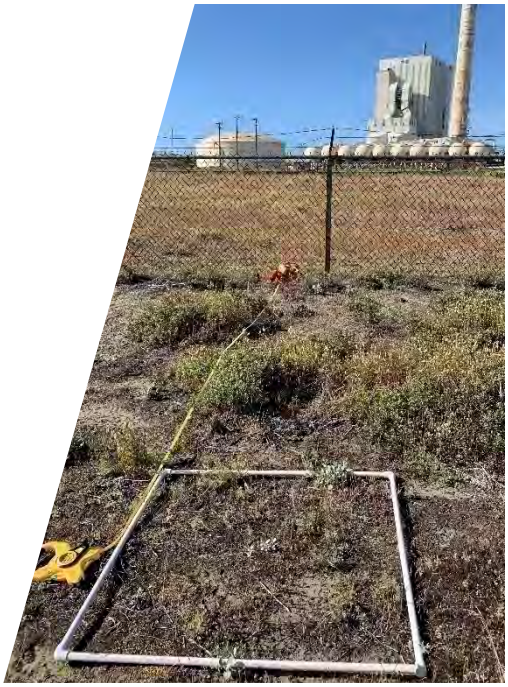
Appendix K

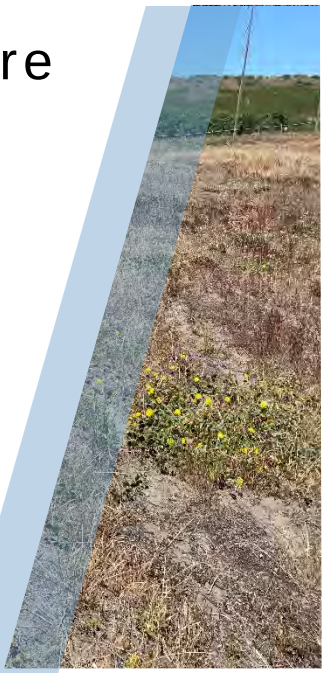
Restoration and Monitoring Plan



Nordic Aquafarms California Samoa Peninsula Land-based Aquaculture Project

Restoration and Monitoring Plan
Samoa, Humboldt County, California
Rev. 4

August 4, 2021



Executive Summary

This Restoration and Monitoring Plan was prepared on behalf of Nordic Aquafarms California, LLC. The Nordic Aquafarms proposed Samoa Peninsula Land-based Aquaculture Project (Project) consists of a land-based finfish aquaculture facility and associated infrastructure that would cover approximately 29 acres. The Project would include brownfield redevelopment with demolition of existing pulp mill infrastructure and construction of a sustainable land-based finfish aquaculture facility. Although much of the proposed development would occur within the current footprint of the pulp mill, it is also proposed to expand into the undeveloped, but mostly previously graded, area of the parcel. The undeveloped Project Area consists of sand substrate primarily vegetated by coastal dune plants, including areas of native dune mat that support a rare annual dune plant, dark-eyed gilia (*Gilia millefoliata*). The Project is expected to impact two Sensitive Natural Communities: 4.5 acres of dune mat (*Abronia latifolia-Ambrosia chamissonis* Alliance G3 S3) and 0.02 acres of coastal brambles (*Rubus ursinus* Alliance G4 S3). Dune mat quality varies in the area, with highly invaded dune mat around the brownfield, and higher-quality patches characterized by a dominance of native dune mat species, lower total vascular plant cover, and undulating topography on the south side of the Project Area. The Project Area has been degraded by previous land use and invasive species. Invasive European beachgrass (*Ammophila arenaria*) and yellow bush lupine (*Lupinus arboreus*) dominate much of the area. Proposed mitigation measures include 3.49 acres of onsite dune restoration and protection of remaining dark-eyed gilia and coastal habitats as well as a minimum of 7.22acres of compensatory off-site restoration. Offsite restoration is planned in backdune habitats on the North Spit of Humboldt Bay in partnership with Humboldt Bay Harbor District, Manila Community Services District, Friends of the Dunes, and U.S. Fish and Wildlife Service.

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1. Introduction

1.1 Purpose

This Restoration and Monitoring Plan (RMP) was prepared on behalf of Nordic Aquafarms in support of the proposed Samoa Peninsula Land-based Aquaculture Project (Project). A population of dark eyed gilia, a rare annual dune plant, and sensitive habitats occur within the area of Project impacts. The RMP provides conceptual methods for mitigating proposed Project impacts to sensitive vegetation and rare plants and monitoring methods to ensure that mitigation meets designated Success Criteria. The RMP will guide development of Mitigation Plans and Specifications that will include supplemental site-specific details on restoration maintenance, restoration planting stock source(s), site access, disposal sites for plant material, seed collection and storage requirements, and partner coordination requirements.

1.2 Project Location

The Project Site is located within Assessor Parcel Number (APN) 401-112-021, in the town of Samoa on the North Spit of Humboldt Bay, CA (Figure 1). The site of the planned aquaculture facility (APN 401-112-021) is owned by the Humboldt Bay Development Association, Inc. (HBDA), and is leased to the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD). The Project Site is located in the California Coastal Zone, with primary permitting jurisdiction with the Humboldt County Local Coastal Program. The Project Site is designated for Industrial, Coastal Dependent (MC) land use and is zoned Industrial/Coastal Dependent.

1.3 Project Description

The Project proposes to redevelop the site of the decommissioned Freshwater Tissue Samoa Pulp Mill facility (pulp mill) in order to construct a land-based finfish recirculating aquaculture system (RAS) facility (aquaculture facility). Nordic Aquafarms will conduct the Project in collaboration with the Humboldt County Planning Department, the Humboldt Bay Harbor, Recreation and Conservation District (HBHRCD), and applicable regulatory agencies.

The finfish aquaculture facility is planned to be developed in two phases and would have an annual production capacity of approximately 25,000-27,000 metric tons of whole fish once complete. The aquaculture facility would utilize water and energy efficient processes to sustainably produce fresh Head On Gutted (HOG) fish and fillets for delivery to regional markets. The species to be produced at the facility has not finally been decided, but a short-list is under consideration.

The proposed aquaculture facility will include a complete process, from egg to harvestable fish in a single indoor location, and would contain the following design elements (Figure 2):

1. A hatchery operation where eggs are hatched, and fish fry grow to juvenile size
2. A grow-out operation with large tanks where fish are grown to market size
3. A fish processing facility from which fish is processed and fresh product is shipped out 5 days a week, coproducts are packaged and shipped to customers for further use.

4. Backup systems that will enable critical functions to operate indefinitely in the event of a power outage
5. Oxygen generation plant and liquid oxygen storage
6. Water intake treatment that ensures consistently clean water for the fish
7. An advanced tertiary wastewater treatment plant to treat the discharge water, including a Moving Bed Biofilm Reactor (MBBR), an ultrafiltration membrane bioreactor (MBR), and 300 mJ/cm UV-C disinfection.
8. Administrative building and associated operations/maintenance facilities

RAS technology enables producers to establish a controlled production environment indoors, thus eliminating noise, odor, and other potential nuisances to neighboring areas. Discharge of nutrients from the proposed RAS facility is also greatly reduced by removing more than 99% of most nutrients and over 90% of nitrogen before the wastewater is discharged.

Demolition of existing pulp mill structures and site remediation work (Phase 0) will be conducted prior to the commencement of the initial stage of aquaculture facility construction (Phase 1). EPA 2019 soil sample analysis for contaminants showed that all measurements came back either non-detect (ND), or below DTSC screening levels for industrial sites or regional background levels. Based on the results of the 2019 EPA study, and past clean-up efforts on the project site, there is low risk of significant contamination existing on the site. Excavated soils will be sampled for contaminants, and responsible remediation will occur if contaminated soils or debris are encountered during demolition, excavation, or construction. Much of the site will be “capped” with either structures or impervious surfaces or landscaped and equipped with proper stormwater control measures. Thus, any risk of contamination migration will be minimized post-construction.

Once the footprint of Phase 1 aquaculture facility development has been determined, a demolition plan will be implemented to clear the construction footprint. A similar plan will be developed for the remaining buildings and infrastructure in preparation of Phase 2 aquaculture facility construction, which is planned for the vicinity of the brownfield. Maximum building height within the facility is expected to be approximately 60 feet. The footprint of the buildings included in Phase 1 of construction is approximately 48,370 square feet, and the Phase 2 production module footprint is approximately 289,000 square feet. Egg raising in the hatchery will begin as early as feasible during Phase 1, followed thereafter by the completion of the remaining Phase 1 grow-out and processing construction. The hatchery facility, located in the center of the site, will raise the fish from egg to juvenile stage, after which they will be transported to the grow-out modules via underground pipes to be raised to market size. The water treatment plant (WTP) will subject all inlet and wastewater to a stringent treatment process, including ultra filtration, biological denitrification treatment, and UV sterilization. The remaining buildings house the administrative functions, backup power generation, and utility infrastructure needed to support operation. The total expected Project footprint is 29 acres, including 23 acres that were industrially developed over previous decades for the decommissioned pulp mill.

1.4 Project History

Large-scale construction on the Project Site began in 1963 when Georgia Pacific LLC (GP) developed the site as a bleached Kraft pulp mill. The pulp mill changed ownership several times and was most recently purchased by Freshwater Tissue Company (FTC) in 2009. The mill was permanently closed by FTC in 2010 and FTC subsequently undertook decommissioning activities and selective demolition of the facility infrastructure until 2013. Asbestos material removal (abatement) at select structures was conducted by FTC subcontractors between 2011 and 2013. Between 2011 and 2013 many pulp mill structures were demolished, including the pulp mill Recovery Boiler, Bleach Plant, re-causticizing area, and liquor storage tanks.

In August 2013 ownership of the former pulp mill site was transferred from FTC to the HBHRCD. In November 2013 the USEPA began a series of studies to assess the existing risks presented by stored chemicals onsite and the degree of contamination of the soils and groundwater from historic pulp mill operations. Based on the USEPA assessments, an emergency remediation effort was commenced in 2014 by the USEPA and the United States Coast Guard at the former pulp mill. The $15 million site remediation involved the removal of spent pulping liquors and other hazardous chemicals that had been stored onsite (Times Standard 2018).

The majority of the former pulp mill infrastructure has been demolished however several structures remain in situ, including the 12-story Reboiler Building and approximately 300-foot smokestack. Additionally, several remnant debris stockpiles resulting from the FTC infrastructure demolition operations remain at the former pulp mill site. Demolition debris piles were assessed by the HBHRCD and found to contain hazardous material contamination, including asbestos, heavy metals and petroleum hydrocarbons. Since 2013, extensive debris removal has been undertaken by HBHRCD and much of the demolition waste has been transported offsite to appropriate disposal facilities. Existing demolition debris stockpiles currently at the Project Site are scheduled to be removed by the HBHRCD prior to the commencement of the proposed Project.

Prior to development for use as a pulp mill over 50 years ago, the location on the Samoa peninsula historically consisted of mobile and vegetated coastal dunes. The natural topography of the area has been altered, and the remaining degraded dunes in the project area have been subject to regular anthropogenic disturbance. The industrially developed parcel is bordered by Humboldt Bay to the east, highly invaded coastal dunes to the west and south, and developed area to the north.

1.5 Responsible Parties

Nordic Aquafarms California, LLC is responsible for funding of the project, including mitigation implementation and monitoring components. The County of Humboldt is the Lead Agency for CEQA and responsible for issuance of the Coastal Development Permit. Other permits are needed from the California Coastal Commission, the Regional Water Quality Control Board, the California Department of Fish and Wildlife and the North Coast Unified Air Quality Management District

2. Goals and Objectives

2.1 Vision and Goals

Nordic Aquafarms seeks to provide sustainably raised seafood to customers on the West Coast using environmentally and socially responsible business practices. The project is expected to benefit the Humboldt Bay area economically by bringing jobs and industry development. The Nordic Aquafarms Restoration and Monitoring Plan (RMP) also seeks net-positive impacts on coastal habitats and species occurring in the Project Area on the North Spit of Humboldt Bay. The purpose of the RMP is to ensure that sensitive vegetation and species occurring onsite are protected and enhanced where possible, or appropriately compensated with in-kind offsite restoration consistent with the Local Coastal Plan. Compensatory mitigation and minimization measures proposed herein aim to protect and restore native habitats and plants threatened by coastal development while contributing to landscape-level planning and conservation on the North Spit of Humboldt Bay. Overarching goals of the RMP addressing target sensitive species and habitats onsite are as follows:

1. **The project will not negatively impact the viability of the rare dark eyed gilia population on the North Spit of Humboldt Bay.**
2. **The project will not have a negative overall impact on native coastal vegetation.**

Table 2.1 Target Species and Communities

Target Biota	Type	Current Status	Onsite Actions	Offsite Compensation
Dark-Eyed Gilia	Rare Plant (CNPS 1B.2)	Population Present Onsite (~100,000)	• Protect and enhance remainder • Seed collection	• Restore and maintain dune habitat for dark-eyed gilia
Dune Mat	Sensitive Natural Community	High Quality and Degraded Dune Mat Present Onsite	• High quality dune mat protected in its entirety • Protect and enhance remainder • Restore remaining invaded dunes	• Restore and maintain dune mat communities by removing invasive plants
European Beachgrass Swards	Degraded Dunes	Highly Invaded Dunes Present Onsite	• Remove onsite • Restore remainder to dune mat	• Restore and maintain degraded dunes by removing European beachgrass
Yellow Bush Lupine Scrub	Degraded Dunes	Highly Invaded Dunes Present Onsite	• Remove onsite • Restore remainder to dune mat or coastal brambles	• Restore and maintain dunes by removing yellow bush lupine
Coastal Brambles	Sensitive Natural Community	Moderately Invaded Coastal Brambles Present Onsite	• Protect and enhance remainder • Plant additional native coastal brambles species onsite	• No offsite compensation necessary

2.2 Mitigation Objectives

Proposed mitigation includes protecting and enhancing remaining habitats and the rare plant population on the property as well as compensatory restoration offsite.

2.2.1 Onsite Mitigation Objectives

Dark-Eyed Gilia

- Dark-eyed gilia population outside of the project footprint will be protected and habitat will be enhanced so that the rare plant may persist along the southern boundary.
- Dark-eyed gilia seeds will be collected from plants within the planned project footprint prior to disturbance for use in offsite restoration.
- Dark-eyed gilia populations co-located with high quality dune mat will be protected in place.

Dune Habitats

- Protect and enhance dune mat habitat remaining onsite by manually removing invasive ripgut brome and other target invasive grass species that reduce dune mat habitat quality.
- Remove and control invasive European beachgrass onsite.
- Remove and control yellow bush lupine and Cal-IPC High rated invasive species.
- Enhance highly degraded dune habitat with low native plant cover (outside of mapped rare plant population) by planting dune mat species.
- Protect in-place and include a 10-foot buffer for all high-quality dune mat, avoiding any construction or operational-related disturbance. All high-quality dune mat will be excluded from any anthropogenic disturbance.

Coastal Brambles

- Enhance coastal brambles remaining onsite by removing and controlling yellow bush lupine and Cal-IPC highly invasive species and planting associated native species in areas of sparse cover.
- Compensate for loss of coastal brambles habitat by planting associated native species onsite.

2.2.2 Offsite Mitigation Objectives

Dark Eyed Gilia

- Restore suitable habitat by removing invasive plants in areas with long-term site protection and maintenance access on the North Spit of Humboldt Bay, and translocate dark eyed gilia by seeding appropriately restored habitat offsite.

Dune Habitats

- Restore backdune habitats by removing invasive plants in areas with long-term site protection and maintenance access on the North Spit of Humboldt Bay.

3. Proposed Mitigation Strategy

3.1 Onsite Mitigation Strategy

Restoration and enhancement of remaining habitats onsite has been incorporated into the RMP as a primary strategy because the site has demonstrated necessary habitat elements to support target species and communities, and remaining natural areas onsite have high potential for improvement.

3.1.1 Dark-Eyed Gilia Protection and Habitat Restoration

The currently occupied habitat for dark-eyed gilia is expected to be reduced to the area outside the Project footprint. The annual plant shows high tolerance to low or moderate levels of surface disturbance, often growing within tire tracks in sandy soil on the site. Manual removal of invasive plants within and around the remaining population is proposed because mechanical removal or burial of invasive plants with heavy equipment has the potential to bury the viable seedbank and impact the remaining population onsite. Disturbance of the remaining currently occupied dark eyed

gilia habitat should be minimized by only using manual invasive plant removal so that the seed bank may be left intact and population may persist onsite. The majority of the high-quality dune mat habitat onsite is located along the southern margins of the Project Area, and dark-eyed gilia will be preserved in this area given the high-quality dune mat and surrounding 10-foot buffer will not be impacted by construction or operations. Additionally, highly invaded remaining dune habitats will be restored to expand the potential high-quality habitat for dark eyed gilia. Onsite protections from human and vehicular disturbance will include permanent signage around the boundaries of onsite restoration areas. Temporary protective staked flagging will mark the boundaries of the dark-eyed gilia Native Plant Protection Area for avoidance during seed collection and construction-related activities.

3.1.2 High Quality Dune Mat Protection Onsite

High quality dune mat will be protected in place, on-site. Exclusionary fencing shall be installed to protect all mapped high quality dune map during construction, inclusive of an additional buffer of 10 feet. The location of exclusionary fencing shall be indicated on final plans for construction. Construction and development shall be excluded from any high quality and the surrounding 10-foot buffer. The nearest building (Building 2) shall be sited no less than 35 feet from the high quality dune mat.

3.1.3 Dune Habitat Restoration Onsite

Dune habitat restoration onsite includes invasive plant removal from remaining dune habitats and restoration planting with dune mat species in designated areas. European beachgrass, yellow bush lupine, and target invasive grasses will be manually removed each year for five years. In year 1, intensive manual removal of invasive plants will be needed in the designated restoration areas. In subsequent years 2-5, the area will be searched for re-sprouting invasive plants and new growth to be removed. Restoration planting with dune mat species is planned for areas of invasive plant removal along the western side of the property and some areas along the southern border where habitat enhancement is needed. Only invasive plant removal and no restoration planting has been recommended within the current dark eyed gilia population area to avoid additional disturbance, competition, or shading from larger perennial native plants. Permanent signage around the boundaries of onsite restoration areas will prevent disturbance by the public, employees and maintenance workers. The shapes of remaining areas for mitigation are constrained to the edges of the parcel by the construction footprint. Invaded dune habitats also occur in the surrounding areas, and low-disturbance manual restoration methods have been recommended to minimize potential disturbance to habitats within mitigation areas and in surrounding areas. Onsite dune mitigation areas may be somewhat exposed to invasive seed sources in the surrounding highly invaded dune habitats on other parcels. The exposure to incoming seed sources is somewhat reduced by the topography onsite characterized by an artificial dune berm blocking wind on the eastern roadside, and the planned building footprint blocking the dominant wind direction from the north. It is expected that five years of intensive invasive plant removal and maintenance will be needed to reduce the seedbank to low-maintenance levels and counteract the effects of dispersal from invasive seed sources.

3.1.4 Coastal Brambles Community Enhancement

The coastal brambles sensitive natural community is moderately disturbed and affected by invasive species, especially yellow bush lupine. A small portion of the coastal brambles community will be impacted by the project. Onsite restoration of the remaining coastal brambles will consist of removing Cal-IPC High-rated invasive species and replanting native shrubs associated with the coastal brambles alliance. Additionally, the coastal brambles community will be expanded and incorporated into the landscaping around the entrance by planting California blackberry (*Rubus ursinus*), coast twinberry (*Lonicera involucrata*), salal (*Gaultheria shallon*) and other native coastal shrub species that provide high habitat value for songbirds and pollinators. Coastal brambles and native landscaping plants selected for adjacent aesthetic (non-mitigation) landscaping provide valuable multi-tiered habitat for native songbirds and pollinators, but coastal brambles and other native landscaping may also tend to spread into stabilized dune habitats where nutrient-enriched soils and moisture levels provide suitable conditions. Tree and shrub species may also increase the level of shading to the north and west. However, dune mat currently coexists with coastal brambles in this area, and dune mat also naturally coexists with the mosaic of dune forests and wetland swales that can be found in unaltered portions of dunes on the North Spit. Native landscaping and coastal brambles will be maintained to ensure that they do not encroach into dune mat restoration areas or negatively affect growing conditions in nearby dune mat areas. Please see attached Native Landscaping Site Plan **(Attachment B)** for planting and landscape maintenance details.

