side of "Laguna Gorge" is much improved, but there are several areas of unstable soils immediately adjacent to the private residential access road. Pipeline construction would likely include a combination of aboveground and buried installation in this reach area.

- **Majors –** Access in this reach area varies from poor to good and would likely occur via the Majors access road off of Highway 1. Access is limited in the heavily wooded and steep canyon area downstream of the diversion structure. The existing pipeline is immediately adjacent to the riparian corridor downstream of the diversion structure. Aboveground construction in the canyon portion of this area in the existing access road would be the most viable option.

- **NCP-Hwy 1 Area –** Access varies from fair to good and generally improves downstream of the Majors Reach crossing. Most access to this stretch of pipeline would occur via Highway 1. While there are several narrow and wide stream/ravine crossings along this reach area, the pipeline would most likely be buried.

- **NCP-In City Area –** Access varies from poor to good in this area. Construction in residential and commercial areas (where the pipeline traverses adjacent to existing structures) would present the greatest access challenges. Access for this portion of the pipeline would occur via Meder Street, Cardiff Place, High Street, Coral Street, Encinal Street, and State Highway 9. Buried pipeline alignments would be likely in this area.

3.2.1.7 Heavy Equipment and Machinery

Anticipated equipment for most phases of this project would consist of tracked excavators, soil compactors, and ½-ton and ¾-ton trucks (dump and hauling). At pump station locations, additional equipment could include a mobile crane and concrete delivery trucks. A directional drill rig for the directional drilling and an augur for the jack and bore construction that will occur at the railroad crossings may also be required. Diesel fuel is required for machinery and heavy equipment; refueling such equipment would be limited to designated areas (such as one of the staging areas) so as not to expose sensitive habitats to the possibility of a fuel spill. Additionally, best management practices (BMPs), such as a spill contingency plan and containment areas

would be incorporated during the construction period. Other BMPs such as vegetable oil-based hydraulic fluids, which are standard for operating construction equipment near environmentally sensitive areas, would be used for this phase of the project.

3.2.2 Construction Staging Areas

Primary staging areas would likely be established at several locations along the western side of Highway 1, with smaller staging areas located adjacent to access roads in the various pipeline reach and diversion areas. Most of these areas are privately owned. No staging areas would occur on the marine terraces. In general, primary staging areas would be established on relatively level ground in existing open spaces. These staging areas would not exceed a maximum size of 300 feet by 150 feet (45,000 square feet) and would be used for materials and equipment storage, preliminary pipeline fabrication, and project management. Secondary staging areas would not exceed a maximum size of 60 feet by 30 feet (1800 square feet) and would be used for temporary storage of materials and equipment. These areas would also support daily activities related to pipeline segment fabrication.

3.2.3 Construction Schedule

Pipeline rehabilitation has already begun. The period of construction for each of the pipeline reaches will vary according to seasonal, budgetary and other limitations. While winter operations will be avoided if practicable to ensure protection of amphibians and reduce potential for erosion and stream sedimentation, there will likely be occasions when projects run into the winter season. An assessment of the fine details of the various pipeline reaches will be made thru project-specific design and environmental review processes. In general, the construction period depends on whether the pipe is buried underground or installed above ground and the actual length of the pipeline reach.

3.3 Water Supply Operations

3.3.1 Water Diversions

The City of Santa Cruz Water Department has six sources of water supply in its system. These include the North Coast Diversions (including Liddell Spring, Reggiardo Creek, Laguna Creek and Majors Creek), the San Lorenzo River (including Felton Diversion and Diversion at Tait Street), Newell Creek Dam and Reservoir (commonly referred to as Loch Lomond Reservoir) and the Live Oak Wells. The current total annual water demand in the service area averages about 3.6 billion gallons, of which the majority occurs in the six-month May-October peak season. The Live Oak Wells draw from groundwater and are not addressed in this HCP. Notably, current diversion volumes are very similar to historic diversions, with seasonal changes more a function of availability and water quality, rather than due to increased demand. This is primarily due to the effectiveness of the City's award-winning conservation program.

The HCP will provide coverage for existing water diversion facilities including operation, rehabilitation, replacement, repair and maintenance of existing infrastructure and related facilities such as water measurement devices, scientific measuring devices, and water quality monitoring stations. The level of diversion for each facility is variable and is based on bypass flows negotiated for the protection of anadromous salmonids for the City's Anadromous Salmonid HCP. Minimum bypass flows associated with the diversions are discussed below under each diversion description.

Liddell Spring Diversion

The Liddell Spring Diversion was developed in 1913 and is a natural spring located at the headwaters of the East Branch of Liddell Creek, approximately 2.5 miles upstream from the mouth of Liddell Creek. The spring box/diversion structure consists of a concrete box with a corrugated locking door. The structure sits on top of the natural spring and is approximately 25 feet above Liddell Creek. Access to the spring box is via an access road through the RMC Pacific Materials quarry. The water right for the diversion is a pre-1914 right. There are currently no permits or other legal requirements that specify limits on diversion rates or quantities or require a bypass flow at the diversion.

The Liddell Spring Diversion operates year round and produces approximately 1.2 to 1.7 million gallons per day with a maximum diversion capacity of approximately 2.7 cfs. The flow diverts water directly from the spring into a 16-inch pipeline that then connects to the North Coast Pipeline via the Laguna Creek pipeline. The flow is controlled by an inline slide gate valve. The valve may be shut during storms and a separate drain valve is most often cracked open to allow sediment transport and passing of the peak of the hydrograph. Sediment is also removed via pumping when it inundates the drain valves during significant storms. When not diverted, the spring flow passes under the access road adjacent to the spring through a culvert and discharges into a tributary to the East Branch of Liddell Creek. The minimum bypass flow that will be required under the Anadromous Salmonid Habitat Conservation Plan in the anadromous reach of Liddell Creek is 0.25 cfs.

Laguna/Reggiardo Creek Diversions

The Reggiardo Creek Diversion is located on Reggiardo Creek approximately 300 feet above its confluence with Laguna Creek. Water rights for the Reggiardo Creek Diversion were acquired along with Laguna Creek in about 1912 (Camp, Dresser & McKee 1996). A concrete dam spans the full width of the creek and is approximately 8 feet high. Immediately behind the concrete dam, the channel is filled with sediment. A small pond is created at the crest of the concrete dam.

The Reggiardo Creek Diversion operates year round, 24 hours a day. Due to inundation by sediment, the current diversion rate ranges from .05-.09 cfs. Historic maximum diversion rates ranged from 1.6-2.8 cfs. Surface water diverted from Reggiardo Creek enters an 8-inch pipe and flows by gravity approximately 850 feet into the upstream side of the Laguna Creek diversion pond. A valve is located at the discharge of the pipe allowing flow to be regulated or shut off completely.

The Laguna Creek Diversion was developed as a water source in 1890 and remains in use currently. Since the diversion is part of a pre-1914 water right, there are currently no legal restrictions on diversion rates or quantity from the diversion nor is there a bypass flow requirement. Water from the diversion is transported through a 14-inch pipeline to the junction of the transmission pipeline from Liddell Spring. After joining at the Liddell junction, the raw water is transferred via the North Coast Pipeline to the water system.

The Laguna Creek Diversion operates year round and has no seasonal restrictions nor bypass requirements. The maximum diversion capacity is approximately 7 cfs. During storm events the diversion intake is shut down as turbidity rises above 25 NTU. When turbidity begins to fall below 25 NTU the diversion is turned back on.

The intake passively diverts water from the impoundment pool through a 5/32 inch woven-wire intake screen. This screen acts to keep debris from entering the intake pipeline and is periodically cleaned of debris by hand. Water enters a flume that conveys flow to the14-inch pipeline. A pneumatically operated (air pressure) slide gate at the inlet of the pipe is used to open or close the inlet. The minimum bypass flow that will be required under the Anadromous Salmonid Habitat Conservation Plan in the anadromous reach of Laguna Creek is 2 cfs.

Majors Creek Diversion

Diversion on Majors Creek has occurred since 1882 to service certain areas within the City. The Majors Creek Diversion was purchased by the City in 1916. The water right for the diversion was established in 1881 and the City operates the diversion under the pre-1914 water right (Camp, Dresser & McKee 1996).

Water from the diversion is conveyed through a 10-inch pipeline to the North Coast Pipeline. The Majors Creek Diversion is located approximately 300 feet lower in elevation than the other North Coast diversions, thus use of the Majors Creek Diversion is presently limited by the hydraulic loading from the other north coast sources. A check valve is located at the lower end of the Majors Creek transmission pipeline to prevent backflow from other sources (Camp, Dresser & McKee 1996).

The Majors Creek Diversion operates year round and has no seasonal restrictions nor bypass requirements. The Majors Creek diversion has an approximate diversion capacity of 2 cfs, due to constraints on the pipeline from hydraulic loading from other sources. During storm events as turbidity rises above 25 NTU the diversion is shut off and the entire stream flow passes over the dam. As turbidity drops below 25 NTU, the diversion is turned back on. The minimum bypass flow that will be required under the Anadromous Salmonid Habitat Conservation Plan in the anadromous reach of Majors Creek is 0.25 cfs.

Newell Creek Diversion and Newell Creek Reservoir

The Newell Creek Diversion consists of the Newell Creek Reservoir impounded by the Newell Creek Dam (commonly referred to as Loch Lomond). Newell Creek Reservoir is located on Newell Creek approximately 1.7 miles upstream of the confluence with the San Lorenzo River. The Newell Creek Reservoir is a drinking water reservoir and is the City's only water storage

facility. Newell Creek Reservoir is approximately 2.5 miles long with an approximate width of 1,500 feet. Newell Creek extends 3 miles upstream of the upper end of the reservoir. In 2009 the capacity of Newell Creek Reservoir was determined to be 8,646 acre-feet (McPherson et al. 2011).

The Newell Creek Diversion (License No. 9847) is an appropriative right for diversion to storage not direct diversion to use. This license allows for a maximum of 5,600 acre feet or 1,825 million gallons per year to be collected from September 1 to July 1 and requires a year round release of 1 cfs to Newell Creek downstream of the reservoir and release of the natural flow during July/August (due to the fully appropriated status of the San Lorenzo watershed) if the natural inflow exceeds 1cfs. The minimum bypass flow that will be required under the Anadromous Salmonid Habitat Conservation Plan in Newell Creek is 0.25 cfs. Withdrawals from Newell Creek Reservoir under the Newell Creek water right can occur from January 1 through December 31 and is limited to 3,200 acre feet or 1,042 million gallons per year. Water that is removed from storage is passed through a valve on the dam face and flows by gravity to the Felton Booster Pump Station for delivery to the Graham Hill Water Treatment Plant.

Legal action taken by the San Lorenzo Valley Water District (SLVWD) subsequent to the date the City obtained the Newell Creek license, resulted in a court decision that provides SLVWD up to 313 acre feet or 102 million gallons per year from Newell Creek Reservoir. This leaves a maximum withdrawal for the City of approximately 2,890 acre feet or 940 million gallons per year from Newell Creek Reservoir.

Felton Diversion on the San Lorenzo River also provides water to Newell Creek Reservoir under two separate diversion to storage water rights permits. This water does not count against the provision in the Newell Creek license nor the SLVWD decision. Details on the Felton Diversion are provided in Section 1.1.6 below.

Newell Creek Dam has five water intakes spaced at 20 foot intervals from 550 to 470 feet above sea level respectively, allowing withdrawals from the level with the best water quality, usually either 510 or 490 feet.

Newell Creek Reservoir is oxygenated by a hypolimnetic aerator during the summer/fall months. The Newell Creek Diversion bypass is provided through a valve at the base of the Newell Creek Dam located approximately 10 feet from the toe of the dam. The water released from this bypass is from the level of draw that is also used for production – which is aerated by the aforementioned hypolimnetic aerator, as well as by the diffuser at the outlet from the dam to Newell Creek just below the dam. Due to the small size of Newell Creek Reservoir, spilling often occurs in years of average to above average rainfall.

Felton Surface Water Diversion at San Lorenzo River

The Felton Diversion is located on the San Lorenzo River just downstream of the Zayante Creek confluence and approximately five miles upstream of the Tait Street Diversion on the San Lorenzo River. The Felton Diversion consists of a three-foot-high concrete weir spanning the stream channel with an inflatable rubber dam attached to the top of the weir structure. When not in operation, the dam is completely deflated and lays flat against the riverbed. The dam is eight

feet high when fully inflated. A pump station is located on the west bank adjacent to the dam and weir structure. Water from the diversion is diverted into a screened intake sump and transferred via a pipeline to the Felton Booster Station located near Graham Hill Road. The flows are transferred via the Felton Booster Station to Newell Creek Reservoir for storage and later use.

The City of Santa Cruz has appropriative water rights at the Felton Diversion. The Felton Diversion is implemented by two permits (Nos. 16123 and 16601) which allow a maximum annual diversion of 3,000 acre feet to Newell Creek Reservoir for storage and later use.

The Felton Diversion operates according to two Memorandum of Agreements (MOAs) signed with the California Department of Fish and Game (Agreement Between City of Santa Cruz and State of California Department of Fish and Game for Streamflow Maintenance and Operation of Fishway at Felton Diversion Project on San Lorenzo River for the Protection and Preservation of the Fish and Wildlife Resources, 1971 (CDFG 1971) and Memorandum of Agreement between California Department of Fish and Game and the City of Santa Cruz Regarding Operation of the Felton Water Diversion, 1998 (Hunter 1998). The maximum rate of withdrawal for October 1 to May 31 is 20 cfs with a minimum bypass flow of 25 cfs for October and 20 cfs for the period November 1 through May 31. In September, the diversion rate is 3500 gpm with a 10 cfs bypass requirement – though diversion in September is often impossible/unnecessary. Additionally, the City's Anadromous Salmonid Habitat Conservation Plan requires a minimum 40 cfs bypass flow at the Felton Diversion. The Felton Diversion does not operate in the summer June through August.

The City operates the inflatable dam at the Felton Surface Diversion according to the MOA (1998) cited above, to allow adult steelhead and coho salmon to migrate upstream. Operations are based on streamflow conditions during winter months and include specific operational changes based on low, moderate and high streamflow conditions as outlined below.

For low flow conditions, during November 1 through March 31 when the mouth of the San Lorenzo River is open and streamflow is 40 cfs or less and the City is diverting water, the dam is inflated to allow 20 cfs bypass flow through the fish ladder and diversion to Loch Lomond. During the same period, if the City is not diverting, the City inflates small air bladders beneath the deflated dam for the purpose of concentrating flows near the center of the deflated dam. The small air bladders are inflated to such a degree that the depth of flow within the zone of concentrated flow crossing the dam is 8 inches or greater.

For moderate streamflow conditions, during November 1 through March 31 when the mouth of the San Lorenzo River is open and streamflows are between 40 and 200 cfs, the City can divert water by inflating the dam and allowing 20 cfs bypass flow through the fish ladder. During these moderate streamflow conditions, the City keeps the dam deflated during the first one or two rainstorms to flush sediments and organic matter from the channel. During these conditions of winter operation, migrating fish can pass over the deflated dam.

In high streamflow conditions (exceeding 200 cfs) from November 1 through March 31, when the City is diverting, the dam is inflated such that the fish ladder is operational. When

streamflow exceeds approximately 300 cfs, the slide gate on the fish ladder is opened approximately 8 inches to increase attraction flow to the ladder entrance. When streamflows have equaled or exceeded 300 cfs for five consecutive days and adult steelhead or salmon are observed holding downstream of the dam, on the following day the dam is partially deflated and the slidegate closed in the evening and overnight. This allows the steelhead and salmon the opportunity to jump and swim over the partially deflated dam. When streamflows exceed 2,000 cfs the City fully deflates the dam.

San Lorenzo River Diversion and San Lorenzo River Wells (Nos. 1, 3, and 4)
The San Lorenzo River Diversion is located approximately 1 mile north of Highway One on the west bank of the San Lorenzo River at the terminus of Tait Street. The diversion consists of a low diversion dam (approximately three feet in height) that spans the width of the river and a concrete intake structure. The San Lorenzo River Diversion also includes three wells (Nos. 1, 3, and 4) located on the east side of the river. The wells range in depth from 85 to 104 feet.

Water rights at the San Lorenzo River Diversion and Wells consist of two licenses (Nos. 1553 and 7200) for appropriative rights to a maximum combined diversion rate of 12.2 cfs year round. There is no annual limit specified in the licenses nor are there downstream release requirements included in the licenses. Water is diverted on a continuous basis, interrupted only for excessive turbidity due to storms, short term water quality degradation resulting from spills of potentially harmful materials, mechanical breakdown, or routine maintenance.

Surface water is directed to the intake by the low diversion dam. The intake structure is concrete, built parallel to the stream bank, and extends downstream from the dam. The intake structure is protected by a debris rack and the downstream end of the intake is fitted with a hydraulic slide gate that is normally open during high flows and closed during low flows. This ensures the intake screens remain submerged and also maintains a continuous flow of water through the intake back into the river. A pipeline carries water from the intake to the pumping clearwell, where three vertical turbine pumps pump the water to the Graham Hill Water Treatment Plant.

The wells operate seasonally, generally July through September and water is delivered to the pumping clearwell on the west side of the river. The groundwater is then pumped into a common transmission line to the Graham Hill Water Treatment Plant. These wells account for about five percent of total volume of water diverted at this San Lorenzo River facility and less than three percent of total annual production from all water sources.

3.3.2 Reservoir Operations

Reservoir operations focus on activities that occur at the Newell Creek Reservoir to provide a safe, reliable source of water for water customers. The activities are required by either the California Division of Dam Safety or the California Safe Drinking Water Act through the California Department of Health and Safety and are included for coverage in the HCP. Covered activities include reservoir water quality treatment and dam facility maintenance.

Chemical Algaecide Treatment of Reservoir

Newell Creek Reservoir is a lacustrine environment and although not nutrient enriched, nevertheless can experience blue green algal blooms during the summer months due to available nutrients, warm water temperatures, and abundant sunlight. When algal blooms do occur or are predicted to occur, chemical algaecide applications are made to the Newell Creek Reservoir to protect against degradation of beneficial uses (e.g., objectionable taste and odor, production of disinfection by-product precursors and cynotoxins, and oxygen depletion and subsequent fish kills). These algaecide applications are regulated by a National Pollutant Discharge Elimination System (NPDES) permit and implementation is described in the City's Aquatic Pesticide Application Plan (APAP).

The Water Department conducts weekly water quality sampling at one station in the lake to assess overall algae population. Species present at the surface and at the levels of the two upper water intakes (elevations 550 and 530 feet respectively) are identified and counted and may be analyzed for chlorophyll. When known nuisance species are on the increase (i.e., *Anabaena, Aphanizomenon, etc.*), sampling is increased to daily and when the counts and chlorophyll values indicate a bloom appears certain, algaecide is applied.

The applications generally occur once or twice between the months of April through September. A private applicator or City staff under the direction of a licensed applicator may conduct the application. The lake shallows are surveyed by staff prior to application to identify any Pacific Pond Turtle, fish breeding or early fish life stage presence. If located, these areas are not treated or treated at a reduced concentration, per direction of the City's SWRCB NPDES permit for aquatic algaecide application. The treatment area is tested the day after treatment to confirm that no high levels of copper are present. Weekly copper monitoring is continued at the surface and 20 foot depth intervals until copper returns to near pre-treatment levels. The fish release below the dam into Newell Creek is also sampled weekly. Finally, upstream and downstream copper sampling may occur on a regional scale to provide context for the copper dynamics observed in the reservoir and feedback on permit compliance. Other algaecides – though less effective than copper carbonate – (including peroxygen (PAK 27)) have also been used at the reservoir and procedures for such basically mirror those for copper carbonate.

Testing Deluge and Gate Valves

Testing of the deluge and gate valves on the dam involves opening the deluge valve and seeing water released and closing the valve and not seeing water released. Additionally, the five intake gates in the lake are closed and the pipeline in the dam is drained to determine that the gates are holding as determined by no water passing through them.

The procedures can result in the discharge of approximately 100,000 gallons of moderate to low oxygen (1-6 ppm at a range of 9-17 C˚ approximately) water discharged to Newell Creek immediately below the dam. The deluge and gate valve flushing typically occurs in the late summer (though may occur any time of year) for a period of several hours on an annual or semi-annual basis. The rate of discharge is approximately 5-10 cfs during the testing period. The discharge is released into boulders/broken concrete below the dam to prevent scour of the streambed and also provide aeration. Dissolved oxygen measurements are taken during release just below the Newell Creek Dam road crossing to confirm aeration of released water. Releases

are “metered” out so changes in streamflow are minimized and designed to mimic natural rise and fall of the hydrograph. Releases are also recorded by a stream gaging station located several hundred feet downstream of the dam. Though release may be conducted during the season when lake coppering could be occurring, releases do not have copper levels higher than that allowable by the Basin Plan as the target dosage for the lake is well below that limit.

Woody Debris Removal on Reservoir Face

Woody debris removal is conducted annually in the late fall when the fire hazard is low (after rains and during burn season). The work requires approximately 4-10 days to complete. A log boom is used to remove the wood at the top of the spillway and a boat, rubber tired skidder and hand crews are used to remove the woody debris from the inside of the dam face. Heavy equipment is excluded from the dam face to minimize soil disturbance. The wood is then piled on the inside face of the dam, cut up with a chainsaw, and burned. Large woody debris pulled from the lake is retained in the wood lot below the dam for restoration projects if possible.

3.4 Water System Operation and Maintenance

Water system operation and maintenance includes activities conducted to maintain operations of the water diversions and water transmission lines, and associated diversion features such as fish screens and fish ladders.

These activities are covered under the HCP and include operation, rehabilitation, replacement, repair and maintenance of existing infrastructure and related facilities such as water measurement devices, scientific measuring devices, and water quality monitoring stations.

3.4.1 Sediment Management

Laguna, Reggiardo, and Majors Creek diversions on the North Coast are concrete impoundments that can collect sediment and debris during storm flows. Sediment management at these diversions primarily focuses on managing bedload and suspended sediment during storm flows with an attempt to mimic the natural hydrograph as much as possible. Each diversion has a dual slide gate valve mechanism in the dam face. The upper gate is opened during the ascending limbs of sediment-transporting storms if it is free of sediment prior to the storms, and then closed on the receeding limb of the storm. The receeding limb is identified either onsite with staff plates, or through real-time dataloggers installed at the Laguna and Liddell diversions, with these gages serving as a surrogate for Majors and Reggiardo Creek – which have no real time communications. If sediment does collect behind the impoundments, the impoundments are dredged. Dredging is conducted during the dry season during low flows (August – October) with heavy equipment and/or hand tools and the material is removed from the site as soon as possible.

The Laguna Creek, Reggiardo Creek, and Majors Creek diversions will be rehabilitated in the future and this project is covered under the HCP. The rehabilitation will make part of the dam face movable so that during stormflows a portion of the dam can be dropped to allow sediment

and flow to proceed downstream. At the end of the stormflows, the dam will again be raised to allow diversion.

Although the Liddell Spring Diversion is located on top of a natural spring and is not an in-channel diversion structure, sediment can still accumulate in the spring box during large storm events. When needed, the City removes the sediment with hand tools, suction pumps or vacuum equipment and removes the material from the site immediately or after brief temporary storage. As previously mentioned, sediment is also allowed to "meter out" continuously by leaving the drain valve slightly ajar – thereby preventing accumulation in the spring box and providing an informal small instream flow to an unnamed tributary to the east branch of Liddell Creek.

Sediment management procedures for all the North Coast Diversions are currently being refined through an SAA process with the Department of Fish and Game.

3.4.2 Fish Ladder and Screen Maintenance

The only City facility with a fish ladder is the Felton Diversion on the San Lorenzo River. The ladder is a standard Denil fish ladder located at the western side of the weir that operates when the dam is inflated. The ladder consists of a fishway with a removable fish trap. The fish ladder is operated according to the MOA described in Section 3.3.1. The ladder is inspected 2-3 times per week and manually cleaned and cleared of debris as needed. Debris removed from the ladder is removed from the site.

The fish screens at all the diversions are inspected regularly and cleaned by hand of any debris. The San Lorenzo River at Tait Street Diversion has two Johnson-type well screens that are cleaned by compressed air back flush at intervals ranging from 10 minutes to 2 hours when the diversion is on. The screens are protected by a debris rack that is inspected daily and manually cleaned as needed.

3.4.3 Pipeline Operations

Adequate operation of the water transmission lines requires system flushing and repairs and specialized operations including pumping well return to prevent sand accumulation and valve blow-offs to prevent breaks in the transmission lines.

<u>Conveyance Pipeline System Inspections and Repairs</u>
The City's two major unfinished water conveyance lines are the Newell Creek Conveyance Pipeline and the North Coast Conveyance Pipeline. Both lines are critical to safe and reliable transmission of water to customers. Pipeline routes are regularly inspected for leaks and pipeline rights of way are maintained to allow for inspection of the pipeline. Usually an eight-foot swath is mowed to allow inspection. Inspection occurs in the fall and spring of each year, and when decreases in flow indicate a leak. Inspection is conducted by production, recreation, distribution, and water resource management staff of the City Water Department. Inspection includes walking the route by foot or traveling the route with an all-terrain vehicle.

Pipeline repairs are conducted on an as needed basis and are identified through the operations and production staff. Repairs may result from damage to the pipeline through natural causes (earthquakes, landslides, etc.) or through deterioration of infrastructure over time. The Newell Creek Conveyance Pipeline is located primarily in upland areas though limited sections are adjacent to Newell Creek and the San Lorenzo River. Discharges from leaks on this pipeline may cause erosion and turbid runoff to surface waters when located adjacent to waterways. Staging areas for repair projects may be required depending on the location of the repair and may include areas for storage of construction materials and construction equipment. Pipeline repairs may also require trenching and construction of temporary access ways.

Finished Water Pipeline System Flushing and Repairs

The finished water pipeline distribution and conveyance system includes approximately 300 miles of pipeline in the water distribution area which includes the entire City of Santa Cruz, as well as a portion of unincorporated Santa Cruz County and a small portion of the City of Capitola. The distribution line must be kept clean of bacteria and contaminants and requires testing for hydrant capacity as well as pipeline repairs.

Regular maintenance activities that occur on the distribution system may include the flushing of the line for fire hydrant testing; repair of main breaks; sediment removal; taste and odor control; control of color, high turbidity, low chlorine residuals, or bacterial growth; corrosion control; or response to customer complaints. Flushing is a water quality practice required by the California Department of Public Health. These maintenance activities occur year round on various parts of the distribution system according to management priorities. SOP nos. 7102-01 and 7102-02 provide procedures to be followed when flushing any part or portion of the distribution line. The SOPs provide details on dechlorination and flushing procedures as well as follow up water quality testing for turbidity and chlorine residual. Dechlorination is accomplished by addition of sodium sulfite tablets to the discharge flow. For main flushing, hydrant testing or main dewatering through a blowoff, a dechlorinating diffuser assembly is typically used. Additionally, "Vactor" trucks are used to prevent discharges when possible. Pipeline repairs may also require trenching and construction of temporary access ways. Most repairs do not involve sensitive habitat, but though those that do are done in consultation with the Service and include avoidance and minimization measures, as described in chapter 5, *Conservation Strategy*.

Pumping Well Return to the San Lorenzo River

Even during moderate river flow, sand accumulates in the pumping clearwell of the San Lorenzo Wells. To reduce damage to equipment and prevent re-deposition in the Graham Hill Water Treatment Plant, sump pumps remove sand from the clearwell, pump it to an adjacent decanting basin and ultimately returns decanted water to the river without any elevation in turbidity.

North Coast Valve Blow Off to the San Lorenzo River

The North Coast Pipeline delivers water from the North Coast sources to the Coast Pump Station, which ultimately delivers water to the Graham Hill Treatment Plant. At the Coast Pump Station (at Tait Street) water from the pipeline is discharged to the San Lorenzo River when pressure within the pipeline threatens to rupture the line. The discharge prevents pressure from

blowing out the North Coast Pipeline (subsequently preventing environmental impacts related to such blowouts) when sources are changed and during situations such as emergencies.

