

**Addendum**  
**Samoa Town Master Plan Biological Resource Study**  
  
**Botanical Survey**  
**And**  
**Invasive Plant Management Plan**

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## Executive Summary

The following addendum to the Samoa Town Master Plan (STMP) Biological Resource Study was prepared to satisfy conditions for approval of the STMP Land Use Overlay Designation of the Humboldt Bay Area Plan. The project applicants incorporated California Coastal Commission (CCC) recommendations into the STMP to fulfill Policy 10 of the Local Coastal Program Amendment. These recommendations include the re-designation of certain degraded habitats within the plan area as Environmentally Sensitive Habitat Areas (ESHA), the establishment of appropriate development setbacks from these habitats, and an updated botanical survey and invasive plant management plan for the project area. The setbacks shown on the tentative map were established based on the CCC review of the site in 2010 and are still appropriate based on the 2013 botanical survey.

Several areas of “degraded dunes” located east of New Navy Base were reclassified as ESHA due to the presence of natural dune processes and the rarity and ease with which they could be further degraded by human activity. The first is the long strip of fenced dunes located within the utility easement between the abandoned log deck and New Navy Base Road. The second area is a continuation of the first, situated between New Navy Base Road, the residential housing, and the coastal coniferous forest at the north end of the plan area. Three other small areas of degraded dunes with similar characteristics, one adjacent to New Navy Base Road, one above the Peninsula Elementary School, and an irregular patch north of Vance Avenue were also reclassified as ESHA. In addition, three small areas of remnant native vegetation previously designated as ESHA were also removed from that designation due to their relative isolation, per CCC recommendation. All upland vegetation communities designated as ESHA are afforded 100-foot development setbacks, except where truncated by existing development.

That portion of the “waste-water treatment facility” previously designated as non-ESHA was reclassified as a natural dune swale feature and state/federal regulatory wetland. This feature and all other wetlands located west of the railroad easement have been designated as ESHA and provided 100-foot development setbacks.

Botanical surveys were undertaken in 2013 within that portion of the plan area subject to redevelopment. No new rare plant occurrences were discovered. Previously documented occurrences of two Special-status plants, beach layia (*Layia carnosa*) and dark-eyed gilia (*Gilia millefoliata*), were relocated within the utility line easement between New Navy Base Road and the former log deck, and within an open sand area next to the forest/scrub habitat at the north end of the plan area. They were found generally in the same locations as they were in 2003/2004 but occupying slightly larger representative areas. Both the beach layia and the dark-eyed gilia occur within areas that have been designated as environmentally sensitive and afforded a 100-foot setback from proposed development. No impacts to these occurrences are anticipated from site development.

Invasive plants targeted for removal within the project area were identified and mapped in 2013. These include certain highly invasive species recognized by the California Invasive Plant Council and/or known to be locally invasive, namely Himalayan blackberry (*Rubus armeniacus*), Ivy (*Hedera helix*), Scotch broom (*Cytisus scoparius*), jubata grass

(*Cortaderia jubata*), iceplant/sea fig (*Carpobrotus* ssp), European beachgrass (*Ammophila arenaria*), and yellow bush lupine (*Lupinus arboreus*).

Key components of the invasive plant management plan include:

- Phased removal of the highly invasive plant species identified within the plan area where development is proposed and within ESHA buffers.
- Provision for the immediate re-vegetation of cleared lands following site development.
- Provision for the use of regional, native plant species for the re-vegetation of ESHA buffers, and use of native or non-native but *non-invasive* plants for re-vegetation of urban and residential areas.
- Five year monitoring program to document the results of eradication efforts and to identify remediation measures.

# 1.0 Introduction

The Samoa Town Master Plan (STMP) Land Use Overlay Designation of the Humboldt Bay Area Plan (HBAP) was approved by the County of Humboldt on December 6, 2011. The HBAP amendment incorporates the adopted findings of the California Coastal Commission (LCP Amendment HUM-MAJ-01-08, February 24, 2011) detailing the conditions for approval. Those conditions involve updating biological resource information within that portion of the plan area subject to redevelopment by providing a current botanical survey, an evaluation of the historic landscape context of the plan area, and preparing a phased management plan for the removal or control of certain ecologically significant invasive exotic plant species.

Consulting biologist, Stephanie Morrisette, conducted seasonally appropriate rare plant surveys and invasive plant surveys during the spring and summer of 2013 to fulfill requirements of the HBAP. The results of those studies, and rationale for the incorporation of Coastal Commission findings that pertain to land use designations, habitat classifications, and resource protection are included in the following addendum to the Samoa Master Plan Biological Resource Study (Mad River Biologists 2004).

The study area includes all development phases of the STMP located east of New Navy Base Road and west of the NW Pacific Railroad right-of-way along North Bay View Street, as well as that portion of the plan area immediately adjacent to the Samoa Cookhouse (east of the railroad), as shown in Figure 1.

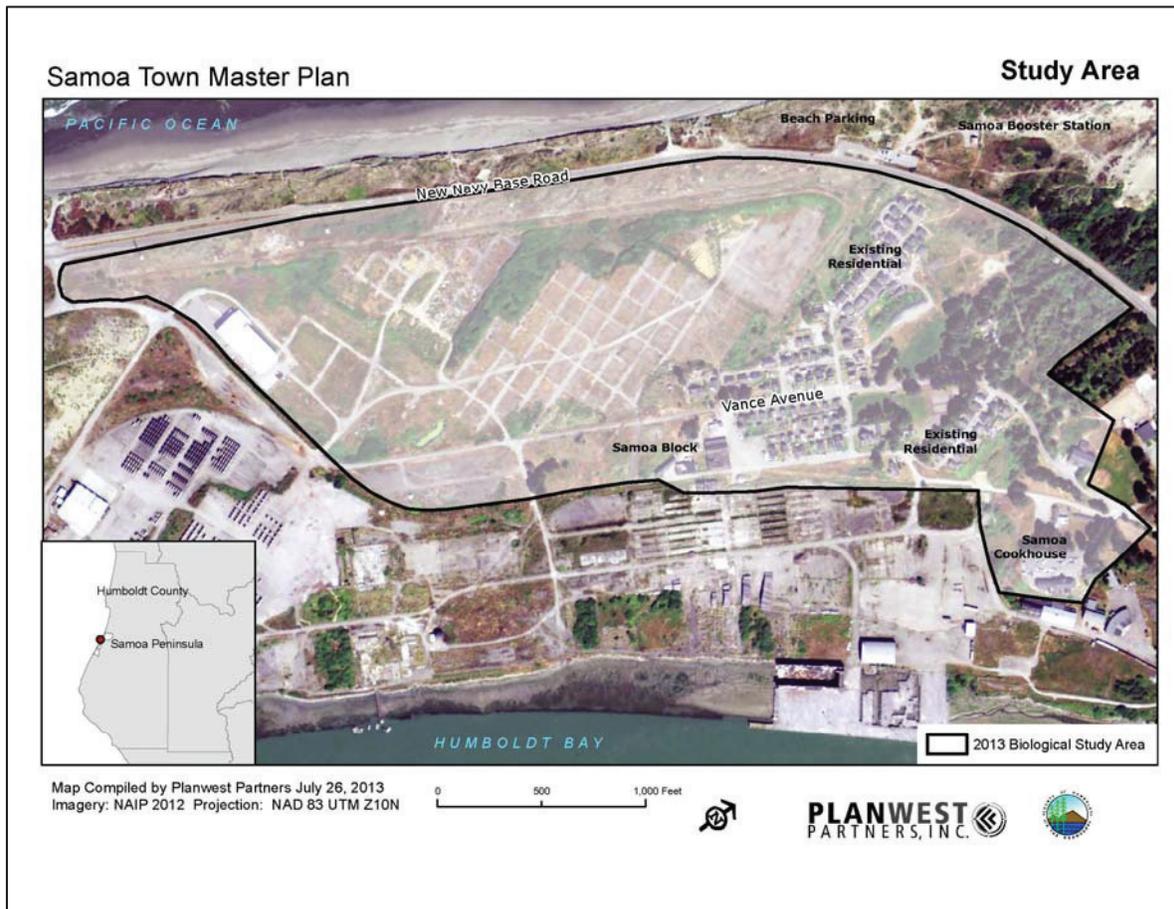


Figure 1 Study Area

## 2.0 Environmental Setting and Historic Landscape Context

The plan area is located on the Samoa Peninsula, a 17-mile long barrier sand spit enclosing the northern section of Humboldt Bay in Humboldt County, California. Access to the property is from Highway 255 (also known as New Navy Base Road). The 171.7-acre property falls within the coastal zone and includes commercial and industrial zoned lands associated with historic lumber mill operations and the town of Samoa, as well as significant areas of undeveloped dunes, coastal scrub and coniferous forest zoned as Natural Resources.

Much of the study area is developed. The exception to this is a significant area of coastal coniferous forest and scrub found on stabilized dunes that abut the town at the north end of the plan area, and a strip of partially developed, degraded dunes that extend southwest from the forest/scrub habitat sandwiched between New Navy Base Road, a residential area, and the historic “log deck” along the western edge of the study area (Figure 2). The degraded dunes are remnant of a more expansive dune system that occurred prior to development of the town and mill.

Like much of the Humboldt Bay region during the turn of the last century, the land that encompasses the plan area was re-shaped for utilitarian purposes. The construction of the mill, town of Samoa, and related systems began in the mid 1890’s, and required grading, diking, filling of wetlands and the leveling of dunes. Artificial embankments and retaining walls can be seen throughout the existing town, which were used to stabilize the dunes and create level building sites, paths and roads. Topsoil was reportedly brought in and spread around the yards to enable the houses to have lawns and for civic landscaping (Heald et al. 2004). Plantings of non-native trees, shrubs and groundcovers are associated with managed yards, recreation areas and travel corridors.