3.2 Offsite Mitigation Strategy

Offsite mitigation is also needed to fully compensate for impacts to dune habitats and dark-eyed gilia. The overall strategy for offsite dune habitat and rare plant mitigation is summarized below, and comprehensive details are provided in Sections 6-11.

3.2.1 Dune Habitat Restoration

Offsite mitigation areas are sourced from a variety of landowners on the North Spit of Humboldt Bay that have comparable dune habitats that can be restored to contiguous native dune ecosystems with long-term site protection. Offsite restoration areas provide “in-kind” mitigation because they contain similar backdune habitats that have been degraded by invasive yellow bush lupine, European beachgrass, annual grasses, and other invasive plants, and they may be appropriately restored to native dune mat communities. Dune habitat restoration will primarily consist of manual invasive species removal, with some transplanting or seeding of native dune mat species in bare areas where sand movement may be a concern for infrastructure. Sources of native plant stock and seed may include transplanting or seed collection of native plants directly from the planned project footprint for highly local sourcing, or regionally sourced native plants provided by a local nursery. Vegetation types, dominant species composition, and percent cover of invasive species at offsite mitigation areas was characterized by visual estimates and observations in 2020 (see Section 6.2 and Rapid Assessments in Appendix D for details), and quantitative baseline surveys of percent cover and special-status plant surveys will occur prior to beginning invasive species removal.

3.2.2 Dark-Eyed Gilia Translocation

Offsite mitigation for dark-eyed gilia will consist of collecting seeds from the planned project footprint prior to grading or other disturbance and broadcasting the seeds into designated macroplots within appropriate restored dune mat habitat. Based on expected project timing, dark-eyed gilia seed collection and storage for future use will need to be undertaken by a qualified restoration professional/nursery, and specifics on seed collection and storage requirements will be provided in Plans and Specifications. Success criteria and management focus on maintaining appropriate habitat and establishing or augmenting dark-eyed gilia populations at restoration sites to support an equivalent number of dark-eyed gilia plants compared to baseline conditions. Dark-eyed gilia is a disturbance-adapted annual plant, and populations may fluctuate naturally. The small seeds disperse readily with the wind, which may allow populations to move from year to year. Density-based monitoring will be used to establish whether the population is within or exceeding the estimated number of plants that were likely impacted onsite, and additional information such as reference site data may be used to account for interannual variability if deemed necessary based on observed site conditions.

4. Baseline Conditions

4.1 Baseline Surveys

GHD conducted botanical surveys and mapping prior to Project-related disturbance between April and August, 2020. Baseline surveys were conducted throughout the previously established Area of Potential Effect (APE), which included the Project Area and an additional area west of Vance Avenue that is outside the scope of the RMP.

4.1.1 Rare Plant Surveys

GHD Botanist Amy Livingston conducted an early season survey of the entire APE for special status plant species on April 17, 2020. GHD Botanist Kelsey McDonald conducted follow-up surveys on May 5, May 9, May 22, and June 29. The special status plant surveys were floristic in nature following *Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities* by the California Natural Resource Agency (CDFW 2018) and *General Rare Plant Survey Guidelines by the Endangered Species Recovery Program* (USFWS 2002).

Systematic sampling was used to calculate a population estimate for dark-eyed gilia (*Gilia millefoliata*, CNPS 1B.2) on May 22, 2020. A baseline transect was established along the southern fence that bisects the population (**Appendix A Figure 3**), and north-south transects were placed every 60ft on both sides of the fence. The number of dark-eyed gilia plants was counted within 1 square-meter quadrats placed every 15 feet along the north-south transects after a random start between 0-15. Average density within the 1 square-meter quadrats was multiplied by the total area of the main population macroplot to obtain population estimates for the area.

4.1.2 Vegetation Assessment and Field Mapping

GHD conducted vegetation mapping on March 24, March 25, April 8, April 23, June 29, and July 27, 2020. GHD vegetation mapping in 2020 expanded and updated SHN's previous mapping efforts

overlapping the area around Vance Avenue. Vegetation was mapped to the Alliance level according to *A Manual of California Vegetation* (Sawyer et al. 2009). Vegetation Rapid Assessments were completed to characterize the dune mat community and adjacent areas that were strongly dominated by non-native species (Appendix D). One-parameter wetlands dominated by coastal willow patches (*Salix hookeriana*) were also investigated for wetland soils and hydrology, but no three-parameter wetlands were found to occur in the Project footprint.

The quality of dune habitats was quantitatively assessed by collecting percent cover data in randomized 1 square-meter plots. Sampling of the degraded dune area near the current footprint of development (north of the southerly cyclone fence) occurred on March 24 and March 25, 2020. Vegetation data was collected in twenty randomized plots north of the fence, including six in bush lupine scrub and 14 in dune mat. Dune mat quality was assessed south of the fence on May 22, 2020 in six randomized plots within dune mat vegetation. Invasive dune vegetation and dune mat species also occur in the surrounding area, but vegetation mapping and surveys were only conducted within areas that may be affected by project-related activities, as required by survey protocol (CDFW 2018).

4.2 Dark-Eyed Gilia Population

Rare dark-eyed gilia (*Gilia millefoliata*) was detected in flower on May 5, 2020 in the degraded dune habitat on the southern side of the project area. Population sampling on May 22, 2020 led to an estimated population of approximately 100,000 dark-eyed gilia plants. Dark-eyed gilia had a clustered distribution scattered from the area west of the clarifiers across the southern end of the property (**Appendix A Figure 3**). The highest density of dark-eyed gilia occurred north of the fence along the disturbed access road and in a couple of small patches near the clarifiers. A total of 133 dark-eyed gilia plants were counted in two small, dense clusters west of the clarifiers. A sparser patch on the east side of the property near the current footprint contained 415 plants. Systematic sampling of the main population macroplot (n=146) showed an average density of 17 (± SE of 7) plants per 1 square-meter quadrat area in the area north of the southern cyclone fence, resulting in an estimate of ~60,000 individuals north of the cyclone fence over the ~3700 square-meter area. Sampling the macroplot south of the cyclone fence showed an average density of seven dark-eyed gilia plants (± SE of 2) per 1 square-meter quadrat, resulting in an estimate of ~40,000 individuals in the ~5600 square-meter macroplot within the APE south of the cyclone fence (Table 4.2).

Dark-eyed gilia was most concentrated in the unpaved access road north of the southern cyclone fence line, where intermittent disturbance appears to have prevented dense establishment of vegetation. The rare annual appeared to favor disturbed areas with lower non-native vegetation cover, such as in the access road north of the fence, and the population appeared to be sparser and patchily distributed closer to the former pulp mill and clarifiers. Some small but dense patches also occurred in open tire tracks through the sand around the clarifiers. Dark-eyed gilia also occurred at moderate density in clusters throughout the dune mat community south of the cyclone fence. Dark-eyed gilia was abundant but stunted in areas where shell and gravel have been distributed in the power-pole access area to the south of the cyclone fence within the APE. Dark-eyed gilia often associated with native dune mat species such as seaside buckwheat (*Eriogonum latifolium*), yellow sand verbena *(Abronia latifolia*), sand mat (*Cardionema ramosissimum*), beach strawberry (*Fragaria chiloensis*), and dune knotweed (*Polygonum paronychia*), disturbance-associated native miniature lupine (*Lupinus bicolor*), as well as many non-native invasive species such as ripgut brome (*Bromus*

diandrus), sheep sorrel (*Rumex acetosella*), and English plantain (*Plantago lanceolata*). Dark-eyed gilia did not occur in areas with high percent cover (>80%) of European beachgrass or other invasive plants. Dark-eyed gilia was in peak flower during May surveys and was >50% in fruit during the June 29th site visit. The annual plant was >90% in fruit and dropping seeds during the July 27th visit.

Table 4.2 Dark-Eyed Gilia Population Estimates by Area

	Area (sqft)	Density (#/sqm)	Number of Plants	Population Estimate Error
Main Population North of Fence	39,950	17	60,000	± 30,000
Main Population South of Fence	60,400	7	40,000	± 10,000
Northeastern Subpopulation	2,990	1.5	415	± 10
Northwestern Subpopulation	40	33	133	± 10

4.3 Vegetation and Sensitive Natural Communities

Dune mat (*Abronia latifolia-Ambrosia chamissonis* Alliance)

Sensitive Natural Community (G3 S3)

Herbaceous vegetation (less than 10% shrub cover) with characteristic presence of dune mat species keyed to the *Abronia latifolia-Ambrosia chamissoni*s Alliance in *A Manual of California Vegetation* (MCV). Dune mat is a Sensitive Natural Community ranked by NatureServe as Vulnerable globally (G3) and within the state of California (S3). Much of the Project Area contains dune mat species at diagnostic levels. Dune mat was primarily characterized by yellow sand verbena, seaside buckwheat, dune knotweed, beach strawberry, and sandmat. Rare dark-eyed gilia, which typically occurs in stabilized dunes, was also widespread in this community. Previous leveling of the natural dune topography, continued anthropogenic disturbance, and the introduction of invasive non-native species have degraded dune mat communities in the area. Much of the area was highly invaded by non-native grasses and forbs, including ripgut brome, sweet vernal grass (*Anthoxanthum odoratum*) and sheep sorrel. Patches of higher quality dune mat were mapped south of the fence in areas that have retained >50% relative native cover and more natural dune processes with undulating topography and greater sand mobility as a result of lower overall vegetative cover. A total of 6.7 acres of the APE was mapped as dune mat, and an additional 0.34 acres was mapped as high-quality dune mat (**Appendix A Figure 4, Table 4.3**).

Yellow bush lupine scrub (*Lupinus arboreus* Alliance)

Non-Native Dune Habitat

Areas dominated by invasive yellow bush lupine (*Lupinus arboreus*) in the shrub layer were mapped as yellow bush lupine scrub. These areas contained high absolute cover of non-native species and very few native plants. Species commonly associated with yellow bush lupine scrub within the APE included ripgut brome, sweet vernal grass, and velvetgrass (*Holcus lanatus*) among many other non-native weedy species. Yellow bush lupine also appears to be encroaching into areas currently mapped as dune mat, with many seedlings occurring at the transition zone between yellow bush lupine and dune mat communities. Some areas previously mapped as generic non-native vegetation or dune mat were dominated by yellow bush lupine at the time of surveys in 2020, and these areas

were updated to show current conditions. An area near the western parking lot previously designated as non-native appeared to have been managed for yellow bush lupine (cut and piled bush lupine and stumps apparent in the area), and this area has been identified as a dune mat community based on current vegetation with at least 10% cover of native dune species. A total of 2.06 acres of yellow bush lupine scrub occurs within the APE (**Appendix A Figure 4, Table 4.3**).

European beachgrass swards (*Ammophila arenaria* Semi-Natural Stand)

Non-Native Dune Habitat

European beachgrass (*Ammophila arenaria*) has invaded a great deal of the remaining dune topography within the APE, and it is widespread in dunes in the surrounding areas. European beachgrass swards were mapped according to MCV online membership rules, and only include areas with >80% relative cover of European beachgrass. European beachgrass swards covered 0.70 acres of the APE (**Appendix A Figure 4, Table 4.3**).

Coastal willow thickets (*Salix hookeriana* Alliance)

Sensitive Natural Community (G4 S3)

Coastal willow thickets were dominated by mature Hooker's willow (*Salix hookeriana*), with lower cover of other shrub species such as coyote brush (*Baccharis pilularis*). Coastal willow thickets are a Sensitive Natural Community with a state rank of S3. Coastal willow thickets primarily occurred in swale topography along Vance Ave (east and west), and Brewer's rush (*Juncus breweri*) was common in the understory. Coastal willow thickets were first mapped in the area by SHN in 2018 mapping for the Samoa Peninsula Wastewater Project. Spatial data showing coastal willow thickets from the previous SHN mapping effort was incorporated into current mapping, and the southern willow thicket east of Vance Avenue was expanded slightly to include associated swale vegetation. Coastal willow thickets cover 0.28 acres of the APE (**Appendix A Figure 4, Table 4.3**). See section 4.2.3 below for further discussion of willow thickets and their wetlands status.

Coastal brambles (*Rubus ursinus* Alliance)

Sensitive Natural Community (G4 S3)

Coastal brambles are a Sensitive Natural Community with a state rank of S3. Coastal brambles within the APE primarily consisted of mixed native shrubs, co-dominated by California blackberry (*Rubus ursinus*) with coast silk tassel (*Garrya elliptica*), coyotebrush (*Baccharis pilularis*), and wax myrtle (*Morella californica*). A mixture of native and non-native species occurred in the herbaceous layer. SHN identified and mapped coastal brambles overlapping with the Nordic APE for the Samoa Peninsula Wastewater Project in 2018, and this spatial data was incorporated into current vegetation mapping. Coastal brambles occurred in a single 0.20 acre patch along the roadside ridge east of Vance Avenue (**Appendix A Figure 4, Table 4.3**).

Table 4.3. Acreage of Vegetation Types within the APE

Vegetation Type	Area (acres)
Coastal Brambles	0.20
Coastal Willow Thicket	0.28
Developed	30.27
Dune Mat	6.72
High Quality Dune Mat	0.34
Invasive European Beachgrass Swards	0.70
Invasive Yellow Bush Lupine Scrub	2.06
Grand Total	**40.55**

4.4 Habitat Quality

Habitat quality of dune mat was assessed based on native and non-native vegetation cover as well as abiotic conditions.

4.4.1 Vegetation

The quality of the dune mat Sensitive Natural Community varied within the Project Area, and randomized percent cover plots were used to characterize the dune mat community and yellow bush lupine scrub. Quantitative analysis showed that dune mat to the north of the cyclone fence has intermediate levels of native cover compared to high quality dune mat to the south of the cyclone fence and adjacent invasive bush lupine scrub (Figure 4.4). The northern dune mat area also had high non-native cover similar to bush lupine scrub. Dune mat areas south of the cyclone fence (n=6) contained a dominance of native species, low overall cover of vascular plants, and low cover of non-native species. The area south of the cyclone fence has strong dominance of dune mat species (68% relative native cover, 27% absolute native cover). European beachgrass swards and yellow bush lupine scrub also occur south of the cyclone fence.

In contrast, dune mat plots north of the cyclone fence (n=14), near the current footprint of the pulp mill, showed diagnostic levels of native dune species (11% absolute cover), but they are dominated by non-native species (76% relative cover of non-native species). Plots within the adjacent yellow bush lupine scrub (n=6) near the footprint of the former pulp mill showed similar total vascular plant cover and presence of non-native plants, but very low cover of native species (4% absolute cover). The access road north of the southern fence line, where dark-eyed gilia was concentrated, appeared to have more areas with open sand and a higher percentage of native dune mat species, but no plots occurred within this area.

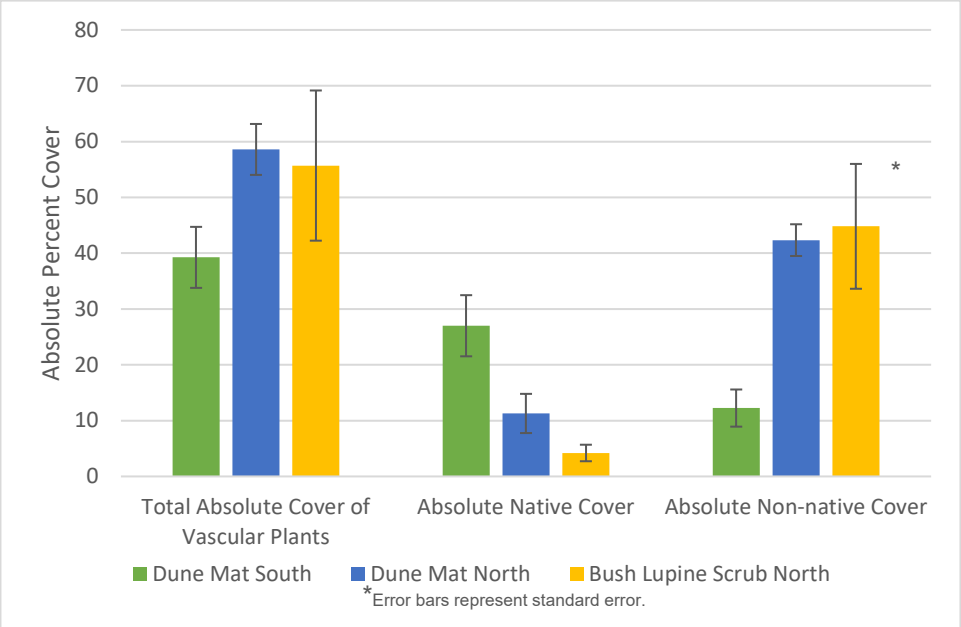

Figure 4.4 Mean Absolute Percent Cover in Dune Habitats

4.4.2 Abiotic Conditions

The project area north of the cyclone fence is a former coastal dune habitat that has been leveled during construction of the pulp mill in the mid to late 60s. Although the natural dune topography has been removed, many dune mat plants, including the rare dark-eyed gilia, have persisted in this altered and highly invaded sandy substrate. The area south of the fence contains a berm structure that is similar to natural dune topography, and areas of high-quality dune mat mapped in the area are characterized by mobile sand. Total vascular plant cover in dune mat south of the fence was 39%, allowing more natural sand movement. Areas south of the fence dominated by European beachgrass and yellow bush lupine are highly stabilized.

5. Impact Analysis and Determination of Credits

Impact analysis and onsite mitigation were assessed over the Project Area, which occurs east of Vance Avenue.

5.1 Rare Plant Impacts

Superimposing the proposed Nordic Aquafarms proposed Project footprint over the dark-eyed gilia population boundaries shows that up to 0.88 acres out of the 2.4-acre population are likely to be impacted. Approximately 1.49 acres of the current dark-eyed gilia area are expected to remain onsite around the southern and southwestern edge of the property after construction. The expected 37% reduction in the population area represents a potentially significant impact to the population. In addition to onsite proposed mitigation, offsite mitigation is needed to compensate for potentially significant impacts to dark eyed gilia.

5.2 Potential Impacts to Sensitive Habitat

The planned Project disturbance footprint (temporary and permanent) intersects with 22.8 acres of previously developed area, and 5.61 acres of undeveloped, but previously disturbed, coastal habitats.

5.2.1 Dune Mat

The planned Project disturbance footprint will avoid all of the 0.34 acres of high-quality dune mat, which will be protected and enhanced by invasive species removal onsite. The Project disturbance footprint (temporary and permanent) will impact 4.5 acres of lower-quality dune mat. After construction, 2.16acres of lower quality are expected to remain in addition to the 0.34 acres of high-quality dune mat. Approximately 0.17 acres of lower quality dune mat will be temporarily impacted by construction-related activities, and these areas will be restored in place. Dark-eyed gilia is primarily concentrated in the dune mat community, and the population overlaps with 0.88 acres of lower-quality dune mat in the disturbance footprint.

5.2.2 Invaded Dune Habitats

The planned Project footprint will permanently impact 1.27 acres of dunes dominated by invasive plants, including 0.09 acres of European beachgrass swards and 1.20 acres of yellow bush lupine scrub. Approximately 0.39 acres of yellow bush lupine scrub and 0.60 acres of European beachgrass will remain onsite, outside of the proposed Project footprint. These areas are highly invaded and support few native plants. Although they currently have low native habitat value, these areas have the potential to be restored to the native dune mat community.

5.2.3 Coastal Brambles

A total of 0.20 acres of coastal brambles occur within the Project Area. The planned Project disturbance footprint (temporary and permanent) intersects with 0.02 acres of coastal brambles. Temporary impacts are expected to 0.01 acres of this area, and temporary impacts will be restored in place. The Project is expected to permanently impact 0.01 acres of coastal brambles.