Recently installed pressure relief valves minimize the potential for this occurrence.
The North Coast Pipeline Blow-off occurs year round but only when the North Coast sources are on. The approximate amount of discharge during this operation ranges from 5-10 cfs. The water is discharged over rip rap to the San Lorenzo River downstream of the intake.

Dewatering of Creeks for Maintenance and Repairs
The City performs various types of instream work including, repair and maintenance of diversion facilities, sediment management, fish ladder and fish screen maintenance and repair, pipeline operations and maintenance, flood control and stormwater maintenance, vegetation management, and aquatic habitat management. During the course of these activities it is often necessary to dewater and otherwise disturb portions of stream channels. In order to minimize effects of these activities on aquatic species, including protected species, the City captures aquatic species in the project area and relocates them to suitable habitat outside the project area. Fish may be captured by electrofishing, seining, or dip netting. California red-legged frogs or WPTs may be captured by hand, dip net or seine and relocated to areas of suitable habitat just outside the work area.

3.5 Municipal Facility Operations and Maintenance

Municipal facility operations and maintenance activities include flood control maintenance, stormwater maintenance, emergency repairs and response, and vegetation management. These activities occur on City facilities and properties in the HCP Program Area. These activities are covered under the HCP and include operation, rehabilitation, replacement, repair and maintenance of existing infrastructure and related facilities.

3.5.1 Flood Control Maintenance

Flood control maintenance is conducted to prevent flooding of city waterways and damage to public and private property. Flood control preventative activities are conducted in July through October on an as-needed basis. Emergency response during storms is conducted if damage to life, property, or public safety is imminent. Flood control maintenance includes debris/obstruction removal, sediment management/removal, and vegetation management.

Debris/Obstruction Removal
Debris/obstruction removal is necessary when a material is either deposited or washes downstream into a waterway and creates a hazard to property or infrastructure. Under these hazardous conditions, the City may conduct debris/obstruction removal, including log jam modification (cutting larger logs into smaller segments that may float downstream in larger flows, moving with cranes, etc.) and vegetation removal. These activities are only conducted in an emergency setting where property, life, or public safety is threatened and are done in consultation with NOAA, USFWS, and DFW staff as appropriate. During and immediately after flood events, City staff inspects conditions at bridges, road culverts, diversions, pipelines, and

other public infrastructure to ascertain whether threat to structures are imminent and will only take action if the structure or property is in immediate danger. Such work is typically overseen by environmental monitors and involves standard avoidance and minimization measures for streamside projects.

Sediment Management/Removal

The City takes a preventative approach to sediment management by implementing BMP's for stormwater facilities including vacuuming storm drains before the winter season and cleaning culverts, vaults and ditches before winter, usually from August through October. See description in Section 3.2 for stormdrain maintenance program. Work is completed with mechanized equipment and hand tools. Mechanized equipment used for this work is kept outside of the stream channel.

The San Lorenzo River Flood Control Project includes 18 drainage discharge structures which are maintained to prevent flood waters from backing into neighboring areas and to prevent spills from entering the river. Branciforte Creek also has several drainage discharge structures to be cleaned. The drainage discharge structures are cleaned on an annual or biannual basis. An excavator is used to remove sediment that has built up near the drainage gates. The amount of sediment averages 2 cubic yards per drainage discharge structure. The sediment is dewatered on site and the dried sediment is spread above ordinary high water on the riverbank to be removed by storm flows during the winter.

Sediment removal is only done as necessary to maintain and/or restore capacity of storm water conveyance facilities or to prevent flood events. The nature and exact location of sediment removal in flood control areas is not know from season to season and is dependent on variation of winter storms flows, upper watershed events that produce sediment, and flood control monitoring data that documents aggraded areas that may not meet flood control standards established by the Corps. In general sediment removal in the channel is not likely to be needed annually and will be conducted out of the active stream channel.

Vegetation Management

Vegetation management focuses on trimming or removing riparian vegetation that may impede storm flows, result in bank erosion, or result in damage to property. In the majority of waterways, mature riparian trees are not removed, but riparian shrubs may be trimmed from ground level to 6-8 feet in height. Mature riparian trees are removed in the San Lorenzo Flood Control Channel and Branciforte Creek Flood Control Channel per maintenance requirements of the Corps. Cuttings are removed from the work area and recycled as green waste at the landfill. Work is generally conducted in late August and may last from a few days to a few weeks depending on the area.

3.5.2 Stormwater Maintenance

Stormwater maintenance is conducted on the City's stormwater conveyance system and at the sanitary landfill. The City has an adopted Stormwater Management Program and has fulfilled the requirements for the NPDES Phase II General Permit for Discharges of Storm Water from

Small Municipal Separate Storm Sewer Systems. The Stormwater Management Program is designed to reduce discharge of pollutants to the maximum extent practical and to protect water quality. The Stormwater Management Program includes inspection and cleaning of streets, public areas, and other City facilities, and structural retrofits.

Inspection and Cleaning

The street sweeping program is conducted daily and covers approximately 35 miles of streets daily. Manual hand sweeping is conducted "on call" in order to clean up after a particular event or accident.

Cleaning of City-owned areas (such as alleys) is conducted with a garden hose, without the use of soap. Prior to hosing, spills and large debris are cleaned or picked up. Also, aluminum grates with small mesh size are inserted into nearby storm drains inlets to prevent small debris from entering the storm drain system. Catch basins in public parking lots are cleaned with a Vactor annually. Wastewater from the cleaning is collected and disposed into a sanitary sewer line. City staff oversees these cleaning events to ensure proper disposal of the wastewater.

The City maintains numerous medians, parks and other landscape areas. The primary pollutants of concern from these sources are sediment from erosion, nutrients from fertilizer use and organic matter, and heavy metals and toxic organics from pesticides/herbicide use. Medians and embankments are planted with vegetation and maintained for both aesthetics and erosion control.

Storm Drain Inspection and Cleaning

The City recognizes that a variety of urban pollutants can flow to and accumulate in the storm drain system. In response to this, the City implements an annual storm drain inspection and cleaning program, "Team Clean", to remove pollutants prior to them being transported by storm waters. The City is currently developing a Geographic Information System (GIS) for storm drains to identify a cleaning frequency for catch basins and inlets. A maintenance tracking software system is under development and will help with scheduling and tracking inspections, cleanings, upgrades, and tracking flooding of storm water facilities. The City also conducts TV camera inspections of at least 5,000 feet of storm drain line each year. These inspections are very helpful in evaluating the conditions of storm drain lines and identifying repair needs.

Cleaning is completed both through the use of a Vactor truck and through hand cleaning. Storm drain lines are plugged at both ends and the Vactor truck, using reclaimed water, "jets" the line and then vacuums the line to remove sediment and material. The resulting sediment and material are disposed of in the sanitary sewer or landfill after dewatering at the Wastewater Treatment Plant. In general, the City operates according to the following schedule for inspecting and cleaning all inlets, catch basins, pipelines, pump stations, and other portions of the storm drain system.

- Problem basins (known basins that collect sediment and trash): Inspect and clean at least monthly or more frequently during wet season.

- Intensive use basins (located in high use areas of the City): Inspect and clean semi-annually. Clean monthly during September and October.

- Commercial basins (located in commercial areas): Inspect and clean annually.

- Residential basins (located in residential areas): Inspect on an eight-year cycle and clean as necessary.

- Pump stations along San Lorenzo River: inspect weekly and cleaned at least annually.

- Large diameter storm water pipelines (including inlets, culverts and vaults): Inspected annually and cleaned at least on a five-year cycle.

- Small diameter storm water pipelines (including inlets, culverts, and vaults): Inspected on a two-year cycle, cleaned as needed or on a fifteen-year cycle.

Structural Retrofits of Storm Drain Inlets and Basins

The City selects structural retrofit projects only if feasibility of long-term maintenance, operation and grant funding has been determined. The City focuses on two types of structural controls to improve water quality associated with the storm drain system. The first are dry-weather diversion systems to divert flow to the sanitary sewer for ultimate treatment at the Wastewater Treatment Facility. The second are in-line treatment systems such as sediment basins and oil/water separators. Additional projects such as sealing slide/flap tide gates along the San Lorenzo River to prevent spills from entering the river have been identified as a priority when funding is available.

Sanitary Landfill Stormwater Management - Bypass System & Stormwater Outfall

The Santa Cruz Landfill was constructed within a south-draining canyon of Lombardi Creek and is connected to a southerly-draining tributary canyon along its west side. As a result, surface waters historically accumulated near the upstream limit of wastes within the "northern" and "western" canyon areas. Because the existing system of pumping surface water around the landfill created the potential for migration of surface water into the landfill, the City constructed a freshwater bypass system in 1996 along the west side of the facility. The freshwater bypass system prevents rainwater from infiltrating into the landfill where it may form leachate.

The freshwater bypass system is comprised of two bypass tunnels and two ponds that collect and reroute the north upstream canyon drainage around the landfill and into the lower portions of Lombardi Creek at the southern boundary of the landfill. Surface waters are controlled by several different diversion methods. Water collected from the North canyon slopes is collected in V-ditches and drains to the North Canyon Pond. Water from the West Canyon slopes is collected in lined trenches and drains to the West Canyon Pond. The ponds catch sediment and withhold stormwater until it drains into the stormwater system located in the southern area of the landfill. Both ponds drain into the storm drain runoff collection system. The two ponds are located along the western edge of the landfill. The City may also construct an additional sediment pond in the future; that action is covered by the HCP.

The South Canyon stormwater outfalls include the final outfall for the freshwater bypass system and the final stormdrain for the landfill. The stormwater outfall systems transfer stormwater from the bypass and pond system and the southern areas of the landfill into Lombardi Creek.

Cleaning of the stormwater outfall structures is dependent on the time of year. During summer the outfalls do not collect much sediment. During the rainy season, the outfalls may collect sediment and may need to be cleaned. The typical schedule for the cleaning of the outfalls has been every other year. This cleaning is strictly dependent on the amount of sediment that has accumulated and is not completed on a routine maintenance schedule. Cleaning of the outfall is conducted typically in September through October before the rainy season. The cleaning process can take up to two hours depending on the amount of sediment in the pipes and the outfall structures. The Vactor truck cleans out the structures by inserting a high-pressure hose into the pipe and forcing trapped materials down to the outfall structure where it is vacuumed by the vacuum truck. Sediment is removed using a small tractor and hand tools down gradient of the outfall structures. The sediment is taken to a non-lined area of the landfill and dewatered and reused at a later date.

Sanitary Landfill Stormwater Management -Sediment Management/Clean Out of Bypass Ponds

Part of the activity associated with collecting stormwater in the bypass ponds is the deposition of sediment in the ponds. The freshwater bypass system relies on maintaining adequate capacity in the ponds during rainy events. If the capacity of the ponds is limited due to buildup of sediment, there is a higher chance for freshwater flow into the landfill. Adequate operation of the freshwater bypass system therefore depends on maintenance of sediment built up in the collection ponds.

The maintenance work conducted on the freshwater bypass ponds may include dewatering the ponds, intake and outfall structure cleaning, sediment removal, and vegetation removal.

Dewatering the ponds involves using pumps and directing the water into the freshwater bypass tunnel system. A long-reach excavator is used to remove the sediment in the pond. The average amount of sediment removed from the ponds is approximately 500 cubic yards of material. The sediment removal takes place during the dry season (September through October). The sediment that is removed is taken to a non-lined area of the landfill where it is dewatered and reused at a later date. Once the excavation has been completed, jute matting is applied to all areas where native soil has been scarified and a native seed mix is then applied to the jute matting. This material is in place and seeded prior to the winter rains.

The ponds are not cleaned on a regular basis, but rather on an as needed basis based on conditions following the winter season. If no significant amounts of sediment are deposited during the winter season, the ponds can remain undisturbed for several years without being cleaned. The City has completed an approved CalRecycle partial closure on the landfill areas adjacent to the ponds which has decreased erosion and prevented landfill sediment from entering the ponds. If large amounts of sediment from tributary areas are deposited into the ponds, then they are cleaned annually. A conservative estimate to clean each pond is approximately two days.

Leachate Management

The goal of the operation of the Leachate Collection and Removal System (LCRS) is to prevent leachate from entering into Lombardi Creek and prevent the public from coming into contact with leachate. The LCRS consists of four major components: a groundwater interceptor trench-barrier wall at the toe of the RRF, two Class II surface ponds; a leachate transport pumping station and electric control building; and a transport pipeline.

There are two leachate collection ponds located at the south toe of the RRF, up gradient of the groundwater interceptor trench-barrier wall. The leachate collection ponds serve to collect leachate resulting from rainfall and underground springs and prevent the leachate from entering into Lombardi Creek. The ponds are operated in a sedimentation and overflow scheme. The ponds are approximately 11 feet deep including 2 feet of freeboard. The primary and overflow ponds have nominal capacities of 100,000 and 175,000 gallons respectively. The leachate sediments settle in the primary collection pond and the leachate overflows to the transfer pump station manhole. At the base of this pond is a 4-inch clean-out where operations vacuum out the sediments on an as needed basis.

The leachate transport pumping station was built between the two ponds, and houses three submersible 200 gpm wastewater pumps. Leachate flows by gravity to the pumping station or into the overflow pond when storage is required. Pumping to the Wastewater Treatment Plant is frequent enough so that the overflow pond is empty most of the time. The pump station was designed so that one pump could meet the peak month flow requirements; the third pump was provided as a backup. Most of the solids in the leachate settle out in the sedimentation pond, minimizing cleaning of the overflow pond and leachate transport line.

In the case that the leachate line would require repair due to some damage from some natural event (i.e., earthquake), the City would undertake repairs as expeditiously as possible, normally within 24-48 hours depending on damage. The process by which the line repair would be undertaken would include assessment by City engineers for fixing the break, assessment of equipment and operation needs, obtaining necessary permits and building the repair.

3.5.3 Emergency Operations and Response

Emergency operations are developed in response to specific emergency incidents. Anticipated types of incidents that may occur in the Plan Area include natural events such storms, floods, fire, earthquakes, as well as hazardous spills and other non-natural emergency events. These incidents may result in log jams, flooding, damage to bridges and levees, mudslides, structures damaged by high surf, and spills into waterways.

Emergency operations may include the use of heavy equipment near waterways and removal of debris and structures in waterways. Operations are completed according to the City's Emergency Management Plan. The overall project manager during emergency situations is the City Manager with support from Fire and Public Works departments.

3.5.4 Vegetation Management

Vegetation management is conducted at City properties and facilities, pipeline rights-of-way, water diversions, tanks, pump stations, and open space and watershed lands. Vegetation management is conducted to provide access to City facilities, provide protection from fire, prevent proliferation of non-natives and illicit activity, and to improve habitat and water quality at some facilities.

Vegetation removal is done through cutting, flaming, pulling, mowing or targeted herbicide application consistent with the City's Integrated Pest Management Program. Removal areas are targeted based on facility maintenance needs, safety, non-native plant invasion potential, available resources and funds, and other natural resource management priorities. Planting may also occur for landscaping or restoration purposes and is typically focused on native or drought tolerant species. Generally speaking, vegetation removal is limited to the dry spring and summer months, while planting is limited to the early winter period when rooting potential is maximized. However, these activities may not occur on a regular or seasonal schedule, nor occur at a specific time of day or rate of frequency, and may occur at any time as needed.

Vegetation management for fire protection involves mowing (usually to an eight-foot width), removal of fire prone species such as broom and eucalyptus, and maintenance on young, low growing native species through thinning and removal of non-natives. Ladder fuel reduction includes removing vertical limbs with chain saws and removing dense smaller trees to establish larger trees in a well-spaced stand. Herbicides, under the direction of the City's IPM program, may also be utilized for maintenance of fire breaks on the City's watershed property outside of the Newell Creek reservoir drainage basin.

Vegetation management for pipeline right-of way access is done primarily through hand trimming and mowing. An eight-foot right of way along the pipeline right of way is maintained the length of the pipeline. Mowing is done monthly in late spring and summer months. Trimming in riparian and other woodland areas is done by hand and maintains canopy, downed trees and snags to the extent possible. All trees are inspected before being felled and downed wood is left and not lopped. All work is done outside of the nesting season if possible. If it is necessary to work during the nesting season, trees are inspected for active nests and active nests are buffered.

Vegetation management for habitat and water quality improvement includes non-native removal through hand trimming and limited herbicide application according to the City's Integrated Pest Management Program. Tule removal is conducted in Neary Lagoon to create more open water habitat. The tule removal program is conducted biannually in August through September. The work is conducted in the central portion of the lagoon and the arms of the lagoon. Tules are removed to an approximate ratio of 1:1 marsh to open water. The work is completed with a floating backhoe known as an Aquamog. The Aquamog enters the lagoon from an access area on the west side of the lagoon near the Wastewater Treatment Plant. The Aquamog is driven into the lagoon from the bank of the lagoon. The Aquamog is fitted with either a tulerake or a clambucket. Prior to initiating removal, work areas are designated on maps. Tules are ripped from the sediment using the Aquamog and transported to a designated staging area by harvestor

or shallow-draw barge and piled for removal by excavator. Material is then moved to a temporary dewatering area prior to off-haul.

3.6 Land Management

Land management activities include recreation, facility maintenance and management, and sensitive habitat management. These activities occur on City Water Department watershed lands including the Loch Lomond Recreation Area in Newell Creek Watershed, and the Zayante and Laguna watershed properties in the HCP Program Area, as well as other anadromous salmonid recovery priority watersheds in Santa Cruz and southern San Mateo counties. Habitat management activities would also occur at the City-owned Moore Creek Preserve. The HCP includes coverage for operation, rehabilitation, replacement, repair and maintenance of existing infrastructure and related facilities.

3.6.1 Management of Recreational Areas

The City of Santa Cruz operates the Loch Lomond Recreation Area in the Newell Creek Watershed. The Water Department operates with a staff of resource planners, rangers and maintenance personnel. The areas are operated to provide appropriate recreational opportunities for the public, to preserve and maintain habitat areas and to provide drinking water source (i.e. watershed) protection at Loch Lomond and surrounding Newell Creek watershed lands.

3.6.2 Facility Maintenance and Management

Activities associated with facility maintenance and management include facility repair, trail maintenance and management, trail construction, and road maintenance and decommissioning. These activities occur on all the open space properties owned by the City and in the Newell Creek and Zayante Creek watershed properties.

Facility Repair

Facility repair includes repair to trails during or after natural events such as winter storms, earthquakes or landslides. The City does not undertake this activity on a regular basis, only on an as needed basis. In cases where a project has been identified as needed to ensure public safety and prevent degradation to sensitive resources, the City prepares a project description, obtains repair specifications, obtains project specific permits and constructs the project. Standard best management practices (as described in California Department of Fish and Wildlife Streambed Alteration Agreements and USFWS biological opinions) are required for facility repair work near riparian corridors and streams. More detail on such measures can be found in Section 4.3.

Trail Maintenance and Management

Trail maintenance and management occurs year round on open space properties and watershed lands. Trail maintenance and management is a preventative activity to keep trails in good physical conditions to avoid blow-outs due to natural events. Trail maintenance can include

installing drainage improvements such as culverts, dips and bars and realigning trail segments to avoid sensitive habitats and steep slopes. Remediation of existing erosion areas is implemented annually as needed. Informal and unauthorized trails are discouraged or removed as resources permit. Ranger patrols are provided to ensure appropriate use of trails and adherence to closures or restrictions.

3.6.3 Road Maintenance and Decommissioning

Road maintenance and decommissioning occurs on the Newell Creek and Zayante Watershed properties owned and operated by the Water Department. Road maintenance and decommissioning is conducted on the watershed lands to maintain access on vital roads. Road maintenance occurs annually on the property, from May-September and can take a few days to several weeks to complete. Road decommissioning is a new activity for the Department and is in its initial stages of planning and implementation but is expected to continue over the next 20 years. All road work is conducted with the support of a Registered Professional Forester and Certified Erosion Control Specialist, with engineers also being involved on more difficult road projects.

Roads are maintained to provide access for patrolling the properties for security and trespass concerns (off road vehicles, poaching, camping, etc.), for fire access, resource management and restoration, and for maintenance of drainage infrastructure. Roads not necessary for these purposes, or which are significant sediment sources which cannot be treated by maintenance activities, will be decommissioned.

Road Maintenance

Road maintenance takes place on "restricted use" or seasonal roads within the Newell Creek and Zayante watershed lands and on City park properties. Maintenance is done on the paved maintenance road to the Loch Lomond Recreation Area and unpaved roads in the watershed lands. Maintenance activities focus on maintaining culverts and trash racks, maintaining proper energy dissipation at outlets, clearing bank slough and conducting bank stabilization, and hand digging rolling dips and/or water bars as necessary to maintain appropriate drainage. Drainage maintenance is usually done with hand tools and bank slough is accomplished with hand tools or a small tractor or loader. Large fill failures or crossing failures are emergency repairs, and are not considered standard maintenance.

Unpaved roads are managed as "restricted use" roads. The restricted use refers to roads that are not appropriate for driving in the winter under saturated conditions. These roads are generally maintained as out-sloped dirt roads, with rolling dips and/or water bars to manage drainage. Culverts are utilized to route drainages that the road would otherwise intercept, through the road prism, or in a few areas where in-sloping had to be maintained to pick up bank seepage, or control drainage away from a landslide or road fill failure. These roads have been historically maintained as dirt surface roads, with no wet season use. In an attempt to reduce road surface sediment production, to improve access for patrols or emergencies, and to extend the season that the roads can be traveled, these roads can be rocked. At this time, the main road on the Newell Creek watershed lands, from the dam to the Bear Creek access is envisioned for rocking. The

east side road in the recreation area may be treated with drain rock at stream crossings, or at road segments which could introduce sediment into water courses, but is not as vital to upgrade for patrol.

Additional maintenance activities for roads would include culvert replacement and road reshaping. These activities would not occur annually as the prescriptions described above, but would rather be done according to management priorities. Culvert replacement or upgrades would occur in July – September with hand tools and heavy equipment. Projects could take several days to several weeks to complete. The City Water Resources Department is planning for a 20-year rotational schedule for culvert replacement and upgrades. Road reshaping would occur approximately every five years and would include reshaping roads to maintain outslope drainage as appropriate for the road and topography. Reshaping work is done within the existing road width and cut fill area for most roads and no additional disturbance is done to adjacent areas. After reshaping, the roadbed is rocked and straw and seed are applied to bare soil areas as necessary. Once reshaping has been accomplished for identified roads, the frequency of repeat treatment would be approximately every 8-10 years.

Road Decommissioning

Road decommissioning is planned for several miles of roads in the Newell Creek and Zayante Creek watershed lands. Road decommissioning varies according to topography, road placement and construction technique when the road was built. Many segments of the roads proposed for decommissioning traverse relatively mild slopes and have few drainage structures (culverts). These road segments would be more severely outsloped than a drivable road, or sloped as close to natural grade as possible without generating excessive levels of disturbance. Where water may still concentrate on the road, frequent, large water bars will also be constructed. A small bulldozer (D-6) could adequately decommission these roads, possibly with the assistance of an excavator or backhoe.

These road segments would require all fill to be removed from the down slope portion of the road. This material would then be placed on top of the roadbed cut surface (keyway) and compacted against the existing cut bank. Compaction could be track walking or tamping with excavator in more benign areas. In the more difficult, steep areas, the fill would be engineered (with compactor, sheepsfoot, etc.) and watered per geotechnical recommendations. A severe out-slope would be constructed to bring the contour to as close as natural grade as possible. The area of disturbance associated with road decommissioning is the 14-16 foot width of the roadbed plus an additional 15-20 feet for the recontouring of the more benign roads, and 20-30 feet for the more difficult ones.

Culvert removal will consist of excavating the culvert fill with an excavator or backhoe, down to native grade, and removal of the culvert. The area of disturbance associated with culvert removal would typically consist of the 14-16 foot wide roadbed, plus the area to the outer edge of the fill (10- 20 feet). The road length at a particular crossing would typically vary from 20-50 feet. Depending on the grade of the channel to be reestablished, and other channel conditions, additional work may be necessary for grade control and energy dissipation above and below the culvert removal site. It is anticipated that most channel adjustments from culvert removal would occur within 30-50 feet of the existing crossing. Gabion sized rock to small rip-rap, or

placement of large wood in the channel, may be necessary for channel stabilization upstream and/or downstream of the removed crossing. Erosion control measures for surface stabilization following removal would be required (straw, seed, straw rolls, blankets etc.), and the area replanted with native species, particularly conifer and riparian species.

Road decommissioning would take place during June – September. Road segments would be chosen so that they could be decommissioned, stabilized for erosion, and replanted within one season. Once decommissioned, maintenance would be reduced to any follow-up erosion control and further planting/care necessary for an additional period of one to two years until the area is stabilized and growing.

3.6.4 Habitat Management

Habitat management includes resource management activities to improve, preserve and maintain existing sensitive habitats and species on City properties. Activities include habitat management and restoration, and public education.

Aquatic Habitat Management

Aquatic habitat management is conducted to protect and enhance aquatic habitat for fish, amphibians, and reptiles.

Fisheries habitat management and restoration is dependent on funding availability and resource management priorities. Fisheries restoration projects focus on adding or protecting fisheries habitat, stabilizing stream bank erosion problems, and removing fish passage barriers. Projects are completed in accordance to the methods detailed in the California Salmonid Stream Habitat Restoration Manual (Flossi et al. 1998) and appropriate state and federal permits are obtained prior to doing the work. Project types and respective equipment details are variable. For example, equipment used may range from chainsaws (for dropping trees into the streams), to excavators and log skidders for placement of large wood/boulders/gravel and related materials which must be brought into an area where there is existing access from roads. Hand crews are also typically involved in instream projects.

These activities take place during the summer/ fall period, when work conditions are dry, and the critical spawning and smolting periods are over. These projects could occur annually for smaller focused projects to every few years for larger projects (longer stream reaches, complex construction). It is estimated that the time length of the projects will vary from 2 to 6 weeks.

Work is conducted during the dry season to minimize soil disturbance and streambed mobilization. Coffer dams are constructed as necessary to prevent degradation of aquatic resources/beneficial uses, and work sites will have standard erosion control measures (i.e., silt fences, seeding and mulching) implemented prior to October 15th each year. Before and concurrent with construction, biotic surveys and contractor outreach are conducted as necessary to ensure that special-status species are not impacted negatively by such work. Equipment is not fueled within 50 feet of creeks. Geomorphologists and aquatic biologists are retained as necessary to consult on projects for design and implementation. Ongoing physical profiling and

biological surveys of project sites occurs post-implementation to demonstrate effectiveness and provide feedback for future projects.

For amphibian and reptile species, exclusion fencing is installed to prevent access to stream corridors. Educational signage is provided at all parks and open space areas that support sensitive amphibian and reptile species. All other typical avoidance and minimization measures are employed for work involving special status amphibian and reptile species as necessary/directed by permit conditions and as described in section 4.3.

Terrestrial Habitat Management

For plant species, grazing, mowing and limited herbicide application and manual non-native removal are the activities.

Grazing is conducted annually on the Newell Creek dam, typically in the late spring, as a means to keep down brush which might compromise the integrity of the dam or prevent adequate inspection of the dam.

Mowing is done along fuel break areas, pipeline rights of way, property boundaries, and some trails. Mowing is done in late spring and summer after vegetation begins to dry and usually is accomplished within one to two weeks depending on the area. A tractor mounted flail or rotary mower is used. Most areas are mowed to a width of eight feet.

Non-native removal is completed year round and is based on needed management and removal prescriptions for non-native species. City or volunteer crews use hand tools or mechanical tools (chain saws) as necessary to remove vegetation. Material is removed from the site or chipped and spread on site. Limited herbicide use may also be employed to expedite removal of non-natives, per the guidance of the City's IPM policies.

Habitat restoration and management activities at Moore Creek Preserve could include removal of non-native species and use of grazing to maintain open areas for use by OTB. Management activities at the Moore Creek Preserve would be conducted in accordance with a Habitat Management Plan subject to approval by the Service.

4.0 CONSERVATION STRATEGY

4.1 Introduction

This chapter sets out the HCP Conservation Strategy, which consists of multiple components that are designed collectively to achieve the HCP overall planning goals and objectives of the conservation of Covered Species and the habitats on which they depend while at the same time allowing the City to carry out its O&M activities. The chapter describes the Plan's biological goals and objectives and identifies a set of measures designed to minimize and mitigate for the potential impacts of Covered Activities on Covered Species. The measures are broken down into General Measures (GM) and Species-Specific Measures (SSM). The Conservation Strategy also includes programs for monitoring and adaptive management.