Until 1923, the only transportation corridor was the railroad to Arcata and a ferry that crossed the bay to Eureka. A network of graveled roads, reinforced stairways and boardwalks provided access for pedestrians throughout the town and mill site. During the 1920’s major upgrades of both the mill and the town were made, including the first road linking the Peninsula to communities north of Humboldt Bay. The new county road was completed in 1923 and connected to the short stretch of Vance Avenue that had been developed as the town was established. In support of the war effort, funding was provided in the 1940’s to upgrade the county road by extending it south to the naval base and Fairhaven airstrip. Truck traffic and vehicles became more prominent with the upgrade. Until New Navy Base Road (Highway 255) was constructed in 1970, all Peninsula traffic went through Samoa on Vance Avenue, which was gravel and packed dirt, and reportedly the only place not covered with sand. (McCormick 1992 *in* Heald et al. 2004).

# Samoa Town Master Plan

## Humboldt County, California

### Habitat Map



- Samoa Pacific Group Property Line
- Dune Hollow Coastal Act Jurisdictional Wetland
- Dune Hollow Wetlands - ESHA
- Dune Hollow Coastal Act/USACE Jurisdictional Wetland
- Urban Habitats
- Degraded Dunes, ESHA
- Degraded Dunes, Non-ESHA
- Developed Dunes, Non-ESHA
- Urban Landscape, Non-ESHA
- Coastal Confirous Forest, ESHA
- Coastal Confirous Forest, Non-ESHA
- Northern Coastal Scrub, ESHA
- Northern Coastal Scrub, Non-ESHA
- Beach Strand, ESHA
- Native Dune Mat, ESHA
- Open Sand, ESHA
- European Beachgrass, ESHA
- Ice Plant, ESHA
- Yellow Bush Luma, ESHA
- "Man Induced" Wetlands - Non-ESHA
- Man Induced Coastal Act Wetland
- Man Induced Coastal Act/USACE Wetland
- Waste Water Treatment Facility
- Industrial Impoundment

Map Compiled by PlanWestPartners  
 June 9, 2005, Updated May 14, 2013.  
 Habitat Data Derived from Mad River Biological Field Surveys  
 Habitat Delineations Derived from Mad River Ecologist's February 11, 2011 Memo.  
 Revised per Coastal Commission Staff Ecologist's February 11, 2011 Memo.

PLANWEST PARTNERS, INC.

0 1,000 Feet

Humboldt County  
 Samoa Peninsula

Figure 2 Habitat Map

Figures 3-5 depict the extent of development associated with the historic mill and company town of Samoa prior to construction of New Navy Base Road. The area south of the town and west of the mill remained undeveloped in 1947, comprising a natural dune system. By 1958, the dunes were partially graded into a network of roads and used for log storage. By 1962, the log deck was expanded to near its present day boundary and an industrial water line was constructed along its western edge to serve the mills on the Peninsula. Today, unpaved areas of the log deck show a significant accumulation of wood fiber and gravel fill and remain either un-vegetated or dominated by invasive, non-native plants.



*Figure 3. Aerial view of Samoa millyard and docks prior to construction of New Navy Base Road, log deck, and water pipelines, 1947 (Humboldt County Public Works Department)*



*Figure 4. Aerial view of Samoa and early development of log deck, 1958 (Humboldt County Public Works Department)*



*Figure 5. Aerial view of Samoa and expansion of log deck and construction of first water line, 1962 (Humboldt County Public Works Department)*

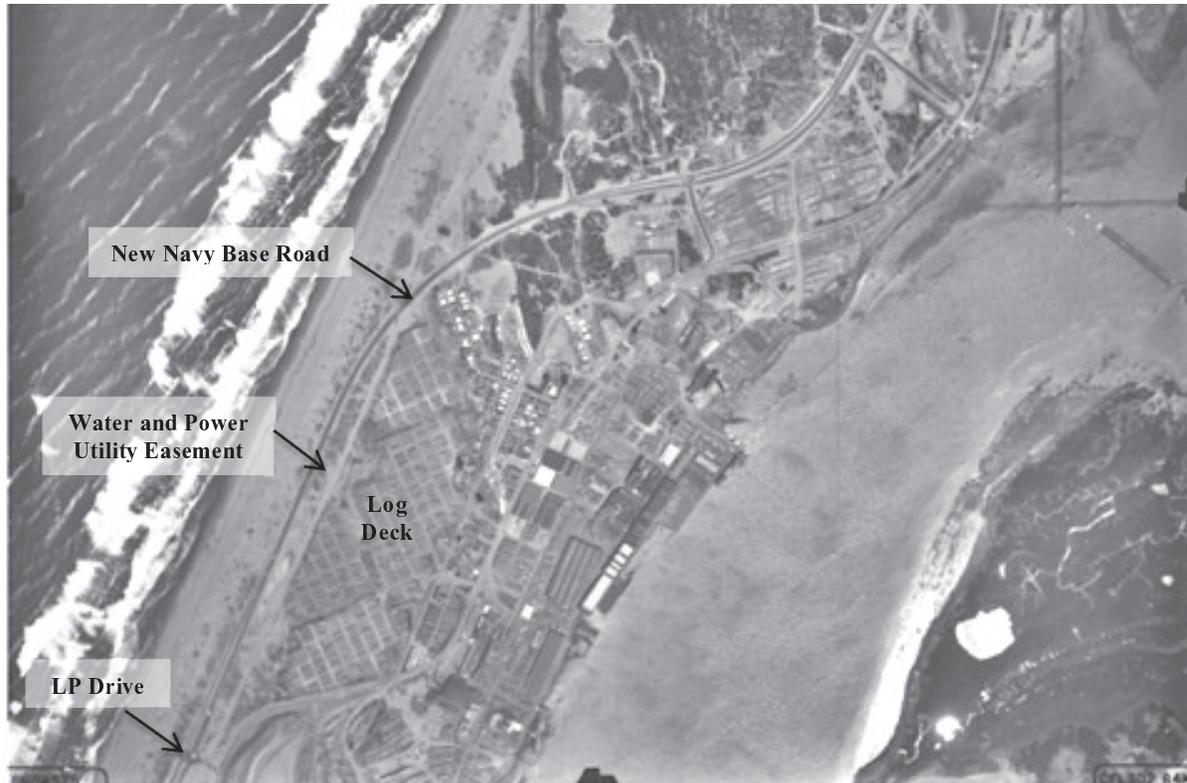


Figure 6. Aerial view of Samoa, including the newly constructed water/power line easement and New Navy Base Road, 1970 (Humboldt County Public Works Department)

New Navy Base Road and LP Drive (southern extent of plan area) were fully constructed by 1970, as shown in Figure 6. In the early 1970's, a domestic water line and aboveground transmission lines were added next to the industrial water line and the newly constructed highway (pers. comm. Dale Davidson, Humboldt Bay Municipal Water District (HBMWD)). Significant ground disturbance occurred with the installation of the utilities and construction of the highway, however, the area remained topped with sand and continued to exhibit some degree of natural dune processes.

Most of this area is currently dominated by invasive, non-native species such as European beach grass (*Ammophila arenaria*), ice plant (*Carpobrotus* sp), and yellow bush lupine (*Lupinus arboreous*). These plants in particular were once widely planted in coastal areas in an effort to stabilize dunes to protect roadways and other developments. Once established, they managed to spread rapidly, forming dense stands that altered the morphology of the dunes and displaced much of the native vegetation. Patches of open sand, native dune mat habitat and dune hollow wetlands remain, interspersed between the more degraded habitats.

HBMWD retains an easement within the utility corridor to maintain the water pipelines. Maintenance is conducted on the vaults at least once annually, with additional inspections occurring as needed (pers. comm. Dale Davidson, HBMWD). During maintenance and inspections, the easement is accessed by vehicle, which results in ground disturbance that helps to maintain areas of open sand suitable for the establishment of native plants, including locally rare species such as beach layia and dark-eyed gilia.

### **3.0 Environmentally Sensitive Habitats and Land Use Designations**

In 2004, Mad River Biologists completed a biological resource study on behalf of the Samoa Pacific Group and County of Humboldt to identify biological constraints for the proposed Samoa Town Master Plan (STMP) (Mad River Biologists 2004). That report served as the basis for biological resource information presented in Chapters 2.04 and 4.04 of the environmental impact report prepared by Planwest Partners for the STMP (Planwest Partners 2007).

The California Coastal Commission reviewed these documents, and conducted a field investigation on December 7, 2010. Coastal Commission Ecologist, John Dixon, provided the results of his field review in a memorandum dated February 11, 2011. In this report, Mr. Dixon states that the various habitat areas, including wetlands, had been accurately characterized and mapped; however, he recommended changes to some of the descriptions of these areas in terms of use and habitat sensitivity.

Mr. Dixon identified several areas of “degraded dunes” located east of New Navy Base that were not classified as ESHA that warrant that designation due to the presence of natural dune processes, dune hollow wetlands, and remnant native dune mat vegetation. The first is the long strip of fenced dunes located within the HBMWD waterline easement between the abandoned log deck and New Navy Base Road. The second area is a continuation of the first, situated between New Navy Base Road, the residential housing, and the coastal coniferous forest/scrub ESHA at the north end of the plan area. There are three other small patches of degraded dunes with similar characteristics; one adjacent to New Navy Base Road and one above the Peninsula Elementary School, both of which are surrounded by wetlands and ESHA; and an irregular patch north of Vance Avenue that is contiguous with Coastal Coniferous Forest ESHA.

It was recommended that all of these remnant and degraded dune areas be considered ESHA due to their rarity and the ease with which they could be further degraded by human activity. Mr. Dixon also identified three small areas of remnant native vegetation that were designated as ESHA that he suggested removing from that designation due to their relative isolation.

In addition, a portion of the “waste water treatment facility” previously designated as non-ESHA, is thought to be a natural dune swale feature since it could not be proven that its creation and subsistence is dependent on artificial hydrological input, as suggested in the biological report. Dense vegetation associated with this swale area can be seen in aerial photos dating back to 1958 (Figures 4-6), which suggests that it may have been a natural hollow at one time, and therefore a convenient place to direct effluent from the treatment pond. This wetland hollow was reclassified as a regulatory wetland for planning purposes, as shown in Figure 7.

The Coastal Commission recommended that all the delineated wetlands west of the railroad easement be considered ESHA and provided with 100-foot development setbacks, as should the upland vegetation communities designated ESHA, and that the buffer areas be cleared of construction remnants, debris, and invasive non-native plants and restored to appropriate native vegetation, where such habitat is lacking.