Table 5.2 Impacts to Vegetation within the Project Area

Vegetation Type	Permanent Impact (acres)	Temporary Impact (acres)	Undisturbed Area (acres)
Coastal Brambles	0.01	0.01	0.18
Dune Mat	4.32	0.17	2.16
High Quality Dune Mat	0.00	0.00	0.34
Invasive European Beachgrass Swards	0.09	0.00	0.60
Invasive Yellow Bush Lupine Scrub	1.18	0.02	0.39

5.3 Mitigation Ratios

Dune habitats occupied by rare dark eyed gilia will be mitigated at a 3:1 ratio. Dark eyed gilia occupies 2.37 acres of dune habitat in the Project Area, including 0.88 acres within the area of impact. The 0.88 acres of gilia habitat to be mitigated at a 3:1 ratio primarily consists of lower quality dune mat, and some overlap (0.01 acres) with European beachgrass within the area of impact. The remaining 3.46 acres of dune mat habitat to be permanently impacted consists of lower quality non-native dominated habitat to the north that has been degraded by human disturbance. Based on the low native habitat quality of the dune mat to the north around the project footprint, a 2:1 mitigation ratio is proposed. Invasive yellow bush lupine scrub contained low native plant cover and has been highly degraded. A 1:1 mitigation ratio is proposed for yellow bush lupine scrub outside of the rare plant population area, based on the poor native habitat quality of these highly invaded areas. European beachgrass swards were composed of at least 80% cover of the invasive beachgrass, and impacts to European beachgrass do not require mitigation. A total of 10.72 acres of compensatory dune habitat mitigation is needed, including restoration of 2.61 acres of dark eyed gilia habitat. A small patch of coastal brambles (0.02 acres permanent and temporary impact) also occurs within the area of impact, and a 3:1 mitigation ratio is proposed based on the status of the vegetation alliance as a Sensitive Natural Community. Mitigation ratios and acreage are provided in **Table 5.3**. For acreages of onsite and offsite dune restoration listed by habitat type, please see Tables 6.1 and 6.2.

Table 5.3 Mitigation Ratios and Acreage

Habitat Type	Ratio	Permanent Impact Area	Mitigation Acreage
Dark Eyed Gilia Habitat*	3:1	0.87	2.61
Dune Mat**	2:1	3.46	6.93
Invasive Yellow Bush Lupine Scrub	1:1	1.18	1.18
Coastal Brambles	3:1	0.01	0.03
Total Dune Mitigation Area			**10.72**

* Dark Eyed Gilia Habitat consists of all areas of overlap with the boundaries of the dark eyed gilia population

** Remaining area of impacted Dune Mat not overlapping with the dark eyed gilia population is of lower habitat quality.

6. Mitigation Site Selection

6.1 Onsite Mitigation Areas

Preservation and enhancement of remaining onsite habitats is proposed to maintain and improve native habitat quality on the margins of the project site. Temporarily impacted and other remaining dune mat, European beachgrass swards, yellow bush lupine scrub, and coastal brambles onsite have high restoration potential. After restoring 3.49 acres of available dune habitat onsite, an

additional 7.22 acres of offsite compensatory mitigation (including dune restoration and dark-eyed gilia translocation) is needed to meet the total mitigation area (**Table 6.1**).

6.1.1 Dark-Eyed Gilia Protection and Habitat Restoration

Restoration by removing competing invasive dune species onsite is expected to help preserve and maintain the remaining 1.49 acres of dark eyed gilia mapped in the Project Area in 2020. Additionally, 2.00 acres of dune habitats unoccupied by dark eyed gilia in 2020 will be restored onsite. No seeding with dark-eyed gilia is planned onsite, where the population may disperse naturally. Competition from aggressive invasive species that occur in dune habitats onsite may limit the habitat of dark eyed gilia onsite, and removal of invasive dune plants is expected to improve and expand potential dark eyed gilia habitat within the remaining area. Only manual removal of invasive plants will occur within the dark eyed gilia population boundary, and no restoration planting is recommended within the population boundary to avoid unnecessary disturbance and alteration of sensitive plant habitat.

6.1.2 Dune Habitat Restoration Onsite

A total of 3.49 acres of dune habitats will remain on the project site, including 0.99acres of highly invaded dunes dominated by yellow bush lupine and European beachgrass, 2.16 acres of dune mat that have been severely affected by annual grasses, and 0.34 acres of high-quality dune mat. Remaining yellow bush lupine scrub and European beachgrass swards are strongly dominated by invasive plants with low native cover, and restoring these habitats to the native dune mat community will provide a major improvement in native habitat quality. Much of the remaining dune mat on the property has been severely affected by invasive annual grasses, and these areas may be restored to high-quality dune mat by repeated pulling of targeted annual grass species and any CAL-IPC High-rated invasive plants. Although high-quality dune mat has a strong dominance of native species, baseline surveys in 2020 showed 12% non-native cover, and maintaining/improving high-quality dune mat by removing target invasive annual grasses and any CAL-IPC High-rated invasive plants is recommended as mitigation. Invasive plant removal crews will manually dig and pull invasive plants each year during the growing season during the five-year maintenance and monitoring period (see Table 7.2 for full schedule).

Table 6.1 Onsite Restoration Areas

Vegetation Type	Onsite Treatment	Acreage
High Quality Dune Mat	Annual Grass Removal and Maintenance	0.34
Degraded Dune Mat	Annual Grass, Bush Lupine Removal	2.16
Yellow Bush Lupine	Bush Lupine, Annual Grass Removal	0.39
European Beachgrass	European Beachgrass Removal	0.60
	TOTAL DUNE RESTORATION ONSITE	**3.49**
	Remaining Restoration Acreage Needed Offsite	7.22

6.1.3 Coastal Brambles Community Enhancement

The remaining 0.18-acre coastal brambles community will be enhanced in place and expanded by an additional 0.09 acres around the western entrance by removing invasives and planting native

species associated with the community. Enhancement in place is preferred to preserve as much of the mature native brambles as possible. Expanding the current community around the facility entrance will add to the contiguous habitat area.

6.2 Offsite Mitigation Areas

In addition to habitat restoration onsite, offsite mitigation is needed to compensate for loss of dune communities and dark-eyed gilia habitat. Offsite mitigation areas were sourced on the North Spit of Humboldt Bay based on the availability of in-kind habitat, restoration history, restoration feasibility, and long-term site protection. The 10.67 acres of invaded dunes available for off-site restoration (Table 6.2) from restoration partners exceeds the calculated mitigation acreage of 7.22 acres needed (Table 6.1 above) by 3.45 acres. Landowners of mitigatory restoration sites include the Friends of the Dunes 501c(3) non-profit, the local Manila Community Services District, the Harbor District, and the U.S. Fish and Wildlife Service. Restoration sites are summarized in Table 6.2. Qualitative baseline habitat characterization of these sites occurred in 2020, and protocol level surveys for special status plants and quantitative baseline percent cover data collection will occur prior to implementing invasive species removal.

Table 6.2 Restoration Partners and Acreage for Offsite Mitigation

Landowner	Area	Habitat	Treatment	Acreage
U.S. Fish and Wildlife	A	Degraded Dune Mat	Annual Grass, Bush Lupine, Brush/Debris Removal	1.75
	B	Degraded Dune Mat	Annual Grass Removal	0.27
Friends of the Dunes	A	Degraded Dune Mat	Annual Grass Removal	0.47
	B	Degraded Dune Mat	Annual Grass Removal	1.07
	C	Degraded Dune Mat	Annual Grass Removal	2.08
	D	European Beach Grass	European Beach Grass Removal	2.80
Manila Community Services District	A	Degraded Dune Mat	Annual Grass, Iceplant Removal	1.68
	B	Burn Site	Trash Removal, Revegetation	0.05
Harbor District	A	Bush Lupine/Degraded Dune Mat	Bush Lupine, Annual Grass, Iceplant Removal	0.50
			TOTAL DUNE RESTORATION OFFSITE	**10.67**

6.2.1 Humboldt Bay Harbor District

The 0.50-acre Humboldt Bay Harbor District (HBHD) restoration area (parcel APN 401-111-006) west of New Navy Base Road, contains dune mat habitat that has been invaded by yellow bush lupine, ice plant, and invasive grasses. Despite the dominance of yellow bush lupine (estimated 10% cover) and invasive grasses (estimated 47% cover), this area contains diagnostic levels of native dune mat species (estimated 10% cover) and high native diversity. This area is likely habitat for rare dark-eyed gilia as well as Federally and State Endangered Humboldt Bay wallflower (*Erysimum menziesii*), Federally and State Endangered beach layia (*Layia carnosa*), and rare pink sand verbena (*Abronia umbellata* var. *breviflora,* CNPS 1B.1).

6.2.2 Manila Community Services District

The Manila Community Services District (MCSD) restoration Area A covers 1.68 acres of dune mat in remote backdunes surrounded by dune forest and scrub on parcel APN 400-161-001. Restoration on this parcel is permitted under previous Coastal Development Permits (CDP 68-95, CDP 59-96). The area is invaded by ice plant (estimated 20% cover) and invasive grasses (estimated 20% cover), as well as trace amounts of yellow bush lupine, pampas grass, and European beachgrass. This area has high cover of native dune mat plants (estimated 35% cover) and is likely potential habitat for rare dark-eyed gilia as well as Federally and State Endangered Humboldt Bay wallflower and beach layia.

The MCSD property also contains a burned encampment area with a large amount of burned trash and hazardous debris like broken glass (Area B). Although cleanup of the remote site is likely to be labor intensive, this area is a priority for MCSD and important for public safety. Cleanup of the site is recommended as mitigation and a public service.

6.2.3 Friends of the Dunes

The Friends of the Dunes (FOD) property (parcel APNs 506-111-025 and 506-111-021) contains three restoration areas (Areas A, B, and C) totaling 3.62 acres where invasive grass removal is needed, and one 2.8-acre restoration area (Area D) that is highly invaded by European beachgrass. Restoration on these parcels is permitted under a Coastal Development Permit (CDP-06-49M). The sites have high restoration potential, with a diversity of native dune mat plants and habitat for rare dark-eyed gilia as well as Federally and State Endangered Humboldt Bay wallflower and beach layia. The Friends of the Dunes staff are experienced and have provided mitigatory restoration for dark-eyed gilia, and have a wide network of volunteers that help with restoration and maintenance of native dune habitats.

6.2.4 U.S. Fish and Wildlife Service

The Lanphere Dunes Unit of the Humboldt Bay National Wildlife Refuge, owned by U.S. Fish and Wildlife Service (USFWS), has a long history of ongoing dune restoration. Two areas of the Bair Parcel (APN 506-291-010) on the Lanphere Dunes Unit has been selected for in-kind mitigation based on high restoration potential and long-term site security. The areas have been the target of the annual volunteer-based Lupine Bash, which have reduced invasive yellow bush lupine to an estimated 2% cover. However, this nitrogen fixing shrub has altered soil composition in the area, and encouraged the growth of invasive grasses and coyotebrush. Despite the history of invasion and encroaching scrub, the location is high-quality habitat for Federally and State Endangered Humboldt Bay wallflower, Federally and State Endangered beach layia, and dark-eyed gilia. At Area A, initial site preparation will consist of removing encroaching lupine, coyotebrush scrub, and decaying brush that may be a source of excessive nitrogen from the dune mat area. Both Areas A and B will need annual invasive grass removal.

7. Work Plan

The following work plan and schedule (**Table 7.2**) address both onsite and offsite mitigation with seed collection and translocation of dark-eyed gilia from the area of impact. Additional details on

plant installation, maintenance, access routes, and disposal sites will be provided in plans and specifications.

7.1 Preparation

Hiring restoration crew(s) is a critical component of the work plan, which could be accomplished in multiple ways. Partnering with local non-profit organization, Friends of the Dunes, could enable them to hire a small part-time crew of paid interns seasonally between mid-February and August each year to remove invasive grasses, yellow bush lupine, and iceplant on all properties, and aid in dark-eyed gilia translocation, restoration planting, and annual monitoring. Additionally, a larger crew (such as a California Conservation Corps crew, or Redwood Community Action Agency crew) is recommended to remove European beachgrass because it is labor-intensive. Contracting with restoration crews directly is another option that would consist of include developing restoration plan specifications and putting them out to bid.

7.2 Schedule

Offsite mitigation may commence concurrent with Phase 0 demolition as early as spring 2021, or concurrent with Phase 1 construction. Phase 0 and Phase 1 are not expected to significantly affect the dark-eyed gilia population, and this will likely allow for multiple years of native seed/propagule collection from the project footprint. Dark-eyed gilia seed collection is planned for 2021 and likely 2022, and may occur in additional years as needed until Phase 2 construction begins in the dark eyed gilia population area. Phase 2 soil densification may commence as early as summer of 2022 which could limit some dark-eyed gilia seed collection that season. Onsite mitigation will be completed after construction has been completed (Phase 0, 1 and 2) in the area to avoid disturbance to restoration in progress. Some landscaping and onsite mitigation areas may be installed after Phase 1 is complete, depending on staging and laydown areas needed. Because of the staggered timeline of offsite and onsite restoration, the five years of offsite mitigation will be completed prior to the onsite mitigation period. The seasonality of mitigation implementation is shown by year in Table 7.2, and the sites where each action applies are provided in the *Location* column.

Table 7.2 Schedule of Mitigation Implementation

Year	Season	Locations	Action	Details
0	May-June	All Locations	Baseline Monitoring	Floristic surveys for special status plants and quantitative baseline monitoring of percent vegetative cover will occur prior to invasive plant removal.
0	May	Onsite	Onsite dark-eyed gilia baseline population sampling, Site Preparation	Native Plant Protection Areas will be clearly flagged for avoidance prior to demolition, construction activities, and seed collection. The dark-eyed gilia population within the area of impact will be sampled to establish a pre-construction population estimate.
1-2	Monthly, March - October	Onsite, FOD C	European beachgrass removal	Monthly treatments are needed during the initial treatment in year 1 and likely in year 2 to dig out all plants as they re-sprout (until <1% cover).
1-5	Early Spring (Feb-April)	Onsite, USFWS A, HBHD, MCSD A	Yellow bush lupine, other target invasive removal	Remove yellow bush lupine, ice plant and other target invasives in early spring.
1-5	Spring (March-May)	Onsite, USFWS A&B, FOD A&B, MCSD A, HBHD	Invasive grass removal	Pulling invasive grasses should occur before they drop seeds.
0-5	Mid/Late Summer (late June-Aug)	Onsite	Seed collection	Collect dark-eyed gilia seeds and any other native seeds for restoration. Seed collection may occur as-needed until project impacts begin.
1-5	Fall	USFWS B, FOD A, MCSD A, HBHD A	Broadcast dark-eyed gilia seed	Broadcast dark-eyed gilia seeds in designated macroplots after initial invasive species removal in year 1, and supplement as needed in subsequent years
1-5	May-June	Onsite	Monitoring	Monitor restoration progress and dark-eyed gilia populations while in bloom.
1	Any Season	MCSD B	Clean-up	Remove trash and hazardous debris from the burn site.
3-5	Late Summer /Fall (Aug-Oct)	Onsite, FOD C	European beachgrass removal	Dig out all resprouting beachgrass in late summer/fall to avoid potential impacts to annual rare plants
2-5	Winter/ Spring	Onsite, HBHD	Restoration planting	Plant dune mat species in designated areas.
1-5	December 31	All Sites	Annual Reporting Due	Annual reports on restoration activities and monitoring are due by the end of the year.

7.3 Onsite Mitigation Work Plan

The onsite mitigation work plan includes invasive plant removal, dark-eyed gilia seed collection, and restoration planting of dune mat and coastal brambles.

7.3.1 Invasive Plant Management

Manual invasive plant management using hand tools is recommended for all target invasive species (**Table 7.1**) or other Cal-IPC High-rated invasive species. The primary invasive species affecting dune habitats onsite are yellow bush lupine, European beachgrass, and invasive grasses. Invasive plant removal may begin concurrent with construction activities onsite, and stakes with flagging and signage will be used to mark the exclusion area for heavy equipment and unnecessary foot traffic that will protect the mitigation areas during this time period. Please see the Native Landscaping Site Plan (Appendix B) for additional details on signage to protect restoration areas onsite.

7.3.1.1 **Dune Habitat Target Invasive Species**

Target invasive species include non-native plants observed in the area that are rated as *High* by the California Invasive Plant Council (Cal-IPC), as well as invasive grasses with *Moderate* and *Low* ratings that cumulatively have a substantial negative impact on the dune mat community. Early detection and removal of any other Cal-IPC High rated invasive species that may occur onsite in the future is also recommended. Timing for invasive species removal is provided in Table 7.2 above, beginning with implementation in early spring of Year 1.

Table 7.3 Target Invasive Plant Species

Scientific Name	Common Name	Cal-IPC Rating	Level of Invasion	Action
Ammophila arenaria	European beachgrass	High	Severe	Repeated Digging
Anthoxanthum odoratum	sweet vernal grass	Limited	Moderate	Hand Pull Grasses
Avena barbata	slender oats	Moderate	Low	Hand Pull Grasses
Briza maxima	rattlesnake grass	Limited	Low	Hand Pull Grasses
Bromus diandrus	ripgut brome	Moderate	Moderate	Hand Pull Grasses
Bromus hordeaceus	soft chess brome	Limited	Low	Hand Pull Grasses
Carpobrotus chilensis	sea fig	Moderate	Present	Hand Pull/Dig
Carpobrotus edulis	iceplant	High	Present	Hand Pull/Dig
Cortaderia jubata	purple pampas grass	High	Present	Digging
Cynosurus echinatus	hedgehog dogtail	Moderate	Low	Hand Pull Grasses
Cytisus scoparius	Scotch broom	High	Occurs Nearby	Early Detection and Removal
Festuca myuros	rattail grass	Moderate	Moderate	Hand Pull Grasses
Holcus lanatus	velvet grass	Moderate	Low	Hand Pull Grasses
Lupinus arboreus	yellow bush lupine	Problematic	Severe	Repeated Digging/Cutting
Rubus armeniacus	Himalayan blackberry	High	Occurs Nearby	Early Detection and Removal

7.3.1.1 European Beachgrass Swards

Intensive manual removal efforts are needed for remaining areas of European beachgrass swards onsite. In the first two years of restoration, a crew of workers will be needed for multiple visits to dig out European beachgrass by the rhizomes to a depth of at least 8 inches (Pickart and Sawyer 1998, DiTomaso et al. 2013). In years one and two, as many as 8 monthly crew visits will be needed to remove resprouting European beachgrass (Pickart and Sawyer 1998, DiTomaso et al. 2013). The number of monthly treatments may be reduced if less than 1% cover is observed. In subsequent years 3-5, annual maintenance will consist of re-digging rhizomes where any new growth is observed. European beachgrass may be piled outside of the restoration areas and left to decompose in areas that are highly invaded by European beachgrass and are not near-term candidates for restoration, or hauled offsite.

7.3.1.2 Yellow Bush Lupine Scrub

Annual crews will be needed to clear invasive yellow bush lupine from the remaining natural area by digging below the crown and cutting the vigorous shrub at the taproot to prevent regrowth. Seed pods should be bagged and removed to prevent dispersal. Yellow bush lupine may be piled in highly invaded areas outside of the restoration areas and left to decompose or hauled offsite.

7.3.1.3 Invasive Grasses

Non-native grasses have established high percent cover in much of the dune mat community, altering natural dune processes and likely soil composition. Invasive grasses, most notably ripgut brome (*Bromus diandrus*), sweet vernal grass (*Anthoxanthum odoratum*), and rattail fescue (*Festuca myuros*), were widespread in the dune mat community and may negatively affect habitat quality for dark eyed gilia and other native dune mat species. A small crew is needed to pull target invasive grasses annually in the spring, before they set seed. Invasive grasses should be bagged and removed from the dune mat community. Removal of these widespread non-native grasses from other habitats is not required. Target invasive grasses for removal from dune habitats are listed in **Table 7.3** above.