The conservation strategy was developed to recognize that, unlike regional habitat conservation plans that cover extensive development activities that result in the permanent loss of substantial amounts of habitat, Covered Activities under this Plan tend to have discrete, mostly temporary impacts spread across the Plan Area over time. As such, the conservation strategy is focused on efforts to avoid and minimize the permanent loss of habitat and to minimize the potential for injury or mortality to occur to individuals of the Covered Species during the carrying out of the Covered Activities. For effects remaining after implementation of the avoidance and minimization measures that would warrant mitigation, conservation opportunities have been identified that would allow the City to establish up front credits that could be drawn upon as needed.

4.2 General Biological Goals and Objectives

The HCP is designed to meet the conservation needs of Covered Species through incorporation of goals and objectives developed around the species-specific needs of Covered Species and the needs of the natural communities on which Covered Species depend.

> **Biological Goal #1**: Maintain habitat quality in the Plan Area for Covered Species by restoring habitat temporarily disturbed by Covered Activities.

Objective 1.1: Decompact and revegetate work areas with an appropriate assemblage of native riparian, wetland, and upland vegetation suitable for the area. Return stream contours to the original condition at the end of project activities, unless consultation with the Service has determined that it is not beneficial to the species or feasible.

> **Biological Goal #2**: Contribute to the permanently protected and managed lands in the Plan Area that support populations of Covered Species.

Objective 2.1: Increase the amount of lands protected or managed for Covered Species within areas identified as having high quality habitat for conservation.

Biological Goal #3: Pursue conservation actions that will result in conservation benefits to Covered Species.

Objective 3.1 Contribute to habitat enhancement and restoration through in-kind services or monetary contributions to organizations undertaking conservation work.

4.3 General Conservation Measures

4.3.1 Introduction

The City will implement conservation measures during construction and O&M activities to avoid and minimize incidental take or adverse effects on individuals, populations, or habitat of

Covered Species to the maximum extent practicable. The following conservation measures will be incorporated into the Covered Activities, as appropriate, to ensure that the effects of Covered Activities are avoided, minimized, and mitigated.

4.3.2 General Minimization and Best Management Practices

GM-1. During project activities, all trash that may attract predators will be properly contained, removed from the work site, and disposed of regularly. Following construction, all trash and construction debris will be removed from work areas.

GM-2. All refueling, maintenance, and staging of equipment and vehicles will occur at least 65 ft. from any riparian habitat or water body. The City will ensure contamination of habitat does not occur during such operations. Prior to the onset of work, the City will ensure that the contractor has prepared a plan to allow a prompt and effective response to any accidental spills. All workers will be informed of the importance of preventing spills and of the appropriate measures to take should a spill occur.

GM-3. The spread or introduction of invasive, non-native plant species will be avoided to the extent practicable. The City will provide a tailgate worker training session for City crews and all other construction personnel that will outline measures to prevent introduction and spread of invasive, non-native plant species on to or off the project work area. The training session will include dissemination of a 2-3 page handout that will contain photographs and descriptions of the most prevalent invasive plant species in the work area. Workers will be instructed to notify the project monitor if any of the species are observed in the work area. The project monitor will determine if the project has the potential to dislodge and transport any reproductive plant parts (i.e., reproductive stems, rhizomes or seeds) within or outside the work area. If reproductive plant parts are found to be dislodged and may be transported during the project, the monitor will require that the tires and other earth-related equipment pieces be inspected to ensure no invasive species are transported within or from the site. As part of project construction and regular maintenance activities, occurrences of invasive, non-native plants in the project areas will be removed and properly disposed as per current CalIPC recommendations.

GM-4. Prior to any on-site work in areas where Covered Species may occur, a qualified member of the City's Water Resources Management staff will conduct a tailgate training session in which all construction personnel will receive training regarding measures (below) that are to be implemented to avoid environmental impacts. This training will include a presentation of the potential for sensitive species to occur at the site and measures to protect habitat including aquatic habitat and avoid impacts to the species. All personnel working on the site will receive this training and will sign a sign-in sheet showing they received the training.

GM-5. Prior to the commencement of work, the limits of the work area will be clearly marked with orange construction fencing to prevent workers from impacting habitat outside the work area. No work will occur outside the designated marked work area.

GM-6. Each morning before work begins, a Service-approved biological monitor will survey the work site and habitat immediately surrounding the work site for conditions that could impact Covered Species, and will remain on-site whenever work is occurring. No work will be allowed to begin each morning until the monitor has inspected the work site.

GM-7. To protect water quality, water pumped from construction areas will be discharged into a basin created out of straw bales lined with filter fabric.

GM-8. To reduce the potential for erosion after work is completed, project sites will be decompacted and revegetated with an appropriate assemblage of native riparian, wetland, and upland vegetation suitable for the area. Planted material may include native seed mixes, pole cuttings, or container stock as appropriate.

GM-9. Stream contours will be returned to the original condition at the end of project activities, unless consultation with the Service has determined that it is not beneficial to the species or feasible.

GM-10. To control erosion during and after project implementation, the applicant will implement best management practices, including:

a. Install straw wattles/silt fencing to break up and filter surface runoff.

b. Install rice straw, jute netting, or native duff to cover bare soil after work is completed except in OTB habitat (see section 5.4.4). Avoid use of plastic mesh netting at all sites, as this can entrap native animals such as snakes.

c. Install exclusion fencing to prevent heavy equipment from entering muddy/unstable areas.

d. Installation of rolling dips and revegetation on accessways utilized for repairs.

e. Installation of energy dissipators on pump/dewatering equipment outlets.

f. Revegetation with site-specific native materials, where appropriate.

g. Conduct activities outside of the channel whenever feasible by timing work to the low flow season or by utilizing equipment or methods that do not require access in the channel.

h. Conduct activities during the low flow season (June through October) unless that conflicts with seasonal restrictions in SSM.

i. Avoidance of disturbance of retained riparian/wetland vegetation where practicable.

j. Utilization of “floating” platforms for mobilization of heavy equipment in saturated soil conditions, as appropriate.

k. Repair by high-lining HDPE pipeline to ensure longevity of pipeline repairs and to avoid site disturbance/unnecessary excavation and subsequent erosion impacts. Where placing pipeline in trench is not feasible because of topographic features, the pipeline will be elevated on piers above ground, as opposed to placement directly on the ground, to avoid potential for creating a barrier to movement/habitat use by species.

l. Limit removal of riparian vegetation to pruning/trimming where practicable.

m. Minimize excavation in the active stream channel to that which was historically permitted.

n. Isolation of the channel from flowing water through temporary bypass before beginning work (i.e. aquadam, coffer dam, etc.).

o. Store construction and erosion control materials outside of the stream channel and cover loose soils/excavations during non-work hours and wet periods.

GM-11. A Service-approved biologist or biological monitor will remove from within the project area, any individuals of exotic species, such as bullfrogs, crayfish, and centrarchid fishes to the extent practicable.

GM-12. The City has adopted an Integrated Pest Management Program (IPM) to govern the use of pesticides and herbicides in parks and other landscaped areas such as street medians. Any application of pesticides or herbicides by the City would be in compliance with the labeling instructions and applicable State and local law. Other than algaecides, pesticides, herbicides and fertilizers are not applied adjacent to watercourses and riparian areas or in proximity of other covered species habitat. A copper-based algaecide is applied at Loch Lomond under a SWRCB general permit.[6] Copper-based algaecides were evaluated in the March, 2000 biological opinion (1-1-98-F-21) issued for the California Water Quality Standards and Numeric Criteria for Toxic Pollutants, in which the Service concluded that the use of copper algaecides was not likely to jeopardize listed species, including the California red-legged frog (McGinnis and Spear 2000). Furthermore, the CEQA process for the City's enrollment in the general permit involved specific analysis for impacts on Western Pond Turtle and determined that use of algaecides was likely to have minimal effects on turtles (Blankenship and Associates 2010).

GM-13. Upon locating individuals of Covered Species that are dead or injured initial notification will be made to the Ventura Fish and Wildlife Office at (805) 644-1766 within three working days of its finding. Written notification will be made within five calendar days and will include the date, time, and location of the carcass, a photograph, cause of death, if known, and any other pertinent information. Written notification will be sent to the Ventura Fish and Wildlife Office at 2493 Portola Road Suite B, Ventura, California 93003.

[6] The City is not requesting take coverage under the HCP for pesticide or herbicide application.

Dead California red-legged frogs may be placed with the California Academy of Sciences. If necessary, the City will work with the Service to locate contacts for the deposition of dead insects and other species.

GM-14. If directional drilling is planned for any pipeline repairs or rehabilitation, an Inadvertent Drilling Fluid Return Response Plan or "frac-out" contingency plan will be developed and implemented in consultation with and concurrence of Ventura Fish and Wildlife Office staff prior to initiation of drilling activity. At a minimum, the plan will prescribe the measures to ensure protection of water quality and related biological resources (e.g., aquatic resources, and special-status plants and wildlife) including: a) Procedures to minimize the potential for frac-out associated with directional drilling activity; b) Procedures for timely detection of frac-outs c) Procedures for timely response and remediation in the event a frac-out; and d) Monitoring of drilling and frac-out response activities by a qualified biologist. An example of a frac-out contingency plan can be found in Appendix A.

4.3.3 Species-Specific Measures During Construction of the North Coast Pipeline

4.3.3.1 Covered Plant Species

The following SSM will apply to all covered plant species in the Plan Area during construction related Covered Activities.

SSM-1. Prior to the initiation of construction activities, covered plant species population boundaries or critical habitat for covered plant species will be clearly delineated with visible flagging or fencing, which will remain in place for the duration of construction activities. Flagged areas will be avoided during construction activities in that area.
Warning signs will be posted on the temporary fencing to alert excavators and other workers not to proceed beyond the fence. All protective fencing will remain in place until all repairs have been completed. Signs will include the following language:

"NOTICE: SENSITIVE HABITAT AREA. DO NOT ENTER."

If the area cannot be avoided and it is determined that the activity will adversely affect the covered plant species, the activity will be conducted outside of the bloom period for that species. In the appropriate season prior to construction, seed from the covered species (BLS, robust spineflower and Santa Cruz tarplant) will be collected from plants within the impact area and stored. Soil excavation activities in areas where covered plant species are known to occur will ensure that the topsoil will be segregated to preserve the viability of the seed bank. To adequately capture the seed bank, the top 2 inches of soil will be removed and appropriately stored. Upon completion of the project, the salvaged (top 2 inches) soil will be replaced in the area affected and seed collected from plants within the impact area will be hand broadcast onto the revegetated area.

Success of the revegetation efforts will be monitored for a minimum of five years, wherein the number of covered plant species growing within the revegetated area will be inventoried. The

revegetation will be deemed successful if the site attains 50% of the pre-disturbed number of plants. If no covered plant species are detected in Year 1, the City will develop and implement remedial measures, in coordination with and subject to the concurrence of the Service. If revegetation is not successful after year five, the City will develop and implement alternative restoration plans with the concurrence of the Service. Occurrences of invasive, non-native plant species will be removed from the revegetated area until success criteria are achieved.

SSM-2. Appropriate dust control measures, including periodically wetting down the work areas, will be used as necessary for any project-related construction activities that generate dust.

4.3.3.2 Ohlone Tiger Beetle (*Cicindela ohlone*)

The following measures will minimize the number of OTB immatures and adults that could otherwise be injured or killed as a result of project-related activities.

SSM-3. Locate Project Within Previously Disturbed Areas: To the extent practical, new habitat disturbance will be minimized by locating components of this project either within the footprint of or adjacent to previously disturbed areas (such as the existing pipeline alignment) or paved areas. Micro-siting of the new pipeline within the project alignment will be utilized to the extent practical to avoid impacts to active OTB larval burrows that are encountered. Alternatively, the City may implement new technologies that would minimize or avoid new ground disturbance.

SSM-4. Educational Awareness Training Session for All Construction Workers: Prior to the start of any construction-related activities, a Service-approved entomologist will conduct a training session for all construction personnel. This training will include a description of the OTB life stages that might be encountered by workers, information about its natural history and habitat, and measures to be observed to avoid and minimize impacts to the beetle and its habitat during all work activities. The training will also include a discussion of why sensitive habitat areas are fenced and procedures workers will follow if any OTB life stages are encountered.

SSM-5. Delineate Boundaries of the Impact Area: In portions of the project located on Watsonville loams occupied by the OTB, temporary fencing and signs will be erected before any vegetation clearing or ground disturbing (i.e., excavation, trenching, grading, etc.) activities occur to clearly delineate the boundaries of the project's impact area. Warning signs will be posted on the temporary fencing to alert equipment operators and other construction workers not to proceed beyond the fence. Protective fencing will remain in place until all construction and revegetation activities have been completed. Signs will include the following language:

"NOTICE: SENSITIVE HABITAT AREA. DO NOT ENTER."

SSM-6. Identify Locations for Refueling, Worker Parking, and Staging Areas Outside of Sensitive Habitat: Whenever possible, locations for refueling, maintenance, and staging of equipment and vehicles will be situated outside of sensitive habitat areas. Similarly, worker's vehicles will be parked in designated areas outside of sensitive habitat areas. The City will ensure that contamination of sensitive habitat does not occur during such operations, including

accidental spills. All workers will be informed of the appropriate procedures to prevent spills and response measures should an accidental spill occur.

SSM-7. Relocate Observed Life Stages of the Covered Species: To avoid the need to relocate adult OTBs, pipeline construction activities at Moore Creek or Younger Ranch will not occur during the flight season (January 15 to May 30), unless monitoring surveys indicate that adults are no longer active. A pre-construction survey will be performed by a Service-approved entomologist to salvage any larvae and other life stages of the OTB. During the pre-construction training session, all construction personnel will be shown pictures of the OTB larval and adult life stages, and instructed to cease construction activities and contact the project's Service-approved entomologist, who would be permitted to handle and translocate the endangered beetle should any be observed during the Covered Activities. If a larva is found in an earthen tunnel, a new tunnel of the same depth will be created outside of the impact area and the larva placed in it. Burrows with active larvae that cannot be avoided will be salvaged and relocated within the Moore Creek Preserve.

SSM-8. Dust Control: Dust can clog the spiracles of adult beetles and larvae, the latter of which are active throughout much of the year. Appropriate dust control measures, such as periodically wetting down the work areas, will be used as necessary for any project-related activities that generate dust. Care will need to be exercised to avoid saturating areas supporting life stages of the OTB.

SSM-9. Revegetation of Coastal Terrace Prairie Habitat: OTB adults and larvae prefer patches of bare to sparsely vegetated soil in this grassland habitat. Revegetation of disturbed portions of the project area at locations known to support the OTB will use only grasses and forbs indigenous to the coastal terrace prairie habitat. Also, weed control will be part of the revegetation activities. Dense ground covers, weed matting, aggregate, and mulch can degrade habitat conditions and will not be used.

SSM-10. All excavated soil will be retained and used to refill the trench after installation of the new pipeline. To maintain the pre-construction soil profile, soil from the bottom of the trench will be returned to the trench's bottom. Similarly, topsoil will be re-deposited as top soil. No off-site soils or other materials will be utilized to refill the trench.

Mitigation for Residual Impacts

Avoidance of impacts to OTB through construction techniques such as sliplining and directional drilling is preferred over a translocation program for OTB. The City will coordinate with the Service to determine whether impacts to OTB would be avoided by using these methods in and around OTB habitat through the duration of the pipeline construction project. In the event that construction of the pipeline can be completed without disturbing Watsonville loam soils, incidental take of OTB will not occur and the City will not be required to provide mitigation for the species.

To anticipate the potential need to relocate individual OTB and to provide mitigation for OTB as a result of habitat disturbance, the City would, within 90 days of permit issuance, augment the existing management activities (City of Santa Cruz Parks and Recreation Department 2002) at an

11-acre portion of the City-owned Moore Creek Preserve to benefit OTB. The Moore Creek Preserve contains habitat for OTB and is currently occupied by OTB. The augmented management actions would include:

- Habitat assessment to establish baseline conditions
- Periodic grazing
- Fencing
- Signage

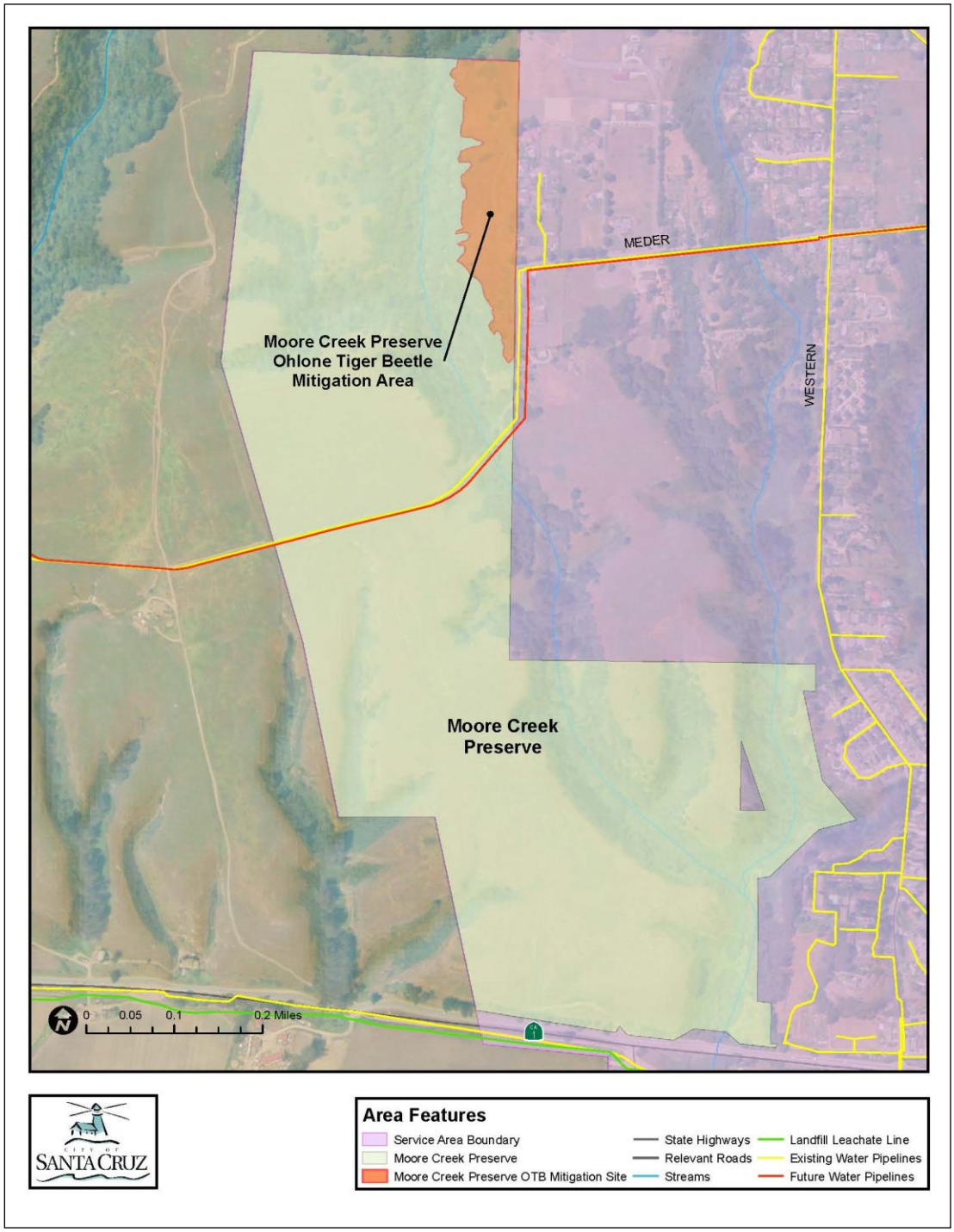
To anticipate the need to translocate OTB out of the work area and into Moore Creek Preserve, the City will prepare an OTB translocation plan for Service review and approval within six months of permit issuance.

The augmented management actions at Moore Creek Preserve will be continued until the end of pipeline construction. If pipeline construction avoids disturbance of Watsonville loam soils, the continuation of the augmented management actions at Moore Creek Preserve will not be required under this Plan. In that event, the City may, at its option, continue the augmented management actions, including possibly through a Safe Harbor Agreement with the Service.

If pipeline construction activities will require disturbance of Watsonville loam soils, then the City will manage a portion of the Moore Creek Preserve as mitigation and as a translocation site for OTB. An OTB Habitat Management Plan will be prepared for the 11-acre area and submitted to the Service for review and approval prior to the start of construction in OTB habitat. If required, as described above, the Habitat Management Plan will include, but not be limited to the following: guidelines for biological surveys; methods for exotic, non-native species control and establishment of areas of bare ground; and annual reporting to the Service. The Habitat Management Plan will include details regarding in perpetuity management of the 11 acres as well as the roles and responsibilities of the City and designated entities in implementing the Habitat Management Plan. Three-year success criteria, based on habitat conditions preferred by the OTB, will be developed to evaluate habitat restoration progress and demonstrate that the goals have been achieved.

In the event that Moore Creek Preserve is used for OTB mitigation as a result of pipeline construction, the City will establish a non-wasting endowment to fund the OTB management plan, the size of which would be determined through a Property Analysis Record (PAR) or similar analysis approved by the Service prior to the start of construction. The endowment will be held by an eligible third party approved by the Service. If Moore Creek Preserve is used for OTB mitigation, the City will record a conservation easement in favor of an appropriate third-party entity approved by the Service over the 11-acre habitat area within six months of the start of construction.

Figure 2: Moore Creek Preserve Mitigation Area



4.3.3.3 Mount Hermon June Beetle (*Polyphylla barbata*)

Minimization Measures
Construction of the proposed new North Coast Pipeline will not cross any areas mapped as Zayante sands by the Natural Resources Conservation Service (Bowman and Estrada 1980), thus it will not impact any habitat for the MHJB. Thus, no minimization measures are proposed for this Covered Activity.

Mitigation for Residual Impacts
Since construction of the proposed new North Coast Pipeline will not impact any mapped areas of Zayante sands, no residual impacts from the project are anticipated. Thus, no mitigation is proposed.

4.3.3.4 Tidewater Goby (*Eucyclogobius newberryi*)

Minimization Measures
The North Coast Pipeline alignment does not directly cross tidewater goby habitat. Construction has the potential to result in mobilization of sediments and their introduction to streams tributary to tidewater goby habitat. The pipeline is suspended on a trestle at most locations where it crosses streams, so in-water work will be avoided. Implementation of general measures GM-1 – G M-11 will avoid and minimize any potential effects to tidewater goby.

Mitigation for Residual Impacts
Effects will be fully avoided by the measures described above. No residual impacts are anticipated.

4.3.3.5 Pacific Lamprey (*Entosphenus tridentata*)

Minimization Measures
Extensive fisheries surveys of north coast streams performed by the City of Santa Cruz and others have not yielded any Pacific lamprey, nor are they otherwise known to occur in streams crossed by the North Coast Pipeline and therefore will not be affected by the project.

Mitigation for Residual Impacts
Extensive fisheries surveys of north coast streams performed by the City of Santa Cruz and others have not yielded and Pacific lamprey, nor are they otherwise known to occur in streams crossed by the North Coast Pipeline and no residual impacts are anticipated.

4.3.3.6 California Red-Legged Frog (*Rana draytonii*)

Minimization Measures
The measures for avoidance and minimization of adverse impacts to CRLF during construction of the new North Coast Pipeline project are those typically employed for construction activities

that may result in short-term impacts to individuals and their habitat. The focus of these measures is on scheduling activities at certain times of year, keeping the disturbance footprint to a minimum, and monitoring.

SSM-11. The City will annually submit the name(s) and credentials of biologists who would conduct activities specified in the following measures. No project activities will begin until the City receives approval from the Service that the biologist(s) is qualified to conduct the work.

SSM-12. A Service-approved biologist will survey the work site 48 hours prior to the onset of activities. If CRLF, tadpoles, or eggs are found, the approved biologist will determine the closest appropriate relocation site within the same watershed. The approved biologist will be allowed sufficient time to move them from the work site before work activities begin. Only Service-approved biologists will participate in activities associated with the capture, handling, and moving of CRLF.

SSM-13. Before any activities begin on a project, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the CRLF and its habitat, the importance of the CRLF and its habitat, general measures that are being implemented to conserve the CRLF as they relate to the project, and the boundaries within which the project may be accomplished. Brochures, books, and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.

SSM-14. A Service-approved biologist will be present at the work site until such time as all removal of CRLF, instruction of workers, and disturbance of habitat have been completed. After this time, the contractor or City will designate a person to monitor on-site compliance with all minimization measures and any future staff training. The Service-approved biologist will ensure that this individual receives training outlined in measure SSM-13 above and in the identification of CRLF. The monitor and the Service-approved biologist will have the authority to stop work if CRLF are in harm's way.

SSM-15. The number of access routes, number and size of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Routes and boundaries will be clearly demarcated, and these areas will be outside of riparian and wetland areas to the extent practicable. Where impacts occur in these staging areas and access routes, restoration will occur as identified in the general BMP measures above.

SSM-16. Work activities will be completed between April 15 and October 15 to the extent practicable. Should the City need to conduct Covered Activities outside this period, the City will coordinate with the Service on a case-by-case basis prior to conducting such activities.

SSM-17. If a work site is to be temporarily dewatered by pumping, intakes will be completely screened with wire mesh not larger than five millimeters (mm) to prevent CRLF from entering the pump system. Water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow will be removed in a manner that would allow flow to resume with the least disturbance to the substrate.

SSM-18. The Declining Amphibian Populations Task Force's (DAPTF) Fieldwork Code of Practice (DAPTF 1998, Appendix B), as it may be revised in the future, will be followed to minimize the possible spread of chytrid fungus or other amphibian pathogens and parasites.

SSM-19. During electrofishing in areas known to provide CRLF habitat a Service-authorized biologist shall be present. The biologist shall work ahead of electrofishing team to survey for CRLF. Electrofishing shall be halted if CRLF are present and shall not resume until CRLF disperse or if otherwise authorized by the Service.

Mitigation for Residual Impacts

To offset the effects of residual impacts, the City will provide off-site mitigation. To calculate the cost of off-site mitigation, the following organizations were surveyed to determine the cost of one acre of riparian revegetation within the North Coast area of Santa Cruz County: California State Parks, Santa Cruz Land Trust, Santa Cruz County Resource Conservation District, and a private habitat restoration company (Central Coast Wilds). The average cost for one acre of riparian revegetation was $10,000. To compensate for potential adverse effects that may occur as a result of Covered Activities, including up to 0.50 acre of permanent impact to CRLF habitat, the City will provide $5,000 to the Santa Cruz County Resource Conservation District In Lieu Fee Program or State Parks specifically to fund restoration activities for CRLF.[7] The benefits from restoration of 0.50 acre of habitat is intended to fully offset the potential impacts associated with impacts to scattered CRLF habitat, including a total of 0.50 acre of permanent impact over the life of the Plan.

The City may also partner with one or more of the following departments or organizations to fund additional off-site CRLF mitigation:

- City of Santa Cruz Parks & Recreation Department, for maintenance and restoration of the Moore Creek Preserve, a park known to be occupied by CRLF as well as some of the other Covered Species;
- County of Santa Cruz Resource Conservation District, for riparian habitat restoration projects within the known range of CRLF on the North Coast;
- Land Trust of Santa Cruz County for acquisition or restoration of habitat occupied by CRLF;
- State Parks as possible; and
- Other agencies as the opportunity arises (e.g., Elkhorn Slough Reserve, Watsonville Wetlands Watch, Bureau of Land Management for Coast Dairies projects, etc.).

Any additional CRLF mitigation options that the City pursues will be coordinated with and approved by the Service.

[7] The $5,000 figure is an estimate of current costs for the mitigation, but this amount could change once the fee schedule is determined for the In-Lieu Fee Program. The City agrees to fund the required mitigation at the final rate when it is determined by the RCD at a future time.