The project applicants have incorporated these recommendations into the STMP to fulfill Policy 10 of the LCP Amendment, as shown in Figure 8. All delineated wetlands west of the railroad easement are designated as ESHA and provided a 100-foot development setback. Similarly, all upland vegetation communities designated as ESHA are afforded 100-foot development setbacks, except where truncated by existing development.

**Samoa Town Master Plan**  
Humboldt County, California

**Wetland Jurisdiction Map**



Map Compiled by PlanWest Partners  
June 9, 2008; Updated May 14, 2013.  
Imagery: NAIP 2012  
Habitat Delineations: Derived from Mad River Biologist Field Surveys.  
Revised per Coastal Commission Staff Ecologist's February 11, 2011 Memo.

Figure 7 Wetland Jurisdiction Map

**Samoa Town Master Plan**  
Humboldt County, California

**Environmentally Sensitive Habitat Area (ESHA) Map**



Map Compiled by Planwest Partners  
June 9, 2005, Updated July 22, 2013  
Imagery: NAIP 2012  
Habitat Delineations: Derived from Mad River Biologist Field Surveys  
Revised per Coastal Commission Staff Ecologist's February 11, 2011 Memo.

Figure 8 Environmentally Sensitive Habitat Areas and Established Buffers

## 4.0 Botanical Survey

Floristic surveys were conducted in 2013 for all development phases of the STMP except for the Coastal Access and Visitor Use Area of Phase 1 located west of New Navy Base Road. The biological resource information for the Coastal Access and Visitor Use Area was updated in 2009 by Mad River Biologists, and thus is not included in the current study.

A survey of the remaining development areas was performed to update existing resource data for the STMP, as required under the Humboldt Bay Area Plan. The updated information is provided as an addendum to the 2004 Biological Resource Report to comply with requirements for subdivision and Coastal Development Permit Approval by the County of Humboldt.

### 4.1 Methods

Prior to conducting field surveys, the list of Special-status plants with known occurrence in the project region was updated by performing a query of the California Department of Fish and Wildlife Natural Diversity Database (CNDDDB 2013) and the California Native Plant Society On-line Inventory of Rare and Endangered Vascular Plants of California (CNPS 2013) for the Eureka 7.5 minute USGS quadrangle and eight adjacent coastal quadrangles (Arcata North, Tyee City, Arcata South, Trinidad, Crannell, Fields Landing, Fortuna, Cannibal Island, and Ferndale). Seventeen plant species were added to the list generated for the original biological study. These additions are listed in Table 1, along with an assessment of their potential for occurrence within the study area. Habitat suitability was evaluated using the following criteria:

**Present.** The species is known to occur within the study area, based on historical occurrence records and/or recent survey data.

**High Potential.** Habitat components meeting the species requirements are present and most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found in the study area.

**Moderate Potential.** Habitat components meeting the species requirements are present; however, some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found in the study area.

**Low Potential.** Some habitat components meeting the species requirements are present; however, the majority of habitat on and adjacent to the site is unsuitable. The species has a low probability of being found in the study area.

**Not Present.** Habitat on and adjacent to the site is clearly unsuitable for the species or recent survey data indicates that it currently does not occur within the study area.

**Table 1 Special-Status Plants Addressed for STMP Botanical Study – 2013 Additions**

Species	Status*	Habitat Characteristics (CNDDDB/CNPS 2013)	Potential for Occurrence
<i>Angelica lucida</i> sea-watch	Rare Plant Rank 4.2 G5 / S2S3	Coastal Bluff Scrub, Coastal Dunes, Coastal Scrub, Marshes and Swamps (coastal salt). 0-150m	<b>High Potential.</b> Not found in the study area.
<i>Astragalus rattanii</i> var <i>rattanii</i> Rattan's milk-vetch	Rare Plant Rank 4.3 G4T3 / S3.3	Chaparral, Cismontane Woodland, Lower Montane Coniferous Forest. Gravely streambanks. 30-825m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Cardamine angulata</i> seaside bittercress	Rare Plant Rank 2B.1 G5 / S1	North Coast Coniferous Forest, Lower Montane Coniferous Forest. Wet areas, streambanks. 65-915m	Historic record from Freshwater area. Known habitat characteristics <b>Not Present</b> within study area.
<i>Carex lenticularis</i> var <i>limnophila</i> lagoon sedge	Rare Plant Rank 2B.2 G5T5 / S1S2.2	Bogs and Fens, Marshes and Swamps, North Coast Coniferous Forest. Lakeshores, beaches. 0-6m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Castilleja litoralis</i> Oregon coast paintbrush	Rare Plant Rank 2B.2 G4G5T4 / S2.2	Coastal Bluff Scrub, Coastal Dunes, Coastal Scrub. 15-100m	<b>Low Potential.</b> Occurs mostly on coastal bluff/scrub. Suitable habitat highly limited in study area. Not found in study area.
<i>Clarkia amoena</i> ssp <i>whitneyi</i> Whitney's farewell-to-spring	Rare Plant Rank 1B.1 G5T2 / S2.1	Coastal Bluff Scrub, Coastal Scrub. 10-100m	<b>Low Potential.</b> Historic record from Fortuna area (Sandy Prairie). Not found in study area.
<i>Disceadium nudum</i> naked flag moss	Rare Plant Rank 2B.2 G3G4 / S1	Coastal Bluff Scrub. Moss that grows on moist silty to fine sandy banks of somewhat shaded sites. 5-1500m	<b>Low Potential.</b> Not found in study area.
<i>Erigeron bloomeri</i> var <i>nudatus</i> Waldo daisy	Rare Plant Rank 2B.3 G5T4 / S2?	Lower Montane Coniferous Forest, Upper Montane Coniferous Forest. In open areas on dry rocky outcrops on serpentine. 600-2300m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Juncus nevadensis</i> var <i>inventus</i> Sierra rush	Rare Plant Rank 2B.2 G5T3T4 / S1	Bogs and Fens. 0-10m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Lilium kelloggii</i> Kellogg's lily	Rare Plant Rank 4.3 G3 / S3.3	Lower Montane Coniferous Forest, North Coast Coniferous Forest. Openings, roadsides. 3-1300m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Listera cordata</i> heart-leaved twayblade	Rare Plant Rank 4.2 G5 / S3.2	Bogs and Fens, Lower Montane Coniferous Forest, North Coast Coniferous Forest. 5-1370m	<b>Low Potential.</b> Not found in the study area.

**Table 1 Continued**

Species	Status*	Habitat Characteristics (CNDDDB/CNPS 2013)	Potential for Occurrence
<i>Packera bolanderi</i> var <i>bolander</i> seacoast ragwort	Rare Plant Rank 2B.2 G4T4 / S3	Coastal Scrub, Northern Coast Coniferous Forest. Sometimes along roadsides. 30-915m	<b>Moderate Potential.</b> Not found in the study area.
<i>Piperia candida</i> white flowered rein orchid	Rare Plant Rank 1B.2 G3? / S2	North Coast Coniferous Forest, Lower Montane Coniferous Forest, Broadleaved Upland Forest. Coast ranges from Santa Cruz County north; on serpentine. 0-1200m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Pityopus californica</i> California pinefoot	Rare Plant Rank 4.2 G4G5 / S3.2	Broadleaved Upland Forest, Lower Montane Coniferous Forest, North Coast Coniferous Forest, Upper Montane Coniferous Forest. 15-2225m	Known habitat characteristics <b>Not Present</b> within study area.
<i>Pleuropogon refractus</i> nodding semaphore grass	Rare Plant Rank 4.2 G4 / S3.2?	Lower Montane Coniferous Forest, Meadows and Seeps, North Coast Coniferous Forest, Riparian Forest. 0-1600m	<b>Low Potential.</b> Not found in the study area.
<i>Polemonium carneum</i> Oregon polemonium	Rare Plant Rank 2B.2 G4 / S1	Coastal Prairie, Coastal Scrub, Lower Montane Coniferous Forest. 0-1830m	<b>Low Potential.</b> Not found in the study area.
<i>Ribes laxiflorum</i> trailing black currant	Rare Plant Rank 4.3 G5 / S3.3	North Coast Coniferous Forest, sometimes roadside. 5-1395m	<b>Low Potential.</b> Not found in the study area.

\*TABLE 1 STATUS CODES:

California Rare Plant Ranks:

- 1B Rare, threatened, or endangered in California and elsewhere
- 2B Rare, threatened, or endangered in California, but more common elsewhere
- 4 Plants of limited distribution – a watch list.

Corresponding Threat Ranks:

- 0.1 Seriously threatened in California
- 0.2 Moderately threatened in California
- 0.3 Not very threatened in California

CNDDDB Element Ranking:

- Global Ranks
  - G3 Vulnerable
  - G4 Apparently secure, considering populations outside of California
  - G5 Secure, considering populations outside of California

State Ranks

- S1 Very Threatened
- S2 Imperiled
- S3 Vulnerable

Seasonally appropriate surveys were performed on April 19<sup>th</sup> and 22<sup>nd</sup>, May 23<sup>rd</sup> and 24<sup>th</sup>, and June 18<sup>th</sup> by Stephanie Morrissette, a local botanist with over 20 years of experience working with local coastal species. Surveys were conducted for all target plants listed in the original biological study and the additions listed in Table 1 for which suitable habitat was deemed present.

The distribution of rare plant occurrences was recorded and mapped using a Trimble Juno SB handheld GPS. Native Species Field Survey Forms were completed for each rare plant occurrence, which are included as Attachment 2. A list of species encountered during the field investigation is included as Attachment 1.

## 4.2 Results of Rare Plant Survey

Beach layia (*Layia carnosa*) and dark-eyed gilia (*Gilia millefoliata*) were relocated within the water/power utility line easement between New Navy Base Road and the former log deck, and within an open sand area next to the forest/scrub habitat at the north end of the plan area. They were found generally in the same locations as they were in 2003/2004 but occupying slightly larger representative areas, as shown in Figure 9. No other Special-status plants were found within the study area during the 2013 survey effort.