7.3.2 Dark-Eyed Gilia Seed Collection and Translocation

Dark-eyed gilia seeds should be collected from the project footprint prior to construction site preparation in the population area. Whenever possible, the seed should be immediately broadcast to suitable dune mat habitats in offsite restoration areas where invasive plants have been removed to minimize the loss in viability that can be associated with extended seed storage. However, it is anticipated that seed storage will be a necessary component based on the near-term planned construction timeline and the need to remove invasive plants offsite prior to broadcasting seed. Trained restoration professionals will collect dark-eyed gilia in summer of 2021, and seed will be processed and stored in a cool, dark, dry controlled environment according to the project's Mitigation Plans and Specifications. Dark-eyed gilia will be seeded in restoration macroplots in the fall after removal of invasive plants, which will allow Dark-eyed gilia translocation macroplots (recommended size ~100m^2) are to be marked with a GPS in the field at the time of translocation. Dark-eyed gilia translocation macroplots should be located within the best available habitat in the following dune restoration sites:

- U.S. Fish and Wildlife Area B
- Friends of the Dunes Area A
- Manila Community Services District Area A
- Harbor District A

Seed collection and broadcasting will occur when dark eyed gilia is in fruit and beginning to drop seeds (June-August, based on 2020 observations of the Project Area). As many seeds as possible should be collected from the area of the gilia population within the impact footprint, and this is expected to be many thousands of the miniscule seeds collected with the fruits to be processed later by separating the chaff for storage. Translocation by collecting and broadcasting seeds should occur in Year 1, holding approximately a quarter of seeds collected in storage to be broadcast in

subsequent years as needed. The seed supply may be supplemented with additional seed collection in Year 2 and as needed to ensure a viable population in subsequent years until ground disturbance begins in the project footprint.

7.3.3 Onsite Restoration Planting Plan

Restoration planting will enhance and revegetate areas of invasive plant removal and temporary project disturbance to target sensitive natural communities. Onsite restoration planting will occur after temporary disturbances associated with project construction have been concluded. The five year monitoring period will not be tied to native plant installation to allow for potential construction-related delays, as long as onsite mitigation areas meet success criteria for five years following initial invasive plant removal. Sensitive dark-eyed gilia habitats will be marked with flagging and signage prior to replanting designated onsite restoration areas to avoid disturbing the rare plant population. Please see **Appendix B** for the complete landscaping site plan showing restoration areas and remaining vegetation as well as other landscaping details. Further information on plant installation and container stock source(s) will be provided in Plans and Specifications.

7.3.3.1 **Dune Mat Restoration Planting**

After manual removal of invasive species, approximately 0.84 acres of existing lower quality dune mat habitat will be enhanced by lightly planting native dune mat plants. A total of 0.34 acres of invasive European beachgrass and yellow bush lupine will be converted to the native dune mat community by removing target invasive plants and replanting the area with dune mat species. Approximately 1.47acres of dunes occupied by dark-eyed gilia and high-quality dune mat areas will be allowed to revegetate naturally after invasive species removal. Species used in restoration planting include the following native herbaceous plants that are characteristic of the dune mat community found in the area:

- Yellow sand verbena (*Abronia latifolia*)
- Beach sagewort (*Artemisia pycnocephala*)
- Seaside daisy (*Erigeron glaucus*)
- Seaside wild buckwheat (*Eriogonum latifolium*)
- Beach strawberry (*Fragaria chiloensis*)
- Beach pea (*Lathyrus littoralis*)

7.3.3.2 **Coastal Brambles Restoration Planting**

The remaining coastal brambles will be restored by removing encroaching highly invasive species and planting additional native shrubs associated with the community. The coastal brambles community will also be expanded by planting an additional 0.09 acres with coastal brambles species. Species used in the coastal brambles restoration planting include the following native shrubs associated with the sensitive natural community:

- California blackberry (*Rubus ursinus*)
- Coast silk tassel (*Garrya elliptica*)

- Coast twinberry (*Lonicera involucrata*)
- Wax myrtle (*Morella californica*)
- Coyotebrush (*Baccharis pilularis*)
- Salal (*Gaultheria shallon*)
- Evergreen huckleberry (*Vaccinium ovatum*)

7.4 Offsite Restoration Work Plan

Offsite restoration work crews and implementation will be arranged in cooperation with the following restoration partners as discussed below. Plans and Specifications with details on disposal of plant material and access routes will be developed in coordination with partner agencies, who should be the primary source to ensure that implementation will be consistent with their management plans, rules, and preferences. Communication with designated representatives of restoration partners prior to initiating treatment each year will ensure that implementation of the work plan is not in conflict with restoration partners' management objectives. Floristic surveys for special-status plants and quantitative baseline monitoring of percent cover are planned prior to initiating invasive plant removal.

7.4.1 Humboldt Bay Harbor District

The 0.5-acre HBHD restoration site is located directly west of the Nordic Project Area across New Navy Base Road. This area was defined in the field by tracing the area of backdune habitat that has high potential to support dark-eyed gilia and other rare dune plants. The HBHD site is invaded by yellow bush lupine, ice plant and invasive grasses. Annual treatment of target invasives is recommended in early spring before yellow bush lupine and invasive grasses drop seeds. Invasive plants removed may be piled in adjacent areas that are densely vegetated by European beachgrass or hauled offsite. Because this site is adjacent to the public road, restoration planting is also recommended to minimize potential sand movement. After invasive plant removal in Year 1, the restoration crew will transplant or seed with native dune mat species that occur within the planned Project footprint into any bare areas >1m^2. This site is also recommended for dark-eyed gilia translocation. After Year 1 invasive species removal, dark-eyed gilia seeds should be broadcast into a 100m^2 macroplot that will be marked by GPS in the field for future monitoring.

7.4.2 Manila Community Services District

The 1.68-acre MCSD Area A has high potential as dark-eyed gilia habitat, but it is highly affected by iceplant and invasive grasses, with sparse yellow bush lupine, pampas grass, and European beachgrass. The restoration crew will be employed in removing target invasives from the site. Although the site is remote, a quad/4WD-truck access road is located nearby. Invasive plant debris may be piled along the road to be retrieved by quad or truck. Plans and Specifications to be developed will designate this pre-existing access route on a site map. The MCSD site is also recommended for dark-eyed gilia translocation. After Year 1 invasive species removal, dark-eyed gilia seeds should be collected from the Project footprint and broadcast into a 100m^2 macroplot that will be marked by GPS in the field for future monitoring. The MCSD site has good cover and

diversity of native dune mat species and does not require any additional planting with dune mat species.

7.4.3 Friends of the Dunes

The FOD property contains three backdune restoration areas (Areas A, B, and C) totaling 3.62 acres that are highly invaded by invasive grasses, and 2.8 acres of backdunes (Area D) that are highly invaded by European beachgrass. Restoration on the FOD property will be overseen by the Friends of the Dunes Restoration Manager, pursuant to the CDP. A large crew will likely be needed to remove European beachgrass from the dense sward. In Year 1, successful removal will require repeated monthly treatments by digging the plant out by the rhizomes. Monthly treatments are recommended between April and October, or until the rhizomes appear to have been depleted and less than 1% re-sprouts are observed. Invasive plant debris may be piled onsite or removed according to the judgement of the Restoration Manager. Area C is recommended as high-quality potential habitat for dark-eyed gilia, and a translocation macroplot shall be marked by GPS. The restoration crew and manager will aid in broadcasting dark-eyed gilia seeds within the macroplot as well as annual monitoring. Overall, the FOD site has good cover and diversity of native dune mat species. No restoration planting is recommended at this time but may occur as needed for adaptive management or at the discretion of the FOD restoration manager.

7.4.4 U.S. Fish and Wildlife Service

The USFWS property contains a 1.75-acre restoration area (Area A) that has been affected by yellow bush lupine and encroaching scrub habitat. Yellow bush lupine has been largely removed from the area, but the nitrogen fixing shrub has had lingering effects. Site preparation in Year 1 shall include removing any remaining yellow bush lupine, cutting the associated coyotebrush that is encroaching on the area, and remove remaining debris. In subsequent years, it is expected that the main effort will consist of pulling invasive grasses, which thrive in a nutrient enriched environment. The smaller 0.27-acre Area B is also invaded by annual grasses, and repeated annual grass pulling is needed at this site. After invasive grass removal, it is expected that Area B may be high-quality dark-eyed gilia habitat, and a translocation macroplot will be located here. The USFWS site has good cover and diversity of native dune mat species, and no restoration planting with dune mat species is planned for the site at this time.

8. Success Criteria

Mitigation success shall be defined by meeting the following annual criteria in **Table 8.1**. Success criteria were developed based on the following critical attributes:

1. Success criteria can be measured or observed and documented.
2. Success criteria show progress toward meeting stated goals and objectives.
3. They may be met by implementing the work and maintenance plan and are not outside of management control.
4. Success criteria should be realistic.
5. Success criteria should inform adaptive management.

Reduction in target invasive plant cover is a primary measure of progress toward meeting habitat restoration objectives, and it may be directly addressed by implementing the invasive species control measures outlined in the work plan. Reduction in target invasive plant cover will be evaluated relative to quantitative baseline monitoring. Successful mitigation of impacts to dark-eyed gilia is defined by protecting the remaining rare plant habitat along the southern boundary and translocating the population from the project footprint to suitable restored offsite habitat. Presence of dark-eyed gilia at translocation sites and onsite is the preferred indicator of success because population numbers of an annual plant may be naturally variable and outside of management control. In the final year of monitoring (Year 5), reports will also address whether all dune restoration sites have been successfully restored to the native dune mat sensitive natural community (defined herein as >50% relative vegetative cover of native dune mat species). The success of onsite coastal brambles restoration and enhancement will also be evaluated in Year 5 by whether it is dominated by native species (>50% relative cover) associated with the coastal brambles sensitive natural community. Successful implementation of invasive species removal according to the work plan and schedule will be evaluated each year, and adaptive management may be implemented if modifications to the work plan are needed.

Table 8.1 Success Criteria

Indicator Type	Year	Annual Success Criteria
Invasive Vegetation	1	≥50% Reduction in target invasive plant cover (absolute) at dune restoration sites.
	2	≥65% Reduction in target invasive plant cover at dune restoration sites.
	3	≥80% Reduction in target invasive plant cover at dune restoration sites.
	4	≥90% Reduction in target invasive plant cover at dune restoration sites.
	5	≥95% Reduction in target invasive plant cover at dune restoration sites.
Rare Plants	1	Dark-eyed gilia seeds were collected from the Project footprint and broadcast at designated restoration macroplots. The remaining population outside of the footprint was preserved.
	2-5	Dark-eyed gilia plants detected at or near designated macroplots, and total population estimates in restored areas are equal to (within the 90 percent confidence interval) or greater than the impacted population estimate.
Native Dune Mat	5	Dune restoration areas (at all sites) are dominated by native dune mat species (≥50% relative percent cover).
Native Coastal Brambles	5	Coastal brambles restoration areas are dominated by native species associated with the community (≥50% relative percent cover).
Maintenance	All Years	The restoration crew completed invasive plant removal on schedule.

9. Monitoring Requirements

Annual monitoring will be required to evaluate whether restoration success criteria have been met based on Table 8.1 above. Vegetation monitoring will consist of systematic sampling of percent vegetative cover using a statistically valid number of plots at each restoration site. Rare plant monitoring will consist of carefully walking transects at restoration macroplots while searching for dark-eyed gilia and systematic sampling where needed to obtain an estimate of population numbers. Implementation of the invasive species management work plan will be qualitatively monitored by recording work dates, photo-documentation, and evaluating challenges and any need for adaptive management.

9.1 Dune Vegetation Monitoring

Percent vegetative cover will be monitored annually at all dune restoration sites to calculate percent target invasive species and native cover. A systematic sampling scheme using 1m^2 quadrats with a randomized start shall be used at all sites. Restoration sites vary in shape and in size from less than an acre to 2.8 acres. A baseline shall be established lengthwise along the long axis of each restoration area and quadrat sampling will occur along transects spaced every 10m perpendicular to the baseline. Quadrats will be placed every 5-10m (as needed to fit the minimum sample size at each site with good interspersion) along transects after a randomized start. Quadrats should be spaced at least 3m from the boundaries of the restoration area. Sampling shall continue along regularly spaced transects until the minimum number of sampling units have been completed. Each species occurring within the 1m^2 quadrat will be identified to the lowest taxonomic level necessary, and absolute percent cover of each species as well as bare ground and debris will be estimated.

9.1.1 Sample Size and Data Analysis

Minimum sample size for each restoration location is calculated according to methods for determining sample size in *Measuring and Monitoring Plant Populations* (Elzinga et al. 1998, p. 346).

Equation 1. $$n = \frac{(Z_\alpha)^2 (s)^2}{(B)^2}$$

Sample size for vegetation monitoring shall be calculated based on a 90% Confidence Interval (α=0.1) and a precision level of no more than 10 absolute percent cover (*B*=10). Minimum sample size at each restoration site has been estimated as 17 plots, using an assumed standard deviation of approximately 25 percent cover based on previous experience with restoration monitoring. Mean percent cover data will be analyzed with 90 percent confidence intervals by site and compared to baseline conditions to establish whether it has met annual performance criteria for the reduction in target invasive plant cover, and whether it is on track to establish relative dominance of the native plant community at the end of the restoration period. Confidence intervals that encompass the target value will be interpreted as meeting the criteria for that site, with the caveat that sample size must be adequate to meet the precision level above.

9.2 Dark-eyed Gilia Monitoring

Prior to project related ground disturbance or seed collection, baseline population sampling will be used to establish a pre-construction population estimate within the area of impact. Baseline population sampling will use a randomized systematic sampling scheme with elongated 0.5 x 2 meter quadrats as recommended for sampling clustered plant distributions (Elzinga et al. 1998). The established dark-eyed gilia population to be preserved onsite and translocation macroplots shall be searched for dark-eyed gilia during the blooming period. Macroplots measuring approximately 100m^2 are to be established at the time of translocation in the best available habitat at each of the offsite properties (USFWS B, FOD A, MCSD A, and HBHD A), and these will be marked by GPS in the field. Annual monitoring will begin by navigating by GPS to the established macroplots, and radiate outwards as needed to include population spread or dispersal throughout the restoration area. Transects spaced every 3m will be carefully walked to search for and count dark-eyed gilia plants where they are sparse. Where plants become too numerous to reliably count, a randomized systematic sampling scheme with 0.5 x 2 meter quadrats comparable to baseline monitoring will be implemented to obtain a population estimate. Annual success is defined by the continued presence of dark eyed gilia within the area preserved onsite, and at least an equivalent number of plants established at restoration sites compared to the number impacted. Population estimates inform whether supplementation with additional seed collection or other adaptive management may be needed. This assessment of population health and adaptive management recommendations for additional reseeding should be included in annual reports.

9.2.1 Sample Size and Data Analysis

Baseline sampling within the project footprint will set threshold for success of gilia translocation in all future monitoring years. At least 68 plots will be distributed along evenly spaced transects within the project footprint, as determined by Equation 1 for sample size above using the parameters α=0.1, *s*=25, and *B*=5. Success of offsite gilia translocation efforts has been defined by total population estimates in restored areas within or greater than the 90 percent confidence interval of the impacted baseline population estimate. Confidence intervals on the population estimate shall be determined according to Elzinga et al. (1998, p. 365). Population monitoring data in future years should also be reported with 90 percent confidence intervals where statistically determined, and total estimates may include both population estimates and counts. Because dark-eyed gilia is an annual plant, populations may fluctuate naturally and disperse to new locations from year to year. The 90 percent confidence interval on the baseline estimate is expected to provide a statistically determined range that accounts for potential sampling variation. However, parameters for interannual variability are unknown and may differ from site to site. In addition to recommending measures to improve population numbers or habitat quality if success criteria are not being met, annual reports may include additional information to inform interpretation of population success such as data from reference sites or referring to local expertise.

9.3 Sensitive Natural Community Assessment

In addition to conducting annual quantitative monitoring of dune restoration sites, Rapid Assessment forms should be used to qualitatively assess the restored sensitive natural communities in Year 5. Rapid Assessments provide a standardized protocol for establishing the dominant vegetation alliance according to a Manual of California Vegetation (Sawyer et al. 2009) and evaluating their

status and quality as sensitive natural communities. Rapid Assessments should be completed for dune restoration on each property and for coastal brambles onsite. The sensitive natural community assessment is the only monitoring needed to ensure sufficient mitigation for the small area of moderately invaded coastal brambles that will be impacted onsite (0.02 acres) and mitigated at a greater than 3:1 ratio. The sensitive natural community assessment applies to both areas that have been restored by invasive plant removal only and those that have had supplemental planting. Please see Section 5 Impact Analysis for acreages of remaining dune restoration areas onsite by habitat type, and Native Landscaping Site Plan in Appendix B to locate designated dune mitigation areas by baseline habitat and restoration type.

9.4 Implementation Monitoring

Implementation monitoring of invasive species removal can ensure that restoration is proceeding according to plan and provide valuable information to steer adaptive management if challenges are encountered. Implementation monitoring shall consist of conducting site visits during invasive plant removal at each restoration location to photo-document restoration in progress, record dates and effort needed for invasive plant removal, meet with crews, and make field observations, and implement adaptive management if needed. Qualitative observations of restoration planting survival and any issues with restoration planting health should be noted, but quantitative monitoring of survival rates is not needed to ensure successful mitigation.

10. Adaptive Management Plan

If invasive plant removal success criteria are not being met or problems with implementation of the work plan arise, adaptive management recommendations should be made in annual reports to resolve issues, and these may be implemented in future years with permitting agency approval. Dark-eyed gilia translocation may require multiple years of seed collection and distribution at restoration sites to successfully establish a viable population. Monitoring dark-eyed gilia presence and population estimates should inform whether additional translocation effort is needed. For example, if very few gilia plants are observed during the blooming period at or near a translocation macroplot, additional seed collection and supplementation is recommended at the site. Adaptive management should be implemented as needed throughout the five-year maintenance and monitoring period and will only be needed in subsequent years if the project cannot demonstrate sufficient restoration success to mitigate for onsite impacts to dark-eyed gilia and habitats.

Table 10. Recommended Adaptive Management

Mitigation Type	Location	Adaptive Management Triggers	Proposed Actions
Dune Mat	All Sites	Invasive annual grasses and other target invasives are not being reduced	• Address potential invasive plant seed sources upwind • Increase hand-pulling treatment to twice/year (early and late in season)

		according to annual criteria (Table 8.1).	• Adjust seasonality or other methods as needed
European Beachgrass	Onsite, FOD D	European beachgrass cover is not being reduced according to annual criteria (Table 8.1).	• Increase depth of digging for rhizomes • Add additional monthly treatments
Yellow Bush Lupine	Onsite, USFWS A, HBHD A	Invasive plant cover is not being reduced according to annual criteria (Table 8.1).	• Address potential invasive plant seed sources upwind • Increase depth in digging out taproot • Increase treatment to twice/year (early and late in season) or adjust season • Remove any remaining nitrogen-rich plant material that may be facilitating invasive plant growth
Coastal Brambles	Onsite	The coastal brambles restoration area is not meeting SNC status criteria.	• Increase invasive species removal effort, targeting yellow bush lupine and Cal-IPC High rated plants • Increase planting density of native *Rubus* spp. and other associated shrubs. • Evaluate plant and soil health, moisture, and add supplemental nutrients, mulch, or hand irrigation in areas where secondary effects to dune mat are unlikely.
Dark-eyed Gilia	HBHD A, USFWS B, FOD A, MCSD A	Dark-eyed gilia is not present at translocation sites, or population numbers are not meeting annual success criteria.	• Supplement translocation efforts using remaining seed in storage or additional collection • Evaluate site suitability, establish new macroplot location if necessary • Evaluate seed viability • Grow dark-eyed gilia in a protected nursery setting for out-planting

11. Long-Term Management and Site Protection

Nordic Aquafarms will be responsible for funding and implementing the five-year RMP onsite and offsite and will continue onsite maintenance of the Project Area as needed thereafter. The off-site dune restoration areas were chosen because of their proximity to the Project, the presence of "in-kind" restorable backdunes habitat, compatible land management plans, and long-term protection of the site and surrounding landscape for natural resource conservation. All of the proposed dune restoration areas are owned by public or non-profit entities that are land stewards with management plans and stable funding for the long-term restoration of coastal dunes. The offsite restoration partners have experienced staff that perform conservation and restoration duties, and some have large networks of volunteers that may be used to maintain restoration sites in perpetuity. Project partners may choose to continue implementing the adaptive management plan (Section 10) after the five-year maintenance period using other funding sources or implement other management for the overall benefit of native dune communities at their discretion. Nordic Aquafarms is committed to dune restoration with five years of required maintenance and monitoring to ensure no net loss of sensitive coastal habitats. After funding restoration over five years as outlined in the RMP, the Nordic Aquafarms project will likely result in a substantial overall increase in native coastal dune habitat on the North Spit of Humboldt Bay, meeting or exceeding mitigatory requirements. Five years of implementing the RMP is intended to result in primarily self-sustaining natural dune plant communities. After five years of invasive plant removal, maintenance, and monitoring by Nordic Aquafarms, property owners will independently continue to implement their long-term management plans. After five years of intensive invasive species removal, the onsite mitigation site is expected to be self-sustaining, and Nordic Aquafarms will likely only implement additional invasive species removal or other treatments if problems are observed in mitigation areas onsite and no additional reporting will be required after the five-year period.