4.3.3.7 Western Pond Turtle (*Actinemys marmorata*)

Minimization Measures

The measures for avoidance and minimization of adverse impacts to WPT during construction of the new North Coast Pipeline project are those typically employed for construction activities that may result in short-term impacts to individuals and their habitat. The focus of these measures is on scheduling activities at certain times of year, keeping the disturbance footprint to a minimum, and monitoring.

SSM-20. The City will annually submit the name(s) and credentials of biologists who would conduct activities specified in the following measures. No project activities will begin until proponents have received approval from the Service that the biologist(s) is qualified to conduct the work.

SSM-21. A Service-approved biologist will survey the work site 48 hours prior to the onset of activities. If WPT adults, juveniles, or eggs are found, the approved biologist will determine the closest appropriate relocation site. The approved biologist will be allowed sufficient time to move them from the work site before work activities begin. Only Service-approved biologists will participate in activities associated with the capture, handling, and moving of WPT.

SSM-22. Before any activities begin on a project, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include a description of the WPT and its habitat, the importance of the WPT and its habitat, general measures that are being implemented to conserve the WPT as they relate to the project, and the boundaries within which the project may be accomplished. Brochures, books, and briefings may be used in the training session, provided that a qualified person is on hand to answer any questions.

SSM-23. A Service-approved biologist will be present at the work site until such time as all removal of WPT, instruction of workers, and disturbance of habitat have been completed. After this time, the contractor or City will designate a person to monitor on-site compliance with all minimization measures. The Service-approved biologist will ensure that this individual receives training outlined in measure SSM-22 and in the identification of WPT. The monitor and the Service-approved biologist will have the authority to stop work if WPT are observed in harm's way.

SSM-24. The number of access routes, number, and size of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Routes and boundaries will be clearly demarcated, and these areas will be outside of riparian and wetland areas to the extent practicable. Where impacts occur in these staging areas and access routes, restoration will occur as identified in the general BMP measures above.

SSM-25. Work activities will be completed between April 1 and November 1 to the extent practicable. Should the City need to conduct activities outside this period, the City may conduct such activities after providing notification to the Service.

SSM 26. Work within open grasslands within 100 m of occupied aquatic habitat will be avoided to the extent practicable.

Mitigation for Residual Impacts
Restoration of 0.50 acre of habitat as described under CRLF residual impact mitigation will also compensate for potential adverse effects that may occur as a result of Covered Activities, including up to 0.50 acre of permanent impact to WPT habitat.

The City may also conduct restoration of its own watershed property on Newell and Zayante Creeks or partner with one or more of the following departments or organizations to fund additional off-site WPT mitigation:

- City of Santa Cruz Parks & Recreation Department, for maintenance and restoration of the Moore Creek Preserve, a park known to be occupied by WPT as well as some of the others Covered Species;
- County of Santa Cruz Resource Conservation District, for riparian habitat restoration projects within the known range of WPT on the North Coast;
- State Parks as possible;
- Land Trust of Santa Cruz County for acquisition or restoration of habitat occupied by WPT; and
- Other agencies as the opportunity arises (e.g., Elkhorn Slough Reserve, Watsonville Wetlands Watch, Bureau of Land Management for Coast Dairies projects, etc.).

Any additional off-site WPT mitigation options that the City pursues will be coordinated with and approved by the Service.

4.3.4 Species-Specific Measures During Operations and Maintenance Activities

The City will implement conservation measures during O&M activities to avoid and minimize incidental take or adverse effects on individuals, populations, or habitat of Covered Species to the maximum extent practicable. The following conservation measures will be incorporated into the Covered Activities, as appropriate, to ensure that the effects of Covered Activities are avoided, minimized, and mitigated.

4.3.4.1 Covered Plant Species

The following SSM will apply to all covered plant species in the Plan Area during O&M related Covered Activities.

SSM-27. Prior to the initiation of O&M activities, covered plant species population boundaries or critical habitat for covered plant species will be clearly delineated with visible flagging or fencing, which will remain in place for the duration of O&M activities. Flagged areas will be avoided during O&M activities in that area. Warning signs will be posted on the temporary fencing to alert excavators and other workers not to proceed beyond the fence. All protective

fencing will remain in place until all repairs have been completed. Signs will include the following language:

"NOTICE: SENSITIVE HABITAT AREA. DO NOT ENTER."

If the area cannot be avoided and it is determined by a Service-approved biologist that the activity will adversely affect the covered plant species, the activity will be conducted outside of the bloom period for that species. In the appropriate season prior to construction, the number of plants to be impacted by the project will be determined. Seed from the covered species (BLS, robust spineflower and Santa Cruz tarplant) will be collected from plants within the impact area and stored. Soil excavation activities in areas where covered plant species are known to occur will ensure that the topsoil will be segregated to preserve the viability of the seed bank. To adequately capture the seed bank, the top few inches of soil will be removed and appropriately stored. Upon completion of the project, the soil will be replaced in the area affected and seed collected from plants within the impact area will be hand broadcast onto the revegetated area. Success of the revegetation efforts will be monitored for a minimum of five years, wherein the number of covered plant species growing within the area will be inventoried. The revegetation will be deemed successful if the site attains 50% of the pre-disturbed number of plants. If no covered plant species are detected in Year 1, the City will develop and implement remedial measures, which may include additional site management and revegetation, upon concurrence from the Service. Occurrences of invasive, non-native plant species will be removed from the revegetated area for a minimum of five years.

SSM-28. Appropriate dust control measures, such as periodically wetting down the work areas, will be used as necessary for any project-related O&M activities that generate dust.

4.3.4.2 Ohlone Tiger Beetle (*Cicindela ohlone*)

The primary O&M activities that may affect the OTB are vegetation trimming, mowing, and clearing to allow pipeline inspections and protection from fire, and as-needed repairs to existing infrastructure and facilities. These activities result in removal or reduction of vegetative cover and ground disturbances, such as excavation, trenching, and grading, or creation of temporary access routes to repair sites. The following measures are designed to minimize the effects of the covered O&M activities on the OTB by reducing incidental take of individuals and the degradation of habitat conditions.

SSM-29. Use Existing Access Routes Whenever Practicable: To the extent practicable, existing access routes will be used to transport maintenance and repair equipment and vehicles to work and repair sites. When a new route is necessary in terrestrial habitats characterized by Watsonville loams and occupied by the OTB, staff will attempt to identify a route that causes the least amount of ground disturbance and requires the least amount of vegetation clearing.

SSM-30. Delineate Boundaries of the Impact Area: For non-emergency repair work in areas characterized by Watsonville loams and occupied by the OTB, temporary fencing and signs will be erected by a Service-approved biologist before any vegetation clearing, excavation, or grading

activities occur to clearly delineate the boundaries of the project's impact area. If new access routes are utilized, these will also be clearly demarcated for workers. Warning signs will be posted on the temporary fencing to alert excavators and other workers not to proceed beyond the fence. All protective fencing will remain in place until all repairs have been completed. Signs will include the following language:

"NOTICE: SENSITIVE HABITAT AREA. DO NOT ENTER."

SSM-31. Relocate Observed Life Stages of the Covered Species: To minimize the potential for killing or harming individuals of the species, a Service-approved entomologist permitted to handle OTB will be present during all planned Covered Activities that are conducted at Moore Creek or Younger Ranch during the flight season (January 15 to May 30). An entomologist will also be required to be present at other work sites that are documented to be occupied by OTB in the future. If a larva is found in an earthen tunnel, a new tunnel of the same depth will be created outside of the impact area by the entomologist and the larva placed in it. If an adult OTB is found on the soil surface, it will be relocated and released by the entomologist outside of the impact area on the soil surface. For Covered Activities conducted outside of the flight season, a pre-construction survey will be conducted in work areas containing appropriate soils. If OTB are detected, an entomologist permitted to handle OTB will relocate the individuals. Unplanned Covered Activities conducted in response to events that pose a risk to human life or property may proceed even if an entomologist cannot be present due to time constraints. In such cases, an entomologist will review the site afterwards to assess potential impacts.

SSM-32. Dust Control: Dust can clog the spiracles of adult beetles and larvae, the latter of which are active throughout much of the year. Appropriate dust control measures, such as periodically wetting down the work areas, will be used as necessary for any project-related activities that generate dust. Care will need to be exercised to avoid saturating areas supporting life stages of the OTB.

SSM-33. Revegetation of Coastal Terrace Prairie Habitat: OTB adults and larvae prefer patches of bare to sparsely vegetated soil in this grassland habitat. Revegetation of disturbed portions of the project area at locations known to support the OTB will use only grasses and forbs indigenous to the coastal terrace prairie habitat. Also, weed control will be part of the revegetation activities. Dense ground covers, weed matting, aggregate, and mulch can degrade habitat conditions and will not be used.

4.3.4.3 Mount Hermon June Beetle (*Polyphylla barbata*)

The primary O&M activities that may affect the MHJB are vegetation trimming, mowing, and clearing to allow pipeline inspections and protection from fire, and as-needed repairs to existing infrastructure and facilities. These activities result in removal or reduction of vegetative cover and ground disturbances, such as excavation, trenching, and grading, or creation of temporary access routes to repair sites. The following measures are designed to minimize the effects of the covered O&M activities on the MHJB by reducing incidental take of individuals and degradation of habitat conditions.

SSM-34. Use Existing Access Routes Whenever Practicable: To the extent practicable, existing access routes will be used to transport maintenance and repair equipment and vehicles to work areas. When a new route is necessary in terrestrial habitats characterized by Zayante sands, staff will attempt to identify a route that causes the least amount of ground disturbance and vegetation clearing.

SSM-35. Delineate Boundaries of the Impact Area: For planned repair work in areas characterized by Zayante sands, temporary fencing and signs will be erected by a Service-approved biologist before any vegetation clearing, excavation, or grading activities occur to clearly delineate the boundaries of the project's impact area. If new access routes are utilized, these will also be clearly demarcated for workers. Warning signs will be posted on the temporary fencing to alert excavators and other workers not to proceed beyond the fence. All protective fencing will remain in place until all repairs have been completed. Signs will include the following language:

"NOTICE: SENSITIVE HABITAT AREA. DO NOT ENTER."

SSM-36. Cover Exposed Soils: Adult males of the MHJB actively search for breeding females during the evenings between about May 15 and August 15. During this adult activity season, both sexes burrow into duff and soils during the daytime. If repairs occur during any portion of the MHJB flight season, all exposed soils within the impact area will be covered by tarps, plywood, erosion control fabric, or another suitable impervious material. Exposed soils will be covered between the hours of 7pm and 7am daily. This will prevent adult males from burrowing into the exposed soils and subsequently being injured or killed by soil disturbance (i.e., digging, grading, covering, relocation, etc.).

SSM-37. Dust Control: Dust can clog the spiracles of adult beetles and accumulated dust on plants may cause them to experience a decline in vigor or even die, which would affect the roots that larvae of the MHJB may feed upon. Appropriate dust control measures, such as periodically wetting down the repair areas, will be used as necessary for any project-related activities that generate dust.

SSM-38. New Outdoor Lighting: Adult MHJBs are active at dusk and may be distracted by incandescent, mercury vapor, sodium, and black light sources, which can disrupt normal behaviors and breeding activities. Thus, any outdoor lighting installed or replaced as part of repairs performed in habitats characterized by Zayante sands will use bulbs certified to not attract nocturnal insects.

SSM-39. Revegetation Elements That Degrade MHJB Habitat: Because MHJB adults emerge from the soil to attract and search for mates, turf grass, dense ground covers (such as ivy), weed matting, aggregate, and mulch can degrade habitat conditions and will not be used at repair sites. Revegetation of habitat disturbed due to repairs or new access routes that are characterized by Zayante sands will use only plants indigenous to the sandhill habitats. Also, weed control will be part of the revegetation activities.

4.3.4.4 Tidewater Goby (*Eucyclogobius newberryi*)

Covered Activities with the most likelihood to affect tidewater goby involve maintenance of the flood control channel and sediment management in particular. The following measures will be implemented to minimize and avoid effects to tidewater goby from these activities. These measures are consistent with measures generally employed for such projects (USFWS 1997b).

SSM-40. If work areas are to be de-watered, as many tidewater gobies as possible will be removed prior to draining the site. After barriers are constructed, tidewater gobies will be captured, transported in buckets, and released in the most appropriate (i.e., similar water quality parameters) habitat immediately adjacent to the de-watered area. If a seine is used, it will be pulled in a deliberate manner with care being taken to avoid rolling the lead line inward. The number of tidewater gobies will be estimated prior to release. Electrofishing will not be conducted in areas where tidewater gobies may occur. All debris and aquatic and emergent vegetation in the pumped area will be carefully inspected for tidewater gobies and other vertebrates. As the work site is de-watered, remaining pools will be inspected for tidewater gobies. As many individuals as possible will be captured using dipnets and other appropriate tools and moved as described above. Handling time for tidewater gobies will be minimized to the maximum extent practicable.

SSM-41. If, in the judgment of the Service, the most practical means of conserving tidewater gobies at a particular work site is to hold them in captivity until the completion of the project, individuals will be collected as described above and held in aquaria that provide the proper conditions for the species. Tidewater gobies that are held in this manner will be maintained by a person or institution with experience in their husbandry. During the time they are in captivity, they will be kept apart from tidewater gobies from other locations and will not be used for any other purpose. The tidewater gobies will be released at the earliest possible time, in coordination with the Service, after post-project conditions have become suitable for the species.

SSM-42. Only qualified personnel authorized by the Service (Service-approved biologists) will participate in activities associated with the capture, handling, and monitoring of tidewater gobies. The City will provide the Service with the names and credentials of personnel who they desire to conduct these activities for review and approval at least 15 days prior to the onset of the activities. No project activities will begin until the Service notifies the City and Corps in writing that the biologist(s) is qualified to conduct the work.

SSM-43. Prior to the onset of activities that result in disturbance of potential tidewater goby habitat or individuals, a Service-approved biologist will conduct a training session for all construction personnel. At a minimum, the training will include: a description of the tidewater goby; a description of the species' habitat; the importance of the species and its habitat; the general measures that are being implemented to conserve the species as they relate to the project; and the boundaries within which the project may be accomplished. Brochures, books, and briefings may be used in the training session.

SSM-44. A Service-approved biologist will monitor the work site until all removal of tidewater gobies, instruction of workers, and habitat disturbance have been completed. After this time, the City will designate a person to monitor on-site compliance with all minimization measures. The Service-approved biologist will ensure that this individual receives training in the identification of tidewater gobies and on the topics outlined above in measure SSM-43. The monitor and the Service-approved biologist will have the authority to halt any action that might result in impacts that exceed the levels anticipated by the Service in this biological opinion. If work is stopped, the City will notify the Corps and Service immediately.

SSM-45. If a work site is to be temporarily de-watered by pumping, intakes will be completely screened with wire mesh not larger than three millimeters (mm) to prevent tidewater gobies from entering the pump system. Water will be released or pumped downstream at an appropriate rate to maintain downstream flows during construction. Upon completion of construction activities, any barriers to flow will be removed in a manner that would allow flow to resume with the least disturbance to the substrate.

SSM-46. If project activities could degrade water quality, the existing water quality parameters will be determined (e.g., salinity, temperature, dissolved oxygen, and turbidity) prior to the onset of work. Water samples will be taken in a manner that minimizes disturbance, injury, or mortality of tidewater gobies. Results will be used to monitor water quality parameters during and after maintenance and sediment removal activities.

SSM-47. Maintenance of the flood control channel and sediment management will be conducted between July 1 and October 31. Should the City need to conduct these activities outside this period, it will notify the Service to obtain concurrence.

SSM-48. If the substrate of the natural stream channel is altered during work activities, it will be graded or otherwise restored to approximate natural conditions after the work is completed.

SSM-49. The number of access routes, number and size of staging areas, and the total area of the activity will be limited to the minimum necessary to achieve the project goal. Routes and boundaries will be clearly demarcated, and these areas will be outside of riparian and wetland areas.

The San Lorenzo River Flood Control Channel Project also includes gravity outlet drainage discharge structures in the San Lorenzo River Lagoon where tidewater goby may occur. Small amounts of sediment are removed near the drainage gates. Prior to sediment removal in areas where tidewater goby may be present, surveys using visual methods, dip-nets, and seines will be conducted to determine whether tidewater goby are actually present at the site.

SSM-50. If tidewater goby are present, the work area will be isolated using fine mesh nets and tidewater goby in the enclosed work area will be removed using seines and dip nets and released to suitable habitat outside the work area. This work will be supervised by a qualified fishery biologist.

SSM-51. Sediment removal will be limited to the summer low-flow period to the extent practicable (generally between May and July). The use of best management practices will be implemented to reduce the probability of sediment and/or contaminated material from entering the river.

SSM-52. Potential effects on tidewater goby related to water diversion will be mitigated through implementation of the following instream flow provisions. A minimum bypass of at least 2.0 cfs will be provided downstream of the Laguna/Reggiardo diversion; a minimum bypass of at least 8.0 cfs will be provided downstream of the Tait Street diversion at all times.[8]

4.3.4.5 Pacific Lamprey (*Entosphenus tridentata*)

Larval Pacific lamprey inhabit soft sand and mud substrate where they burrow and feed. When sediment is removed from the streambed in areas that support lamprey, it may contain larval lamprey. It is generally not practical to verify presence or absence prior to sediment removal activities. In order to minimize potential effects on Pacific lamprey, the following measure will be implemented:

SSM-53. A Service-approved biologist will be present during sediment removal activities. Lamprey will be removed by electrofishing while removal of anadromous salmonids is occurring. A Service-approved biological monitor will also observe the sediment as it is removed and look for lamprey larvae. Any lamprey encountered will be collected, immersed in water, and transferred to suitable nearby habitat outside of the work site.

SSM-54. Potential effects on Pacific lamprey related to water diversion will be mitigated through implementation of the following instream flow provisions. A minimum bypass of at least 2.0 cfs will be provided downstream of the Laguna/Reggiardo diversion in all years; a minimum bypass of at least 8.0 cfs will be provided downstream of the Tait Street diversion at all times.[9]

4.3.4.6 California Red-Legged Frog (*Rana draytonii*)

The measures to avoid and minimize impacts to CRLF during O&M activities are the same as those listed above in section 4.3.3.6, which focus on scheduling of activities, keeping the footprint of activities to a minimum, and removal and monitoring of individuals from the work site as needed.

[8] These flow commitments are being developed for anadromous salmonids in the City of Santa Cruz Anadromous Salmonid HCP but will also benefit USFWS-jurisdictional species.

[9] These flow commitments are being developed for anadromous salmonids in the City of Santa Cruz Anadromous Salmonid HCP but will also benefit USFWS-jurisdictional species.

4.3.4.7 Western Pond Turtle (*Actinemys marmorata*)

Measures to avoid and minimize impacts to WPT during O&M activities are the same as those listed above in section 4.3.3.7, which focus on scheduling of activities, keeping the footprint of activities to a minimum, and removal and monitoring of individuals from the work site as needed. To avoid and minimize impacts to WPT during the biannual vegetation and sediment removal from Neary Lagoon, a biologist captures the WPT (currently only three adults) and transports them to a CDFW-approved facility where they are held and fed for four to six week period of time, and then returned to Neary Lagoon when the work is completed.

Conservation measures for the WPT at Loch Lomond Reservoir include hand clearing of vegetation, including through use of weed whippers or grazing by goats, as needed. Furthermore, female WPT have not been observed in the vicinity of the dam (Allterra Environmental 2009). Habitat will be kept open and suitable for turtle nesting along an abandoned section of road 2 miles upstream where breeding has been observed in the past. In addition the City monitors for illegal motorized vehicle use (e.g., dirt bikes), and places barriers (e.g., tree trunk) to prevent vehicle entry as needed. The City implements an on-going recycling program for used fishing line to reduce entanglement danger and conducts regular trash removal to reduce attraction for predators such as raccoons. And finally, the City is planning to install refugia for juvenile WPTs, such as floating rafts, to provide more cover during periods when the lake is low and shallow shoreline habitat is reduced.

5.0 ASSESSMENT OF IMPACTS AND LEVEL OF TAKE

5.1 Introduction

Future City Covered Activities have the potential to occur almost anywhere along the City's facilities and pipeline corridor. Therefore, it is not possible to predict exactly where and when activities will occur within those areas during the HCP permit duration. The estimates of expected magnitude of potential impacts and the proportion of temporary versus permanent impacts were based on a review of City activities in the Plan Area in recent years and available species locality data.

5.2 Direct Effects

Direct effects occur when biological resources are altered, disturbed, destroyed, or removed during the course of new construction or O&M activities. During new construction and O&M activities, direct impacts could occur by damaging or killing individuals of the species and by removing habitat occupied by the species.

5.3 Indirect Effects

The ESA Section 7 regulations define "indirect effects" as "those that are caused by the proposed action and are later in time, but still are reasonably certain to occur" (50 C.F.R. § 402.02). Indirect effects could occur from invasive species, siltation, erosion, and fugitive dust. Invasive species can out-compete and displace native species. Disturbances and disturbed sites allow invasive species to become established and invade adjacent native communities. Temporary indirect impacts from human disturbance associated with the construction crews could occur to individuals in or immediately adjacent to work areas.

5.4 New Construction – Impacts to Covered Plant Species Associated with Construction of the North Coast Pipeline

5.4.1 Introduction

Populations of covered plant species have been documented or have the potential to occur along portions of the North Coast Pipeline. The types of direct and indirect effects to each covered plant species would be similar and are therefore collectively discussed for all covered plant species below.

5.4.2 Direct Effects

Construction activities could result in the disturbance of covered plant species located within the Plan Area by damaging or killing individual plants and by removing habitat occupied by the species. These direct effects could potentially result in the loss of habitat and individuals. Chapter 5 identifies avoidance and minimization measures that will reduce or eliminate the potential adverse effects from Covered Activities. Specifically, the City would implement conservation measure SSM-1 and SSM-24 to minimize direct effects, which requires that covered plant species population boundaries will be clearly delineated with visible flagging or fencing prior to beginning the covered activity.

5.4.3 Indirect Effects

Potential indirect effects that could result from Covered Activities include increased invasive species, siltation, erosion, and fugitive dust.

<u>Invasive Weeds</u>
Invasive species can out-compete and displace native species. Disturbances and disturbed sites (e.g. construction areas) allow invasive species to become established and invade adjacent native communities. Chapter 5 identifies measures that will reduce the potential for invasive plant species to colonize work sites in the Plan Area. Specifically, GM-3 requires that the spread or introduction of invasive exotic plant species be avoided to the extent practicable, and that when practicable, invasive exotic plants in the project areas will be removed.

Fugitive Dust

Increased levels of fugitive dust in the vicinity of work sites could alter plant metabolic processes such as photosynthesis and respiration, which can result in reduced growth, vigor and reproduction. Dust deposited on leaves of plants can reduce photosynthetic rates by reducing gas exchange and light quantity and quality. Reduction in photosynthetic rates could reduce plant growth, vigor and reproduction.

The City will implement dust reduction procedures in SSM-2 and elsewhere that will minimize the potential adverse effects from fugitive dust.

Erosion and Siltation

Increased erosion and subsequent down slope and downstream siltation could adversely affect plant populations that are immediately adjacent to the activity. The City will implement erosion control measures that will minimize the potential for adverse effects to occur as a result of increases in erosion and siltation. Specifically, the City will implement GM-8 GM-9, and GM-10 to minimize the potential effects related to erosion and siltation.

5.4.4 Conclusion

Effects to covered plant species as a result of new construction and maintenance activities are expected to be minimal after implementation of the avoidance and minimization measures.

5.5 New Construction – Impacts to Covered Wildlife Species Associated with Construction of the North Coast Pipeline

5.5.1 Ohlone Tiger Beetle (*Cicindela ohlone*)

5.5.1.1 Introduction

Since there are no accurate estimates of the numbers of OTBs that reside in the areas of occupied habitat within the Plan Area, it is not possible to quantify the exact number of individual animals that could be taken directly or indirectly by the proposed new construction or O&M activities. Population monitoring at other known OTB locations by Richard Arnold indicates that beetle numbers may fluctuate rather dramatically from year to year, and within areas of suitable habitat they often occur in a patchy distribution pattern. Also, depending upon the time of year when construction occurs, one or more life stages of the OTB may not be apparent, which complicates obtaining an accurate estimate of take. For these reasons, the level of incidental take is expressed as the estimated acreage of known occupied habitat. A worst case scenario is assumed for estimating the level of take. If similar levels of O&M activities from recent years continue in future years, then actual take levels during the life of the incidental take permit will be substantially less than estimated.

For the covered insect taxa, the assessment of impacts included a desktop GIS analysis as well as field surveys to assess habitat conditions and survey for the covered taxa at locations where impacts might occur based on the findings of the GIS analysis. Since the OTB is closely associated with grassland habitats underlaid by Watsonville loams, GIS shapefiles for soils data were obtained from the Natural Resources Conservation Service for the Plan Area.

The soils data were overlaid in GIS onto an aerial photograph of the Plan Area to examine habitat types. Then a GIS file illustrating the City's water main system was overlaid to identify locations where the soils and existing habitat conditions appeared potentially suitable for either insect within the Plan Area. Field surveys of these locations were performed by entomologist Richard Arnold to verify that habitat conditions were suitable and to conduct presence-absence surveys for OTB life stages. Additionally, all Watsonville soil locations for the North Coast Pipeline alignment were visited to ensure that there were no new areas that support the OTB.

The GIS analysis revealed that the proposed North Coast Pipeline project crosses an estimated 14,411 linear feet of Watsonville loam soils. Vegetation types included grassland, scrub, forest, agriculture, and ruderal. Presence-absence surveys for the OTB were conducted during the spring of 2011 by Arnold. The surveys determined that the beetle occupied a much smaller subset of the loam soils.

5.5.1.2 Direct Effects

OTB adults, active larval burrows, and new egg burrows were found in the spring of 2011 by Arnold along the 3,645 linear feet of the proposed North Coast Pipeline alignment, specifically in the Moore Creek Open Space Preserve and at the neighboring Younger Ranch property. Thus, the proposed North Coast Pipeline project has the potential to directly impact life stages of the OTB by causing mortality of eggs, larvae, pupae, and adults within the construction zone and along access routes where vegetation is removed and Watsonville loam soils are disturbed. The City, in coordination with the Service will evaluate the use of techniques such as sliplining and directional drilling to avoid the need to disturb Watsonville loam soils.

Both permanent and temporary habitat loss is expected to occur during the life of the incidental take permit. It should be noted, however, that life stages of the OTB were observed in the spring of 2011 within the existing pipeline alignment at both of these properties, suggesting that the long-term impacts of the proposed new pipeline may be somewhat less than described.

Assuming a worst case scenario, a total of 3,645 linear feet of coastal terrace prairie habitat occupied by the OTB will be affected by construction of the new pipeline. Assuming a 16 ft. right-of-way for construction activities, the estimated total disturbed habitat area measures about 1.34 acres. If construction techniques selected by the City will require disturbance of Watsonville loam soils, the City will implement a translocation program for individual OTB encountered during construction.

5.5.1.3 Indirect Effects

Implementation of the minimization measures below will largely avoid potential indirect effects of new construction activities on the OTB. However, since OTB larvae are active throughout much of the year, dust is the primary factor that may cause indirect impacts to the OTB. Dust is likely to be generated during vegetation clearing, grading, and trenching activities.

5.5.1.4 Conclusion

Direct effects to the OTB due to new construction are expected to total about 1.34 acres. However, this impact area was previously disturbed when the existing North Coast water pipeline was constructed and the OTB has subsequently recolonized it. Thus, the direct effects of the new alignment on the OTB may be more temporary rather than permanent. Indirect effects will be minimized through the implementation of avoidance and minimization measures and are expected to be minimal.