Beach layia is a California endemic that is both state and federally listed as endangered throughout its limited range. Dark-eyed gilia is not state or federally listed, but it is considered endangered in a portion of its range, rare outside of California, and distributed in a limited number of occurrences. Both are locally common in the dunes on the Samoa Peninsula, where they are typically associated with the native dune mat community, but they also occur along edges and sandy openings of dunes dominated by invasive exotic plants.

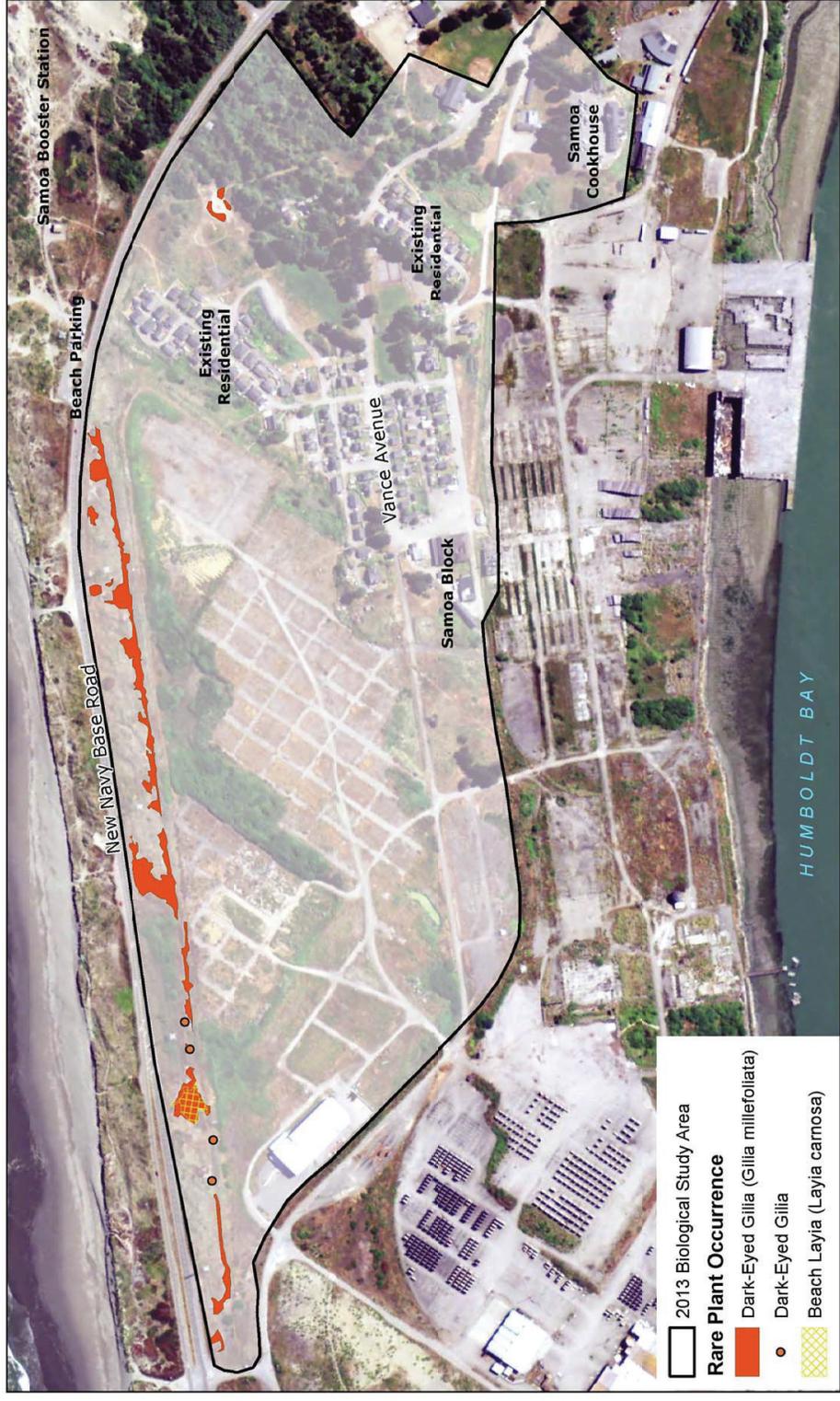
Beach layia requires areas of open sand to colonize and cannot establish itself in the thick vegetative cover of nonnative plants that similarly inhabit the dunes of the plan area. It was observed within one small section of the utility easement associated with native dune mat species such as coast buckwheat (*Eriogonum latifolium*), beach bur (*Ambrosia chamissonis*), beach evening primrose (*Chamissonia cheiranthifolia*), dune knotweed (*Polygonum paronychia*), coast goldenrod (*Solidago spathulata*), beach pea (*Lathyrus littoralis*), sand mat (*Cardionema ramosissimum*), and dark-eyed gilia.

Dark-eyed gilia was observed growing over a larger area of the utility easement, often within lower quality habitats such as those impacted by light vehicle and foot traffic and areas dominated by invasive-exotic plants. Common associates include native dune mat species but also non-native grasses and forbs such as ripgut brome (*Bromus diandrus*), hairgrass (*Aira praecox*), sheep sorrel (*Rumex acetosella*), rattlesnake grass (*Briza maxima*), vulpia (*Vulpia bromoides*), and rough cat's ear (*Hypochaeris radicata*). Dark-eyed gilia was most abundant within the vehicle corridor along the HBMWD easement where light truck traffic retained areas of open sand suitable for colonization.

Both the beach layia and the dark-eyed gilia occur within an area that has been designated as environmentally sensitive and afforded a 100-foot setback from proposed development. No impacts to these occurrences are anticipated from site development.

# Samoa Town Master Plan

# Rare Plant Map



- 2013 Biological Study Area
- Rare Plant Occurrence**
- Dark-Eyed Gilia (*Gilia millefoliata*)
- Dark-Eyed Gilia
- Beach Laylia (*Laylia carnosa*)

Map Compiled by Planwest Partners, July 24, 2013  
 Habitat Delineations: Field Surveys Stephanie Morrisette 2013  
 Imagery: NAIP 2012 Projection: NAD 83 UTM Z10N

Figure 9 Rare Plant Distribution Map

## 5.0 Invasive Plant Management Plan

A number of invasive plants occur within the plan area, some of which are known to have severe ecological impacts on the physical and biotic structure of natural communities. Given the proximity of the plan area to Environmentally Sensitive Habitat Areas (ESHA), both on and adjacent to the site, a phased management plan for the control and eradication of certain ecologically significant, invasive plants has been developed to mitigate potential negative impacts caused by these species.

Key components of the invasive plant management plan include:

- Phased removal of certain highly invasive plant species identified within the plan area where development is proposed and within ESHA buffers.
- Provision for the immediate re-vegetation of cleared lands following site development.
- Provision for the use of regional, native plant species for the re-vegetation of ESHA buffers, and use of native or non-native but *non-invasive* plants for re-vegetation of urban and residential areas.
- Survey of the plan area five years post phased-development to document the results of the eradication efforts and to identify remediation measures, if needed.

The botanical inventory for the study area is included as Attachment 1. Each species is identified as either native or non-native to California. Non-native species are further identified by their California Invasive Plant Council (Cal-IPC) inventory database rating, when applicable. Cal-IPC uses a rating system that recognizes the following three levels of threat:

- **High** - These species have severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
- **Moderate** - These species have substantial and apparent—but generally not severe—ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.
- **Limited** - These species are invasive but their ecological impacts are minor on a statewide level or there was not enough information to justify a higher score. Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Forty-three plant species documented within the study area are listed in the Cal-IPC database (Table 2). Six of these are considered highly invasive and will be targeted for eradication during site development. One additional species, yellow bush lupine (*Lupinus arboreus*), will also be targeted for removal. Although native to central and southern California, yellow bush lupine is considered invasive to local dunes where it has been shown to replace native plant communities with a dense monoculture of shrubs. It has also been shown to cause ecosystem-level changes by elevating nitrogen levels that in turn facilitate invasion by non-native, weedy grasses (Pickart et al. 1998).

**Table 2 Invasive Non-Native Plants Occurring within the Study Area**

Cal-IPC Threat Rating	Species	Common Name
<b>HIGH</b>		
	<i>Ammophila arenaria</i>	European beachgrass
	<i>Carpobrotus edulis x chilensis</i>	iceplant, sea fig
	<i>Cortaderia jubata</i>	jubata grass
	<i>Cytisus scoparius</i>	Scotch broom
	<i>Hedera helix</i>	English ivy
	<i>Rubus armeniacus</i>	Himalayan blackberry
<b>MODERATE</b>		
	<i>Anthoxanthum odoratum</i>	sweet vernal grass
	<i>Bromus diandrus</i>	ripgut grass
	<i>Cirsium vulgare</i>	bull thistle
	<i>Cotoneaster franchetii</i>	cotoneaster
	<i>Cynosurus echinatus</i>	hedgehog dogtail
	<i>Dipsacus fullonum</i>	Fuller's teasel
	<i>Eucalyptus globulus</i>	eucalyptus
	<i>Festuca arundinacea</i>	tall fescue
	<i>Festuca perennis</i>	ryegrass
	<i>Geranium dissectum</i>	cranesbill, geranium
	<i>Holcus lanatus</i>	velvet grass
	<i>Hypochaeris radicata</i>	rough cat's ear
	<i>Ilex aquifolium</i>	holly
	<i>Leucanthemum vulgare</i>	oxeye daisy
	<i>Mentha pulegium</i>	pennyroyal
	<i>Rumex acetosella</i>	sheep sorrel
	<i>Senecio glomeratus</i>	cutleaf burnweed
	<i>Senecio minimus</i>	coastal burnweed
	<i>Trifolium hirtum</i>	rose clover
	<i>Vinca major</i>	periwinkle
<b>LIMITED</b>		
	<i>Agrostis stolonifera</i>	creeping bent grass
	<i>Brassica rapa</i>	field mustard
	<i>Briza maxima</i>	rattlesnake grass
	<i>Bromus hordeaceus</i>	soft chess
	<i>Cakile maritima</i>	sea rocket
	<i>Cotula coronopifolia</i>	brass buttons
	<i>Cupressus macrocarpa</i>	Monterey cypress
	<i>Dactylis glomerata</i>	orchard grass
	<i>Erodium cicutarium</i>	storksbill, filaree
	<i>Lythrum hyssopifolium</i>	hyssop loosestrife
	<i>Medicago polymorpha</i>	California burclover
	<i>Parentucellia viscosa</i>	yellow parentucellia
	<i>Pinus radiata</i>	Monterey pine
	<i>Plantago lanceolata</i>	English plantain
	<i>Polypogon monspeliensis</i>	annual beardgrass
	<i>Ranunculus repens</i>	buttercup
	<i>Rumex crispus</i>	curly dock

## 5.1 Invasive Plant Removal

In June of 2013, a survey for invasive plants was performed within the study area. Ecologically significant species were mapped within the town of Samoa, as shown in Figure 10. Detailed mapping of the former log deck area proved infeasible due to the high concentration and variability of invasive plants that occur there, and was therefore mapped generally as “Invasive Plant Area”. This area will be entirely cleared and graded prior to site development, thereby allowing for mass removal of the invasive and other non-native plants that currently dominate the site, including those classified as having a limited or moderate Cal-IPC threat level.