12. Financial Assurances

Financial assurance for this project is the responsibility of Nordic Aquafarms California, LLC. (Nordic). Nordic will be responsible for permitting, implementation of permit conditions and CEQA mitigation measures (as they apply to this RMP), preparation of plans and specification, preconstruction surveys, preparation of agreements with landowners, required insurance, construction (removal of invasives and planting/seeding), five years of maintenance and annual reports.

13. Scope and Limitations

GHD prepared this report for Nordic, and Nordic may only use and rely on this report for the purpose agreed upon between GHD and Nordic, as set out in the scope and contract for work effort reported herein. GHD Inc. is not liable for any action arising out of the reliance of any third party on the information contained within this report. GHD otherwise disclaims responsibility to any entity other than the Nordic arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The opinions, conclusions, and any recommendations in this report are based on conditions encountered and information reviewed by the date of preparation of the report. Site conditions may change after the date of this report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this report if the site conditions change unless contracted to do so.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

14. Literature Cited

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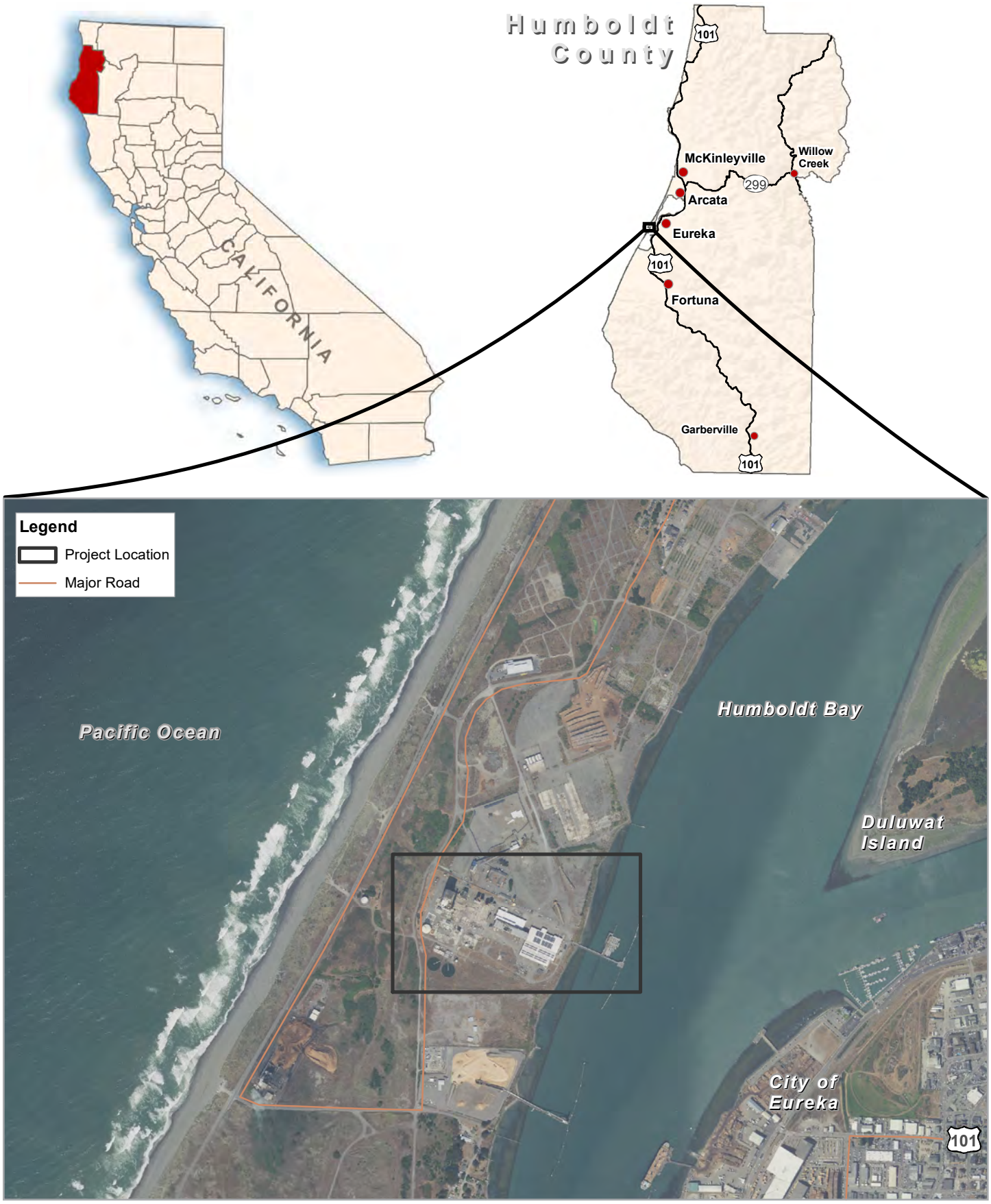
Appendix A. Map Figures



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GHD

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Vicinity Map

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

FIGURE 1

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Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Project No. 11205607
Revision No. 4
Date Jun 2021

Proposed Site Layout

FIGURE 2

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Data source: Project design elements, April 1st, 2021; APE, June 12, 2020; USDA, NAIP Imagery, 2018; Humboldt County Parcel Dataset, 2019. Created by: jclark2

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Map Projection: Lambert Conformal Conic
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Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

Sensitive Plant Species

FIGURE 3

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Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

Sensitive Vegetation Communities

FIGURE 4

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Data source: Vegetation data, GHD, July 2020; APE, GHD, June 2020; . Created by: jclark2

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Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Humboldt Bay Harbor District Restoration Area

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

FIGURE 5

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GHD

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Manila Community Services District Restoration Area

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

FIGURE 6

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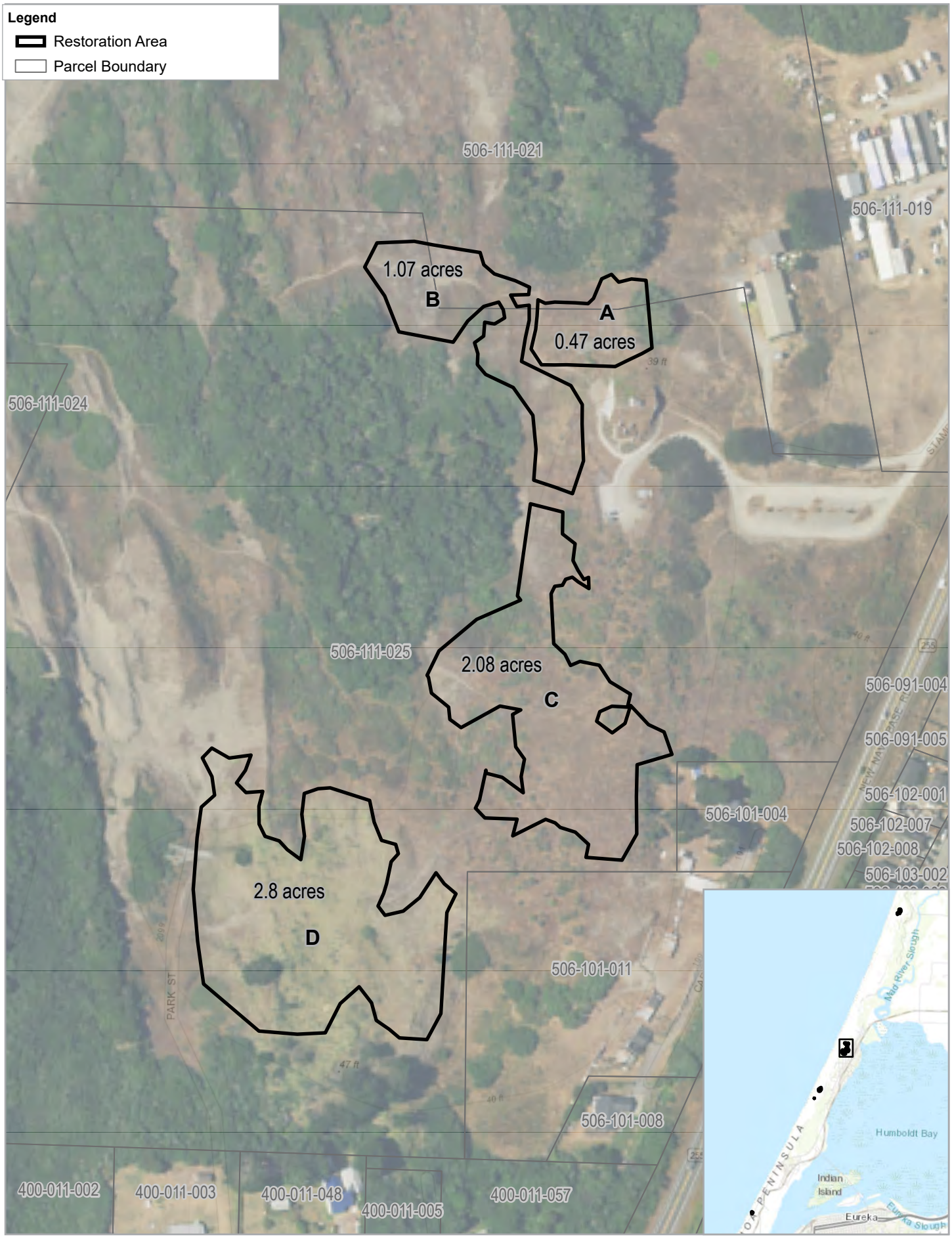

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Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

Friends of the Dunes Restoration Areas

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

FIGURE 7

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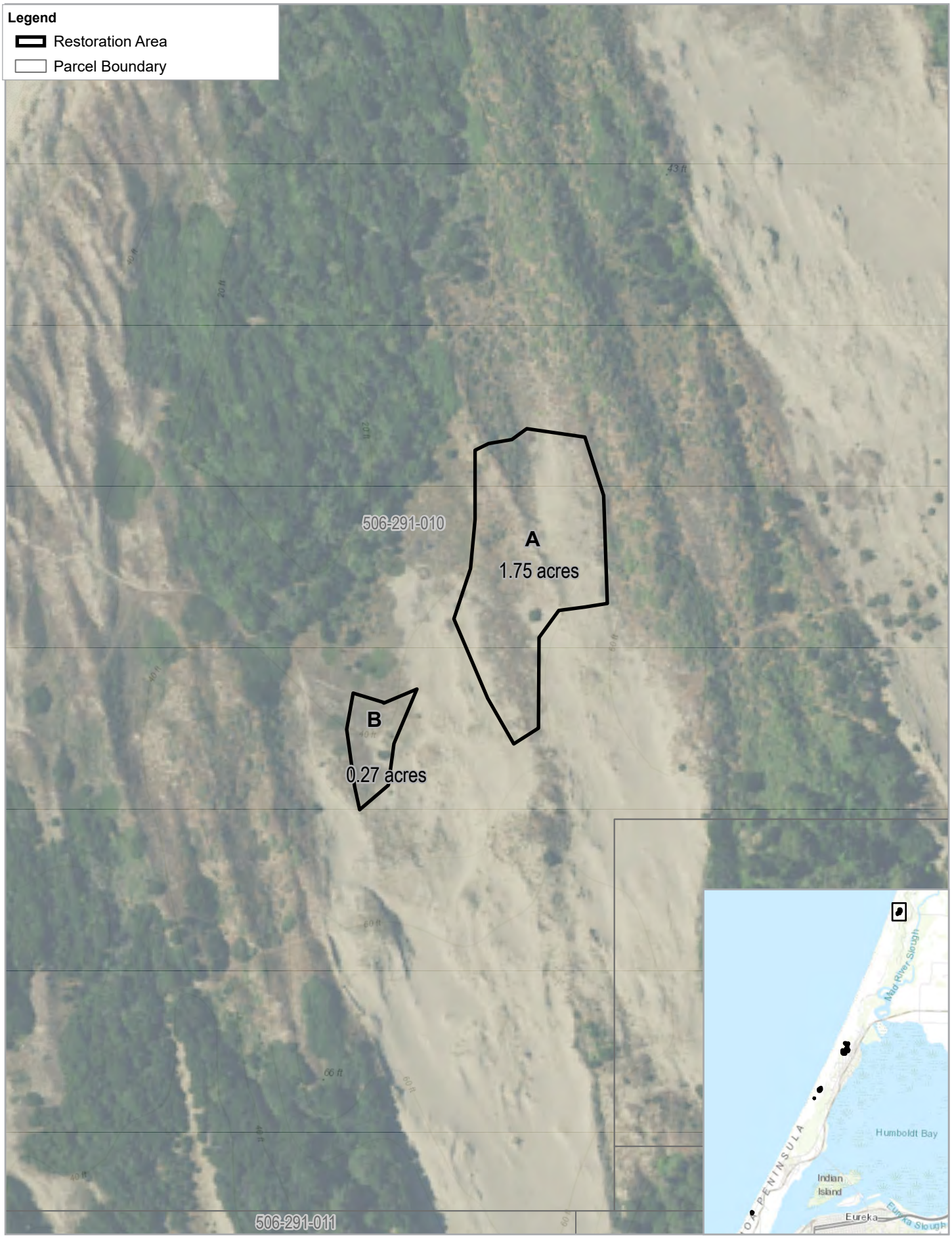

Nordic Aquafarms California, LLC
Samoa Peninsula Sustainable Aquaculture Development Project
Samoa, Humboldt County, California

U.S. Fish and Wildlife Service Restoration Areas

Project No. **11205607**
Revision No. **4**
Date **Jun 2021**

FIGURE 8

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Appendix B. Native Landscaping Site Plan

Existing	AC	SF
Plant Communities - outside of G.m area		
Developed	0.04	1,531.9
Coastal Brambles	0.17	7,356.0
Dune Mat	0.83	36,172.9
High Quality Dune Mat	0.02	901.9
Coastal Dune Willow Thicket	0.06	2,462.9
Invasive Yellow Bush Lupine Scrub	0.17	7,372.4
Invasive European Beach Grass Swards	0.22	9,778.0
Within G.m overlay area	**AC**	**SF**
Dune Mat	0.85	36,828.9
High Quality Dune Mat	0.31	13,534.4
Invasive Yellow Bush Lupine Scrub	0.07	2,851.8
Invasive European Beach Grass Swards	0.24	10,627.8
Total	2.97	129,418.9

Proposed Total	AC	SF
Plant Communities - outside of G.m area		
Developed	0.00	-
Coastal Brambles	0.25	11,068.6
Dune Mat	1.17	51,142.7
High Quality Dune Mat	0.02	901.9
Coastal Dune Willow Thicket	0.05	2,231.0
Invasive Yellow Bush Lupine Scrub	0.00	-
Invasive European Beach Grass Swards	0.00	-
Passive restoration within G.m overlay area	**AC**	**SF**
Dune Mat	1.16	50,540.5
High Quality Dune Mat	0.31	13,534.4
Invasive Yellow Bush Lupine Scrub	0.00	-
Invasive European Beach Grass Swards	0.00	-
Total	2.97	129,418.9

Incrased plant community areas	AC	SF
	0.09	3,712.6
	0.34	14,969.7
	AC	**SF**
	0.31	13,711.5
	0.74	32,393.8

ON SITE MITIGATION QUANTITIES

GILIA MILLEFOLIATA PRESENT

DUNE MAT

HIGH QUALITY DUNE MAT

COASTAL BRAMBLES

1 P COASTAL DUNE WILLOW

INVASIVE YELLOW BUSH LUPINE

INVASIVE EUROPEAN BEACHGRASS

EXISTING PLANT COMMUNITIES LEGEND

L101

DUNE MAT (NEW)
(2) Abronia latifolia
(1) Artemisia pycnocephala
(3) Erigeron glaucus
(2) Eriogonum latifolium
(3) Fragaria chiloensis
(2) Lathyrus littoralis

DUNE MAT (RESTORED)
(95) Abronia latifolia
(19) Artemisia pycnocephala
(152) Erigeron glaucus
(95) Eriogonum latifolium
(152) Fragaria chiloensis
(95) Lathyrus littoralis

DUNE MAT (NEW)
(128) Abronia latifolia
(39) Artemisia pycnocephala
(153) Erigeron glaucus
(128) Eriogonum latifolium
(204) Fragaria chiloensis
(128) Lathyrus littoralis

COASTAL BRAMBLES (NEW)
(1) Baccharis pilularis
(1) Garrya elliptica
(16) Gaultheria shallon
(8) Lonicera involucrata ledebourii
(1) Morella californica
(29) Rubus ursinus
(6) Vaccinium ovatum

DUNE MAT (RESTORED)
(21) Abronia latifolia
(5) Artemisia pycnocephala
(33) Erigeron glaucus
(21) Eriogonum latifolium
(33) Fragaria chiloensis
(21) Lathyrus littoralis

DUNE MAT (RESTORED)
(13) Abronia latifolia
(3) Artemisia pycnocephala
(21) Erigeron glaucus
(13) Eriogonum latifolium
(21) Fragaria chiloensis
(13) Lathyrus littoralis

COASTAL BRAMBLES (NEW)
(1) Baccharis pilularis
(1) Garrya elliptica
(12) Gaultheria shallon
(5) Lonicera involucrata ledebourii
(1) Morella californica
(20) Rubus ursinus
(4) Vaccinium ovatum

COASTAL BRAMBLES (RESTORED)
(4) Baccharis pilularis
(12) Garrya elliptica
(22) Gaultheria shallon
(24) Lonicera involucrata ledebourii
(1) Morella californica
(128) Rubus ursinus
(24) Vaccinium ovatum

DUNE MAT (RESTORED)
(158) Abronia latifolia
(32) Artemisia pycnocephala
(253) Erigeron glaucus
(158) Eriogonum latifolium
(253) Fragaria chiloensis
(158) Lathyrus littoralis

GILIA MILLEFOLIATA
PASSIVE RESTORATION AREA

GENERAL GROUNDCOVER (953 sf)
(28) Arctostaphylos uva-ursi
(100) Armeria maritima
(248) Fragaria chiloensis
(23) Iris douglasiana
(25) Juncus breweri
(89) Sisyrinchium bellum

LID GENERAL (1,700 sf)
(177) Armeria maritima
(2,473) Carex densa
(30) Festuca californica
(45) Juncus effusus
(111) Juncus patens
(89) Symphyotrichum chilense

GENERAL GROUNDCOVER (370 sf)
(11) Arctostaphylos uva-ursi
(39) Armeria maritima
(97) Fragaria chiloensis
(9) Iris douglasiana
(10) Juncus breweri
(35) Sisyrinchium bellum