5.5.2 Mount Hermon June Beetle (*Polyphylla barbata*)

5.5.2.1 Introduction

Since there are no accurate estimates of the numbers of MHJBs that reside in the areas of occupied habitat within the Plan Area, it is not possible to quantify the exact number of individual animals that could be taken directly or indirectly by the proposed new construction or O&M activities. Females of the MHJB do not fly, so they are much more difficult to sample than males. The egg, larval, and pupal stages of the MHJB have not been formally described, so distinguishing them from these life stages of three other non-endangered species of June beetle that co-occur in the Zayante Sandhills region is problematic. Prior monitoring studies by Richard Arnold indicates that population densities of adults and larvae vary substantially at different locations in the sandhills, and also vary from year-to-year at a particular location, factors which further complicate describing the level of incidental take using the number of beetles and its life stages. For these reasons, the level of incidental take is expressed as the estimated acreage of potentially occupied habitat for the MHJB. A worst case scenario is assumed for estimating the level of take. If similar levels of O&M activities from recent years continue in future years, then actual take levels during the life of the incidental take permit may be substantially less than estimated. For the covered insect taxa, the assessment of impacts included a desktop GIS analysis as well as field surveys to assess habitat conditions and survey for the covered taxa at locations where impacts might occur based on the findings of the GIS analysis. Since the MHJB is closely associated with various habitats underlaid by Zayante sand, GIS shapefiles for these soils were obtained.

The City has established a mitigation site for MHJB on City-owned habitat in Bonny Doon. The mitigation site supports high quality MHJB sandhills habitat and is occupied by MHJB. The mitigation site consists of 17 acres and was established in 2014 pursuant to the City's low-effect HCP for the Graham Hill Water Treatment Plant Operations, Maintenance, and Construction

Activities that was approved in 2014. The City has used 5.7 acres of the 17 acres to offset impacts to MHJB resulting from activities at the Graham Hill Water Treatment Plant and has 11.3 acres remaining for future impacts to MHJB.

The soils data were overlaid in GIS onto an aerial photograph of the Plan Area to examine habitat types. Then a GIS file illustrating the City's water main system was overlaid to identify locations where the soils and existing habitat conditions appeared potentially suitable for MHJB within the Plan Area. Because the MHJB is usually found wherever the Zayante soils occur, presence-absence surveys were limited to only the City's Bonny Doon mitigation site (summer of 2011). Surveys for the endangered Zayante Band Winged Grasshopper, *Trimerotropis infantilis* (Orthoptera: Acrididae) were also conducted (summer of 2011) at the City's Bonny Doon mitigation site to determine if habitat management activities implemented there might affect the grasshopper.

Since the proposed construction of the new North Coast Pipeline does not cross any Zayante sands, no direct or indirect impacts to the MHJB or its habitat are anticipated to occur.

5.5.2.2 Direct Effects

The North Coast Pipeline alignment does not cross any Zayante sands so no direct effects to the MHJB or its habitat are anticipated.

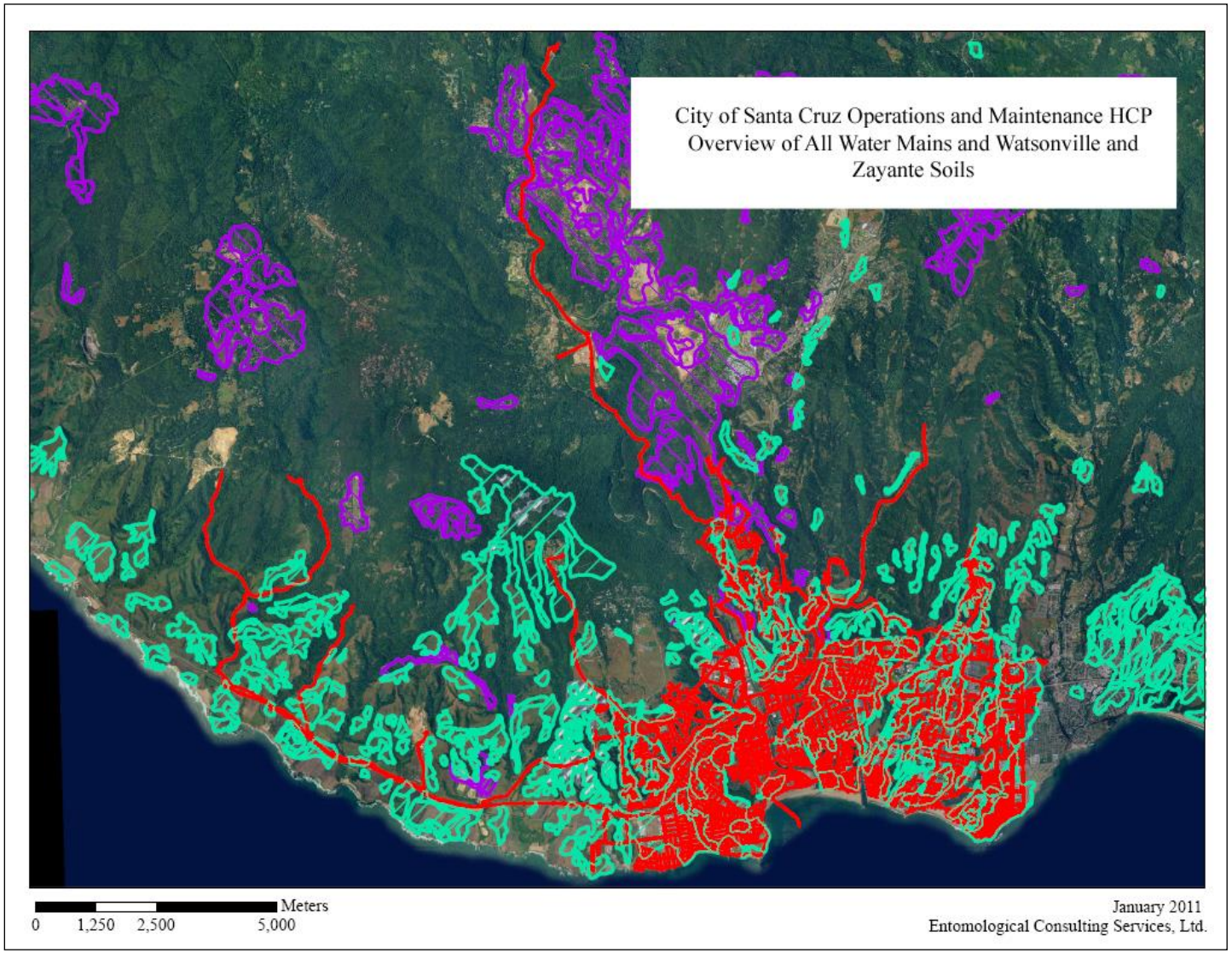
5.5.2.3 Indirect Effects

The North Coast Pipeline alignment does not cross any Zayante sands so no indirect effects to the MHJB or its habitat are anticipated.

5.5.2.4 Conclusion

No direct or indirect effects to the MHJB or its habitat will occur due to construction of the North Coast Pipeline project.

Figure 3: City Water System and Watsonville/Zayante Soils



5.5.3 Tidewater Goby (*Eucyclogobius newberryi*)

5.5.3.1 Introduction

Tidewater gobies are known to inhabit, or have recently inhabited, the coastal lagoons of several streams crossed by the North Coast Pipeline, including Laguna Creek, Baldwin Creek, Lombardi Gulch, Old Dairy Gulch, Wilder Creek, Younger Lagoon, and Moore Creek. Tidewater goby also occur in the San Lorenzo River Lagoon, downstream from the terminus of the North Coast Pipeline at the Tait St. Diversion Facility.

5.5.3.2 Direct Effects

The North Coast Pipeline crosses streams tributary to lagoons but does not directly traverse any potential tidewater goby habitat. No direct effects to tidewater goby are expected from construction of the North Coast Pipeline because no construction activity will be conducted in or near tidewater goby habitat.

5.5.3.3 Indirect Effects

The potential for indirect effects to tidewater goby from construction of the North Coast Pipeline is from discharge of sediment or contaminants to streams tributary to lagoons where tidewater goby may occur. Construction practices and BMPs to minimize and avoid sediment discharge to water courses, and contain sediment and spills are expected to result in no indirect effects of pipeline construction on tidewater goby.

5.5.3.4 Conclusion

No direct or indirect effects to tidewater goby from pipeline construction are expected.

5.5.4 Pacific Lamprey (*Entosphenus tridentate*)

5.5.4.1 Introduction

Pacific lamprey are not known to occur in streams crossed by the North Coast Pipeline and therefore will not be effected by the project.

5.5.4.2 Direct Effects

Because the Pacific lamprey is not present, no direct effects are expected.

5.5.4.3 Indirect Effects

No indirect effects to Pacific lamprey are expected.

5.5.4.4 Conclusion

No direct or indirect effects to Pacific lamprey from pipeline construction are expected.

5.5.5 California Red-Legged Frog (*Rana draytonii*)

5.5.5.1 Introduction

The North Coast Pipeline new construction will occur over a period of 10-20 years. Therefore, annual effects to CRLF are expected to be minimal. The existing pipeline is currently routed through special status species habitat in many cases and this will be avoided or minimized with the new replacement pipeline. Over the long-term, as the new pipeline is constructed, there will be less right-of-way (ROW) in riparian areas than the existing pipeline, and therefore, less need for maintenance within CRLF habitat. GIS was used to calculate the area of North Coast existing pipeline ROW versus new pipeline ROW within riparian habitat with a standard ROW width of 20 feet and a width of 40 feet at impoundments. The existing ROW calculated is approximately 7 acres and the new ROW is approximately 6.2 acres. Construction of the new pipeline will impact an average of 0.19 acre of riparian habitat per year.

5.5.5.2 Direct Effects

Construction of portions of the new North Coast Pipeline that cross creeks and riparian areas has the potential to cause injury or mortality to adult or juvenile CRLF from the use of heavy equipment. Temporary dewatering during rehabilitation of diversion structures also has the potential to injure or kill adult or juvenile CRLF if they become entrained in the pump used for dewatering. Additional vehicle traffic on access roads during construction is expected to be minimal; however, vehicles have the potential to cause injury or mortality to adult or juvenile CRLF if any are present. CRLF are not known to breed in the portions of creeks or diversion structures that the new North Coast Pipeline will traverse; therefore new construction is not expected to affect CRLF eggs or tadpoles.

Although work has been proposed to be conducted during the dry season, CRLF can disperse overland in mesic conditions if substantial rainfall occurs. Potential impacts to dispersing frogs in the event of a substantial rain event would be reduced or avoided by ceasing activities to the extent practicable.

Survey, capture, and relocation are intended to reduce the potential for injury or mortality that may occur should CRLF be found in the action area. Relocating CRLF out of harm's way will reduce injury or mortality from equipment, foot traffic, or ground disturbance; however, injury or mortality of CRLF may occur as a result of improper handling, containment, transport of

individuals, or from releasing them into unsuitable habitat (e.g., where exotic predators are present).

Based on experience with similar projects in this vicinity in the past and the footprint of the proposed work, no more than 50 adult and juvenile CRLF will be directly affected by these activities annually. The primary direct effect to CRLF will be from relocating individuals from the construction zone. Handling individuals may cause harassment or injury which will be minimized by use of properly trained biologists to conduct the relocation as stated in SSM-12. Although relocating frogs will protect most individuals, occasionally a frog may be directly injured or killed by equipment during dewatering and construction. The presence of a biological monitor as stated in SSM-14 will minimize this potential effect.

5.5.5.3 Indirect Effects

CRLF could be affected by potential erosion and sedimentation during project construction activities. There is potential for a temporary increase in erosion and sedimentation along bank shoulders in the project areas due to the loss of natural substrate or vegetation. Implementation of the standard erosion control BMPs and GM-10 will minimize these potential impacts to CRLF.

Work activities, including vibration, may cause CRLF to leave the work site and surrounding areas. This disturbance and displacement may increase the potential for predation, desiccation, and/or competition for food and shelter. Implementation of SSM-12 and SSM-14 for pre-construction surveys and the relocation of individuals would reduce these impacts.

Trash left during or after project activities could attract predators to work sites, which could, in turn, prey on CRLF. For example, raccoons (*Procyon lotor*) and feral cats (*Felis catus*) are attracted to trash and also prey opportunistically on the CRLF. This potential impact will be reduced or avoided by careful control of waste products at all work sites through implementation of GM-1.

The new construction may indirectly affect CRLF adults and juveniles through the temporary loss of cover and foraging habitat within creeks and riparian vegetation. As noted above, this effect is expected to be of minimal area and duration. Implementation of revegetation immediately after construction is completed as described in GM-8 will minimize this potential effect. Indirect effects to CRLF adults and juveniles may include potential for increased exposure to predation of relocated individuals. Use of properly trained biologists to select suitable relocation sites (SSM-12) will minimize this potential effect.

Observations of diseased and parasite-infected amphibians are now frequently reported. Releasing amphibians following a period of captivity, during which time they can be exposed to infections of disease agents, may cause an increased risk of mortality in wild populations. Amphibian pathogens and parasites can also be carried between habitats on the hands, footwear, or equipment of fieldworkers, which can spread them to localities containing species which have had little or no prior contact with such pathogens or parasites. Chytrid fungus is a water-borne fungus that can be spread through direct contact between aquatic animals and by a spore that can

move short distances through the water. The fungus only attacks the parts of an animal's skin that have keratin (thickened skin), such as the mouthparts of tadpoles and the tougher parts of adults' skin, such as the toes. It can decimate amphibian populations, causing fungal dermatitis, which usually results in death in 1 to 2 weeks. Infected animals may spread the fungal spores to other ponds and streams before they die. Once a pond has become infected with chytrid fungus, the fungus stays in the water for an undetermined amount of time. Relocation of individuals captured from the project area could contribute to the spread of chytrid fungus. In addition, infected equipment or footwear could introduce chytrid fungus into areas where it did not previously occur. The possible spread of chytrid fungus or other amphibian pathogens and parasites would be minimized by implementing SSM-18.

5.5.5.4 Conclusion

The new North Coast Pipeline will not increase the capacity of the system or result in increased levels of water diversion above current levels. Implementation of the new North Coast Pipeline is going to occur in phases over a 10 to 20-year period. As noted above, an average of 0.19 acre of riparian habitat is expected to be impacted by construction of the new pipeline each year. Thus, the annual direct and indirect effects to CRLF of construction of the new pipeline and facilities will be very small.

Over the long term, the new North Coast Pipeline project will have potential beneficial effects on CRLF. Portions of the new pipeline will be relocated from existing alignments to new alignments outside of creek and riparian habitat. The new pipeline will also reduce the number of emergency repairs needed due to failure of the old pipe, reducing overall disturbance to creek and riparian habitats in the future. Rehabilitation of the Laguna and Majors diversions will include automated slide gates and self-cleaning intake screens, reducing the number of vehicle trips to the structures for maintenance over the long term. Maintaining minimum stream flows year round as provided under the Plan may also benefit CRLF foraging habitat within the pipeline area as well as breeding habitat downstream (e.g., in lagoons).

5.5.6 Western Pond Turtle (*Actinemys marmorata*)

5.5.6.1 Introduction

The North Coast Pipeline new construction will occur over a period of 10-20 years. As noted above, an average of 0.19 acre of riparian habitat is expected to be impacted by construction of the new pipeline each year. WPT are potentially present in low numbers throughout the Plan Area, but annual effects to WPT are expected to be minimal. WPT use upland habitats for basking, overwintering and nesting. Winter season upland movements of 100 m- 300 m away from aquatic habitat have been shown in Santa Cruz County studies. WPT nesting activity has been documented only within 100 m of occupied aquatic habitat. Over the long-term, the new pipeline will have less ROW in riparian areas (6.2 acres) than the existing pipeline (7 acres), and therefore, less need for maintenance within WPT habitat. The new pump station at Majors diversion will be built within the existing footprint and thus is not expected to affect WPT habitat.

Surveys for WPT within the North Coast Unit showed few individuals occur within the portions of streams where the diversion structures and pipeline exist; most potential WPT habitat is located downstream in the agricultural ponds and lagoons. WPT breeding is assumed, but has not been documented in the affected North Coast Pipeline upland habitats. The paucity of hatchling and juvenile WPT sightings in the North Coast lagoons, streams and diversion impoundments reflects both the low population numbers and the cryptic nature of the species in the plan area. The chance for encountering WPT in the course of carrying out Covered Activities is low.

5.5.6.2 Direct Effects

Construction of portions of the new North Coast Pipeline that cross creeks and riparian areas has the potential to cause injury or mortality to adult or juvenile WPT from use of heavy equipment. Additional vehicle traffic on access roads during construction is expected to be minimal; however, vehicles have the potential to cause injury or mortality to adult or juvenile WPT if any are present. Construction in grasslands adjacent to creeks has the potential to injure or kill WPT eggs if any are present.

Since there are no accurate estimates of the numbers of WPT that reside in the areas of occupied habitat within the North Coast Pipeline Plan Area, it is not possible to quantify the exact number of individual animals that could be taken directly or indirectly by the proposed new construction. Based on experience with similar projects in this vicinity in the past and the footprint of the proposed work, an estimate of no more than 20 WPT will be directly affected by the new pipeline construction annually. Avoiding open grasslands within 100 meters of aquatic habitats to avoid potential WPT nests as described in SSM-26 and the implementation-of preconstruction surveys, monitoring, and relocation of individual WPT as stated in SSM-21 and SSM-23 will minimize these potential effects.

5.5.6.3 Indirect Effects

Indirect effects to WPT adults and juveniles may include potential for increased exposure to predation of relocated individuals. Relocation of WPT to suitable habitat by a properly trained biologist (SSM-21) will minimize this potential effect.

It is unlikely that the minor amounts of temporary disturbance to riparian habitat during the pipeline construction will adversely affect WPT. Creation of small openings in the riparian habitat may create temporary basking habitat for WPT. Revegetation of work sites immediately after construction is completed (GM-8) will minimize this potential effect.

5.5.6.4 Conclusion

The new North Coast Pipeline will not increase the capacity of the system or result in increased levels of water diversion above current levels. Implementation of the new North Coast Pipeline

is going to occur in phases over a 10 to 20-year period, and WPT occur in low numbers in the work areas. As noted above, an average of 0.19 acre of riparian habitat is expected to be impacted by construction of the new pipeline each year. Thus, the annual direct and indirect effects to WPT of construction of the new pipeline and facilities will be very small.

Over the long term, the new North Coast Pipeline project will have potential beneficial effects on WPT. Portions of the new pipeline will be relocated from existing alignments to new alignments outside of creek and riparian habitat, reducing the acres of pipeline ROW from existing 7 acres to 6.2 acres for the new pipeline. The new pipeline will also reduce the number of emergency repairs needed due to failure of the old pipe, reducing overall disturbance to creek and riparian habitats in the future. Rehabilitation of the Laguna and Majors diversions will include automated slide gates and self-cleaning intake screens, reducing the number of vehicle trips to the structures for maintenance over the long term. Maintaining minimum stream flows year round may also benefit WPT foraging habitat both within the pipeline area as well as downstream.

5.6 Operations and Maintenance – Impacts to Covered Plant Species Associated with Operations and Maintenance Activities

5.6.1 Introduction

O&M Covered Activities that have the potential to affect covered plant species include vegetation control at the diversions and periodic vegetation clearing/mowing along the pipeline ROW. As discussed below, vegetation maintenance of the diversions is not expected to adversely impact covered plant species as these species are not found at the diversion sites. On an annual basis, the City mows portions of the pipeline route to maintain, at minimum, an eight-foot swath immediately adjacent to the pipeline. Mowing the pipeline route allows City personnel to travel the pipeline route more easily by foot or by vehicle to check the system for leaks or other damage.

5.6.2 Direct Effects

Vegetation management for pipeline right-of-way access is done primarily through hand trimming and mowing. An eight-foot right-of-way along the pipeline right of way is maintained the length of the pipeline. Mowing is done monthly in late spring and summer months. O&M activities such as mowing along current pipeline routes typically occurs in previously disturbed areas and are not expected to adversely affect covered plant species, as the covered species are absent. However, if surveys document the presence of a covered species in an area subject to vegetation management, direct effects to plants and habitat (including seedbank) will be minimized through avoidance, mowing after flowering and release of seeds, and soil/seedbank segregation and salvage during pipeline repair or other required ground disturbing activity.

5.6.3 Indirect Effects

Potential indirect effects to covered plant species will be minimized through measures addressing invasive species, erosion and siltation, and dust, and are not expected to adversely affect covered plant species.

5.6.4 Conclusion

The combination of the implementation of avoidance and minimization measures along with the nature and location of O&M activities would result in only minimal direct or indirect effects to covered plant species within the Plan Area.

5.7 Impacts to Covered Wildlife Species Associated with Operations and Maintenance Activities

5.7.1 Ohlone Tiger Beetle (*Cicindela ohlone*)

5.7.1.1 Introduction

Although construction of the new North Coast Pipeline will not traverse any areas with Zayante sands, the GIS analysis revealed that existing water pipelines and related facilities cross an estimated 80,065 linear feet of Watsonville loam soils in other parts of the Plan Area. Vegetation types included grassland, scrub, forest, agriculture, and ruderal in addition to developed or paved areas. Presence-absence surveys for the OTB were conducted during the spring of 2011 by Arnold and indicated that the beetle occupied a much smaller portion of the Plan Area than predicted by a GIS analysis of soils.

5.7.1.2 Direct Effects

OTB adults, active larval burrows, and new egg burrows were found along the approximately 3,645 linear feet of the existing North Coast water pipeline alignment in the Moore Creek Open Space Preserve and at the neighboring Younger Ranch property. Thus, routine O&M activities of this existing pipeline segment or repairs to it before the proposed North Coast Pipeline project is completed, as well as any repairs to the new North Coast pipeline after it has been constructed, have the potential to directly impact life stages of the OTB by causing mortality of eggs, larvae, pupae, and adults wherever vegetation is removed or ground disturbance occurs.

Both permanent and temporary habitat loss is expected to occur during the life of the incidental take permit. However, since life stages of the OTB were observed during the spring of 2011 within the existing pipeline alignment, long-term impacts may be less than described. Assuming a worst case scenario, a total of 3,645 linear feet of coastal terrace prairie habitat occupied by the OTB could possibly be affected by repairs of the existing pipeline where it crosses the Moore Creek Open Space Preserve and the Younger Ranch. Assuming a 16 ft. right-of-way for repair

activities, the total area of disturbed habitat is estimated to be 1.34 acres. However, during the life of the permit it is unlikely that this full area will be disturbed by routine O&M activities. Based on past repair history for the existing pipeline, repairs have averaged only about 20 linear feet (0.007 acre) per year. If only routine O&M occurs along this segment of the existing pipeline during the 30-year permit life, then the estimated total disturbed habitat area would only be approximately 0.21 acre. Indeed, the presence of the aforementioned OTB life stages in areas previously impacted suggests that impacts from routine O&M activities may be minimal.

5.7.1.3 Indirect Effects

Use of the minimization measures in GMs 3, 8, and 10, and SSM 8 will largely avoid potential indirect effects of O&M activities on the OTB. However, since OTB larvae are active throughout much of the year, dust is the primary factor that may cause indirect impacts to the OTB. Dust is likely to be generated during vegetation clearing, grading, excavation activities, as well as vehicles and other equipment.

5.7.1.4 Conclusion

Impacts to the OTB due to routine O&M and repair activities are expected to be minimal. It is estimated that annual repairs to the existing North Coast Pipeline in the past have averaged only about 20 linear feet per year. If only routine O&M occurs along this segment of the existing pipeline during the 30-year permit life, then the estimated total disturbed habitat area would only be approximately 0.21 acre. Thus, over the life of the incidental take permit, the actual amount of direct and indirect effects on the OTB are likely to be substantially less than the worst case scenario of 1.34 acres of impact.

5.7.2 Mount Hermon June Beetle (*Polyphylla barbata*)

5.7.2.1 Introduction

The GIS analysis revealed that existing water pipelines and related facilities cross an estimated 16,910 linear feet of Zayante sands throughout the Plan Area. Vegetation types included grassland, chaparral, forest, agriculture, and ruderal in addition to developed or paved areas. Presence-absence surveys for the MHJB were conducted during the summer of 2011 by Arnold at selected locations to determine areas actually occupied by the beetle.

5.7.2.2 Direct Effects

Throughout the entire Water Department's service area existing water pipelines cross a total of 16,910 linear feet of Zayante sands at various locations in the City Unit and San Lorenzo River Unit of the Plan Area. Repairs to existing pipelines within the approximately 6.21 acres of potential habitat could lead to killing, harm, and harassment of MHJB (16,910 linear ft. x 16 ft. wide work area = 6.21 acres). It is anticipated that pipeline repair during the term of the Permit

could directly impact between 0.21 and 0.42 acre of habitat. Vegetation clearing or grading to create new access routes to some locations may result in direct effects to additional habitat. However, the existing pipelines are often buried in or at the edges of paved streets and in developed areas, and the potential direct impacts related to new access routes is expected to be minimal.

5.7.2.3 Indirect Effects

Although existing evidence is limited, it appears that subterranean larvae of the MHJB feed on a variety of plants. Thus, vegetation clearing and use of herbicides could reduce the vigor of or kill various larval food plants, which could indirectly affect the MHJB. Similarly, use of vehicles and equipment in areas of Zayante sands may cause compaction of the soils, which could crush subterranean MHJB life stages (both immatures and adults). Dust generated by vehicles and equipment needed for repairs and maintenance or other ground disturbing activities, such as trenching or grading, may adversely affect MHJB adults if these activities are conducted during the adult flight season and the beetle's nocturnal activity period.

5.7.2.4 Conclusion

Impacts to the MHJB due to routine O&M activities are expected to be minimal. Recent water pipeline repair history indicates that annual repairs occur on approximately 20 linear feet (0.007 acre) of pipeline. Thus, over a 30-year permit term, the total area of disturbance due to O&M activities is expected to range between 0.21 and 0.42 acre out of a total of 6.21 acres where City operations occur in potential MHJB habitat.

5.7.3 Tidewater Goby (*Eucyclogobius newberryi*)

5.7.3.1 Introduction

Covered Activities with potential to affect tidewater goby are limited to water supply operations, pipeline O&M, flood control maintenance, and stormwater maintenance. Land management activities are conducted on watershed lands well removed from the estuaries where tidewater goby occur and, due to their limited scope and potential for downstream effects, are not expected to have any effect on tidewater goby.

The Laguna Creek Lagoon consistently supports tidewater gobies at varying levels of abundance, even during relatively dry years with low levels of freshwater inflow and under existing diversion levels. There is not a well-developed lagoon at Majors Creek, and tidewater gobies have not been consistently documented there although suitable habitat is present. Tidewater goby populations in the San Lorenzo River Lagoon appear to be somewhat sporadic, and lagoon habitat has been highly altered by urban development and encroachment.

5.7.3.2 Direct Effects

Sediment management and removal can occur at drainage discharge structures in the San Lorenzo Lagoon and in the San Lorenzo River and Branciforte Creek flood control channels. Sediment accumulated in the drainage discharge structures is removed as needed by the City under their existing Nationwide Permit (File No. 268761S). Tidewater goby are likely to occur in the lower part of Branciforte Creek from slightly upstream of Ocean Street to the San Lorenzo River confluence and in the San Lorenzo River lagoon downstream of Water Street. Sediment removal may affect all life-stages of tidewater goby including eggs in burrows. Males remain in the burrows when eggs are present and are also vulnerable. Breeding begins in April or May after the lagoon closes to the ocean and may occur all year, with peaks in spring and late summer.

The magnitude of effect of sediment removal activities will depend on the areal extent of the project, the density of goby and/or burrows present, the extent of breeding activity, and the success of translocation efforts. Translocation efforts are relatively ineffective for males and the eggs they are guarding in burrows as well as embryonic goby which are planktonic for a few days after hatching and very small (4-5 mm at hatching) (USFWS 2005).

The Plan Area includes 18 individual gravity outfall structures in the San Lorenzo River. Tidewater goby are likely to be present only downstream of Water Street. There are 15 structures in the area likely to support tidewater goby. The area to be affected by coffer dam construction and dewatering is expected to be approximately 20 feet by 20 feet at each of the structures. Each structure will require approximately one day for sediment removal. It is anticipated that sediment will be removed at each structure once in every 1 to 5 years. A total of approximately 6,000-square feet (0.14 acre) of channel bed will be affected by the Covered Activities if all outlets are cleaned in any given year.

Habitat in the Plan Area includes tidally influenced, open-water estuarine habitat. Adjacent banks may support native tules and willow species. Scour features occur at the outfalls located on the active channel, and the apron structures themselves may provide fish cover when submerged. Periphyton established on top of the apron structures provides habitat for tidewater goby. Typically, the bed in the concrete outfall areas is sandy with both organic and urban detritus present.