Non-native trees within the plan area with moderate or limited Cal-IPC threat ratings will be retained since they provide significant avian habitat in addition to ornamental value. These include the eucalyptus, Monterey pine, and Monterey cypress found lining Vance Avenue and adjacent to residential and park areas.

Due to the close proximity of environmentally sensitive habitats, including wetlands, invasive plant eradication efforts will utilize mechanical or manual removal methods. The use of heavy equipment is practical in many locations, and is considered appropriate given the significant level of ground disturbance anticipated with site development, as well as the relative cost savings and efficacy compared to other methods such as chemical treatments that involve the use of herbicides or manual efforts such as hand pulling. Manual methods that rely on hand tools and/or hand pulling may be required in areas where access is limited for heavy equipment. Manual methods shall also be utilized for removing invasive plants located within and near ESHA boundaries to avoid impacting these sensitive habitat areas.

As with site development, best management practices (BMPs) shall be incorporated for invasive plant removal activities to ensure the protection of existing ESHAs and to avoid the inadvertent introduction and/or spread of invasive plants. BMPs to be incorporated include the following:

- During wet weather conditions, silt fencing and/or straw wattles shall be utilized to protect wetland areas from potential sedimentation during activities associated with ground disturbance or vegetation removal when operating near wetland ESHA boundaries.
- Upland and wetland ESHA boundaries will be clearly marked in the field to denote limits of operations prior to any ground disturbance or vegetation removal within ESHA buffer areas.
- To avoid the inadvertent spread of invasive species, vehicles, equipment, and clothes shall be clean of mud and plant debris prior to initiating invasive plant removal and before leaving the property after conducting invasive plant removal.
- Invasive plant material shall be properly handled and disposed of to avoid future infestations.

Specific criteria and recommendations for plants targeted for removal are provided below:

### European Beachgrass (*Ammophila arenaria*)

European beachgrass is a dominant species of the open dunes within and adjacent to the plan area. Within the plan area it occurs on remnant dunes next to New Navy Base Road that have been designated as ESHA, and is patchily distributed elsewhere on sandy substrates that border the former log deck, including ESHA buffers.

European beachgrass will not be targeted for removal where site development is not planned or within the ESHA-designated dunes. Efforts shall be made to remove plants from the former log deck and associated ESHA buffer areas (i.e. Invasive Plant Area shown in Figure 10) by means of mechanical removal performed coincident to clearing and grading associated with site development. Habitats identified as “Degraded Dunes, Non-ESHA” in Figure 2: Habitat Map, denote the general location of European beachgrass within the Invasive Plant Area of the former log deck. In these areas, co-dominant species include other highly invasive plants such as yellow bush lupine and iceplant.

European beachgrass is a rhizomatous perennial grass that is able to withstand up to 1 meter a year of sand burial. It rarely becomes established by seed, but once established it expands through vigorous rhizome growth. Shoots grow most vigorously in the spring. Spring through fall is the optimal time to target eradication. Heavy equipment may be used to remove plants by excavating the substrate to a depth of one meter or more. Excavated areas will then be capped with clean sand (in ESHA buffer areas) or fill material where development is planned. Plants occurring along ESHA boundaries will require hand digging (with shovels/rakes) to minimize soil disturbance within the ESHAs. Where hand digging is performed, monthly follow-up treatments conducted through the fall may be required to remove re-sprouts. Re-sprouting may be minimized through careful sifting of the sand to remove rhizome fragments within the top 0.5 to 1 m of substrate during the initial removal effort.

Removed plant material will be burned or composted. If opportunity exists, plant material may be buried on site to a depth of *at least* one meter to discourage re-sprouting.

#### Iceplant / Sea Fig (*Carpobrotus edulis* and *C. edulis x chilensis*)

Iceplant is a low-growing succulent perennial that roots at the nodes, has a creeping habitat, and often forms deep mats covering large areas. Large clonal mats of iceplant occur throughout the town of Samoa, the former log deck, and open dunes within the plan area.

Mechanical removal by tractor is efficient for areas where there are no sensitive resources. To prevent significant soil removal, the use of a brush rake attached to the scoop is recommended (Pickart *in* Bossard 2000). It is also easily removed by hand pulling for areas inaccessible to heavy equipment or along ESHA boundaries where ground disturbance shall be minimized.

Because the plant can grow roots and shoots from any node, all live shoot segments must be removed from contact with the soil to prevent re-sprouting. At least one follow-up visit may be required to remove re-sprouts from areas not immediately developed. Due to the high water content of the shoot tissues, burning of live or dead plants is not a useful method of control or disposal. Removed vegetation will need to be dried prior to disposal. Once dry it may be burned or composted.

#### Jubata Grass (*Cortaderia jubata*)

Jubata grass is a perennial grass six to twenty feet tall with long leaves arising from a tufted base. Flowers are produced from late July to September in a long-stemmed, plumed inflorescence.

Within the plan area, efforts have been made to control this species, which was once abundant on the former log deck, the railroad easement, and within the Coastal Dependent-Industrial Area. Currently, scattered occurrences persist along the railroad easement, the former log deck, along the edges of the forest and within the town. Two plants were also observed within the utility easement / dune ESHA next to New Navy Base Road, as shown in Figure 10.

Grading of the Invasive Plant Area is expected to effectively remove seedlings and larger established plants occurring in this area. In areas inaccessible to heavy equipment, including ESHA boundaries, hand pulling or use of hand tools will be employed. Hand pulling jubata grass seedlings has been shown to be highly effective (Bossard et al. 2000). For large plants, a Pulaski, mattock, or shovel are the safest and most effective tools for removing established clumps. To prevent re-sprouting it is important to remove the entire crown and top sections of the roots. To reduce labor, the top foliage can be removed and the remaining crown treated with diesel oil (Cowan 1976 in Bossard et al. 2000). This method may be most useful within the railroad easement where established plants occur between the railroad ties where digging may prove difficult. The use of diesel oil shall not be employed as treatment for any plants occurring within 100 feet of any ESHA boundary.

Owing to the highly invasive nature of this species and feasibility of complete eradication within the plan area, it is recommended that the two small occurrences within the utility easement (dune ESHA) also be removed by using hand tools. This is best performed in late June, before flower production of Jubata grass and after the peak blooming period for the locally rare plants, beach layia and dark-eyed gilia, that also occur within the easement.

Grading of the log deck and spot removal treatments elsewhere shall be conducted prior to flower production in July to prevent seed dispersal. Once removed, the plant material will be laid out on a bare area (ideally on sheets of black plastic) and left to dry. Dried material may either be composted or burned, depending on local regulations.

#### Scotch Broom (*Cytisus scoparius*)

Scotch broom is a perennial shrub six to ten feet tall, with sharply angled branches and yellow pea-like flowers. It grows in sunny sites with dry sandy soil. It is common in disturbed places but can also colonize undisturbed grassland, shrubland, and open canopy forests. It has a seed bank that can remain dormant for up to 80 years.

Within the plan area, Scotch broom occurs sporadically within the town, the former log deck, in the vicinity of the Samoa Cookhouse, and edges of the coniferous forest. Grading of the former log deck is expected to effectively remove seedlings and larger established plants occurring in this area. In areas inaccessible to heavy equipment, including ESHA boundaries, the use of hand tools will be employed.

The most effective approach for the removal of Scotch broom is an integrated approach that involves cutting the shrubs in September and October (to minimize re-sprouting), allowing the cut shrubs to dry on site, and then burning dried material in late May and early June. The use of a brush hog or saw cutting is preferred over hand pulling since the latter has been shown to result in significantly more trampling of native species, greater soil disturbance, and broom seedling regeneration (Bossard et al. 2000).

Because this species produces a prolific seed bank, monitoring of treatment areas will be important to locate and kill new seedlings. Location and treatment of re-sprouts is also important. Monitoring should be conducted when seed germination ends in late spring for the first two years following removal, and then again on the fifth year after removal and/or any ground disturbance associated with site development.

### Yellow Bush Lupine (*Lupinus arboreus*)

Yellow bush lupine is a bushy shrub that grows to six feet tall, usually with bright yellow (sometimes blue) sweet smelling flowers, and green, palmately compound leaves. Flowering takes place locally from May to July, and seed dispersal occurs in late summer and fall. It reproduces solely by seed. Seeds are long-lived and form a persistent seed bank, creating a need for repeated removal.

Within the plan area, yellow bush lupine occupies many of the same areas as Scotch broom. Within the Invasive Plant Area of the former log deck, grading performed in conjunction with site development is expected to effectively remove seedlings and larger established plants. Within the town and areas inaccessible to heavy equipment, including ESHA boundaries and the coniferous forest ESHA, the use of hand tools will be employed. Mature plants will be removed by cutting them at the base of the trunk, and splitting the trunk to discourage re-sprouting. Small plants can be pulled by hand. Removal efforts shall be conducted prior to seed set, and removed vegetation shall be dried and burned or composted.