GENERAL GROUNDCOVER (40,907 sf)
(1,196) Arctostaphylos uva-ursi
(4,252) Armeria maritima
(10,628) Fragaria chiloensis
(945) Iris douglasiana
(1,063) Juncus breweri
(3,779) Sisyrinchium bellum

LID GENERAL (17,822 sf)
(1,853) Armeria maritima
(25,930) Carex densa
(309) Festuca californica
(464) Juncus effusus
(1,158) Juncus patens
(927) Symphyotrichum chilense

BUILDING 1

L106

GENERAL GROUNDCOVER (4,123 sf)
(121) Arctostaphylos uva-ursi
(429) Armeria maritima
(1,072) Fragaria chiloensis
(96) Iris douglasiana
(108) Juncus breweri
(381) Sisyrinchium bellum

LID - SHADE (11,601 sf)
(804) Clinopodium douglasii
(302) Deschampsia cespitosa
(754) Equisetum laevigatum
(268) Festuca californica
(804) Juncus balticus
(290) Pteridium aquilinum

GRASSY GROUNDCOVER (4,276 sf)
(445) Armeria maritima
(2,889) Festuca rubra
(1,111) Fragaria chiloensis

LID GENERAL (1,920 sf)
(200) Armeria maritima
(2,793) Carex densa
(34) Festuca californica
(50) Juncus effusus
(125) Juncus patens
(100) Symphyotrichum chilense

(173) JUNCUS PATENS

BUILDING 5

GROUNDCOVER - SHADE (8,352 sf)
(245) Arctostaphylos uva-ursi
(145) Festuca californica
(1,736) Fragaria chiloensis
(386) Maianthemum dilatatum
(97) Polystichum munitum

L105

GRASSY GROUNDCOVER (3,061 sf)
(319) Armeria maritima
(2,068) Festuca rubra
(796) Fragaria chiloensis

LID - SHADE (575 sf)
(40) Clinopodium douglasii
(15) Deschampsia cespitosa
(38) Equisetum laevigatum
(14) Festuca californica
(40) Juncus balticus
(15) Pteridium aquilinum

LID - SHADE (889 sf)
(62) Clinopodium douglasii
(24) Deschampsia cespitosa
(58) Equisetum laevigatum
(21) Festuca californica
(62) Juncus balticus
(23) Pteridium aquilinum

BUILDING 3

LID - SHADE (585 sf)
(41) Clinopodium douglasii
(16) Deschampsia cespitosa
(38) Equisetum laevigatum
(14) Festuca californica
(41) Juncus balticus
(15) Pteridium aquilinum

LID GENERAL (300 sf)
(32) Armeria maritima
(437) Carex densa
(6) Festuca californica
(8) Juncus effusus
(20) Juncus patens
(16) Symphyotrichum chilense

GRASSY GROUNDCOVER (4,276 sf)
(445) Armeria maritima
(2,889) Festuca rubra
(1,111) Fragaria chiloensis

LID - SHADE (553 sf)
(39) Clinopodium douglasii
(15) Deschampsia cespitosa
(36) Equisetum laevigatum
(13) Festuca californica
(39) Juncus balticus
(14) Pteridium aquilinum

L102

BUILDING 4

LID GENERAL (398 sf)
(42) Armeria maritima
(580) Carex densa
(7) Festuca californica
(11) Juncus effusus
(26) Juncus patens
(21) Symphyotrichum chilense

LID - SHADE (1,951 sf)
(136) Clinopodium douglasii
(51) Deschampsia cespitosa
(127) Equisetum laevigatum
(46) Festuca californica
(136) Juncus balticus
(49) Pteridium aquilinum

GILIA MILLEFOLIATA
PASSIVE RESTORATION AREA

LID - SHADE (5,811 sf)
(403) Clinopodium douglasii
(151) Deschampsia cespitosa
(378) Equisetum laevigatum
(135) Festuca californica
(403) Juncus balticus
(145) Pteridium aquilinum

L103

LID GENERAL (1,132 sf)
(118) Armeria maritima
(1,648) Carex densa
(20) Festuca californica
(30) Juncus effusus
(74) Juncus patens
(89) Symphyotrichum chilense

GILIA MILLEFOLIATA
PASSIVE RESTORATION AREA

DUNE MAT (RESTORED)
(130) Abronia latifolia
(26) Artemisia pycnocephala
(207) Erigeron glaucus
(130) Eriogonum latifolium
(207) Fragaria chiloensis
(130) Lathyrus littoralis

LID GENERAL (426 sf)
(45) Armeria maritima
(620) Carex densa
(8) Festuca californica
(12) Juncus effusus
(28) Juncus patens
(23) Symphyotrichum chilense

DUNE MAT (NEW) (4,061 sf)
(106) Abronia latifolia
(32) Artemisia pycnocephala
(127) Erigeron glaucus
(106) Eriogonum latifolium
(169) Fragaria chiloensis
(106) Lathyrus littoralis

EXISTING HABITAT AREA

DUNE MAT (NEW)
(67) Abronia latifolia
(20) Artemisia pycnocephala
(80) Erigeron glaucus
(67) Eriogonum latifolium
(106) Fragaria chiloensis
(67) Lathyrus littoralis

EXISTING HABITAT AREA

DUNE MAT (RESTORED)
(3) Abronia latifolia
(1) Artemisia pycnocephala
(4) Erigeron glaucus
(3) Eriogonum latifolium
(4) Fragaria chiloensis
(3) Lathyrus littoralis

DUNE MAT (NEW)
(8) Abronia latifolia
(3) Artemisia pycnocephala
(10) Erigeron glaucus
(8) Eriogonum latifolium
(13) Fragaria chiloensis
(8) Lathyrus littoralis

GILIA MILLEFOLIATA
PASSIVE RESTORATION AREA

DUNE MAT (RESTORED)
(13) Abronia latifolia
(3) Artemisia pycnocephala
(20) Erigeron glaucus
(13) Eriogonum latifolium
(20) Fragaria chiloensis
(13) Lathyrus littoralis

EXISTING HABITAT AREA

DUNE MAT (RESTORED)
(2) Abronia latifolia
(1) Artemisia pycnocephala
(3) Erigeron glaucus
(2) Eriogonum latifolium
(3) Fragaria chiloensis
(2) Lathyrus littoralis

DUNE MAT (RESTORED)
(3) Abronia latifolia
(1) Artemisia pycnocephala
(4) Erigeron glaucus
(3) Eriogonum latifolium
(4) Fragaria chiloensis
(3) Lathyrus littoralis

GILIA MILLEFOLIATA
PASSIVE RESTORATION AREA

DUNE MAT (NEW) (268 sf)
(7) Abronia latifolia
(3) Artemisia pycnocephala
(9) Erigeron glaucus
(7) Eriogonum latifolium
(12) Fragaria chiloensis
(7) Lathyrus littoralis

L104

BUILDING 2

LID GENERAL (3,950 sf)
(411) Armeria maritima
(5,748) Carex densa
(69) Festuca californica
(103) Juncus effusus
(257) Juncus patens
(206) Symphyotrichum chilense

LID GENERAL (2,403 sf)
(250) Armeria maritima
(3,497) Carex densa
(42) Festuca californica
(63) Juncus effusus
(157) Juncus patens
(125) Symphyotrichum chilense

DUNE MAT (5,275 sf)
(138) Abronia latifolia
(42) Artemisia pycnocephala
(165) Erigeron glaucus
(138) Eriogonum latifolium
(220) Fragaria chiloensis
(138) Lathyrus littoralis

DUNE MAT (RESTORED) (1,390 sf)
(19) Abronia latifolia
(4) Artemisia pycnocephala
(29) Erigeron glaucus
(19) Eriogonum latifolium
(29) Fragaria chiloensis
(19) Lathyrus littoralis

DUNE MAT (RESTORED) (1,477 sf)
(20) Abronia latifolia
(4) Artemisia pycnocephala
(31) Erigeron glaucus
(20) Eriogonum latifolium
(31) Fragaria chiloensis
(20) Lathyrus littoralis

PLANTING PLAN

1" = 50'

TREES	CODE	BOTANICAL NAME	COMMON NAME	SIZE	WUCOLS	QTY
	ABI GRA	Abies grandis	Grand Fir	15 GAL		7
	ACE CIR	Acer circinatum	Vine Maple	15 GAL	M	31
	ALN RUB	Alnus rubra	Red Alder	TREEPOT	M	19
	COR SE2	Cornus sericea sericea	Creek Dogwood	TREEPOT	M	12
	PIC SIT	Picea sitchensis	Sitka Spruce	15 GAL	M	4
	PIN CO5	Pinus contorta contorta	Shore Pine	15 GAL	L[1]	16
	PIN MUR	Pinus muricata	Bishop Pine	15 GAL		4
	SAL HOO	Salix hookeriana	Dune Willow	TP-4		5
	TSU HET	Tsuga heterophylla	Western Hemlock	15 GAL	M	2

SHRUBS	CODE	BOTANICAL NAME	COMMON NAME	SIZE	WUCOLS	QTY
	ARC UVA	Arctostaphylos uva-ursi	Kinnikinnick	1 GAL	L	458
	BER AQU	Berberis aquifolium	Oregon Grape	5 GAL		300
	BER RPN	Berberis aquifolium repens	Creeping Oregon Grape	1 GAL	L[1]	18
	CAL NUT	Calamagrostis nutkaensis	Reed Grass	1 GAL	M	45
	CEA TH2	Ceanothus thyrsiflorus	Blue Blossom	5 GAL	L	15
	CEA AVL	Ceanothus thyrsiflorus thyrsiflorus	Blue Groundcover Ceanothus	1 GAL	L	24
	COR KE2	Cornus sericea `Kelseyi`	Kelseyi Dwarf Redtwig Dogwood	1 GAL	M[1]	213
	DES TUF	Deschampsia cespitosa	Tufted Hair Grass	1 GAL	L	60
	FRA CHI	Fragaria chiloensis	Beach Strawberry	4"	L[1]	103
	FRA PUR	Frangula purshiana	Cascara Buckthorn	1 GAL	M	42
	GAR COA	Garrya elliptica	Coast Silktassel	5 GAL	L	48
	GAU SH2	Gaultheria shallon	Salal	1 GAL	M	6
	IRI IR2	Iris douglasiana	Douglas Iris	Bulb	L[1]	9
	JUN PAT	Juncus patens	California Gray Rush	PLUGS	L	1
	LON ITO	Lonicera involucrata ledebourii	Coast Twinberry	1 GAL	L	18
	MOR CAL	Morella californica	California Wax Myrtle	5 GAL	L[1]	41
	POL CA2	Polypodium californicum	California Polypody	---	L[1]	187
	POL MUN	Polystichum munitum	Western Sword Fern	1 GAL	M	127
	RIB SAN	Ribes sanguineum	Red Flowering Currant	5 GAL	L	50
	ROS NUT	Rosa nutkana	Nootka Rose	5 GAL	M	85
	RUB SPE	Rubus spectabilis	Salmonberry	5 GAL		15
	SAM RED	Sambucus racemosa	Red Elderberry	5 GAL		15
	SCI MIC	Scirpus microcarpus	Small-fruited Bulrush	PLUGS	M	140
	SPI DOU	Spiraea douglasii	Western Spirea	5 GAL	M	45
	VAC OVA	Vaccinium ovatum	Evergreen Huckleberry	5 GAL	L[1]	105

MITIGATION AREAS[2]

CODE	BOTANICAL NAME	COMMON NAME	SIZE	SPACING	QTY
COASTAL BRAMBLES (NEW)					**3,713 sf**
BAC PIL	Baccharis pilularis	Coyote Brush	1 GAL	2% @ 120' o.c.	1
GAR CO2	Garrya elliptica	Coast Silktassel	1 GAL	2% @ 96' o.c.	2
GAU SHA	Gaultheria shallon	Salal	1 GAL	25% @ 72' o.c.	27
LON IT2	Lonicera involucrata ledebourii	Coast Twinberry	1 GAL	5% @ 48" o.c.	13
MOR CA2	Morella californica	California Wax Myrtle	1 GAL	2% @ 240' o.c.	1
RUB URS	Rubus ursinus	California Blackberry	1 GAL	45% @ 72" o.c.	49
VAC OV2	Vaccinium ovatum	Evergreen Huckleberry	1 GAL	4% @ 48" o.c.	10
COASTAL BRAMBLES (RESTORED AREAS)					**7,356 sf**
BAC PIL	Baccharis pilularis	Coyote Brush	1 GAL	5% @ 120' o.c.	4
GAR CO2	Garrya elliptica	Coast Silktassel	1 GAL	10% @ 96' o.c.	12
GAU SHA	Gaultheria shallon	Salal	1 GAL	10% @ 72" o.c.	22
LON IT2	Lonicera involucrata ledebourii	Coast Twinberry	1 GAL	5% @ 48" o.c.	24
MOR CA2	Morella californica	California Wax Myrtle	1 GAL	5% @ 240' o.c.	1
RUB URS	Rubus ursinus	California Blackberry	1 GAL	60% @ 72" o.c.	128
VAC OV2	Vaccinium ovatum	Evergreen Huckleberry	1 GAL	5% @ 48" o.c.	24
DUNE MAT (NEW)					**14,970 sf**
ABR LA3	Abronia latifolia	Yellow Sand Verbena	PLUGS	10% @ 24" o.c.	453
ART PC2	Artemisia pycnocephala	Beach Sagewort	PLUGS	3% @ 24" o.c.	136
ERI BE2	Erigeron glaucus	Beach Daisy	PLUGS	3% @ 12" o.c.	543
ERI LA3	Eriogonum latifolium	Coast Buckwheat	PLUGS	10% @ 24" o.c.	453
FRA CH2	Fragaria chiloensis	Beach Strawberry	PLUGS	4% @ 12" o.c.	724
LAT LIT	Lathyrus littoralis	Silky Beach Pea	PLUGS	10% @ 24" o.c.	453
DUNE MAT (RESTORED AREAS)					**36,634 sf**
ABR LA3	Abronia latifolia	Yellow Sand Verbena	PLUGS	5% @ 24" o.c.	471
ART PC2	Artemisia pycnocephala	Beach Sagewort	PLUGS	1% @ 24" o.c.	95
ERI BE2	Erigeron glaucus	Beach Daisy	PLUGS	2% @ 12" o.c.	753
ERI LA3	Eriogonum latifolium	Coast Buckwheat	PLUGS	5% @ 24" o.c.	471
FRA CH2	Fragaria chiloensis	Beach Strawberry	PLUGS	2% @ 12" o.c.	753
LAT LIT	Lathyrus littoralis	Silky Beach Pea	PLUGS	5% @ 24" o.c.	471

GILIA MILLEFOLIATA PASSIVE RESTORATION AREA - INVASIVES REMOVAL ONLY/PASSIVE RESTORATION AREA HAND REMOVAL OF NON-NATIVE SPECIES SHALL BE PERFORMED. CONTRACTOR TO REVIEW HABITAT MITIGATION AND MONITORING PLAN AND CONFORM TO CONDITIONS. NO REPLANTING IN THIS AREA — **64,075 sf**

EXISTING HABITAT AREAS — NO WORK IS TO BE CONDUCTED WITHIN THESE AREAS. CONTRACTOR TO CONFIRM BOUNDARIES WITH PROJECT MANAGER PRIOR TO COMMENCEMENT OF WORK — **3,133 sf**

LANDSCAPE PLANTING AREAS

CODE	BOTANICAL NAME	COMMON NAME	SIZE	WUCOLS	SPACING	QTY
GENERAL GROUNDCOVER						**45,438 sf**
ARC UV2	Arctostaphylos uva-ursi	Kinnikinnick	1 gal.		45% @ 48" o.c.	1,472
ARM MAR	Armeria maritima	Sea Thrift	1 GAL		10% @ 12" o.c.	5,231
FRA CH3	Fragaria chiloensis	Beach Strawberry	4"		25% @ 12" o.c.	13,077
IRI IRI	Iris douglasiana	Douglas Iris	BULB	L	5% @ 18" o.c.	1,163
JUN BRE	Juncus breweri	Brewer`s Rush	PLUGS		10% @ 24" o.c.	1,308
SIS BE2	Sisyrinchium bellum	Blue Eyed Grass	4"	L	5% @ 9" o.c.	4,650
LID GENERAL						**31,570 sf**
ARM MA2	Armeria maritima	Sea Thrift	PLUGS		10% @ 12" o.c.	3,999
CAR DEN	Carex densa	Dense Sedge	4"	M	35% @ 6" o.c.	55,986
FES CA3	Festuca californica	California Fescue	PLUGS	L	15% @ 36" o.c.	667
JUN EFF	Juncus effusus	Soft Rush	PLUGS	M	10% @ 24" o.c.	1,000
JUN PAT	Juncus patens	California Gray Rush	PLUGS		25% @ 24" o.c.	2,500
SYM CHI	Symphyotrichum chilense	Pacific Aster	---		5% @ 12" o.c.	2,000
GRASSY GROUNDCOVER						**7,553 sf**
ARM MA2	Armeria maritima	Sea Thrift	PLUGS		10% @ 12" o.c.	785
FES RE3	Festuca rubra	Red Fescue	PLUGS		65% @ 12" o.c.	5,103
FRA CH3	Fragaria chiloensis	Beach Strawberry	4"		25% @ 12" o.c.	1,963
LID - SHADE						**26,051 sf**
CLI DOU	Clinopodium douglasii	Yerba Buena	PLUGS		15% @ 18" o.c.	804
DES TU3	Deschampsia cespitosa	Tufted Hair Grass	PLUGS		10% @ 24" o.c.	302
EQU LAV	Equisetum laevigatum	Smooth Scouring Rush	PLUGS		25% @ 24" o.c.	754
FES CA3	Festuca californica	California Fescue	PLUGS	L	20% @ 36" o.c.	268
JUN BAL	Juncus balticus	Baltic Rush	PLUGS		15% @ 18" o.c.	804
PTE WES	Pteridium aquilinum	Western Brackenfern	4"		15% @ 30" o.c.	290
GROUNDCOVER - SHADE						**7,702 sf**
ARC UV2	Arctostaphylos uva-ursi	Kinnikinnick	1 gal.		45% @ 48" o.c.	340
FES CA3	Festuca californica	California Fescue	PLUGS	L	15% @ 36" o.c.	202
FRA CH3	Fragaria chiloensis	Beach Strawberry	4"		20% @ 12" o.c.	2,416
MAI DIL	Maianthemum dilatatum	False Lily-of-the-Valley	PLUGS		10% @ 18" o.c.	537
POL MU2	Polystichum munitum	Western Sword Fern	4"		10% @ 36" o.c.	135
	JUN PA2	Juncus patens	California Gray Rush	PLUGS	24" o.c.	173

[1] WATER USE INDICATED DEVIATES FROM WUCOLS LIST DUE TO LOCAL CLIMATE CONDITIONS.
[2] CONTRACTOR TO REMOVE INVASIVE SPECIES FROM THESE MITIGATION AREAS.