Density of tidewater gobies can be highly variable. The Recovery Plan (USFWS 2005) presents the following data:

> Worchester (1992) documented a patchy distribution within habitats using meter-square drop traps for fine scale sampling. The results indicated density at Little Pico Creek, San Luis Obispo County ranged from 0 to 67 tidewater gobies per square meter in May 1990, 0 to 138 tidewater gobies per square meter in November 1990, and 0 to 27 tidewater gobies per square meter in February 1991. Density ranges for the following locations at the Camp Pendleton Marine Corps Base, San Diego County in October 1996 included 2 to 11 tidewater gobies per square meter in San Mateo Creek, 1 to 102 tidewater gobies per square meter in the creek at San Onofre Lagoon (October 1996), 0 to 4 tidewater gobies per square meter in Los Flores Creek (November 1996), 0 to 6 tidewater gobies per square meter in

Hidden Creek (November 1996), and 1 to 51 tidewater gobies per square meter in French Creek Lagoon (October 1996)(Swift and Holland 1998).

Based on these estimates, there may be from 0 to 5000 goby in each 37 square meter sediment removal area. Population density of tidewater goby in the San Lorenzo River is considered rare and presence is considered intermittent (USFWS 2006). TWG were captured during steelhead population surveys in 2008 (1 individual) and 2009 (noted as present), but were not captured in 2010 or 2011 (HES 2009, HES 2010, HES 2011, HES in draft). Observed densities of tidewater goby in the San Lorenzo River Lagoon are quite a bit lower than the highest densities cited. Swift collected 15 tidewater gobies in seven seine hauls on May 11, 2004. Swift and Kittleson sampled a number of locations around the lagoon and in lower Branciforte Creek later in May and found tidewater gobies at most locations (Swift and Kittleson, personal observation, 2004). During these observations, gobies were present in the vicinity of gravity outlets (Kittleson, personal observation, 2004).

The majority of tidewater gobies would be moved outside the work area prior to construction, although there could be the loss of some males and eggs remaining in burrows. The area subject to temporary impacts of the proposed project (6,000-square feet or 0-.14 acre) constitutes a small percentage of the habitat available to the species in the San Lorenzo River.

5.7.3.3 Indirect Effects

Operation of the City water diversions results in lower levels of freshwater inflow to the lagoons at the mouths of Laguna Creek, Majors Creek, and the San Lorenzo River, particularly during the dry season. Reduced freshwater inflow potentially influences goby habitat through alteration of the timing and duration of lagoon closure, water depth, development of aquatic vegetation, and water quality parameters including salinity, dissolved oxygen, temperature, and pH. Tidewater goby are found exclusively in estuaries. Estuaries are dynamic environments that experience wide fluctuations in the habitat conditions just listed (USFWS 2005).

The status of tidewater goby in Laguna Creek Lagoon suggests that the City water diversion has had little influence on population abundance or viability. The City diversion at Tait Street influences inflows to the San Lorenzo River Lagoon and may have a small effect on summer lagoon breaching. Summer lagoon breaching is most likely during years with high runoff and resulting high lagoon stage relative to the sandbar elevation at the mouth. Diversions may result in earlier closure of the lagoon with more stable water levels and a slight reduction in the potential for summer breaching. Breaching can be damaging to goby populations by dewatering burrows and reducing extent of habitat. Mortality of tidewater goby was observed in the San Lorenzo Lagoon in October 2008 when a breach resulted in rapid draw-down of the lagoon and stranding of gobies, and likely dewatering of burrows, along the lagoon margin (Hagar, personal communication, 2010). On the negative side, diversions may result in lower lagoon stage during the summer with reduced shallow water habitat at lagoon margins and backwater areas and reduced water depth. It is not clear whether the diversions have any significant effect on lagoon water quality, but tidewater goby are adapted to a wide range of environmental conditions including low dissolved oxygen and high salinity (USFWS 2005). Since 2007, the City Water Department has been implementing experimental diversion bypass in Laguna Creek during the

summer months that has resulted in maintenance of a full lagoon throughout the summer (Berry, personal communication, 2007). Instream flow provisions set forth in SSM-52 will minimize the potential for effects of the Laguna Creek and Tait Street diversions on tidewater goby habitat.

Operation of Newell Reservoir has a potential indirect effect on tidewater goby habitat related to treatment of the reservoir with algaecide containing copper, flow releases from testing of the outlet valves, and removal of large woody debris. These activities are expected to have minimal impact on tidewater goby. Monitoring of copper levels below the reservoir has shown that copper levels are in compliance with applicable limits of the State Water Resources Control Board Basin Plan. Reservoir releases are further diluted in the San Lorenzo River and by additional downstream tributaries, including the Zayante Creek and Branciforte Creek watersheds. Testing of the outlet valves involves release of up to 100,000 gallons (about 0.3 acre-feet) of water during several hours, usually in late summer. The total amount of water would be insignificant in terms of the lagoon volume which ranges from 50 to 250 acre-feet during the summer. Removal of large woody debris from the reservoir results in some diminishment in recruitment to downstream areas and ultimately the lagoon, however, the area above the dam is a small fraction of the total area of the San Lorenzo watershed and tidewater goby habitat is not known to be particularly enhanced by large woody debris. Tidewater goby tend to be most abundant on open sand substrate and dense aquatic vegetation is usually more important to gobies for cover and food production than large woody debris (USFWS 2005).

Sediment management at the Laguna Creek and Majors Creek diversions may somewhat influence sediment transport timing, but not overall magnitude. Any effects on sediment transport timing are likely to be greatly muted in the stream reach between the diversion and the lagoon. Tidewater goby prefer sand substrate for breeding, but they can be found on rocky, mud, and silt substrates as well. Lagoon dynamics result in primarily sand substrate in the main part of the Laguna Creek Lagoon with some mud and gravel in the upper part of the lagoon and silt and mud in the overwash pond to the south of the main lagoon. In Majors Creek, the only potential lagoon habitat forms in a small area along the back side of the beach and is primarily sand substrate. In the San Lorenzo Lagoon, the substrate is primarily sand with thin accumulations of silt in some areas. Substrate conditions in the lagoons are expected to be unaffected by O&M of the diversions.

Pipeline O&M activities include conveyance pipeline system inspections and repairs, finished water pipeline system flushing and repairs, pumping well return to the San Lorenzo River, and North Coast valve blow-off to the San Lorenzo River (Activities Report). These activities have minimal potential to affect tidewater goby habitat. Discharges from leaks may cause erosion and turbid runoff to surface waters when located adjacent to waterways. Except for the San Lorenzo River Lagoon, tidewater goby habitat is geographically removed from these activities and impacts to tidewater goby are not expected. Finished water pipeline system flushing and repairs are managed by Standard Operating Procedures (SOPs 7102-01 and 7102-02) to ensure dechlorination and flushing procedures to minimize effects to aquatic habitat as well as follow up water quality testing for turbidity and chlorine residual. Pumping well return to the San Lorenzo River and North Coast valve blow-off to the San Lorenzo River are managed to avoid erosion and turbid runoff. The quantity of water involved is very small relative to the lagoon volume. The City also maintains a leachate line from the City landfill to the treatment plant. The line

runs along the Highway 1 corridor and does not directly traverse any habitat supporting tidewater goby. However, any leak in the leachate line could result in water quality issues, however, if the discharge reaches habitat containing tidewater goby.

Flood control maintenance involves debris/obstruction removal, sediment management/removal, and vegetation management. Debris/obstruction removal occurs on an as needed basis to comply with flood conveyance requirements as determined by hydraulic modeling. Debris and/or obstructions are generally removed during the high flow season when tidewater goby abundance is low. Debris removal is generally focused at bridges, road culverts, diversions, pipelines, and other structures where property or safety is threatened. This activity does not occur in Laguna Creek or Majors Creek lagoons. Debris removal has little to no potential to affect tidewater goby within the San Lorenzo lagoon.

Riparian shrubs and trees are removed from the San Lorenzo Flood Control Channel and Branciforte Creek Flood Control Channel per maintenance requirements of the Corps. This activity may occur in conjunction with sediment removal. Removal of riparian vegetation per se is unlikely to affect tidewater goby in the San Lorenzo Lagoon.

The City will annually remove accumulated sediment and vegetation throughout portions of an approximately 3,100-foot reach of Branciforte Creek between the Ocean Street and Hubbard Street Bridges. The size of the maintenance area may require that the removal of sediment from the fish passage channel be conducted in sections. For example, depending on the amount of work needed, sediment removal activities would proceed in increments of approximately 50- to 1,000-foot sections. Therefore, work areas would be limited at any given time to a maximum of a 1,000-foot by 35-foot (35,000 square feet, 0.8 acre) section of channel. Previous surveys have indicated that tidewater goby are not expected to frequently occur upstream of Ocean Street and that potential reproductive habitat for tidewater goby is likely restricted to the reach downstream of Ocean Street (USFWS 2005b). Fish relocation activities completed prior to construction are expected to remove the majority of tidewater gobies in the unlikely event that they are present.

5.7.3.4 Conclusion

Covered Activities with greatest potential to impact tidewater goby are limited to sediment removal in the San Lorenzo River Lagoon and lower Branciforte Creek flood control channel; and the diversion of water from Laguna Creek, Majors Creek, and the San Lorenzo River. Sediment removal in areas where tidewater goby are present will result in harm, harassment, and potential killing of goby through capture and removal of individuals from the work areas and destruction of burrows with any eggs and males present. The proposed activities will not cause complete disruption of breeding activities in the San Lorenzo River lagoon or Laguna Creek Lagoon and will not result in long-term changes in substrate or water quality that would prevent tidewater gobies from using the area after the cessation of the disturbance. Disturbance will be relatively infrequent and only a small area will be involved. TWG have a short lifespan and can become abundant under favorable conditions. Population effects will be negligible and TWG are expected to rapidly recolonize disturbed areas.

The effect of the diversions is unclear and there are potentially both negative and positive effects. Diversions may result in earlier closure of the lagoons with conversion to a more stable habitat condition for goby and lower potential for summer breaching. Diversions may also result in lowering lagoon stage and dewatering valuable habitat in backwater areas such as the overwash pond at Laguna Creek. This condition can be exacerbated in dry years. Diversion bypasses at Laguna Creek demonstrate that good habitat conditions for tidewater goby can be maintained in the lagoon with relatively small bypass of flow (about 0.25 cfs). The minimum flow requirements established under this Plan will minimize the potential effect of water diversions on tidewater goby. In addition, instream flow increases that the City is proposing under a separate HCP for Anadromous Salmonids would result in lagoon inflows that are closer to levels that would occur in the absence of City diversions in both Laguna Creek and the San Lorenzo River downstream of Tait Street.

5.7.4 Pacific Lamprey (*Entosphenus tridentata*)

5.7.4.1 Introduction

Covered Activities with the greatest potential for impacts to Pacific lamprey or its habitat are related to water supply operations and flood control maintenance. Other Covered Activities are conducted in areas where lamprey do not occur or have negligible potential for effects due to limited scope or potential for downstream effects. The Pacific Lamprey is not known to occur in any of the North Coast streams influenced by the Covered Activities. Migration, spawning, and rearing habitat occur in the HCP Plan Area in Newell Creek, Zayante Creek, and the San Lorenzo River. Pacific lamprey are not well studied and there is relatively little information regarding abundance, status, distribution, or specific life-history characteristics in the HCP Plan Area.

5.7.4.2 Direct Effects

Sediment removal in the San Lorenzo River and Branciforte Creek flood control channels has the potential for direct effects on Pacific lamprey larvae. Pacific lamprey ammocoetes (larvae) colonize the channel when sediment accumulates there. Ammocoetes have been observed in the channel between Water St. and May Avenue. A total of 18 ammocoetes were captured during electrofishing surveys in August 2003 in a 116-foot section of the channel (HES 2003). Lamprey are unlikely to occur downstream of Water Street in the San Lorenzo FCC or downstream of May Avenue in the Branciforte Creek FCC due to higher salinity that occurs during high lagoon stages. There is the potential for direct mortality and disturbance to lamprey ammocoetes during sediment removal activities. Lamprey ammocoetes are not likely to be captured during fish removal and translocation since they are found within the substrate. While some ammocoetes may emerge from burrows and be susceptible to capture during electrofishing surveys, this is not expected to be an effective method for capture and removal of the majority of the population in any area as not all ammocoetes within the burrows could be expected to be within range of the electrofisher.

The City will annually remove accumulated sediment and vegetation throughout portions of an approximately 3,100-foot reach of Branciforte Creek between the Ocean Street and Hubbard Street Bridges. The size of the maintenance area may require that the removal of sediment from the channel be conducted in sections. For example, depending on the amount of work needed, sediment removal activities would proceed in increments of approximately 50- to 1,000-foot sections. Therefore, work areas would be limited at any given time to a maximum of a 1,000-foot by 35-foot (35,000 square feet, 0.8 acre) section of channel. The entire section will be treated on an as needed basis depending on sediment deposition and is expected to recur every 3-5 years. Therefore, a worst case estimate of the total acreage disturbed would be 2.5 acres to be disturbed 10 times during a 30 year permit period.

Provided the flood control channel is maintained free of sediment, there is no habitat for lamprey. If sediment accumulates in the channel, lamprey may take up residence there. Assuming that the 3 to 5-year maintenance rotation allows some accumulation of sediment and colonization by lamprey, there will be an ongoing disturbance that would best be regarded as a permanent effect for the 3,100 foot reach or the equivalent loss of 2.5 acres of potential lamprey habitat.

5.7.4.3 Indirect Effects

Operation of the City water diversions results in altered streamflows in stream sections potentially supporting lamprey including Newell Creek and the San Lorenzo River downstream of Felton.

Standard facility operations for Newell Creek include a year round minimum release requirement of 1 cfs below Newell Dam (see Appendix A: Facility Operations – Water Diversion Bypasses). During the fully appropriated season, there is a requirement that the greater of 1 cfs or the natural flow of Newell Creek must be released. Hydrologic modeling indicates that the operation of the reservoir results in a slight reduction in median flows through the anadromous reach (compared to reservoir inflows) during the early part of the anadromous salmonid rearing period in wet, normal and dry years, and in an augmentation of median flows during the latter part of the rearing period due to the 1 cfs minimum release (ENTRIX 2004b Appendix A, Physical Resources Report Table A-21).

The Felton Diversion operates according to two Memoranda of Agreement (MOA) signed with the California Department of Fish and Game (Agreement Between City of Santa Cruz and State of California Department of Fish and Game for Streamflow Maintenance and Operation of Fishway at Felton Diversion Project on San Lorenzo River for the Protection and Preservation of the Fish and Wildlife Resources, 1971 (CDFG 1971); and, Memorandum of Agreement between California Department of Fish and Game and the City of Santa Cruz Regarding Operation of the Felton Water Diversion, 1998 (Hunter 1998). These agreements set the maximum rate of withdrawal for October 1 to May 31 as 20 cfs with a minimum bypass flow of 25 cfs for October and 20 cfs for the period November 1 through May 31. In September, the diversion rate is 3500 gpm with a 10 cfs bypass requirement – though diversion in September is often not possible or necessary. Additionally, the City's Anadromous Salmonid Habitat Conservation Plan requires a

minimum 40 cfs bypass flow at the Felton Diversion. The Felton Diversion does not operate in the summer months of June through August.

Reduced flows during winter occur in Newell Creek in years when Loch Lomond Reservoir does not spill or when reservoir filling delays winter storm flows. This may affect the ability of lamprey to migrate in Newell Creek and may influence the quality of spawning habitat at times when the reservoir is not spilling. Migration passage may be inhibited by project-related low flows, though, due to their unique ability to use their rasping mouths to effectively climb barriers, Pacific lamprey are potentially able to pass difficult stream reaches that may be inaccessible to salmonids. Movement and migration rates of sea lamprey (*Petromyzon marinus*), a related species, has been shown to be influenced by flow changes (Almeida et al. 2002), however, sufficient detailed information for prediction of behavior of Pacific lamprey in Newell Creek is lacking in the scientific literature. Flows are less altered in the summer when the 1 cfs minimum streamflow is required in Newell Creek and there are no diversions at Felton (June through August). Larval lamprey (ammocoetes) occupy benthic habitat composed of fine sediments, generally in quieter water. The effect of flow on the larval stage of this species is likely to be less than on juvenile salmonids which feed in a current.

Operation of Newell Reservoir has the potential to indirectly affect lamprey habitat related to treatment of the reservoir with algaecide containing copper, flow releases from testing of the outlet valves, and removal of large woody debris. These activities are expected to have minimal impact on lamprey. Monitoring of copper levels below the reservoir has shown that copper levels are in compliance with applicable limits of the State Water Resources Control Board Basin Plan. Reservoir releases are further diluted in the San Lorenzo River and by additional downstream tributaries including the Zayante Creek and Branciforte Creek watersheds. Testing of the outlet valves involves release of up to 100,000 gallons (about 0.3 acre-feet) of water during several hours, usually in late summer. The rate of discharge is approximately 5-10 cfs during the testing period. This change in flow during the rearing period is not expected to result in movement of sediments or disturbance to burrows in the areas potentially occupied by lamprey ammocoetes. Removal of large woody debris from the reservoir results in some diminishment in recruitment to downstream areas. Lamprey ammocoetes occupy burrows in the substrate and would not be expected to be influenced by the presence or lack of large woody debris. Lamprey adults are also not known to be particularly dependent on large woody debris as a component of migration or spawning habitat.

Operation of Loch Lomond reservoir also interrupts sediment transport from the Upper Newell Creek watershed to the stream reach downstream of the dam by trapping sediments upstream of the dam and by altering the "sediment hydrograph" (flow-dependent sediment transport). Retention of fine sediments behind the dam has the potential to reduce burrowing habitat for lamprey ammocoetes. On the other hand, reduction in the magnitude or frequency of high flows in years when the reservoir does not spill may alter sediment transport dynamics and result in the accumulation of fine sediments downstream of the dam. Retention of larger particle sizes such as gravel and cobble may reduce the amount and quality of lamprey spawning habitat.

Instream substrate downstream of Newell Creek Reservoir has been reported to have lower sedimentation rates and subsequent embeddedness than many other stream reaches in the San

Lorenzo Basin, possibly due to retention of fine sediments in the reservoir (Swanson 2001-Zayante Area Sediment Source Study - Final Figure 5.2, Final - Appendix p. 11).

Sediment management at the Laguna Creek and Majors Creek diversions would not influence Pacific lamprey since lamprey are not known to occupy these streams.

Pipeline O&M activities include conveyance pipeline system inspections and repairs, finished water pipeline system flushing and repairs, pumping well return to the San Lorenzo River, and North Coast valve blow-off to the San Lorenzo River (Chapter 3, *Covered Activities*). These activities have minimal potential to affect Pacific lamprey. Conveyance pipeline corridors and most of the distribution network are located either on the North Coast where lamprey do not occur or in the City urban center, downstream of most of the lamprey habitat in the San Lorenzo River system. Discharges from pipeline leaks near the San Lorenzo mainstem or Newell Creek may cause erosion and turbid runoff to surface waters when located adjacent to waterways. This would not likely have much influence on lamprey ammocoetes, which burrow in the sediments. Potential effects on spawning habitat are largely minimized and avoided by sediment control BMPs and SOPs for pipeline repair and maintenance.

Finished water pipeline system flushing and repairs are also managed by Standard Operating Procedures (SOPs 7102-01 and 7102-02) to ensure dechlorination and flushing procedures to minimize effects to aquatic habitat as well as follow up water quality testing for turbidity and chlorine residual. Most of the finished water pipeline system is located downstream of lamprey habitat in the San Lorenzo River. Pumping well return to the San Lorenzo River and North Coast valve blow-off to the San Lorenzo River are managed to avoid erosion and turbid runoff. No lamprey spawning habitat is located downstream of the area of these releases and any lamprey rearing habitat is not expected to be impacted by sediments or turbidity. The City leachate line from the City landfill to the treatment plant runs along the Highway 1 corridor and does not directly traverse, and is not upstream of any habitat supporting lamprey.

Flood control maintenance involves debris/obstruction removal, sediment management/removal, and vegetation management. Debris removal is generally focused at bridges, road culverts, diversions, pipelines, and other structures where property or safety is threatened. Debris removal has little to no potential to affect lamprey or lamprey habitat since the activity occurs primarily downstream of lamprey habitat and lamprey are not particularly dependent on this material as a component of habitat.

Riparian shrubs and trees are removed from the San Lorenzo Flood Control Channel and Branciforte Creek Flood Control Channel per maintenance requirements of the Corps. This activity may occur in conjunction with sediment removal. Removal of riparian vegetation per se is unlikely to affect lamprey that may either migrate through the area as adults or rear as ammocoetes.

5.7.4.4 Conclusion

Pacific lamprey are most likely to be directly influenced by sediment removal in the San Lorenzo River and Branciforte Creek flood control channels. Indirect effects may be related to operation

of Loch Lomond and diversion of stream flows. Although lamprey ammocoetes in the flood control channels may be injured or killed during sediment removal activities the numbers are expected to be small due to the relatively small area of the effect and small numbers of lamprey ammocoetes likely to use the area. Lamprey rearing in the flood control channels likely represents a minor component of the population in the San Lorenzo River system.

Reduced flows in Newell Creek during the winter in years when Loch Lomond reservoir does not spill may impair the ability of adult lamprey to migrate into Newell Creek and spawn, though, due to their unique ability to use their rasping mouths to effectively climb barriers, Pacific lamprey are potentially able to pass difficult stream reaches that may be inaccessible to salmonids. Reduced flows during winter are not expected to affect lamprey ammocoetes. Summer flows are maintained by a 1 cfs minimum release from Loch Lomond. Lamprey ammocoetes generally inhabit quiescent habitats and are not expected to be significantly affected by flow alterations in the range experienced under operation of the reservoir and diversion.

The effects of sediment retention in the reservoir and alteration of sediment transport downstream of the reservoir may have an effect on habitat for rearing ammocoetes and spawning adults, particularly closer to the dam. The magnitude of these effects is expected to be relatively small based on existing habitat conditions.

5.7.5 California Red-Legged Frog (*Rana draytonii*)

5.7.5.1 Introduction

CRLF occur only within the North Coast Unit of the Plan Area. The primary effects on the CRLF in the past have been due to relocating individuals for emergency repairs. A review of the last five years of repairs to the existing pipeline found that 0.14 to 0.23 acre of impact per year occurs within riparian habitat. The need for emergency repairs will decline over time with implementation of the new North Coast Pipeline. CRLF do occur and breed at the ponds on the Dimeo Lane Landfill; however, sediment removal from these ponds has only occurred twice over the past decade, and the frequency at most is expected to be once every three years.

5.7.5.2 Direct Effects

Emergency repairs to pipelines within creeks and riparian habitats in the North Coast Unit and sediment removal from diversion dams and the ponds at the Dimeo Lane Landfill may cause injury or mortality to CRLF adults or juveniles from vehicles entering those areas and heavy equipment used for the work. CRLF are known to breed at the Dimeo Lane Landfill ponds, and dewatering, sediment and vegetation removal have the potential to cause injury or mortality to CRLF eggs and tadpoles.

Capturing and relocating CRLF prior to emergency repairs and sediment removal has the potential to directly affect eggs, tadpoles, juveniles, and adults if they are handled improperly. Use of a trained biologist to implement relocation (SSM-12 and SSM-14) will minimize this potential effect.

Based on experience with similar projects in this vicinity in the past and the footprint of the proposed work, no more than 100 adult and juvenile CRLF will be directly affected by these activities annually. No more than 30 CRLF egg masses and 100 tadpoles will be directly affected by activities at the Dimeo Lane Landfill over the term of the permit.

It is unlikely that mowing along the North Coast Unit will affect CRLF adults and juveniles, as this species makes movements across open habitats at night, whereas mowing is conducted during the day when the species is unlikely to be present.

5.7.5.3 Indirect Effects

Vegetation removal in riparian habitats occurs only as access is needed to repair facilities. The infrequency and small area of riparian vegetation trimming (currently 0.14 to 0.23 acre annually) may cause minor indirect effects to CRLF. Implementation of revegetation (GM-8) will minimize this potential effect. Indirect effects to CRLF adults and juveniles may include potential for increased exposure to predation of relocated individuals. Selection of a suitable relocation site by trained biologists (SSM-12) will minimize this potential effect. Sediment removal at the Dimeo Lane Landfill ponds may also remove vegetation that provides attachment substrate for CRLF egg masses, thus temporarily reducing suitable egg deposition habitat. Vegetation removal in these ponds may also temporarily affect cover habitat for CRLF tadpoles. Limiting the work area to the minimum necessary (GM-5) will minimize this potential effect.

O&M activities at the Loch Lomond Reservoir may include the use of algaecides in the dry season, as described in Section 3.2.2. Application of algaecide in the reservoir is not expected to result in harm or harassment to CRLF. CRLF do not currently occur at the reservoir and known breeding populations of the species occur more than 8 miles away. In addition, reservoir operations, human recreation, and existing populations of several non-native predators (e.g., bass, bullfrog, and crayfish) make it unlikely that a breeding population of CRLF would become established in the reservoir. It is possible, however, that individual CRLF could appear in the vicinity of the reservoir. As such, only adult stages of CRLF are likely to be potentially exposed to algaecide, and only when in the aquatic environment. It is possible, but unlikely, that adult CRLF could be harmed or harassed through the use of algaecides at the reservoir. Application and monitoring of algaecides by the City is conducted in compliance with applicable limits of the State Water Resources Control Board Basin Plan and the City's SWRCB NPDES permit for aquatic algaecide application. These permits establish application levels that have been determined through section 7 consultation that the Service conducted for the EPA approval of State Water Quality Standards to not be likely to jeopardize the continued existence of the CRLF (*See* Biological Opinion 1-1-98-F-21, McGinnis and Spear 2000).

5.7.5.4 Conclusion

The effects to CRLF by O&M within the North Coast Unit are expected to decline over time once the facilities are upgraded. The new facilities will require less maintenance than the existing aging facilities, and the overall area of pipeline ROW with riparian habitat will be

reduced from the current 7 acres to 6.2 acres. Annual effects until the new facilities have been fully implemented are minimal on the overall north coast population of CRLF. Currently 0.14 to 0.23 acre of riparian habitat is disturbed annually for necessary repairs, and as the new facilities are built, this amount will gradually be reduced. Implementation of minimal bypass flows at the diversions as provided under the Plan is expected to benefit the CRLF that occur downstream (e.g., the lagoons).

5.7.6 Western Pond Turtle (*Actinemys marmorata*)

5.7.6.1 Introduction

WPT are not known to occur at any of the City's diversion dams or at the Dimeo Lane Landfill ponds, thus no effects to WPT are expected to occur as a result of the O&M of those facilities. WPT may occasionally be encountered during repair of the North Coast Unit pipeline, and measures are included to avoid and minimize any construction related impacts, including SSM-21 and SSM-23.

A small population of WPT exists at the City's Neary Lagoon facility and measures described in Section 4.3.3.7 will be implemented to avoid and minimize direct effects to those individuals during routine maintenance (tule removal as described in Section 3.5.4. Loch Lomond Reservoir also supports a small population of WPT, and the City will implement the measures in Section 4.3.3.7 to reduce effects to individuals during operations, and is planning new measures to improve habitat conditions to benefit juvenile survival.

5.7.6.2 Direct Effects

Although the chance of encountering a WPT during emergency repairs along the North Coast Unit is small, a few individuals may be injured or killed by equipment during repairs. Relocation of individuals during repair work has the potential to affect them if they are handled improperly. No more than 10 WPT may be directly affected by repairs annually. Implementation of SSM-21 and SSM-23 for preconstruction surveys, monitoring and relocation will minimize these potential effects.

The effect on WPT of copper containing algaecide use at the Loch Lomond Reservoir was analyzed by Blankenship and Associates (2010). The authors found that application rates of up to 0.47 mg/L have no effect on WPT. The usual application rate the City uses is 0.2 mg/L; therefore, the use of copper containing algaecide is not expected to affect WPT.