Soil disturbance may stimulate seed germination from the seed bank; therefore, monitoring conducted during the flowering period will need to be performed within five years following removal. Stapling weed mat to the substrate where plants are removed for a period of two years may minimize the need for follow-up treatments of new recruitments.

### Himalayan Blackberry (*Rubus armeniacus*)

Himalayan blackberry is a sprawling shrub that forms dense thickets of long, bending branches (canes) with hooked prickles, white flowers, and black berries that usually ripen later than the native blackberry. It is a strong competitor with other species, and possesses a highly versatile means of reproduction. Thickets can produce 7,000 to 13,000 seeds per square meter (Amor 1974 in Bossard et al. 2000), which are readily dispersed by gravity, and by birds and mammals. Seeds can remain viable in the soil for several years (Brinkman 1974 in Bossard et al. 2000). Seeds germinate in the spring, flowering begins in May and continues through July, and fruit is produced from July to September.

Within the plan area Himalayan blackberry occurs sporadically along roadways throughout the town, in the understory of shrub and forest habitats, and within the Invasive Plant Area of the former log deck where it densely lines the fence that separates the log deck from the utility easement/degraded dune ESHA next to New Navy Base Road.

For removal, care will need to be taken to prevent vegetative reproduction from cuttings. Removal of canes alone is insufficient, as root crowns will re-sprout and produce more canes. Mechanical techniques that incorporate the use of heavy equipment to grade substrates to depths sufficient to remove root crowns are appropriate for the Invasive Plant Area. Removing rootstocks by hand digging is a slow but effective method for small infestations around houses, trees and shrubs, and within ESHAs where the use of heavy equipment is not practical or feasible.

The best time for removal is when the plants begin to flower in May. At this stage the reserve food supply in the roots has been nearly exhausted, and new seeds have not yet been produced. Burning slash piles is an effective method of disposal.

English Ivy (*Hedera helix*)

English ivy is a woody evergreen vine commonly found in moist, shady woodlands. It is especially common in forest habitats near urban areas, where it uses adventitious roots to climb up tree trunks and along branches into the canopy. It also grows as a dense ground cover where it inhibits regeneration of understory plants. English ivy spreads primarily by rhizomes, but it can also reproduce from seed. It will grow as a vine and groundcover for up to 10 years before flowering. It has a shallow root system, but can re-sprout from cut roots as small as half an inch that are left in contact with soil.

Within the plan area, English ivy is found as a ground cover and growing up the trunks of trees in urban landscape areas of the town. It is also found on the edge of the coniferous forest habitats growing on native spruce and pine.

Physical removal of English ivy is best accomplished by using pruners to cut the vines from around the base of trees and then pulling the plants up from the roots and down from the trees. Removing the vines that spread up into the trees is important because the fertile branches grow primarily on the upright portions of the vine (Bossard et al. 2000), although the vine will eventually die without access to the roots. Vines on the ground shall also be removed (dug up with a shovel) to prevent re-sprouting. Once removed, the plant material may be left to decompose on a tarp on-site and then burned or composted.

**Table 3 Summary of Invasive Plant Removal Methods**

Species	Optimal Removal Period	Disposal <sup>1</sup>	Follow-up Treatment
European Beachgrass	Spring through fall	Dry and burn, or bury on-site at least 1 meter deep	Monthly through the fall in first year where hand pulling is performed.
Iceplant	Any time of year	Material must be dried due to high water content prior to burning or composting	At least once following treatment where hand pulling is performed.
Jubata Grass	June within ESHA before July elsewhere	Dry and burn or compost	As identified from annual spring monitoring
Scotch broom	September - October	Dry then burn May-June	As identified from annual spring monitoring
Yellow bush Lupine	May through June	Dry and burn or compost	As identified from annual spring monitoring
Himalayan Blackberry	May	Dry and burn or compost	As identified from annual spring monitoring.
English Ivy	Spring but effective any time of year	Dry and burn or compost	As identified from annual spring monitoring.

<sup>1</sup> *Drying of removed material best performed on tarp or sheet of black plastic when feasible*

# Samoa Town Master Plan

## Invasive Plant Map



Map Compiled by Planwest Partners August 13, 2013  
 Habitat Delineations: Field Surveys Stephanie Morrissette 2013  
 Imagery: NAIP 2012. Projection: NAD 83 UTM Z10N



Figure 10 Invasive Plant Map

## **5.2 Re-Vegetation Guidelines**

The Cal-IPC maintains a list of invasive plants that are serious problems in areas that support native ecosystems. The most current version of this list is provided on line at: <http://www.cal-ipc.org/ip/inventory/index.php#inventory>. Re-vegetation plans shall exclude any plant species listed by Cal-IPC, regardless of threat level.

Non-native, non-invasive plants may be utilized within commercial and residential areas for landscaping purposes, although native species will be incorporated to the greatest extent possible. Only locally native species adapted to the habitats of the plan area shall be used for landscaping of ESHA buffers. All planting plans shall be approved by a qualified biologist prior to installation to insure that selected species are appropriate for a given area.

Spot treatments of invasive plants will not require re-vegetation where infestations are small and ground disturbance is minimal. Where significant ground disturbance occurs from invasive plant removal and/or site development in areas designated for open space, re-vegetation will proceed by the next suitable planting season following the disturbance. If re-vegetation is delayed through the rainy season, disturbed areas shall be covered and secured with landscape fabric to minimize soil erosion.

## **5.3 Post-Development Monitoring**

Invasive plant treatment areas shall be monitored annually during the spring for a period of five years to evaluate the success of eradication efforts, and to identify corrective actions as needed. Annual monitoring of the plan area will allow for early detection of failed treatments and/or new recruitment within areas subject to significant ground disturbance associated with site development.

Monitoring shall be conducted by a qualified biologist familiar with all growth phases of the species targeted for removal. Success shall be defined as the absence of ecologically significant invasive plants within areas targeted for restoration, and other areas subject to significant ground disturbance from site development, for a period of five years following removal/site development. Ecologically sensitive invasive plants include all those targeted for eradication and any previously undocumented species with a Cal-IPC threat rating of high that may have been inadvertently introduced during site development.

Monitoring may be phased based on the timeline of development. Annual monitoring reports shall be submitted to the County of Humboldt within 30 days of each inspection. Success of the invasive plant removal project will be fully assessed following the last field inspection. If after five years, restoration objectives have not been met, corrective measures will be implemented and an additional two years of monitoring will ensue. Remediation may include a reassessment of site conditions, additional planting and/or invasive plant removal.

## 6.0 Literature Cited

- Baldwin, B. G., D. H. Goldman, D. J. Keil, R. Patterson, T. J. Rosatti and D. H. Wilken, editors. 2012. *The Jepson Manual: Vascular Plants of California*, Second Edition. University of California Press. Berkeley and Los California.
- Bossard, Carla, John M. Randall, and Marc C. Hoshovsky. 2000. *Invasive plants of California's wildlands*. Berkeley and Los Angeles, CA: University of California Press.
- California Department of Fish and Game (CDFG). 2009. Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities. California Department of Fish and Game. Sacramento, California.
- California Invasive Plant Council. California Invasive Plant Database. Accessed in June 2013. Available at: <http://www.cal-ipc.org/paf/>
- California Native Plant Society (CNPS). 2013. Online Inventory of Rare, Threatened, and Endangered Plants of California. California Native Plant Society. Available at: <http://www.rareplants.cnps.org/>.
- California Natural Diversity Data Base (CNDDDB). 2013. Query of Eureka and surrounding U.S. Geological Survey quadrangles. California Natural Diversity Database, Biogeographic Data Branch, California Department of Fish and Game.
- County of Humboldt. Humboldt Bay Area Plan, Chapter 4 Land Use Designations, Amended Dec. 6, 2011.
- Heald, Leslie S., Suzanne Guerra, Amanda Cannon. 2004. Cultural Resource Survey of the Samoa Town Master Plan Site. Draft report prepared for Planwest Partners, Arcata, CA.
- Hitchcock, A.S. and Agnes Chase. (1971). *Manual of the grasses of the United States*. New York: Dover Publications, Inc.
- Holloran, et al. (2004). *Weed workers handbook*. Watershed Project and the California Invasive Plant Council. California. <http://www.cal-ipc.org/ip/management/wwh/index.php> Accessed June 2013.
- Mad River Biologists. December 2004. Samoa Town Master Plan Biological Resource Study. Prepared for County of Humboldt Community Development Services Department and Samoa Pacific Group, Eureka, CA.
- Pickart A. J. and J. O. Sawyer. 1998. *Ecology and restoration of Northern California coastal dunes*. California Native Plant Society. Global Interprint, Santa Rosa, CA.
- Planwest Partners, Inc. 2007. Samoa Town Master Plan Final Master Environmental Impact Report. State Clearinghouse #2003052054. Prepared for Humboldt County Community Development Services.
- Sawyer, J., Keeler-Wolf, T., Evens, J. (2009). *A manual of California vegetation*. Second Edition. Sacramento, CA: California Native Plant Society.