PRELIMINARY PLANTING SCHEDULE

KEY PLAN
N.T.S. F0

REV	DESCRIPTION	DATE
3	COUNTY COMMENTS	4-15-2021
2	COASTAL COMMISSION COMMENTS	4-5-2021
1	ICF COMMENTS	2-12-2021

CURRENT ISSUE STATUS:

PROJECT NORTH:

SMRT Architects and Engineers
75 Washington Avenue
Portland, Maine 04101
1.877.700.7678
www.smrtinc.com

GHD Inc.
718 Third Street
Eureka, California 95501 USA
T 1.707.443.8326 . 1.707.444.8330
www.ghd.com

NORDIC AQUAFARMS

SCHEMATIC LANDSCAPE & ONSITE MITIGATION PLAN

SHEET TITLE:

0" 1/4" 1/2" 1" 2" 3"

SCALE: AS NOTED

PROJECT MANAGER:	NPS	PROJECT NO:	19120
A/E OF RECORD:		SHEET No.	L100
JOB CAPTAIN:			
DRAWN BY:	JAH/WDS		
SMRT FILE:			

36x48

DUNE MAT (NEW)
(2) Abronia latifolia
(1) Artemisia pycnocephala
(3) Erigeron glaucus
(2) Eriogonum latifolium
(3) Fragaria chiloensis
(2) Lathyrus littoralis

DUNE MAT (RESTORED)
(95) Abronia latifolia
(19) Artemisia pycnocephala
(152) Erigeron glaucus
(95) Eriogonum latifolium
(152) Fragaria chiloensis
(95) Lathyrus littoralis

DUNE MAT (NEW)
(128) Abronia latifolia
(39) Artemisia pycnocephala
(153) Erigeron glaucus
(128) Eriogonum latifolium
(204) Fragaria chiloensis
(128) Lathyrus littoralis

COASTAL BRAMBLES (NEW)
(1) Baccharis pilularis
(1) Garrya elliptica
(16) Gaultheria shallon
(8) Lonicera involucrata ledebourii
(1) Morella californica
(29) Rubus ursinus
(6) Vaccinium ovatum

DUNE MAT (RESTORED)
(21) Abronia latifolia
(5) Artemisia pycnocephala
(33) Erigeron glaucus
(21) Eriogonum latifolium
(33) Fragaria chiloensis
(21) Lathyrus littoralis

DUNE MAT (RESTORED)
(13) Abronia latifolia
(3) Artemisia pycnocephala
(21) Erigeron glaucus
(13) Eriogonum latifolium
(21) Fragaria chiloensis
(13) Lathyrus littoralis

COASTAL BRAMBLES (NEW)
(1) Baccharis pilularis
(1) Garrya elliptica
(12) Gaultheria shallon
(5) Lonicera involucrata ledebourii
(1) Morella californica
(20) Rubus ursinus
(4) Vaccinium ovatum

COASTAL BRAMBLES (RESTORED)
(4) Baccharis pilularis
(12) Garrya elliptica
(22) Gaultheria shallon
(24) Lonicera involucrata ledebourii
(1) Morella californica
(128) Rubus ursinus
(24) Vaccinium ovatum

LID GENERAL (1,700 sf)
(177) Armeria maritima
(2,473) Carex densa
(30) Festuca californica
(45) Juncus effusus
(111) Juncus patens
(89) Symphyotrichum chilense

GENERAL GROUNDCOVER (953 sf)
(28) Arctostaphylos uva-ursi
(100) Armeria maritima
(248) Fragaria chiloensis
(23) Iris douglasiana
(25) Juncus breweri
(89) Sisyrinchium bellum

GENERAL GROUNDCOVER (370 sf)
(11) Arctostaphylos uva-ursi
(39) Armeria maritima
(97) Fragaria chiloensis
(9) Iris douglasiana
(10) Juncus breweri
(35) Sisyrinchium bellum

GENERAL GROUNDCOVER (40,907 sf)
(1,196) Arctostaphylos uva-ursi
(4,252) Armeria maritima
(10,628) Fragaria chiloensis
(945) Iris douglasiana
(1,063) Juncus breweri
(3,779) Sisyrinchium bellum

GRASSY GROUNDCOVER (4,276 sf)
(445) Armeria maritima
(2,889) Festuca rubra
(1,111) Fragaria chiloensis

LID GENERAL (1,920 sf)
(200) Armeria maritima
(2,793) Carex densa
(34) Festuca californica
(50) Juncus effusus
(125) Juncus patens
(100) Symphyotrichum chilense

GROUNDCOVER - SHADE (8,352 sf)

(173) JUNCUS PATENS

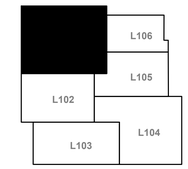
MATCH L102

MATCH L106

1

5

ENLARGED PLANTING PLAN
1" = 20'



KEY MAP

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SCHEMATIC LANDSCAPE & ONSITE MITIGATION PLAN

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SCALE: AS NOTED

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DRAWN BY:	JAH/WDS		
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(24) Lonicera involucrata ledebourii
(1) Morella californica
(128) Rubus ursinus
(24) Vaccinium ovatum

DUNE MAT (RESTORED)
(158) Abronia latifolia
(32) Artemisia pycnocephala
(253) Erigeron glaucus
(158) Eriogonum latifolium
(253) Fragaria chiloensis
(158) Lathyrus littoralis

(173) JUNCUS PATENS

(34) Festuca californica
(50) Juncus effusus
(125) Juncus patens
(100) Symphyotrichum chilense

5

MATCH L101

GROUNDCOVER - SHADE (8,352 sf)
(245) Arctostaphylos uva-ursi
(145) Festuca californica
(1,736) Fragaria chiloensis
(386) Maianthemum dilatatum
(97) Polystichum munitum

MATCH L105

GRASSY GROUNDC
(319) Armeria maritim
(2,068) Festuca rubra
(796) Fragaria chiloen

GRASSY GROUNDCOVER (4,276 sf)
(445) Armeria maritima
(2,889) Festuca rubra
(1,111) Fragaria chiloensis

LID - SHADE (553 sf)
(39) Clinopodium douglasii
(15) Deschampsia cespitosa
(36) Equisetum laevigatum
(13) Festuca californica
(39) Juncus balticus
(14) Pteridium aquilinum

4

LID - SHADE (575 s
(40) Clinopodium do
(15) Deschampsia c
(38) Equisetum laev
(14) Festuca californ
(40) Juncus balticus
(15) Pteridium aquili

LID GENERAL (398 sf)
(42) Armeria maritima
(580) Carex densa
(7) Festuca californica
(11) Juncus effusus
(26) Juncus patens
(21) Symphyotrichum chilense

LID - SHADE (1,951 sf)
(136) Clinopodium douglasii
(51) Deschampsia cespitosa
(127) Equisetum laevigatum
(46) Festuca californica
(136) Juncus balticus
(49) Pteridium aquilinum

MATCH L104

LID - SHADE (5,811 sf)
(403) Clinopodium douglasii
(151) Deschampsia cespitosa
(378) Equisetum laevigatum
(135) Festuca californica
(403) Juncus balticus
(145) Pteridium aquilinum

MATCH L103

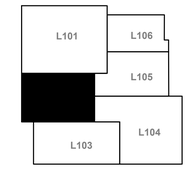
LID GENERAL (1,132 sf)
(118) Armeria maritima
(1,648) Carex densa
(20) Festuca californica
(30) Juncus effusus
(74) Juncus patens
(59) Symphyotrichum chilense

DUNE MAT (RESTORED)
(130) Abronia latifolia
(26) Artemisia pycnocephala
(207) Erigeron glaucus
(130) Eriogonum latifolium
(207) Fragaria chiloensis
(130) Lathyrus littoralis

LID GENERAL (426 sf)
(45) Armeria maritima
(620) Carex densa
(8) Festuca californica

DUNE MAT (NEW) (4,061 sf)
(106) Abronia latifolia
(32) Artemisia pycnocephala
(127) Erigeron glaucus

ENLARGED PLANTING PLAN
1" = 20'



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LID GENERAL (398 sf)
(42) Armeria maritima
(580) Carex densa
(7) Festuca californica
(11) Juncus effusus
(26) Juncus patens
(21) Symphyotrichum chilense

LID - SHADE (1,951 sf)
(136) Clinopodium douglasii
(51) Deschampsia cespitosa
(127) Equisetum laevigatum
(46) Festuca californica
(136) Juncus balticus
(49) Pteridium aquilinum

(40) Clinopodium douglasii
(15) Deschampsia cespitosa
(38) Equisetum laevigatum
(14) Festuca californica
(40) Juncus balticus
(15) Pteridium aquilinum

LID - SHADE (889
(62) Clinopodium c
(24) Deschampsia
(58) Equisetum lae
(21) Festuca califo
(62) Juncus balticu
(23) Pteridium aqu

LID - SHADE (5,811 sf)
(403) Clinopodium douglasii
(151) Deschampsia cespitosa
(378) Equisetum laevigatum
(135) Festuca californica
(403) Juncus balticus
(145) Pteridium aquilinum

MATCH L102

MATCH L104

LID GENERAL (1,132 sf)
(118) Armeria maritima
(1,648) Carex densa
(20) Festuca californica
(30) Juncus effusus
(74) Juncus patens
(59) Symphyotrichum chilense

DUNE MAT (RESTORED)
(130) Abronia latifolia
(26) Artemisia pycnocephala
(207) Erigeron glaucus
(130) Eriogonum latifolium
(207) Fragaria chiloensis
(130) Lathyrus littoralis

LID GENERAL (426 sf)
(45) Armeria maritima
(620) Carex densa
(8) Festuca californica
(12) Juncus effusus
(28) Juncus patens
(23) Symphyotrichum chilense

DUNE MAT (NEW) (4,061 sf)
(106) Abronia latifolia
(32) Artemisia pycnocephala
(127) Erigeron glaucus
(106) Eriogonum latifolium
(169) Fragaria chiloensis
(106) Lathyrus littoralis

MATCH L104

DUNE MAT (NEW)
(67) Abronia latifolia
(20) Artemisia pycnocephala
(80) Erigeron glaucus
(67) Eriogonum latifolium
(106) Fragaria chiloensis
(67) Lathyrus littoralis

DUNE MAT (RESTORED)
(3) Abronia latifolia
(1) Artemisia pycnocephala
(4) Erigeron glaucus
(3) Eriogonum latifolium
(4) Fragaria chiloensis
(3) Lathyrus littoralis

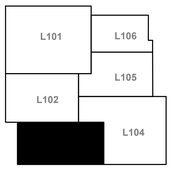
DUNE MAT (NEW)
(8) Abronia latifolia
(3) Artemisia pycnocephala
(10) Erigeron glaucus
(8) Eriogonum latifolium
(13) Fragaria chiloensis
(8) Lathyrus littoralis

DUNE MAT (RESTORED)
(13) Abronia latifolia
(3) Artemisia pycnocephala
(20) Erigeron glaucus
(13) Eriogonum latifolium
(20) Fragaria chiloensis
(13) Lathyrus littoralis

DUNE MAT (RESTORED)
(2) Abronia latifolia
(1) Artemisia pycnocephala
(3) Erigeron glaucus
(2) Eriogonum latifolium
(3) Fragaria chiloensis
(2) Lathyrus littoralis

DUNE MAT (RESTORED)
(3) Abronia latifolia
(1) Artemisia pycnocephala
(4) Erigeron glaucus
(3) Eriogonum latifolium
(4) Fragaria chiloensis
(3) Lathyrus littoralis

ENLARGED PLANTING PLAN
1" = 20'



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0" 1/4" 1/2" 1" 2" 3"

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JOB CAPTAIN:			
DRAWN BY:	JAH/WDS		
SMRT FILE:		SHEET No.	L103

36x48

MATCH L105

MATCH L102

LID - SHADE (575 sf)
(40) Clinopodium douglasii
(15) Deschampsia cespitosa
(38) Equisetum laevigatum
(14) Festuca californica
(40) Juncus balticus
(15) Pteridium aquilinum

LID - SHADE (889 sf)
(62) Clinopodium douglasii
(24) Deschampsia cespitosa
(58) Equisetum laevigatum
(21) Festuca californica
(62) Juncus balticus
(23) Pteridium aquilinum

3

LID - SHADE (585 sf)
(41) Clinopodium douglasii
(16) Deschampsia cespitosa
(38) Equisetum laevigatum
(14) Festuca californica
(41) Juncus balticus
(15) Pteridium aquilinum

LID GENERAL (300 sf)
(32) Armeria maritima
(437) Carex densa
(6) Festuca californica
(8) Juncus effusus
(20) Juncus patens
(16) Symphyotrichum chilense

MATCH L103

LID GENERAL (3,950 sf)
(411) Armeria maritima
(5,748) Carex densa
(69) Festuca californica
(103) Juncus effusus
(257) Juncus patens
(206) Symphyotrichum chilense

LID GENERAL (2,403 sf)
(250) Armeria maritima
(3,497) Carex densa
(42) Festuca californica
(63) Juncus effusus
(157) Juncus patens
(125) Symphyotrichum chilense

2

61 sf)
ohala
um
s

DUNE MAT (NEW) (5,275 sf)
(138) Abronia latifolia
(42) Artemisia pycnocephala
(165) Erigeron glaucus
(138) Eriogonum latifolium
(220) Fragaria chiloensis
(138) Lathyrus littoralis

DUNE MAT (RESTORED) (1,390 sf)
(19) Abronia latifolia
(4) Artemisia pycnocephala
(29) Erigeron glaucus
(19) Eriogonum latifolium
(29) Fragaria chiloensis
(19) Lathyrus littoralis

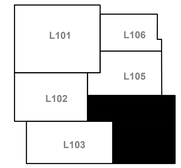
DUNE MAT (RESTORED) (1,477 sf)
(20) Abronia latifolia
(4) Artemisia pycnocephala
(31) Erigeron glaucus
(20) Eriogonum latifolium
(31) Fragaria chiloensis
(20) Lathyrus littoralis

r (RESTORED)
latifolia
ia pycnocephala
n glaucus
um latifolium
a chiloensis
s littoralis

DUNE MAT (RESTORED)
(3) Abronia latifolia
(1) Artemisia pycnocephala
(4) Erigeron glaucus
(3) Eriogonum latifolium
(4) Fragaria chiloensis
(3) Lathyrus littoralis

DUNE MAT (NEW) (268 sf)
(7) Abronia latifolia
(3) Artemisia pycnocephala
(9) Erigeron glaucus
(7) Eriogonum latifolium
(12) Fragaria chiloensis
(7) Lathyrus littoralis

ENLARGED PLANTING PLAN
1" = 20'



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JOB CAPTAIN:			L104
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SMRT FILE:		SHEET No.	

3 sf)

GENERAL GROUNDCOVER (40,907 sf)
(1,196) Arctostaphylos uva-ursi
(4,252) Armeria maritima
(10,628) Fragaria chiloensis
(945) Iris douglasiana
(1,063) Juncus breweri
(3,779) Sisyrinchium bellum

f)

1

LID GENERAL (17,822 sf)
(1,853) Armeria maritima
(25,930) Carex densa
(309) Festuca californica
(464) Juncus effusus
(1,158) Juncus patens
(927) Symphyotrichum chilense

MATCH L106

MATCH L101

GENERAL GROUNDCOVER (4,123 sf)
(121) Arctostaphylos uva-ursi
(429) Armeria maritima
(1,072) Fragaria chiloensis
(96) Iris douglasiana
(108) Juncus breweri
(381) Sisyrinchium bellum

LID - SHADE (11,601 sf)
(804) Clinopodium douglasii
(302) Deschampsia cespitosa
(754) Equisetum laevigatum
(268) Festuca californica
(804) Juncus balticus
(290) Pteridium aquilinum

GRASSY GROUNDCOVER (3,061 sf)
(319) Armeria maritima
(2,068) Festuca rubra
(796) Fragaria chiloensis

MATCH L102

MATCH L104

LID - SHADE (575 sf)
(40) Clinopodium douglasii
(15) Deschampsia cespitosa
(38) Equisetum laevigatum
(14) Festuca californica
(40) Juncus balticus
(15) Pteridium aquilinum

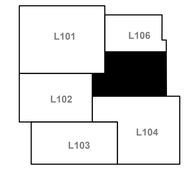
3

LID - SHADE (889 sf)
(62) Clinopodium douglasii
(24) Deschampsia cespitosa
(58) Equisetum laevigatum
(21) Festuca californica

LID - SHADE (585 sf)
(41) Clinopodium douglasii
(16) Deschampsia cespitosa
(38) Equisetum laevigatum

LID GENERAL (300 sf)
(32) Armeria maritima
(437) Carex densa
(6) Festuca californica
(8) Juncus effusus

ENLARGED PLANTING PLAN
1" = 20'



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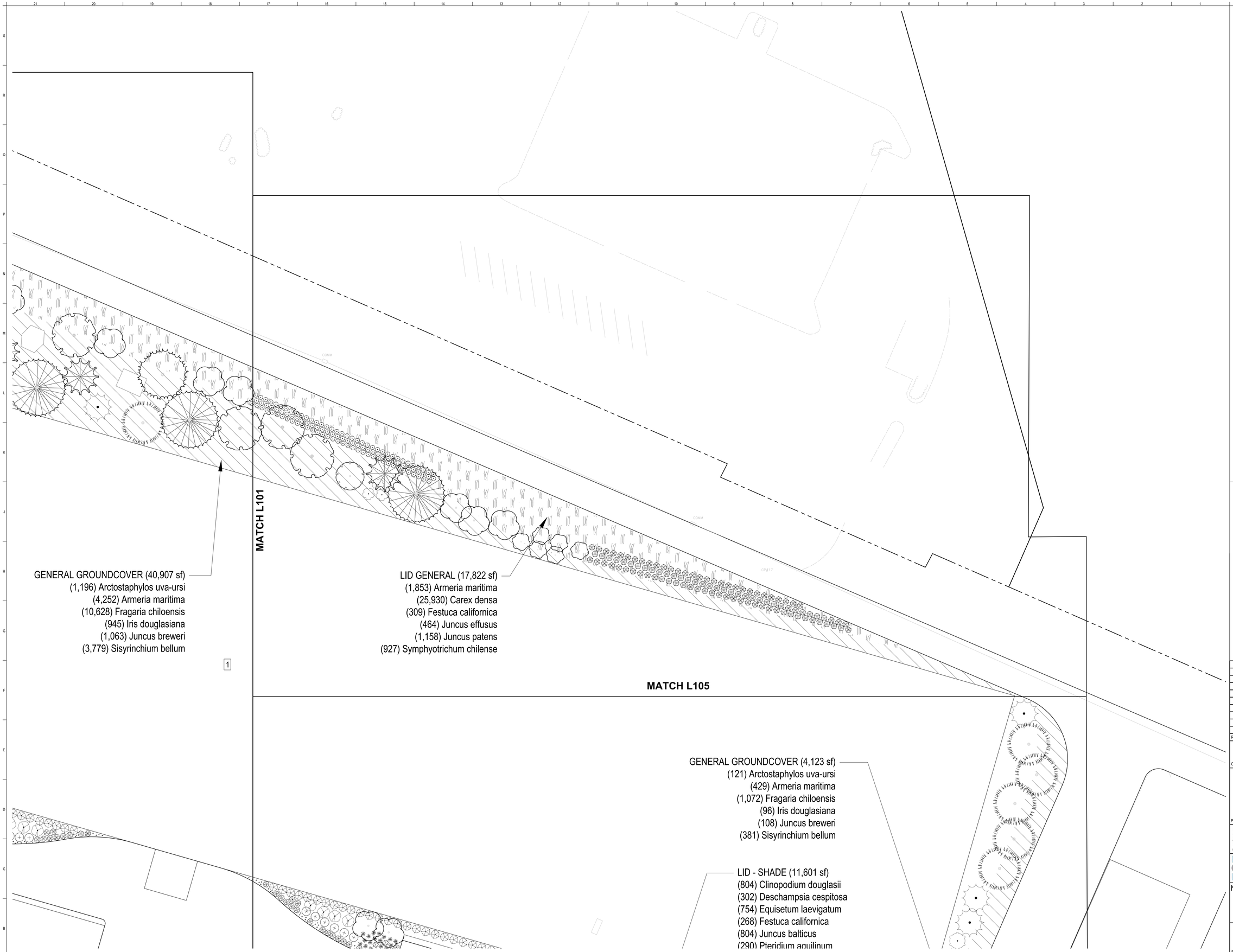
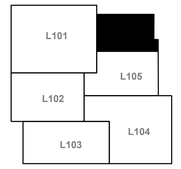


ENLARGED PLANTING PLAN
1" = 20'



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JOB CAPTAIN:			
DRAWN BY:	JAH/WDS		
SMRT FILE:		SHEET No.	L106