The biannual vegetation removal at Neary Lagoon has the potential to injure or kill WPT from the blades of the machines that are used. Trapping and transporting WPT prior to vegetation removal has the potential to injure or kill adults if they are handled improperly. Currently there are only three adult WPT at Neary Lagoon. Use of a trained biologist for trapping and relocation (SSM-21) will minimize this potential effect.

Weed removal on the dam at Loch Lomond Reservoir is conducted by weed whippers or goat grazing, neither of which are expected to affect WPT.

WPT are known to occasionally nest in the dirt access roads at Loch Lomond Reservoir. Use of heavy equipment for road maintenance has the potential to injure or kill WPT eggs or hatchlings. Because road maintenance is conducted during the daytime, and WPT adults nest at night, road maintenance is not expected to affect adult WPT. No more than five WPT eggs or hatchlings may be affected annually by road maintenance. Implementation of SSM-21 and SSM-23 will minimize this potential effect.

5.7.6.3 Indirect Effects

The temporary relocation of WPT during vegetation removal at Neary Lagoon has the potential to cause indirect effects to the individuals by stress and disruption of normal breeding behavior. Use of a veterinary clinic with experience in handling WPT will minimize this potential effect.

The annual drawdown of the Loch Lomond Reservoir reduces the shallow shoreline cover habitat necessary for protection of juveniles from predators (e.g., bass, raccoons, etc.).

5.7.6.4 Conclusion

As noted above, the upgrading of the North Coast Pipeline and diversions will decrease the need for emergency repairs over time, and thus the potential effects that repairs may have on WPT. The area of pipeline ROW within riparian habitat will be reduced from 7 acres to 6.2 acres when the new pipeline is completed, and the new facilities will require less maintenance and repairs than the aging facilities. The implementation of minimal bypass flows at the diversions as provided under the Plan is expected to benefit the WPT that occur downstream (e.g., the lagoons). The infrequency of repairs and small area involved (currently 0.14 to 0.23 acre annually) is not expected to affect the overall WPT population in the North Coast Unit. Recent studies of the Loch Lomond Reservoir population have recommended measures to improve survival of juveniles, and the City will implement those measures as described in Section 4.3.3.7.

5.8 Impacts to Critical Habitat

5.8.1 Ben Lomond Spineflower (*Chorizanthe pungens* var. *hartwegiana*)

Critical habitat has not been designated for the BLS, thus none will be affected by the Covered Activities.

5.8.2 Robust Spineflower (*Chorizanthe robusta* var. *robusta*)

Critical Habitat occurs in the Plan Area (City Urban Center Unit), however Critical Habitat does not occur in proximity to City facilities. As a result, Critical Habitat will not be affected by the Covered Activities.

5.8.3 Santa Cruz Tarplant (*Holocarpha macradenia*)

The Service designated 2,902 acres of critical habitat for the Santa Cruz tarplant on October 16, 2002 (USFWS 2002a). Included in the designation was 65-acres at Arana Gulch (Unit D), 5 acres at DeLaveaga (Unit C), and 30 acres at Graham Hill (Unit B). These units total 100 acres of Santa Cruz tarplant critical habitat within the City Urban Center Unit of the Plan Area; however, only Arana Gulch (Unit D) is City-owned property. The 5-acre DeLaveaga area (Unit C) is on land owned by the California Army National Guard yet is immediately adjacent to the City's DeLaveaga Golf Course. The 30-acre Graham Hill area (Unit B) is privately owned; however, a City water pipeline is located within this area. Mowing would be the predominate activity occurring within critical habitat, and it is generally thought to be beneficial for this species' habitat. The final critical habitat designation states that the ability to maintain disturbance factors such as mowing maintains the openness of vegetation that the species requires for successful germination and is critical to the long-term persistence of the species (USFWS 2002a). Available information also suggests that habitat manipulation such as burning, mowing, grazing, and scraping can increase standing numbers of plants and may be necessary to enhance and maintain populations of Santa Cruz tarplant (USFWS 2002a). In addition to mowing, the only other Covered Activities occurring in critical habitat would be necessary repairs to City water supply infrastructure within the Graham Hill area (Unit B). Critical Habitat will be flagged and avoided to the extent practicable. Such repairs could potentially still cause temporary impacts to critical habitat. These impacts would be temporary in nature and would be lessened through avoidance and minimization measures required by the Plan.

Covered Activities have the potential to temporarily impact up to two acres of the total of 2,902 acres of critical habitat designated for Santa Cruz tarplant. This impact would represent less than 1% of the total critical habitat for the species. The small amount of temporary impact to critical habitat that could result from implementation of the Covered Activities will not appreciably reduce the value of the critical habitat to the recovery of the Santa Cruz tarplant.

5.8.4 San Francisco Popcornflower (*Plagiobothrys diffusus*)

Critical habitat has not been designated for the San Francisco popcornflower. As a result, Critical Habitat will not be affected by the Covered Activities.

5.8.5 Ohlone Tiger Beetle (*Cicindela ohlone*)

Critical habitat has not been designated for the OTB, thus none will be affected by the Covered Activities.

5.8.6 Mount Hermon June Beetle (*Polyphylla barbata*)

Critical habitat has not been designated for the MHJB, thus none will be affected by the Covered Activities.

5.8.7 Tidewater Goby (*Eucyclogobius newberryi*)

Critical habitat for tidewater goby occurs in lagoons in the HCP plan area in Laguna Creek lagoon, Baldwin Creek lagoon, Moore Creek lagoon, and Corcoran lagoon. Construction of the North Coast Pipeline could result in temporary minor degradation of tidewater goby habitat due to discharge of sediment or contaminants to streams tributary to lagoons where tidewater goby may occur. Construction practices and BMPs to minimize and avoid sediment discharge to water courses, and contain sediment and spills are expected to result in no indirect effects of pipeline construction on tidewater goby Critical Habitat.

City diversions may result in minor alteration of tidewater goby Critical Habitat in Laguna Creek lagoon. The diversion may have a positive effect, resulting in earlier closure of the lagoons with conversion to a more stable habitat condition for goby and lower potential for summer breaching. The diversion may also result in lowering lagoon stage and dewatering valuable habitat in backwater areas such as the overwash pond at Laguna Creek, particularly in dry years. This potential effect can be minimized by diversion bypasses in SSM-52 at the Laguna/Reggiardo diversions.

5.8.8 Pacific Lamprey (*Entosphenus tridentata*)

The Pacific lamprey is not currently listed as threatened or endangered under the Endangered Species Act and Critical Habitat has not been designated for the species. As a result, Covered Activities will not affect Critical Habitat.

5.8.9 California Red-Legged Frog (*Rana draytonii*)

The North Coast Unit of the City's water system is located within unit SCZ-1 of designated Critical Habitat for the CRLF (USFWS 2010b). Implementation of the North Coast Pipeline project is expected to result in the temporary disturbance of 5.7 acres (all of which is Critical Habitat), but will have long-term beneficial effects to CRLF by reducing the need for emergency repairs and for sediment removal at diversion dams. In addition, some portions of the pipeline will be moved outside of riparian areas, reducing the acreage of ROW from 7 acres to 6.2 acres. O&M activities are expected to result in the permanent loss of 0.50 acres and temporary

disturbance to 8.4 acres, all of which is Critical Habitat. Maintaining minimum stream flows year round and over time reducing the amount of water diverted will likely also benefit CRLF foraging habitat within the pipeline area as well as breeding habitat downstream (e.g., in lagoons). With these beneficial effects, the project is not expected to adversely modify Critical Habitat for CRLF.

5.8.10 Western Pond Turtle (*Actinemys marmorata*)

The WPT is not currently listed as threatened or endangered under the Endangered Species Act and Critical Habitat has not been designated for the species. As a result, Covered Activities will not affect Critical Habitat.

5.9 Conclusion

Based on the implementation of the GM and the SSM during the completion of Covered Activities under the Plan, effects to Covered Species will be minimal and will be mitigated to the maximum extent practicable.

Table 1: Impacts to Covered Wildlife Species Summary[10]

Covered Species	Potential Construction Impacts Prior to AMMs (acres)		Potential O&M Impacts Prior to AMM (acres)		Mitigation for Permanent Impacts
	Temporary	Permanent	Temporary	Permanent	
Ohlone tiger beetle	1.34	0.0	0.21	0.0	Relocate OTB to the Moore Creek Preserve and prepare and fund supplemental management plan for portions of Moore Creek Preserve.
Mt. Hermon June beetle	0.0	0.0	0.42	0.0	Deduct mitigation credits from Bonny Doon Mitigation Site as necessary.[11]
Tidewater goby	0.0	0.0	0.14	0.0	Provide minimum bypass of at least 2.0 cfs downstream of the Laguna/Reggiardo diversion in all years. Provide at least 8.0 cfs downstream of the Tait Street diversion at all times.[12]
Pacific lamprey	0.0	0.0	0.80	0.0	Provide at least 8.0 cfs downstream of the Tait Street diversion at all times.[13]
California red-legged frog[14]	5.70	0.0	8.40	0.50	Fund habitat restoration by providing $5,000[15] to Santa Cruz County Resource Conservation District In-Lieu Fee

[10] This table reflects the impacts to covered wildlife species only. The impacts to covered plant species are addressed in narrative form.

[11] The City has established a mitigation site for MHJB on City-owned habitat in Bonny Doon. The City has used 5.7 acres of the 17 acres to offset impacts to MHJB resulting from activities at the Graham Hill Water Treatment Plant and has 11.3 acres remaining for future impacts to MHJB.

[12] These are the base commitments provided by the HCP for this species. Additional flow requirements are being developed for anadromous species in the City of Santa Cruz Anadromous Salmonid HCP.

[13] Again, these are the base commitments provided by the HCP for this species. Additional flow requirements are being developed for anadromous species in the City of Santa Cruz Anadromous Salmonid HCP.

[14] In addition to the impact acreages listed above for CRLF, the Plan anticipates that relocation to minimize harm could affect up to 150 adults/juveniles, 30 egg masses and 100 tadpoles over the term of the permit. The mitigation includes the restoration of 0.5 ac of habitat through the Santa Cruz County Resource Conservation District In-Lieu Fee Program or State Parks that is intended to fully offset these potential impacts and effects associated with impacts to scattered CRLF habitat. Any additional off-site CRLF mitigation options that the City pursues will be coordinated with and approved by the Service. See Section 4.3.3.6.

[15] The $5,000 figure is an estimate of current costs for the mitigation, but this amount could change once the fee schedule is determined for the In-Lieu Fee Program. The City agrees to fund the required mitigation at the final rate when it is determined by the RCD at a future time.

					Program or State Parks for CRLF habitat restoration (concurrent with mitigation for WPT).
Western pond turtle[16]	5.70	0.0	8.90	0.50	If mitigation takes the form of habitat restoration for CRLF, that habitat restoration will also serve as mitigation for WPT).

[16] In addition to the impact acreages listed above for WPT, the Plan anticipates impacts to 33 adults/juveniles and 5 eggs/hatchlings as a result of harm/harassment from relocation. The mitigation includes the restoration of 0.5 ac through the Santa Cruz County Resource Conservation District In-Lieu Fee Program or State Parks that is intended to fully offset these potential impacts and effects associated with impacts to scattered WPT habitat.

6.0 PLAN IMPLEMENTATION, COSTS, AND FUNDING

6.1 Introduction

This chapter identifies the issues that are related to Plan implementation and the approaches that will be used to address those issues over the term of the Plan. The chapter describes requirements for short-term and long-range planning, annual workplans and budgets, monitoring, and compliance reporting. The chapter further describes the regulatory assurances under the ESA that are expected to be provided to the City. It also describes the commitment of the City to respond to foreseeable changes in circumstances that may adversely affect listed species and habitats, and identifies a process by which changes that are not foreseeable can be addressed. The chapter identifies the circumstances under which regulatory authorizations may be suspended or revoked. The Plan is intended to be incorporated into the incidental take permit issued by the Service. The City acknowledges that the Plan was drafted by the City. Characterizations, analyses and representations in the Plan, and in particular, characterizations, analyses and representations of federal laws, regulations, and policies, represent the views of the City and will not control the administration of the Permit by the Service in accordance with federal laws, regulations, and policies. Further, in the event of any inconsistency between the Plan and the Permit, the Permit controls.

6.2 Role of the Permittee

6.2.1 City of Santa Cruz Water Department

The City of Santa Cruz Water Department will provide for coordinated and effective implementation of the Plan on behalf of the City. The Water Department will have the following obligations:

Financial Planning and Management
Financial planning and management of revenues and expenditures for habitat protection and biological and compliance monitoring.

Report Preparation
Reporting on Plan implementation, including annual accounting of activities.

Database Maintenance
Maintenance and updates of the regional geographic information system (GIS) database on habitat, species, and other relevant information.

Implementation and Coordination
HCP program implementation and coordination, including coordination between the City and the Service.

Support Personnel and Facilities
General administrative support for the above activities, including support personnel, accounting, facilities, and equipment.

6.3 Monitoring and Reporting

6.3.1 Compliance and Progress Reporting

The City will prepare, a report annually by March 1of each year to demonstrate compliance with the Plan and to facilitate interagency coordination and public outreach. Under the ESA, habitat conservation plans are required to establish monitoring programs to assess the effects of Plan implementation on Covered Species.[17] The report will include:

- The amount of take of each Covered Species during the prior calendar year and the take avoidance, minimization measures and mitigation implemented during the past calendar year.
- Covered Activities anticipated to occur during the calendar year and take avoidance, minimization and mitigation to be implemented during the calendar year.
- Documentation of assured funding to carry out all required Plan measures anticipated to occur during the calendar year.

Throughout the course of Plan implementation, the City will also prepare and submit to the Service a five-year workplan and budget. The work plan will describe the City's one-time and recurring activities, including all take avoidance, minimization and mitigation measures that are expected to be implemented during the upcoming period. The work plan will document the mitigation provided for impacts and demonstrate how mitigation for future impacts will occur in advance of such impacts. The workplan will describe schedules and costs related to the implementation of actions over five-year timeframes and set out projected expenditures and the funding the City has committed for those expenditures.

6.3.2 Additional Reports.

The City will provide, within thirty (30) days of being requested by the Service, any additional information in its possession or control related to implementation of the Plan requested by the Service for the purpose of assessing whether the terms and conditions of the Permit, including the Plan, are being fully implemented.

6.3.3 Certification of Reports

[17] 50 C.F.R. § 17.22(b)(3) and 50 C.F.R. § 222.307(b)(5).

All reports will include the following certification from a responsible official of the City who supervised or directed preparation of the report:

I certify under penalty of law, to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of this report, the information submitted is true, accurate, and complete

6.4 Regulatory Assurances, Changed Circumstances and Unforeseen Circumstances

6.4.1 Regulatory Assurances under the ESA – the No Surprises Rule

ESA regulations provide for regulatory and economic assurances to parties covered by approved HCPs concerning their financial obligations under a plan. Specifically, these assurances are intended to provide a degree of certainty regarding the overall costs associated with species mitigation and other conservation measures, and add durability and reliability to agreements reached between permittees and the Service. Upon issuance of the Permit, the City will receive regulatory assurances pursuant to the No Surprises Rule at 50 CFR sections 17.22(b)(5) and 17.32(b)(5). Pursuant to the No Surprises Rule, as long as the City has fully complied with its obligations under the Plan, and the Permit with regard to the Covered Species and Covered Activities, the Service may require the City to provide additional conservation and mitigation measures to respond to Unforeseen Circumstances only in accordance with and as limited by the No Surprises rule. The rule generally prohibits the Service from requiring the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available for development or use under the original terms of the Plan and Permit without the consent of the City.

6.4.2 Changed Circumstances

Generally, a "changed circumstance" as defined by Service regulations at 50 C.F.R. 17.3 is a change in the circumstances affecting a species or the geographical area covered by a plan that can be reasonably anticipated, which allows a plan to be developed in advance to respond to the change. Changed circumstances typically include reasonably foreseeable events such as fires, flooding, and other natural occurrences like an invasion of pests or non-native plants. Changed circumstances can also include occurrences such as an illegal dumping or accidental spill of toxic materials. Additionally, changed circumstances includes the listing of new species not covered by the Plan and designation of critical habitat for non-covered species within the Plan area. An HCP must identify potential changed circumstances and prescribe the required response to such circumstances. Changed circumstances are addressed in Section 6.4.2.2.

"Unforeseen circumstances," on the other hand, are events that could not be reasonably anticipated during the development of the HCP. Because of the unpredictable nature of "unforeseen" circumstances, response measures to such events are not included in the HCP.

Unforeseen circumstances are addressed in Section 6.4.3. The difference between a "changed" and an "unforeseen" circumstance might depend upon the severity of the event. For example, a small fire that affects only limited acreage could be a "changed circumstance," but a large fire that destroys hundreds or thousands of acres could be considered unforeseen.

6.4.2.1 Changed Circumstances Defined

Changed Circumstances are defined under the Federal "No Surprises" rule as changes in circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for (e.g., the listing of a new species, or a fire or other natural catastrophic event in areas prone to such events).

6.4.2.2 Changed Circumstances Provided for in this HCP

The Changed Circumstances defined by this section of the Plan represent all Changed Circumstances to be addressed by the City. New listings of species not covered by the Plan and the designation of critical habitat for a listed species not covered by the Plan within the Plan area will be treated as Changed Circumstance throughout the Plan Area. The remaining Changed Circumstances provisions reflect changes in circumstances that can reasonably be anticipated to occur at mitigation sites. Other than the listings of species not covered by the Plan or designation of critical habitat for a species not covered by the Plan, these Changed Circumstances provisions are not intended to cover the same or similar circumstances outside of City-established mitigation sites, and the City will only be responsible for the additional Changed Circumstances on the Moore Creek Preserve or other mitigation sites established by the City.

Each of the defined Changed Circumstances includes a description of the Changed Circumstance and a summary of planned responses (measures to be undertaken in the case of Changed Circumstances). Planned responses are the specific responses that will be undertaken in the event of a Changed Circumstance. Planned responses will not include any actions beyond those expressly identified in this section, nor for any event not identified as a Changed Circumstance. Management of mitigation sites will be funded through an endowment. Five percent of the total endowment established for a mitigation site will be allocated to funding remedial responses to changed circumstances at the mitigation site.

The following Changed Circumstances can reasonably be anticipated by the Plan at mitigation sites:

- Fire
- Invasive Species
- Drought
- Climate Change

The following Changed Circumstances can reasonably be anticipated by the Plan throughout the Plan Area:

- New Listings of Species not Covered by the Plan and the designation of critical habitat for Species not Covered by the Plan

Fire

Large, catastrophic fires could adversely impact the Covered Species, but any such impacts would likely be short-term. Such events can reasonably be anticipated and, therefore, are addressed by the Plan as a Changed Circumstance. Fire poses a risk to Covered Species through direct mortality as well as through the loss of habitat from conversion to non-native grasslands. While there may be a long-term benefit to Covered Species from fire events, repetitive fires or high-intensity fire events are likely to prove detrimental to Covered Species.

Planned Response to Fire

In the event fire occurs at a mitigation site, the Service will be notified and provided with relevant information concerning the intensity and extent of the fire. The City will conduct an assessment of the damage, if any, to sensitive Covered Species resources.

A fire in a City-established mitigation site would likely require an intensified monitoring effort in the affected area to ensure that post-fire conditions are fully understood and that appropriate responsive actions, if warranted, could be promptly undertaken. As part of the increased monitoring effort, changes in conditions related to invasive species, and availability of food would be assessed. Depending on the data obtained from post-fire evaluations, a range of responses would be identified, from no required action to the possible use of changed circumstances funding for re-seeding or restoration of affected areas and control of runoff. The City will prepare a report identifying the impacts of the fire and proposed remedial measures to the Service for review and approval.

Invasive Species

Habitat within a mitigation site may be subjected to significant increases in the levels of non-native invasive plant and/or animal species that may affect the quality of the habitat. A significant infestation of a fast growing weedy species could reduce habitat quality if species diversity and richness is compromised as a result. Similarly, invertebrate pests or non-native animal species may invade a mitigation site, impacting food sources, preying directly on Covered Species, degrading habitat quality, or outcompeting the species for resources. As determined by a Service – approved biologist in consultation with the Service, an increase in an invasive plant or animal species that results in a significant decline in baseline habitat quality over 30% of a City-established mitigation site will be considered a Changed Circumstance.

Planned Response to Invasive Species

If annual monitoring detects an increase in invasive species over 20 % compared to the established baseline habitat quality over 30% of a City-established mitigation site, specific measures will be implemented using changed circumstances funding following consultation with and approval of such measures by the Service, including measures to control the invasive species within the context of the City's IPM policies, and intensified monitoring to determine if

control efforts have been successful. Heightened levels of invasive species monitoring would remain in place until two consecutive surveys demonstrated that invasive species had been reduced back to baseline levels. In addition, detection of significant levels of invasive species would trigger a reevaluation of existing preventive measures in order to assess their effectiveness.

Drought

Drought, defined as a "D4"[18] drought extending more than three years, constitutes a Changed Circumstance. Prolonged drought has the potential to affect Covered Species by reducing the quality and availability of food sources within the mitigation sites.

Planned Response to Drought

The Plan provides initially for a passive response to drought. Drought conditions will be considered, and management measures potentially modified to respond to these conditions should it be determined that a response is necessary. Responses to drought may include the use of changed circumstances funding for augmented watering or vegetation planting at mitigation sites.

Climate change

The signs of global climate change continue to mount and include melting glaciers, heat waves, rising seas, flowers blooming earlier, lakes freezing later, and migratory birds delaying their flights south. The World Meteorological Organization stated "[t]he decade 2001–2010 was also the warmest on record. Temperatures over the decade averaged 0.46°C above the 1961–1990 mean, 0.21°C warmer than the previous record decade 1991–2000. In turn, 1991–2000 was warmer than previous decades, consistent with a long-term warming trend." (WMO 2010). The California Energy Commission's Public Interest Energy Research Program reports that climate change will have significant societal impacts including effects on the water supply, flood risk, levee vulnerability, air quality, agriculture, and human health (Bonfils et al. 2007). In addition to societal impacts, California's vulnerability to climate change and its associated changes in temperature and precipitation will affect water resources, the health of citizens, and natural ecosystems (Mastrandrea et al. 2009). While the direct effects of climate change on ecosystems and species within the Plan Area are difficult to quantify at this time, it is clear that climate change has the potential to increase the frequency and severity of the other Changed Circumstances outlined in the Plan (fire, invasive species, and drought). In addition to monitoring the mitigation site for the effects of climate change, climate change will be monitored and addressed as it relates to each of the Changed Circumstances.

Planned Response to Climate Change

Under the Plan, effects of climate change will be considered, and management measures at mitigation sites potentially modified to respond to these conditions should it be determined that a response is necessary. The effects of climate change primarily will be addressed through the closely related remedial responses to fire, invasive species, and drought.

New Listings of Species not Covered by the Plan or Designation of Critical Habitat

[18] As determined by the National Weather Service.
http://droughtmonitor.unl.edu/Home/StateDroughtMonitor.aspx?CA

The future listings of non-Covered Species and designation of or revisions to critical habitat for listed species are reasonably foreseeable during the term of the Permit and are a Changed Circumstance. The new listing of a species by the Service that is not a Covered Species under the Plan and associated take permit or the designation or revision of critical habitat within the Plan Area for a non-Covered Species will be considered Changed Circumstances.

Planned Response to New Species Listing

In the event a non-Covered Species is newly listed or if critical habitat is designated for a non-Covered Species within the Plan Area, the City will coordinate with the Service to identify actions that may cause take, jeopardy or adverse modification of critical habitat and will initiate those responsive measures, if any, identified by the Service as necessary to avoid such take, jeopardy or adverse modification. Those measures will be followed until and unless the City's permit is amended to include coverage for the newly listed species or the Service notifies the City that such measures are no longer required to avoid take, jeopardy, or adverse modification.

The procedures for Plan modifications and amendments are described in Section 6.6 *Permit Duration and Renewal, Plan Amendments, Permit Suspension and Revocation*.

6.4.3 Unforeseen Circumstances

At 50 C.F.R. 17.3, the Service defines unforeseen circumstances as those changes in circumstances that affect a species or geographic area covered by an HCP that could not reasonably have been anticipated by the Plan participants during the development of the conservation Plan, and that result in a substantial and adverse change in the status of a Covered Species.[19] Under ESA regulations at 50 C.F.R. 17.22(b)(5) and 17.32(b)(5), if unforeseen circumstances arise during the life of the Plan, the Service may not require the commitment of additional land or financial compensation, or additional restrictions on the use of land, water, or other natural resources other than those agreed to in the Plan, unless the Permittees consent.

Pursuant to the No Surprises Rule, the Service bears the burden of demonstrating that unforeseen circumstances exist using the best scientific and commercial data available. A finding of unforeseen circumstances must be clearly documented, based upon the best available scientific and commercial information and made considering certain specific factors.[20] The Service may require additional measures of permittee where the HCP is being properly implemented but only if) such measures are limited to modifications within the HCP's conserved habitat areas, if any or to the Plan's operating conservation program for the affected species and maintain the original terms of the plan to the maximum extent possible. Additional measures may not require the

[19] 50 C.F.R. §17.3; 50 C.F.R. §222.102

[20] These factors include the following: (1) Size of the current range of the affected species; (2) Percentage of range adversely affected by the conservation plan; (3) Percentage of range conserved by the conservation plan; (4) Ecological significance of that portion of the range affected by the conservation plan; (5) Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the conservation plan; and (6) Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild. 50 C.F.R. §17.22(b)(5)(iii)(C); 50 C.F.R. §222.307(g)(3)(iii).

commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources otherwise available for development or use under the original terms of the Plan and Permit without the consent of the City. If such a finding is made and additional measures are required, the City will work with the Service to appropriately redirect resources to address the unforeseen circumstances. The Service may revoke the incidental take permit as a last resort in the unexpected and unlikely situation in which continuation of the permitted activities would likely jeopardize the continued existence of the species covered by the permit and the Service is not able to remedy the situation through other means in a timely fashion.

6.4.4 Future Section 7 Consultations

Unless otherwise required by law or regulation, in any consultation on any Covered Activity with respect to a Covered Species involving the City under section 7 of the ESA and regulations issued thereunder, the Service shall ensure that the biological opinion issued in connection with the proposed action is consistent with the biological opinion issued for issuance of the section 10 permit for the Plan, provided that the Covered Activity as proposed in the consultation is consistent, and will be implemented in accordance with the Plan and the permit. Any reasonable and prudent measures and terms and conditions in the biological opinion on the proposed action shall, to the maximum extent appropriate, be consistent with and not be in excess of those measures required of the City under the Plan and the permit.

6.5 Permit Duration and Renewal, Plan Amendments, Permit Suspension and Revocation

6.5.1 Permit Duration

The City is seeking take authorization from the Service with a term of 30 years. The term of the take authorization issued under the Plan would begin from the date of their issuance. A permit term of 30 years provides a practicable timeframe in which to carry out the activities that will be authorized under the Plan.

6.5.2 Administrative Actions that do not Require Modification or Amendment

The administration and implementation of the Plan will require frequent and ongoing interpretation of the provisions of the Plan. Actions taken on the basis of these interpretations that do not substantively change the purpose of the Plan or the City's substantive commitments under the Plan will not require modification or amendment of the Plan or its associated permit. Such actions related to the ordinary administration and implementation of the Plan may include, but are not limited to, the following:

- Clerical corrections to typographical, grammatical, and similar editing errors that do not change the intended meaning or to maps or other exhibits to address insignificant errors;
- Adjustments to monitoring protocols to incorporate new protocols approved by the Service

6.5.3 Minor Modifications to the Plan

As part of the process of Plan implementation, the City may need to make minor changes ("Minor Modifications") to the Plan from time to time to respond appropriately to new information, scientific understanding, technological advances, and other such circumstances. Minor Modifications may not involve changes that would negatively affect a Covered Species, the level or form of take, result in effects on the environment that are new or different from those analyzed in the NEPA document on the original permit application, or modify the City's substantive obligations under the Plan.