## Attachment 1 Species List for STMP Botanical Study

Scientific Name <sup>2</sup>	Common Name	Status	Cal-IPC Rating
<b>Trees</b>			
<i>Abies grandis</i>	grand fir	Native	
<i>Cupressus macrocarpa</i>	Monterey cypress	Introduced	Limited
<i>Eucalyptus globulus</i>	eucalyptus	Introduced	Moderate
<i>Picea sitchensis</i>	Sitka spruce	Native	
<i>Pinus contorta</i> ssp <i>contorta</i>	beach pine	Native	
<i>Pinus radiata</i>	Monterey Pine	Introduced	Limited
<i>Pittosporum tenuifolium</i>	pittosporum	Introduced	
<i>Salix hookeriana</i>	Hooker willow	Native	
<i>Salix lasiandra</i> ssp <i>lasiandra</i>	Pacific willow	Native	
<b>Shrubs</b>			
<i>Arctostaphylos uva-ursi</i>	bearberry	Native	
<i>Baccharis pilularis</i>	coyote brush	Native	
<i>Cotoneaster franchetii</i>	cotoneaster	Introduced	Moderate
<i>Cytisus scoparius</i>	scotch broom	Introduced	High
<i>Garrya elliptica</i>	silk tassel	Native	
<i>Gaultheria shallon</i>	salal	Native	
<i>Hedera helix</i>	English ivy	Introduced	High
<i>Lonicera involucrata</i>	twinberry	Native	
<i>Lupinus arboreus</i>	yellow bush lupine	Introduced	Limited
<i>Myrica californica</i>	wax myrtle	Native	
<i>Vaccinium ovatum</i>	evergreen huckleberry	Native	
<b>Herbs</b>			
<i>Abronia latifolia</i>	yellow sand verbena	Native	
<i>Achillea millefolium</i>	yarrow	Native	
<i>Acmispon americanus</i> var <i>americanus</i>	Spanish lotus	Native	
<i>Acmispon parviflorus</i>	hill lotus	Native	
<i>Acmispon strigosus</i>	strigose lotus	Native	
<i>Agoseris grandiflora</i>	agoseris	Native	
<i>Agrostis stolonifera</i>	creeping bent grass	Introduced	Limited

<sup>2</sup> Nomenclature conforms to *The Jepson Manual: Vascular Plants of California 2<sup>nd</sup> Edition*. Baldwin et al. 2012.

<b>Herbs</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>Cal-IPC Rating</b>
	<i>Aira caryophyllaea</i>	silver hairgrass	Introduced	
	<i>Aira praecox</i>	little hairgrass	Introduced	
	<i>Ambrosia chamissonis</i>	beach-bur	Native	
	<i>Ammophila arenaria</i>	European beachgrass	Introduced	High
	<i>Anagallis arvensis</i>	scarlet pimpernel	Introduced	
	<i>Anaphalis margaritacea</i>	pearly everlasting	Native	
	<i>Angelica hendersonii</i>	angelica	Native	
	<i>Anthoxanthum odoratum</i>	sweet vernal grass	Introduced	Moderate
	<i>Armeria maritima</i> ssp <i>californica</i>	thrift, sea-pink	Native	
	<i>Artemisia pycnocephala</i>	beach sagewort	Native	
	<i>Aster chilensis</i>	California aster	Native	
	<i>Bellis perennis</i>	English daisy	Introduced	
	<i>Botrychium multifidum</i>	Leather grape-fern	Native	
	<i>Brassica rapa</i>	field mustard	Introduced	Limited
	<i>Briza maxima</i>	rattlesnake grass	Introduced	Limited
	<i>Briza minor</i>	quaking grass	Introduced	
	<i>Bromus carinatus</i>	California brome	Native	
	<i>Bromus diandrus</i>	rip-gut grass	Introduced	Moderate
	<i>Bromus hordeaceus</i>	soft chess	Introduced	Limited
	<i>Cakile edentula</i>	sea rocket	Introduced	
	<i>Cakile maritima</i>	sea rocket	Introduced	Limited
	<i>Calystegia soldanella</i>	beach morning glory	Native	
	<i>Camissonia cheiranthifolia</i> ssp. <i>cheiranthifolia</i>	beach evening primrose	Native	
	<i>Cardamine oligosperma</i>	bitter-cress	Native	
	<i>Cardionema ramosissimum</i>	sand mat	Native	
	<i>Carex obnupta</i>	dune sedge	Native	
	<i>Carpobrotus edulis</i> x <i>chilensis</i>	iceplant, sea fig	Introduced	Moderate/High
	<i>Castilleja exerta</i> ssp <i>latifolia</i>	purple owl's clover	Native	
	<i>Centaurium erythraea</i>	European centaury	Introduced	
	<i>Cerastium glomeratum</i>	mouse-eared chickweed	Introduced	
	<i>Cirsium vulgare</i>	bull thistle	Introduced	Moderate

<b>Herbs</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>Cal-IPC Rating</b>
	<i>Cistantho maritima</i>	seaside cistanthe	Native	
	<i>Claytonia perfoliata</i> ssp <i>perfoliata</i>	miner's lettuce	Native	
	<i>Claytonia rubra</i> ssp <i>depressa</i>	redstem springbeauty	Native	
	<i>Cortaderia jubata</i>	jubata grass	Introduced	High
	<i>Cotula coronopifolia</i>	brass buttons	Introduced	Limited
	<i>Cryptantha leiocarpa</i>	popcorn flower	Native	
	<i>Cynosurus echinatus</i>	hedgohog dogtail	Introduced	Moderate
	<i>Cyperus eragrostis</i>	nutsedge	Native	
	<i>Dactylis glomerata</i>	orchard grass	Introduced	Limited
	<i>Daucus pusillus</i>	wild carrot	Native	
	<i>Dipsacus fullonum</i>	Fuller's teasel	Introduced	Moderate
	<i>Elymus mollis</i> ssp <i>mollis</i>	dunegrass	Native	
	<i>Epilobium ciliatum</i> ssp <i>watsonii</i>	willow herb	Native	
	<i>Erigeron glaucus</i>	seaside daisy	Native	
	<i>Erodium cicutarium</i>	storksbill, filaree	Introduced	Limited
	<i>Eriogonum latifolium</i>	beach buckwheat	Native	
	<i>Festuca arundinacea</i>	tall fescue	Introduced	Moderate
	<i>Festuca perennis</i>	ryegrass	Introduced	Moderate
	<i>Festuca rubra</i>	red fescue	Native	
	<i>Fragaria chiloensis</i>	beach strawberry	Native	
	<i>Galium aparine</i>	goose grass	Native	
	<i>Galium triflorum</i>	sweet-scented bedstraw	Native	
	<i>Gamochaeta ustulata</i>	cudweed	Native	
	<i>Geranium dissectum</i>	cranesbill, geranium	Introduced	Moderate
	<i>Geranium molle</i>	cranesbill, geranium	Introduced	
	<i>Gilia millefoliata</i>	dark-eyed gilia	Native	
	<i>Gnaphalium palustre</i>	cudweed	Native	
	<i>Goodyera oblongifolia</i>	rattlesnake orchid	Native	
	<i>Heracleum maximum</i>	cow parsnip, giant hogweed	Native	
	<i>Holcus lanatus</i>	velvet grass	Introduced	Moderate
	<i>Hordeum brachyantherum</i>	small-flowered barley	Native	

<b>Herbs</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>Cal-IPC Rating</b>
	<i>Hypochaeris radicata</i>	rough cat's ear	Introduced	Moderate
	<i>Ilex aquifolium</i>	holly	Introduced	Moderate
	<i>Juncus breweri</i>	dune rush	Native	
	<i>Juncus bufonius</i> var <i>occidentalis</i>	toad rush	Native	
	<i>Lathyrus littoralis</i>	beach pea	Native	
	<i>Layia carnosa</i>	beach layia	Native	
	<i>Leontodon saxatilis</i>	hairy hawkbit	Introduced	
	<i>Lepidium didymum</i>	lesser swinecress	Introduced	
	<i>Leucanthemum vulgare</i>	oxeye daisy	Introduced	Moderate
	<i>Lonicera hispidula</i>	pink honeysuckle	Native	
	<i>Lotus corniculatus</i>	bird's foot trefoil	Introduced	
	<i>Lupinus bicolor</i>	miniature lupine	Native	
	<i>Lupinus littoralis</i>	seashore lupine	Native	
	<i>Lythrum hyssopifolium</i>	hyssop loosestrife	Introduced	Limited
	<i>Madia sativa</i>	coast tarweed	Native	
	<i>Maianthemum dilatatum</i>	false lily-of-the-valley	Native	
	<i>Malva nicaeensis</i>	bull mallow	Introduced	
	<i>Marah oregana</i>	wild cucumber	Native	
	<i>Matricaria discoidea</i>	pineapple weed	Introduced	
	<i>Medicago polymorpha</i>	California burclover	Introduced	Limited
	<i>Melilotus albus</i>	white sweet clover	Introduced	
	<i>Melilotus officinalis</i>	yellow sweetclover	Introduced	
	<i>Mentha pulegium</i>	pennyroyal	Introduced	Moderate
	<i>Nasturtium officinale</i>	water cress	Native	
	<i>Nuttallianthus texanus</i>	blue toadflax	Native	
	<i>Oenanthe sarmentosa</i>	water parsley	Native	
	<i>Oenothera glazioviana</i>	red sepal evening primrose	Introduced	
	<i>Parentucellia viscosa</i>	yellow parentucellia	Introduced	Limited
	<i>Piperia elegans</i>	elegant rein orchid	Native	
	<i>Plantago erecta</i>	plantain	Native	
	<i>Plantago lanceolata</i>	English plantain	Introduced	Limited

<b>Herbs</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>Cal-IPC Rating</b>
	<i>Plantago major</i>	common plantain	Introduced	
	<i>Platystemon californicus</i>	cream cups	Native	
	<i>Plectritis congesta</i>	sea blush	Native	
	<i>Poa annua</i>	annual bluegrass	Introduced	
	<i>Poa bulbosa</i>	bulbous bluegrass	Introduced	
	<i>Poa confinis</i>	beach bluegrass	Native	
	<i>Poa douglasii</i>	beach bluegrass	Native	
	<i>Polygonum aviculare ssp depressum</i>	knotweed	Introduced	
	<i>Polygonum paronychia</i>	beach knotweed	Native	
	<i>Polypodium californicum</i>	California polypody	Native	
	<i>Polypodium glycyrrhiza</i>	licorice fern	Native	
	<i>Polypogon maritimus</i>	Mediterranean beardgrass	Introduced	
	<i>Polypogon monspeliensis</i>	annual beardgrass	Introduced	Limited
	<i>Polystichum munitum</i>	sword fern	Native	
	<i>Potentilla anserina ssp pacifica</i>	Pacific silverweed	Native	
	<i>Prunella vulgaris var lanceolata</i>	self heal	Native	
	<i>Pteridium aquilinum var pubescens</i>	bracken fern	Native	
	<i>Ranunculus repens</i>	buttercup	Introduced	Limited
	<i>Raphanus raphanistrum</i>	jointed charlock, wild radish	Introduced	
	<i>Ribes sanguineum var glutinosum</i>	red-flowering currant	Native	
	<i>Rubus armeniacus</i>	Himalayan blackberry	Introduced	High
	<i>Rubus ursinus</i>	California blackberry	Native	
	<i>Rumex acetosella</i>	sheep sorrel	Introduced	Moderate
	<i>Rumex crispus</i>	curly dock	Introduced	Limited
	<i>Sanicula crassicaulis</i>	pacific sanicle	Native	
	<i>Scirpus microcarpus</i>	small-fruited bulrush	Native	
	<i>Scrophularia californica</i>	California figwort	Native	
	<i>Senecio glomeratus</i>	cutleaf burnweed	Introduced	Moderate
	<i>Senecio minimus</i>	coastal burnweed	Introduced	Moderate
	<i>Senecio vulgaris</i>	common groundsel	Introduced	
	<i>Silene gallica</i>	catchfly	Introduced	