The City may propose Minor Modifications by providing written notice to the Service. Such notice will include a description of the proposed Minor Modifications, an explanation of the reason for the proposed Minor Modifications, an analysis of its environmental effects including any impacts to Covered Species, and an explanation of why the City believes the effects of the proposed Minor Modifications would not:

- Significantly differ from, and would be biologically equivalent to, the effects described in the Plan, as originally adopted;
- Conflict with the terms and conditions of the Plan, as originally adopted;
- Impair implementation of the Plan Conservation Strategy
- Result in new or different effects on the environment.

The Service will use its reasonable efforts to submit comments on the proposed Minor Modification in writing within 60 days of receipt of notice. If the Service does not concur that the proposed Minor Modification meets the requirements for a Minor Modification or Revision, the proposal must be approved according to the Amendment process. If the County and Service concur that the requirements for a Minor Modification have been met and the modification or revision should be incorporated in the Plan, the Plan will be modified accordingly.

6.5.4 Amendment

Under some circumstances, it may be necessary to amend the Plan. Any proposed changes to the Plan proposed by the City that do not qualify as minor modifications under Section 6.5.3 will constitute an amendment. Amendments require corresponding amendment to the Permit, in accordance with applicable laws and regulations regarding Permit amendments. The City will be responsible for submitting any proposed amendment to the Service.

Amendments to the Plan will likely occur infrequently. Amendments include, but are not limited to, the following:

- Substantive changes to the boundary of the Plan Area;
- Additions of species to the Covered Species list; and
- Changes in Covered Activities that would result in effects on the Covered Species, or an increase in the level of take, beyond that authorized in the permit.

6.5.4 Process for Amendment of the Plan

Amendments to the Plan will require an amendment to the Permit. The Permit may be amended in accordance with all applicable legal requirements, including but not limited to the ESA, NEPA, and the Service's permit regulations. The City shall also provide a statement of the reasons for the amendment and an analysis of its environmental effects, including its effects on operations under the Plan and on Covered Species to the Service.

6.5.5 Suspension of the Permit

The Service may suspend or revoke the permit for cause in accordance with governing regulations which are currently codified at 50 C.F.R. 13.27-29, 17.22(b)(8) and 17.32(b)(8). The Service will provide the City with written notice by certified or registered mail of its proposed suspension of the permit. The Service's correspondence shall include the nature and extent of the violation and of any corrective measures that may be available and appropriate to preserve the proper functioning of the Plan and maintain the take authorization in full force and effect. It will also note the City's right to object to the proposed suspension. The City will have 45 days from the date of the notice of proposed suspension to file written objections, setting forth its response to such notice of suspension and/or to any of the required corrective measures. Such response will set forth any factual or legal basis the County may have for requesting that the Service rescind all or any part of such notice of violation or to delete or modify any of the required corrective measures. A decision on the suspension will be made by the Service within 45 days following the end of the City's objection period.

In the event the Service suspends the permit, the Service will, to the extent reasonably possible, confer with the City concerning how the violation that led to the suspension can be remedied, within 15 days after such suspension. At the conclusion of any such conference, the Service will determine the specific actions necessary, if any such actions are available and appropriate given the nature of the permit violation, to effectively redress the violation. In making this determination the Service will consider the requirements of the ESA or regulations issued thereunder, the conservation needs of the Covered Species, the terms of the permit and any comments or recommendations received during the meet and confer process.

Assuming the Service has determined that there are available and appropriate actions the County may take to address the permit violation, then, upon full performance of such necessary actions, or if the actions cannot be immediately completed, upon receiving adequate assurances from the

City that the City will fully implement the actions, the Service will promptly reinstate the permit. It is the intent of the Service and the City in the event of any suspension of the permit the City will take prompt action to redress the violation that triggered suspension of the permit, and the Service will act expeditiously to reinstate the same.

6.5.6 Revocation of the Permit

The Service may revoke the permit for cause in accordance with 50 C.F.R. 13. 27 – 29, 17.32(b)(8) and 17.32(b)(8). Unless immediate revocation is necessary to avoid the likelihood of jeopardy to a listed species, the Service will not revoke the Permit unless the City fails to fulfill its obligations under the Plan, and only after (1) completing the informal dispute resolution process described in Section 6.5.8, and (2) identifying the actions/inactions that may warrant the revocation and giving the City a reasonable opportunity to implement appropriate responsive actions, if any such actions are available.

6.5.7 Surrender or Revocation of the Permit

The City may withdraw from the permit by surrendering the permit to the Service in accordance with the regulations of the Service in force on the date of such surrender. (These regulations are currently codified at 50 CFR §§ 17.22(b)(7) and 17.32(b)(7) and by their express terms apply in place of 50 CFR § 13.26 to the extent of any conflict). In addition, the Service may revoke the permit for cause. (These regulations are currently codified at 50 CFR §§ 13.28 – 13.29, 17.22(b)(8) and 17.32(b)(8)). Upon surrender or revocation of the permit, no further take is authorized under the Permit. Notwithstanding surrender of the Permit by the City or revocation of the Permit by the Service, the City will remain obligated to fulfill any existing and outstanding minimization and mitigation measures required under the Plan and the permit for any take that occurred prior to surrender or revocation. A surrendered permit shall be deemed cancelled only upon a determination by the Service that such minimization and mitigation measures have been

6.5.8 Dispute Resolution

The City and the Service (Party or collectively Parties) recognize that disputes concerning implementation of the Plan and the Permit may arise from time to time. The Parties agree to work together in good faith and in a timely manner to resolve such disputes

6.6 Costs Associated with Plan Implementation

Costs associated with the implementation of the HCP include costs for Plan implementation and administration, minimization measures, mitigation measures, and monitoring. The costs for these four categories have been broken down in Table 2 below. Ensuring adequate funding to cover these costs is discussed in Section 6.7.

Plan Implementation and Administration

The implementation and administration of the plan will include a variety of tasks by City employees. These tasks include the compilation of data from preconstruction surveys by qualified biologists; coordination of training, surveying, and monitoring personnel; coordination and implementation of mitigation measures; and preparation of annual reports.

Minimization Measures

The conservation strategy of the Plan includes general and species-specific conservation measures that are designed to reduce impacts to Covered Species. The City will incur costs as a result of these measures. Table 2 provides a breakdown of the anticipated costs associated with these measures.

Mitigation Measures

Table 1 provides a summary of the effects on Covered Species and the associated mitigation measures. Table 2 provides the anticipated costs associated these measures.

Monitoring

The Plan calls for the monitoring of the success of restoration activities over the life of the Plan. The Plan also calls for effects monitoring and compliance monitoring. The anticipated costs associated with these tasks are outlined in Table 2.

Table 2: Estimated Costs to Implement the Plan

Category	Item or Activity	One-Time Cost	Periodic Cost	Annual Cost	30-Year Cost (2017 dollars)	30-Year Cost (2047 dollars)
Minimization and Mitigation Measures						
	Preconstruction surveys and tailgate training – CRLF, WPT	$500		$2,500	$75,000	
	Covered species relocation – CRLF, WPT	$5,000		$10,000	$150,000	
	Covered species relocation – OTB	$2,500			$2,500	
	Sediment maintenance, flood control channel maintenance, and relocation for goby and lamprey	$80,000			$80,000	
	Santa Cruz County Resource Conservation District In-Lieu Fee Program or State Parks - CRLF habitat restoration	$5,000			$5,000[21]	
	Purchase of conservation credits	$5,000			$5,000	
	Revegetation and erosion control	$2,000			$2,000	
	Moore Creek Preserve OTB management plan preparation	$12,000			$12,000	
	Removal and control of invasive, non-native plant species along pipelines and other infrastructure areas			$10,000	$300,000	

[21] The $5,000 figure is an estimate of current costs for the mitigation, but this amount could change once the fee schedule is determined for the In-Lieu Fee Program. The City agrees to fund the required mitigation at the final rate when it is determined by the RCD at a future time.

Monitoring						
General						
	Compliance monitoring			$2,000	$60,000	
	Effects monitoring			$2,000	$60,000	
Moore Creek Preserve						
	Restoration Site Start-Up Costs	$20,000			$20,000	
	Restoration/ covered species/invasive species monitoring		$140,000		$420,000[22]	
Reporting						
Annual Report					Included with salary and office expense	
Changed Circumstances						
Response to Fire			$5,000		$10,000	
Response to Invasive Species			$5,000		$10,000	
Response to Drought			$5,000		$10,000	
Response to Climate Change			$5,000		$10,000	
Plan Implementation and Administration						
	Staff salary and office expense			$50,000	$1,500,000	
Total		**$138,000**	**$160,000**	**$54,000**	**$2,726,500**	**$7,652,723.04** [23]

[22] Depends on whether incidental take of OTB can be avoided or not during construction.
[23] Assuming 2017 dollar value total program cost of $2,500,000 and 3.5 percent rate of inflation.

6.7 Funding

6.7.1 Regulatory Context

The ESA requires that a conservation plan approved pursuant to the federal law must assure availability of adequate funding to implement the plan's conservation actions. ESA Section 10 (16 U.S.C. Sec. 1539) states that, prior to approving a habitat conservation plan and issuing an incidental take permit, the Secretary of the Interior must find, among other conditions, that "the applicant will ensure that adequate funding for the plan will be provided." The Service and National Marine Fisheries Service have issued a handbook to assist in the preparation and review of a habitat conservation plan ("HCP Handbook"), which states that the HCP must include "[m]easures the applicant will undertake to monitor, minimize, and mitigate . . . impacts [of incidental take] . . . [and] the funding that will be made available to undertake such measures" (HCP Handbook, Chap. 3, Sec. B.1).

6.7.2 Financial Capacity of the City to Fund the Plan

The City commits to fully fund implementation of the Plan through its Capital Improvement Program budget. Table 2 contains an estimate of implementation costs. The City will fully fund the actual costs of implementing the plan notwithstanding the estimates contained in Table 2. The City may access various sources of funding, but primarily intends to rely on water rate payer fees to cover costs. The City's financial condition continues to be sound, with a stable revenue base and water rates comparable to other water agencies in the region. The City has established a dedicated account for HCP implementation which currently contains $278,088.04 in funding. Additional funding will be provided on multi-year cycles in accordance with work plans. The City's financial condition provides adequate assurance that the City has the financial capability to fund implementation of the conservation measures. In addition, the City will ensure that mitigation for impacts to Covered Species occurs ahead of, or at the same time as the impacts.

On a five-year basis, as described in Section 6.3.1, the City will prepare a work plan and budget for the upcoming implementation period and submit them to the Service for review The work plan will describe the City's one-time and recurring activities, including all take avoidance, minimization and mitigation measures which are expected to be implemented during the upcoming year. The work plan will document the mitigation provided for impacts and demonstrate how mitigation for future impacts will occur in advance of such impacts. The budget will set out projected expenditures and the funding the City has committed for those expenditures. The information in the work plan will contain sufficient information to demonstrate the City's ability to meet its financial obligations under the Plan. In addition to annual reporting and the five-year workplan and budget, in the event of any material change in the City's ability to meet its financial obligations under the Plan, the City will immediately notify the Service. The City understands that the permit would be at risk and federal enforcement measures could be possible if adequate budgets are not approved and measures are not implemented as required under the Plan.

7.0 ALTERNATIVES

7.1 No Action

Under the No Action Alternative, a section 10(a)(1)(B) permit would not be issued. City activities with the potential to cause incidental take of listed species would require measures to avoid incidental take or individual incidental take authorizations on a project-by-project basis, as is currently the case. Incidental take authorizations for activities with the potential to incidentally take listed species would be obtained either through the section 7 consultation process or through the development of individual HCPs.

Under this approach, few of the conservation and economic benefits associated with the Plan would be realized. In the absence of the Plan, take avoidance measures would be focused on listed wildlife species and the conservation objectives for plant species would be less likely to be consistently met as a result of the case-by-case approach to ESA compliance. The Plan, on the other hand, establishes uniform conservation measures to ensure that biological goals and objectives for the Covered Species will be met and that opportunities to ensure the long-term survival of Covered Species are maximized.

Under the No Action alternative, many of the regulatory efficiencies provided by the Plan would not be available to the City. Rather, the City would continue to engage in the time-consuming process of reaching agreement with the Service on the conditions under which activities that may affect listed species may proceed. Through this process, project mitigation requirements may vary from project to project, adding uncertainty and confusion over regulatory obligations. In contrast, the Plan would provide the City with long-term predictability concerning the nature of its operations and activities for which incidental take is permitted, avoiding cumbersome procedures and potential delays that would compromise the operation and maintenance of City facilities.

7.2 Plan Coverage Limited to O&M Activities

The City considered the preparation of an HCP that would limit coverage to operations and maintenance of existing facilities, and would not provide coverage for construction of a North Coast pipeline. Under this alternative, incidental take authorization for construction of the North Coast pipeline would need to be obtained either through the section 7 consultation process or through an additional section 10 HCP permit application.

Although this alternative would provide conservation benefits to species potentially impacted through O&M activities, it would not result in a comprehensive suite of minimization measures to be applied to construction of a new pipeline, nor would it result in pre-determined mitigation for permanent impacts. Because the construction of a North Coast pipeline is reasonably certain to occur during the duration of the Plan and there is sufficient information to cover the activity now, the City rejected an O&M HCP only alternative.

Like the No Action alternative, many of the regulatory efficiencies provided by the Plan would not be available to the City. By combining both construction and O&M related activities under the Plan, the Plan would provide the City with long-term predictability concerning the nature of its operations and activities for which incidental take is permitted, avoiding cumbersome procedures and potential delays with construction approval that could compromise the City's facilities.

7.3 Plan Coverage Limited to Wildlife Species

The City considered an alternative of covering only wildlife species under the HCP. Under this alternative, four plant species being proposed for coverage under the HCP, the federally endangered BLS, the federally endangered Robust spineflower, the federally threatened Santa Cruz tarplant, and the State endangered San Francisco popcornflower, would not be covered. Take of plants is not prohibited under section 9 of the ESA and the City is therefore not required to obtain a permit to impact plant species. Listed plant species may be included on an incidental take permit, however, in recognition of the conservation benefits provided to such species by the HCP. In return for providing for the conservation of plant species under an HCP, the permittee receives regulatory assurances under the No Surprises Rule for the plant species. In addition, covering plant species under an HCP assists the Service in making findings required before issuance of an HCP permit, including that issuance of the permit is not likely to jeopardize any federally listed species, including listed plant species.

Under a wildlife species only alternative, the City would not implement a set of plant conservation measures for all covered activities under the Plan, including flagging, seasonal avoidance, seed collection, soil segregation, and site revegetation. Instead, plant conservation measures would only be instituted on a case-by-case basis in response to requirements imposed by the California Environmental Quality Act or the California Endangered Species Act. Under this alternative, the four plant species would not receive the conservation benefits that would be provided through a comprehensive strategy across the Plan Area. In addition, to the extent future activities would involve separate federal authorizations that would require a Section 7 consultation with the Service, the City would be required to negotiate plant measures on a case-by-case basis, which would lead to project delays and undermine the long-term predictability provided by the HCP.

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Appendix A – Example Inadvertent Drilling Fluid Return Contingency Plan

DRAFT INADVERTENT DRILLING FLUID RETURN CONTINGENCY PLAN

Introduction

The City proposes to replace an existing 22-inch pipeline underneath Lombardi Creek in Santa Cruz County, CA with a new Horizontally Directionally Drilled (HDD) 22-inch pipeline to provide system reliability and reduce maintenance impacts associated with the existing above ground stream crossing. HDD pipeline installation methods minimize environmental impacts normally associated with open trench installation methods. However, with the use of the HDD installation method to traverse waterways, inadvertent returns (IR) of drilling mud could occur and measures of protection must be implemented.

These protection measures primarily focus on prevention of inadvertent returns of drilling mud into sensitive areas. These measures include monitoring the pressure of drilling fluids, maintaining drilled hole diameter and monitoring drilling fluid viscosity and gel strength.

Drilling Process and Equipment

The HDD method will be used to install a 22-inch diameter pipeline beneath Lombardi Creek. The following is an overview of the proposed HDD method.

Drilling Equipment

The essential equipment required for the directional bore operation includes the drill rig, solids control system, mud pump, pipe trailers, bentonite trailers, tool van, water truck, and accessory equipment trailer. The accessory equipment trailer contains the anchor, optional downhole tool, and additional solids control equipment.

The employees required to run the drilling operation typically include the drilling superintendent, surveyor, driller, assistant driller, solids control operator, crane operator, mechanic/welder, and rig hands.

Other Equipment

The site supervisor shall ensure that:

- All equipment and vehicles are checked and maintained daily to prevent leaks of hazardous materials;
- Spill kits and spill containment materials are available on-site at all times and that the equipment is in good working order;
- Equipment required to contain and clean up a frac-out release will either be available at the work site or readily available at an offsite location within 15-minutes of the bore site; and
- If equipment is required to be operated near a riverbed, absorbent pads and plastic sheeting for placement beneath motorized equipment shall be used to protect riverbed from engine fluids.
- Sufficient staffing to implement IR contingency plan;

- Vacuum Truck with sufficient capacity is available for an immediate response;
- Arrangements have been made for additional trucks as needed prior to commencing bores;
- Erosion control and frac-out containment materials such as the following are provided on site at all times;
    - Certified Weed Free Straw or rice straw bales;
    - Stakes to secure bales;
    - Silt fencing is available on site;
    - Sandbags are on site;
    - Leak-free hose(s) and pump(s)
    - Straw logs (wattles, or fiber rolls)
    - Heavy-duty push brooms
    - Turbidity curtains for surface water spill containment
    - Light tower(s) (if necessary, deliver to site as soon as practicable)

Training

- All workers involved in HDD or IR response will be trained on this plan, equipment maintenance, site-specific permit and monitoring requirements prior to initiation of work involving HDD.
- Inspection procedures for release prevention and containment equipment and materials.
- Contractor/crew responsibility to immediately stop work in the event of a frac-out and notify relevant project management and regulatory contacts prior to initiating any further work.
- Contractor/crew responsibility in the event of an accidental release.
- Operation and location of release prevention and control equipment and materials, and
- Protocols for communication with regulatory agency contacts who may be on site responding to a release.

Workspace

Two staging areas are required; the entry site where the drilling rig and auxiliary equipment are positioned, and the exit site-pipeline laydown area.

Drill Rig Setup

After the alignment and entry point are set and the precise location for the drill rig is determined, an anchor is installed to prevent any movement of the drill rig and allow for the several-ton push and pull pressures on the drill pipe.

Once the drill rig is positioned and anchored, the sump pit is excavated. The sump pit is required to hold the drilling fluid and cuttings that have returned to the surface from the borehole. From the sump pit drilling fluid is pumped to the solids control system for processing and recycling. Straw wattles, silt fences, straw bales and related containment materials shall be set up around entry and exit pits.

Drilling Fluid and Drilling Fluid System

Drilling fluids typically used to cool and lubricate the drill motor and reamers consist of a non-toxic mixture of water, bentonite clay, and polymers or other non-toxic additives to improve fluid performance. The drilling fluids further serve to transport rock and soil cuttings away from the drill cutters to reduce friction between the pipe and the bore hole wall and to stabilize the hole. Bentonite is a naturally occurring, non-hazardous clay product.

Drilling fluid is prepared in mixing tanks using both new and recycled drilling fluid. The fluid is pumped through the drill pipe to the cutters. Flow rates, pressure, density, viscosity, gel strength, and lubricity are monitored throughout the drilling and reaming operation to maintain fluid performance and detect drill fluid losses.

Returning fluid flows through the annulus created between the wall of the bore and drill pipe to the sump pit. Once in the sump pit, larger particles are pumped through the shaker screens, desanders, and desilters to progressively remove the different size fractions of cuttings from the drilling fluid. The cleaned and recycled fluid is returned to the mixing tank for reuse in the borehole. All excess drilling mud will be hauled off site with vacuum trucks and taken to an appropriate dump site.

Environmental Concerns

Drilling Fluid Losses and Measures to Control Spills

While directional drilling is an effective and increasingly popular method of pipeline installation for crossing rivers and waterways, it does present some risk of waterway disturbance due to lost circulation or inadvertent returns. The potential for an inadvertent return is greatly reduced by providing adequate depth of cover (as determined by a geotechnical or soils engineer), adequate distance of pits from stream crossing and by selecting an experienced and knowledgeable contractor.

Lost Circulation

Lost circulation refers to the loss of drilling mud into the soil or rock through open fissures, coarse gravel, and highly-jointed or easily fractured formations. Measures that will be taken to control lost circulation include:

- Controlling fluid pressures in the annulus by minimizing viscosity required to satisfy hole cleaning and stabilization requirements.
- Minimizing gel strength.
- Sizing the hole frequently to ensure an adequate clear annulus.
- Controlling “plunger effects” caused by rapid penetration or spoil buildup on bits or pipe.

Inadvertent Returns

“Frac-out”, or inadvertent return of drilling fluid, is a potential concern when an HDD method is used for installing pipelines under sensitive habitats and waterways. An inadvertent return is the abrupt escape of drilling fluid from the pipe annulus to the ground or streambed surface along alternate flow paths through soil and rock. Hydraulic fracturing of rock, open fissures, and insufficient rock cover can all lead to inadvertent returns. Measures that will be taken to reduce chances of inadvertent return during installation include:

- Adequate cover - a minimum depth of 30 feet beneath the streambed surface will be maintained at all points of the alignment.

- Maintaining drilled annulus - cutters and reamers will be pulled back into previously drilled sections after each new joint of pipe is added to remove blockages.

- Monitoring - drilling pressures will be monitored so they do not exceed pressures that may penetrate the formation.

If an inadvertent return occurs on land, standard containment procedures are implemented. The mud pumps are stopped while a shallow pit or sandbags and hay bales are used to contain and collect the returning flow. Once isolated, the fluid can be pumped back to the mud return pits and re-used. After drilling fluid seepage has been contained, the subcontractor will attempt to determine the cause of the seepage.

If inadvertent returns occur through the sediments under the waterway, the seeping mud may produce a visible plume in the water. If not visible in the water, signs of mud loss will be evident through monitoring mud return flow rates and pressures. Corrective measures that will be taken to control the seepage and minimize chances of recurrence include:

- Stopping all work and waiting several hours to see if the fracture occludes.

- Stopping all work and diffusing lost circulation materials such as a "Nut Plur, Flow Check", or shredded paper.

- Stopping all work and pumping cement or grout.

If circulation cannot be restored using sealing materials and adjustments to the fluid properties and drilling practices, the hole will be abandoned (as described below) and redrilled along a deeper alignment.

Protection Measures

Loss of Circulation

Measures that will be taken to control lost circulation include: controlling fluid pressures in the annulus by minimizing viscosity required to satisfy hole cleaning and stabilization requirements, minimizing gel strength, sizing the hole frequently to ensure an adequate clear annulus, and controlling "plunger effects" caused by rapid penetration or spoil buildup on bits or pipe.

Frac Out

Fish and wildlife present in and adjacent to the waterways make these areas environmentally sensitive habitats. Because of the sensitivity of these areas, implementation of the HDD method for crossing these waterways is necessary to reduce the potential for adverse impacts to these species and their habitat.

A Service-approved biological monitor will be on site at all times while drilling under sensitive areas to identify any possible "frac-out" conditions or lowered pressure readings on the drilling equipment. The monitor shall be a biologist experienced with HDD operations and "frac-outs".

If a leak were observed or detected by the pressure readings, all work would stop immediately and remedial actions would be implemented. The monitor will be on site during all aspects of drilling activities within the sensitive areas. Hay bales, sandbags, or silt fencing will be kept on site and used to surround and contain the drilling mud. A mobile vacuum truck will be used to pump the drilling mud from the contained area and recycled to the return pit. The vacuum truck will remain within a temporary workspace and extend a hose to the containment area.

If a "frac-out" is determined to be within the waterway, a spill response team will be called in to contain and clean up excessive amounts of drilling mud within the waterway. Regulatory agency staff will also be notified immediately in the event of a "frac-out". Phone numbers of spill response teams and relevant regulatory agency staff in the area will be on site.

Evacuation Plan

In the event of a "frac-out", the City and the contract drilling engineer will evaluate the feasibility of continuing the boring procedure or implementing the Abandonment Contingency Plan after evaluating the following:

- The exact location of the drilling head assembly will be verified with portable locating equipment. If it is determined that the drilling profile does not match the planned profile, and exceeds design limits, the Abandonment Contingency Plan will be implemented.

- If the location and profile are within design limits, the specific weight of the drilling mud will be verified to ensure a slightly overbalanced condition to the surrounding formation. The specified weight will be adjusted, if necessary.

- If location, profile and drilling mud weight are determined to be within design limits, and seepage of Bentonite slurry is controlled, the contract drilling engineer may proceed.

- Should it be determined that the stability of the bored crossing is in serious question, even if location, profile and drilling mud weight are deemed satisfactory, the Abandonment Contingency Plan will be implemented.

Abandonment Contingency Plan

Abandonment of the bore is a last resort measure that will be followed only when all efforts to restore circulation have failed. Steps that will be taken in the unlikely event that an incomplete bore must be abandoned are the following:

- The as-built hole alignment will be determined to the extent practicable and documented.

- The pilot hole pipe string will be removed.

- A thick, bentonite-cement grout will be pumped through the casing as it is extracted, resulting in complete filling of the bore.

Monitoring, Avoidance and Minimization and Mitigation Measures for Environmental Impacts Related to Frac-Out

Monitoring

Monitoring of frac-out response shall be the responsibility of the site supervisor and include:

- Daily log of all activities including implementation of environmental impact avoidance and minimization and mitigation measures;
- Daily photo monitoring from designated photo points of impacted area;
- Service-authorized biologist relocation and related survey data for affected special-status species.
- Resource agency consultation log.

All monitoring data shall be provided to applicable resource agencies as requested.

Avoidance and Minimization and Mitigation Measures

Frac-out mitigation shall begin immediately or as practicable following IR events subsequent to consultation with applicable resource agencies.

- Qualified wetlands scientists and Service-authorized biologists will be on-site to evaluate conditions, and to assist with minimization of further impacts resulting from cleanup activities (e.g. equipment entering sensitive wetland areas) and evaluation of appropriate mitigation alternatives.

- Frac material will need to be sifted through the fingers (not wood or metal tools) to ensure that no CRLF or other special-status species are present in the frac material. Frac material will be collected and hauled offsite for proper disposal.

- The Service shall be consulted prior to initiating cleanup of downstream estuarine areas where TWG may be affected;

- One path to the cleanup area should be flagged and cleared and should be located such that it will avoid all water on site including tire ruts, pools and puddles, and small marsh areas.

- All personnel will restrict foot travel to that path and all personnel should be escorted by the Service – authorized biological monitor.

- Service-authorized biologist shall remove impacted special-status biota for relocation to adjacent non-impacted habitat;

- Service-authorized biologist shall oversee installation of barriers to prevent non-affected special-status species from entering the project site;

- All pits and berms will be removed and contours will be restored;

- Install coffer dam to isolate any affected stream reaches;
- Erosion/containment materials will be installed as necessary and removed from the site when cleanup is complete;
- Remove drilling muds from wetland/waterbody;
- Restore native vegetation;
- Restore stream banks;
- Restore stream bed substrate;
- Develop and implement additional compensatory mitigation as needed in consultation with applicable resource agencies.

Reporting

Procedures

In the event of a frac-out that reaches a water source, the site supervisor will notify the project manager so they can notify the appropriate resource agencies. All agency notifications will occur within 24 hours and proper documentation will be accomplished in a timely and complete manner. The following information will be provided:

1. Name and telephone number of reporting party;
2. Location of release;
3. Date and time of release;
4. Type and quantity, estimated size of release;
5. How the release occurred;
6. The type of activity that was occurring around the area of the frac-out;
7. Description of any sensitive areas, and their location in relation to the frac-out
8. Description of methods used to clean or otherwise secure the site; and
9. Listing of the current permits obtained for the project.

Contacts[24]

Agency	***Name***	***Position***	***Phone***	***Email***

[24] Project-specific permits should be reviewed for relevant contacts. Those provided here are for illustration purposes only.

City of Santa Cruz	Chris Berry	Watershed Compliance Manager	(831) 420-5483	cberry@cityofsantacruz.com
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ACOE	Greg Brown	Regulatory Project Manager	(415) 503-6791	Gregory.G.Brown@usace.army.mil
RWQCB	Kim Sanders	Environmental Scientist	(831) 542-4771	kim.sanders@waterboards.ca.gov