<b>Herbs</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>Status</b>	<b>Cal-IPC Rating</b>
	<i>Solidago spathulata</i> ssp <i>spathulata</i>	dune goldenrod	Native	
	<i>Sonchus oleraceus</i>	common sow thistle	Introduced	
	<i>Spergula arvensis</i>	spurrey	Introduced	
	<i>Spergularia rubra</i>	red sand-spurrey	Introduced	
	<i>Stachys ajugoides</i>	nettle	Native	
	<i>Tanacetum bipinnatum</i>	dune tansy	Native	
	<i>Trifolium dubium</i>	little hop clover	Introduced	
	<i>Trifolium hirtum</i>	rose clover	Introduced	Moderate
	<i>Trifolium microcephalum</i>	maiden clover	Native	
	<i>Trifolium pratense</i>	red clover	Introduced	
	<i>Trifolium repens</i>	white clover	Introduced	
	<i>Trifolium subterraneum</i>	subterranean clover	Introduced	
	<i>Vicia hirsuta</i>	vetch	Introduced	
	<i>Vinca major</i>	periwinkle	Introduced	Moderate

## **Attachment 2 Native Species Field Survey Forms**

Source Code \_\_\_\_\_ Quad Code \_\_\_\_\_  
 Elm Code \_\_\_\_\_ Occ. No. \_\_\_\_\_  
 EO Index No. \_\_\_\_\_ Map Index No. \_\_\_\_\_

Date of Field Work (mm/dd/yyyy): 4/19/2013

Reset

California Native Species Field Survey Form

Send Form

Scientific Name: Layia carnosa  
 Common Name: Beach layia  
 Species Found?  Yes  No If not, why? \_\_\_\_\_  
 Total No. Individuals no census Subsequent Visit?  yes  no  
 Is this an existing NDDB occurrence? yes  no  unk.  
 Yes, Occ. # \_\_\_\_\_  
 Collection? If yes: \_\_\_\_\_  
 Number \_\_\_\_\_ Museum / Herbarium \_\_\_\_\_  
 Reporter: Stephanie Morrissette  
 Address: 1010 Sea Avenue  
Eureka, CA. 95503  
 E-mail Address: Stephanie.morrissette@gmail.com  
 Phone: (707) 496-1952

Plant Information  
 Phenology: 40% vegetative 60% flowering \_\_\_\_\_% fruiting  
 Animal Information  
 # adults  # juveniles  # larvae  # egg masses  # unknown   
 wintering  breeding  nesting  rookery  burrow site  other

Location Description (please attach map AND/OR fill out your choice of coordinates, below)  
 County: Humboldt Landowner / Mgr.: Samoa Pacific Group and County of Humboldt  
 Quad Name: Eureka Elevation: 22 feet  
 T \_\_\_\_\_ R \_\_\_\_\_ Sec \_\_\_\_\_ 1/4 of \_\_\_\_\_ 1/4, Meridian:  H  M  S  W  
 Source of Coordinates (GPS, topo, map & type): GPS  
 GPS Make & Model Juno SB  
 DATUM: NAD27  NAD83  WGS84   
 Horizontal Accuracy \_\_\_\_\_ meters/feet  
 Coordinate System: UTM Zone 10  UTM Zone 11  OR Geographic (Latitude & Longitude)   
 Coordinates: 399289 E 4518754 N

Habitat Description (plants & animals) plant communities, dominants, associates, substrates/soils, aspects/slope:  
 Animal Behavior (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):  
Growing on remnant dunes between Highway 255 (New Navy Base Road) and historic log deck in Samoa, within utility corridor. Substrate is sand, aspect variable, common associates include Galia millefoliata, Ambrosia Chamissonis, Calystegia soldanella, Chamissonia cheiranthifolia, Polygonum peronychia, Eriogonum latifolium, Solidago spathulata, Lupinus bicolor, Daucus pacellus, Rumex acetosella, Claytonia sp., Cardionema ramosissimum, Cryptantha sp.  
 Please fill out separate form for other rare taxa seen at this site.

Site Information Overall site/occurrence quality/viability (site + population):  Excellent  Good  Fair  Poor  
 Immediate AND surrounding land use: Recreational, Residential + light industrial  
 Visible disturbances: Located within utility easement that is subject to light vehicle + foot traffic during routine maintenance of water/power lines.  
 Threats: Invasive-exotic plants (encroachment of European beachgrass + iceplant)  
 Comments: Sandy openings somewhat maintained by vehicle traffic - disturbance may hinder, encroachment of invasive-exotic plants. Follow-up survey to update existing

Determination: (check one or more, and fill in blanks) Botanical information for \_\_\_\_\_  
 Keyed (cite reference): Jepson Manual (1992) Samoa Town  
 Compared with specimen housed at: Master P  
 Compared with photo / drawing in: \_\_\_\_\_  
 By another person (name): \_\_\_\_\_  
 Other: \_\_\_\_\_  
 Photographs: (check one or more) Slide  Print  Digital   
 Plant / animal     
 Habitat     
 Diagnostic feature     
 May we obtain duplicates at our expense? yes  no

For Office Use Only

Source Code \_\_\_\_\_ Quad Code \_\_\_\_\_  
 Elm Code \_\_\_\_\_ Occ. No. \_\_\_\_\_  
 EO Index No. \_\_\_\_\_ Map Index No. \_\_\_\_\_

Date of Field Work (mm/dd/yyyy): 4/19/2013

Reset

**California Native Species Field Survey Form**

Send Form

**Scientific Name:** Galia millefoliata  
**Common Name:** Dark-eyed Galia  
**Species Found?**  Yes  No If not, why? \_\_\_\_\_  
**Total No. Individuals** Plants **Subsequent Visit?**  yes  no  
**Is this an existing NDDDB occurrence?** yes  no  unk.  
 Yes, Occ. # \_\_\_\_\_  
**Collection? If yes:** \_\_\_\_\_  
 Number \_\_\_\_\_ Museum / Herbarium \_\_\_\_\_  
**Reporter:** Stephanie Morrissette  
**Address:** 1010 sea Avenue  
Eureka, CA, 95503  
**E-mail Address:** Stephanie.morrissette@gmail.com  
**Phone:** (707) 496-1952

**Plant Information**  
 Phenology: April: 80% vegetative, 20% flowering, 0% fruiting  
May: 20% vegetative, 50% flowering, 30% fruiting  
**Animal Information**  
 # adults  # juveniles  # larvae  # egg masses  # unknown   
 wintering  breeding  nesting  rookery  burrow site  other

**Location Description (please attach map AND/OR fill out your choice of coordinates, below)**  
 County: Humboldt Landowner / Mgr.: Samoa Pacific Group and County of Humboldt  
 Quad Name: Eureka Elevation: 22 feet  
 T \_\_\_\_\_ R \_\_\_\_\_ Sec \_\_\_\_\_, \_\_\_\_\_ 1/4 of \_\_\_\_\_ 1/4, Meridian: H  M  S   
 Source of Coordinates (GPS, topo, map & type): GPS  
 T \_\_\_\_\_ R \_\_\_\_\_ Sec \_\_\_\_\_, \_\_\_\_\_ 1/4 of \_\_\_\_\_ 1/4, Meridian: H  M  S   
 GPS Make & Model: Juno SB  
**DATUM:** NAD27  NAD83  WGS84   
 Horizontal Accuracy \_\_\_\_\_ meters/feet  
 Coordinate System: UTM Zone 10  UTM Zone 11  OR Geographic (Latitude & Longitude)   
 Coordinates: 399405 E 4518976 N

**Habitat Description (plants & animals)** plant communities, dominants, associates, substrates/soils, aspects/slope:  
**Animal Behavior** (Describe observed behavior, such as territoriality, foraging, singing, calling, copulating, perching, roosting, etc., especially for avifauna):  
Growing on remnant dunes between Highway 255 and historic log deck in Samoa, within utility (water/power) corridor. Sandy substrate, variable aspect.  
Common associates include: Rumex acetosella, Plantago erecta, Bromus diandrus, Aira praecox, Cardionema ramosissimum, Hypochaeris radicata, Cryptantha leiocarpa.  
Higher quality Habitat Associates: Abronia latifolia, Eriogonum latifolium, Lupinus bicolor.  
 Please fill out separate form for other rare taxa seen at this site. Polygonum paronychia, Layia carnosia

**Site Information** Overall site/occurrence quality/viability (site + population):  Excellent  Good  Fair  Poor  
 Immediate AND surrounding land use: Recreational, Residential, and light industrial  
 Visible disturbances: Light vehicle + foot traffic associated with routine maintenance of water + power lines.  
 Threats: Invasive/exotic species encroachment: European beachgrass, yellow bush lupine + replant.  
 Comments: Follow-up survey to re-document rare plant distributions for the Samoa Town Master Plan

**Determination:** (check one or more, and fill in blanks)  
 Keyed (cite reference): Jepson Manual (1993)  
 Compared with specimen housed at: \_\_\_\_\_  
 Compared with photo / drawing in: \_\_\_\_\_  
 By another person (name): \_\_\_\_\_  
 Other: \_\_\_\_\_  
**Photographs:** (check one or more) Slide  Print  Digital   
 Plant / animal     
 Habitat     
 Diagnostic feature     
 May we obtain duplicates at our expense? yes  no