Appendix C. Plant Species Observed

Scientific Name	Common Name	Family	Status	Observer
Abronia latifolia	yellow sand verbena	Nyctaginaceae	native	KM
Achillea millefolium	western yarrow	Asteraceae	native	AL
Acmispon sp.	lotus	Fabaceae		AL
Ammophila arenaria	European beachgrass	Poaceae	invasive	AL
Anthemis cotula	dog fennel	Asteraceae	non-native	KM
Anthoxanthum odoratum	sweet vernal grass	Poaceae	invasive	AL
Anthriscus caucalis	bur chervil	Apiaceae	non-native	KM
Armeria maritima subsp. californica	sea thrift	Plumbaginaceae	native	AL
Artemisia pycnocephala	beach sagewort	Asteraceae	native	KM
Avena barbata	slender oats	Poaceae	invasive	AL
Baccharis pilularis	coyote brush	Asteraceae	native	AL
Bellardia trixago	Mediterranean lineseed	Orobanchaceae	invasive	KM
Briza maxima	rattlesnake grass	Poaceae	invasive	AL
Briza minor	annual quaking grass	Poaceae	non-native	AL
Bromus diandrus	ripgut brome	Poaceae	invasive	AL
Bromus hordeaceus	soft chess brome	Poaceae	invasive	AL
Calandrinia ciliata	red maids	Montiaceae	native	AL
Calytonia rubra subsp. depressa	red stemmed spring beauty	Montiaceae	native	AL
Camissoniopsis cheiranthifolia	beach evening primrose	Onagraceae	native	AL
Cardamine oligosperma	Idaho bittercress	Brassicaceae	native	KM
Cardionema ramosissimum	sand mat	Caryophyllaceae	native	AL
Carpobrotus chilensis	sea fig	Aizoaceae	invasive	KM
Carpobrotus edulis	iceplant	Aizoaceae	invasive	KM
Castilleja attenuata	narrow leaved owl's clover	Orobanchaceae	native	KM
Cerastium glomeratum	mouse-eared chickweed	Caryophyllaceae	non-native	AL
Cetranthus ruber	red valerian	Valerianaceae	non-native	KM
Clarkia davyi	Davy's clarkia	Onagraceae	native	KM
Claytonia perfoliata	miner's lettuce	Montiaceae	native	AL
Conium maculatum	poison hemlock	Apiaceae	invasive	KM
Cortaderia jubata	purple pampas grass	Poaceae	invasive	AL
Crocosmia ×crocosmiiflora	monbretia	Iridaceae	invasive	KM

Scientific Name	Common Name	Family	Status	Observer
Cryptantha leiocarpa	popcorn flower	Boraginaceae	native	KM
Cynosurus echinatus	hedgehog dogtail	Poaceae	invasive	AL
Cyperus eragrostis	tall nutsedge	Cyperaceae	native	AL
Cytisus scoparius	scotch broom	Fabaceae	invasive	AL
Daucus carota	Queen Anne's lace	Apiaceae	non-native	KM
Elymus mollis	American dune grass	Poaceae	native	KM
Epilobium ciliatum	slender willow herb	Onagraceae	native	KM
Equisetum telmateia ssp. braunii	giant horsetail	Equisetaceae	native	KM
Erigeron canadensis	horseweed	Asteraceae	native	KM
Eriogonum latifolium	seaside wild buckwheat	Polygonaceae	native	AL
Erodium cicutarium	redstem filaree	Geraniaceae	invasive	AL
Euphorbia peplus	Petty spurge	Euphorbiaceae	non-native	KM
Festuca myuros	rattail grass	Poaceae	invasive	AL
Festuca rubra	red fescue	Poaceae	native	AL
Foeniculum vulgare	fennel	Apiaceae	invasive	AL
Fragaria chiloensis	beach strawberry	Rosaceae	native	AL
Galium aparine	goose grass	Rubiaceae	native	AL
Gamochaeta ustulata	featherweed	Asteraceae	native	KM
Garrya elliptica	coast silk tassel	Garryaceae	native	KM
Geranium dissectum	cutleaf geranium	Geraniaceae	invasive	AL
Gilia millefoliata	dark-eyed gilia	Polemoniaceae	rare, native	KM
Hedera helix	English ivy	Araliaceae	invasive	KM
Hirschfeldia incana	mustard	Brassicaceae	invasive	KM
Holcus lanatus	velvet grass	Poaceae	invasive	AL
Hypochaeris glabra	smooth cat's ear	Asteraceae	non-native	KM
Hypochaeris radicata	hairy cats ear	Asteraceae	invasive	KM
Juncus breweri	Brewer's rush	Juncaceae	native	KM
Juncus patens	rush	Juncaceae	native	KM
Lamium purpureum	dead nettle	Lamiaceae	non-native	AL
Linum bienne	pale flax	Linaceae	non-native	AL
Logfia gallica	narrow leaf cotton rose	Asteraceae	non-native	KM
Lonicera involucrata	twinberry	Caprifoliaceae	native	AL
Lotus corniculatus	bird's-foot trefoil	Fabaceae	non-native	AL
Lupinus arboreus	yellow bush lupine	Fabaceae	invasive	AL

Scientific Name	Common Name	Family	Status	Observer
Lupinus arboreus x	blue hybrid bush lupine	Fabaceae	invasive	KM
Lupinus bicolor	miniature lupine	Fabaceae	native	AL
Lysimachia arvensis	scarlet pimpernel	Myrsinaceae	non-native	AL
Lythrum hyssopifolia	hyssop loosestrife	Lythraceae	invasive	AL
Malva neglecta	dwarf mallow	Malvaceae	non-native	KM
Matricaria discoidea	pineapple weed	Asteraceae	native	AL
Medicago polymorpha	California burclover	Fabaceae	invasive	AL
Melilotus alba	white sweetclover	Fabaceae	non-native	AL
Mentha pulegium	pennyroyal	Lamiaceae	invasive	AL
Morella californica	wax myrtle	Myricaceae	native	AL
Nuttallanthus canadensis	Canada toadflax	Scrophulariaceae	native	KM
Oxalis articulata ssp. rubra	windowbox wood sorrel	Oxalidaceae	non-native	KM
Parentucellia viscosa	yellow glandweed	Scrophulariaceae	invasive	AL
Petrohagia dubia	proliferous pink	Caryophyllaceae	non-native	AL
Plantago coronopus	cut leaf plantain	Plantaginaceae	non-native	AL
Plantago erecta	California plantain	Plantaginaceae	native	KM
Plantago lanceolata	English plantain	Plantaginaceae	invasive	AL
Platystemon californicus	cream cups	Papaveraceae	native	AL
Polygonum paronychia	dune knotweed	Polygonaceae	native	AL
Polypodium glycyrrhiza	licorice fern	Polypodiaceae	native	KM
Pseudognaphalium luteoalbum	Jersey cudweed	Asteraceae	non-native	KM
Raphanus sativus	radish	Brassicacae	invasive	AL
Rubus armeniacus	Himalayan blackberry	Rosaceae	invasive	AL
Rubus ursinus	California blackberry	Rosaceae	native	AL
Rumex acetosella	common sheep sorrel	Polygonaceae	invasive	AL
Salix hookeriana	coastal willow	Salicaceae	native	AL
Salix lasiandra var. lasiandra	Pacific willow	Salicaceae	native	KM
Salix lasiolepis	arroyo willow	Salicaceae	native	KM
Scrophularia californica	California figwort	Schrophulariaceae	native	AL
Silene gallica	common catchfly	Caryophyllaceae	non-native	KM
Solidago spathulata	coast goldenrod	Asteraceae	native	AL
Sonchus oleraceus	common sow thistle	Asteraceae	non-native	KM
Spartina densiflora	dense-flowered cord grass	Poaceae	invasive	KM

Scientific Name	Common Name	Family	Status	Observer
Tanacetum bipinnatum	dune tansy	Asteraceae	native	AL
Tanacetum parthenium	feverfew	Asteraceae	non-native	AL
Trifolium dubium	little hop clover	Fabaceae	non-native	AL
Trifolium repens	white clover	Fabaceae	non-native	AL
Tropaeolum majus	garden nasturtium	Tropaeolaceae	non-native	KM
Typha latifolia	broad-leaved cattail	Typhaceae	native	KM
Vicia americana subsp. americana	American vetch	Fabaceae	native	AL
Vicia benghalensis	purple vetch	Fabaceae	non-native	KM
Vicia hirsuta	tiny vetch	Fabaceae	non-native	KM
Vicia sativa	garden vetch	Fabaceae	non-native	AL
Vicia tetrasperma	sparrow vetch	Fabaceae	non-native	AL
Vicia villosa ssp. villosa	hairy vetch	Fabaceae	non-native	KM
Zantedeschia aethiopica	callalily	Araceae	invasive	KM

Appendix D. Rapid Assessment Forms

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Yellow bush lupine scrub Association Lupinus arboreus/Bromus diandrus

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0001	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: Collector — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___ ___ . ___ ___ ___ ___ ___ ___ LONG ___ ___ ___ . ___ ___ ___ ___ ___ ___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___

Camera Name: iphone Cardinal photos at ID point: NESW 10:54AM

Other photos:

Stand Size (acres): (<1), 1-5, >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW (Flat) Variable | Steepness, Actual °: _____ (0°) 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave undulating

Geology code: _____ Soil Texture code: sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: (0) BA Stems: 30 Litter: 20 Bedrock: (0) Boulder: (0) Stone: (0) Cobble: (0) Gravel: 5 Fines: 45 =100%

% Current year bioturbation 2 Past bioturbation present? (Yes) / No | % Hoof punch _____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Previously graded, highly disturbed sand substrate has been colonized by invasive Lupinus arboreus, Rubus armeniacus, Brassica nigra, Raphanus sativus, Bromus diandrus, Arthoxanthum odoratum, Briza maxima, Vicia villosa. Almost no native species in center of polygon, fades to invaded dune mat characterized by Abronia latifolia, Fragaria chiloensis, Eriogonum latifolium at edges.

Disturbance code / Intensity (L,M,H): 05/H 1/H 2/M ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Lupinus arboreus semi-natural stand

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Dune Mat / S, E / _____

Confidence in Alliance identification: L (M) H Explain: Indistinct line between non-native/dune mat

Phenology (E,P,L): Herb P Shrub P Tree / Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised March 27, 2018)
SPECIES SHEET

Database #: NORD0001

IV. VEGETATION DESCRIPTION

% NonVasc cover: ___ **Total % Vasc Veg cover:** 80+

% Cover - **Conifer tree / Hardwood tree:** 0 / 0 **Regenerating Tree:** — **Shrub:** 35 **Herbaceous:** 50

Height Class - Conifer tree / Hardwood tree: NA / — **Regenerating Tree:** — **Shrub:** 2 **Herbaceous:** 1-2

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular
% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Lupinus arboreus	25		
S	Rubus armeniacus	5		
H	Brassica nigra	8		
H	Raphanus sativus	4		
H	Vicia villosa	5		
H	Bromus diandrus	25		
H	Anthoxanthum odoratum	15		
H	Briza maxima	3		
H	Rumex acetosella	5		
H	Festuca bromoides	3		
H	Bromus hordeaceus	1		
H	Erigeron canadensis	1		
H	Plantago lanceolata	2		
H	Hypochaeris glabra	1		
H	Avena barbata	4		
H	Silybum marianum	1		
H	Malva neglecta	<1		
H	Anthemis cotula	<1		
H	Cortaderia jubata	<1		
H	Parentucellia viscosa	<1		
H	Clarkia davyi (throughout)	<1		
H	Eriogonum latifolium	<1		
H	Lupinus bicolor	<1		
H	Juncus breweri	<1		
H	Fragaria chiloensis	<1		
H	Abronia latifolia	1		
H	Polygonum paronychya	<1		
H	Solidago spathulata	<1		

Native spp present at edges

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Dune mat Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0002	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: Collector — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ UTMN ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___.___ LONG ___.___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ UTMN ___

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): <1, (1-5), >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ___ x ___ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW (Flat) Variable | Steepness, Actual °: _____ (0°) 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave undulating

Geology code: _____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H₂0: BA Stems: 30 Litter: 15 Bedrock: Boulder: Stone: Cobble: Gravel: 5 Fines: 50 =100%

% Current year bioturbation 1 Past bioturbation present? (Yes) / No | % Hoof punch _____

Fire evidence: Yes / (No) (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Highly invaded dune mat, previously graded, irregularly driven across. Gilia millefoliata present, especially abundant in road along fenceline (unpaved sand w/ tire tracks). Percent cover varies widely, with invasive dominance and up to 100% cover non-natives in stabilized areas (especially around Lupinus arboreus), and open patches of higher-quality dune mat interspersed throughout, especially where sand appears to be mobilized by intermittent disturbance.

Disturbance code / Intensity (L,M,H): 05 / H 02 / M 01 / M ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), (S2) young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: (H1) (<12" plant ht.), (H2) (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Abronia latifolia-Ambrosia chamissonis-DuneMat

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Lupinus arboreus / N, E, Ammophila arenaria / SE

Confidence in Alliance identification: L (M) H Explain: Highly invaded, but dune species present

Phenology (E,P,L): Herb P Shrub P Tree — Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: NORD0002 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 20 **Total % Vasc Veg cover:** 60

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 3 **Herbaceous:** 57

Height Class - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 1 **Herbaceous:** 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
H	Abronia latifolia	12		
H	Eriogonum latifolia	4		
H	Polygonum paronychia	4		
H	Clarkia davyi	3		
H	Ammophila arenaria	2		
H	Anthoxanthum odoratum	10		
H	Bromus diandrus	30		
H	Rumex acetosella	10		
H	Armeria maritima	3		
H	Hypochaeris glabra	3		
H	Bromus hordeaceus	1		
S	Lupinus arboreus	3		
H	Festuca rubra	5		
H	Juncus breweri	1		
H	Briza maxima	1		
H	Achillea millefolium	1		
H	Fragaria chiloensis	3		
H	Lupinus bicolor	4		
H	Brassica nigra	1		
H	Parentucellia viscosa	1		
H	Cardionema ramosissimum	3		
H	Arena barbata	<1		
H	Festuca bromoides	<1		
H	Plantago lanceolata	1		
H	Solidago spathulata	<1		more abundant in western portion of dune mat
H	Artemisia pycnocephala	<1		

Unusual species: Gilia millefoliata <1

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Yellow bush lupine scrub Association Lupinus arboreus / Anthoxanthum odoratum

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0003	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: Collector — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ____ UTMN ____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ____ . ____ LONG ____ . ____

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID ____ Projected UTMs: UTME ____ UTMN ____

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): (<1,) 1-5, >5 | Plot Area (m²): 100 / ____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: ____ NE NW SE SW Flat Variable | Steepness, Actual °: ____ 0° 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave undulating

Geology code: ____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H2O: BA Stems: 80 Litter: 10 Bedrock: Boulder: Stone: Cobble: Gravel: 5 Fines: 5 =100%

% Current year bioturbation ____ Past bioturbation present? Yes / No | % Hoof punch ____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Highly invaded eastern edge along Humboldt Bay. Characterized by Lupinus arboreus, Cortaderia jubata, Anthoxanthum odoratum, Holcus lanatus, Dune mat species <20% cover, Abronia latifolia present, but high shrub cover.

Disturbance code / Intensity (L,M,H): CS/H 01/H 02/L ___/___ ___/___ "Other" ____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), (S3 mature) (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), (H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Lupinus arboreus semi-natural stand

Field-assessed Association name (optional): ____

Adjacent Alliances/direction: Dune mat / W, Ammophila arenaria / S

Confidence in Alliance identification: L (M) H Explain: Highly invaded and human-modified

Phenology (E,P,L): Herb P Shrub P Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: NORD-0003 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 0 **Total % Vasc Veg cover:** 95+

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 40 **Herbaceous:** 60

Height Class - Conifer tree / Hardwood tree: — / — **Regenerating Tree:** — **Shrub:** 3 **Herbaceous:** 3

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Lupinus arboreus	40		
H	Holcus lanatus	10		
H	Anthoxanthum odoratum	15		
H	Cortaderia jubata	3		
H	Bromus diandrus	5		
H	Briza maxima	8		
H	Juncus breweri	3		
H	Avena barbata	10		
H	Raphanus sativus	2		
H	Vicia villosa	1		
H	Brassica nigra	1		
H	Fragaria chiloensis	3		
H	Abronia latifolia	10		
H	Hypochaeris radicata	1		
H	Festuca rubra	1		
H	Rumex acetosella	2		

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Dune mat Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0004	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: _____ For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___ ___ . ___ ___ ___ ___ ___ ___ LONG ___ ___ ___ . ___ ___ ___ ___ ___ ___

GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME ___ ___ ___ ___ ___ ___ UTMN ___ ___ ___ ___ ___ ___ ___

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): <1, (1-5), >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW (Flat) (Variable) | Steepness, Actual °: _____ (0°) 1-5° >5-25° (>25)

Topography: Macro: top upper mid lower bottom | Micro: convex (flat) concave (undulating) Berm

Geology code: _____ Soil Texture code: Gravel, sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: BA Stems: Litter: Bedrock: Boulder: Stone: Cobble: Gravel: Fines: =100%

% Current year bioturbation _____ Past bioturbation present? Yes / No | % Hoof punch _____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Eastern area South of the fence has been highly modified and invaded, but dune mat species still present at diagnostic levels. Juncus breweri ~35% cover on man-made berm w/ dense Anthoxanthum odoratum (50% cover) and Ammophila arenaria (10%). Scoured area under telephone poles has low vascular cover (~25%) and relatively high non-vascular cover (~25%) forming biotic crust in some areas on the gravel & shells. Eriogonum latifolium & Fragaria chiloensis are characteristic w/ high densities of Gilia millefoliata growing stunted on the biotic crust.

Disturbance code / Intensity (L,M,H): 05/M 01/H 02/H ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), (S3) mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: (H1) (<12" plant ht.), (H2) (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Dune mat

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Lupinus arboreus / E, Ammophila arenaria / W, SE

Confidence in Alliance identification: (L) M H Explain: Unnatural topography, highly invaded

Phenology (E,P,L): Herb P Shrub P Tree — Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: NORD-0004 SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 15 **Total % Vasc Veg cover:** 50

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 1 **Herbaceous:** 100/25

Height Class - Conifer tree / Hardwood tree: — / — **Regenerating Tree:** — **Shrub:** 2 **Herbaceous:** 1-2

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Baccharis pilularis	<1		
S	Lupinus arboreus	<1		
H	Eriogonum latifolium	10		
H	Fragaria chiloensis	5		
H	Juncus breweri	10		
H	Anthoxanthum odoratum	12		
H	Ammophila arenaria	10		
H	Briza maxima	2		
H	Logfia gallica	4		
H	Bromus diandrus	5		
H	Scrophularia californica	1		
H	Plantago lanceolata	5		
H	Achillea millefolium	1		
H	Leontodon taraxacoides	2		
H	Festuca myuros	2		
H	Calandrinia ciliata	1		
H	Rumex acetosella	2		
H	Cynosurus echinatus	1		
H	Trifolium spp.	R		

Unusual species: Gilia millefoliata <1

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Dune Mat Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or (RA)

Database #:	Date:	Name of recorder: Kelsey McDonald
NORD0005	6/29/20	Other surveyors:
	UID:	Location Name: Nordic Fish Farms

GPS name: _____ For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME _____ UTMN _____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___.___ LONG ___.___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME _____ UTMN _____

Camera Name: iphone Cardinal photos at ID point: NESW

Other photos:

Stand Size (acres): (<1,) 1-5, >5 | Plot Area (m²): 100 / _____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: _____ NE NW SE SW Flat Variable | Steepness, Actual °: _____ 0° 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave (undulating)

Geology code: _____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H20: BA Stems: 30 Litter: 35 Bedrock: Boulder: ◯ Stone: ◯ Cobble: ◯ Gravel: | Fines: 34 =100%

% Current year bioturbation 1 Past bioturbation present? (Yes) No | % Hoof punch _____

Fire evidence: Yes / (No) (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Appears to be the best natural dune mat community on the property, with undulating topography and only moderately invaded. Dense patches of Gilia millefoliata present. Characterized by Abronia latifolia, Eriogonum latifolium, polygonum paronychia. Areas with <80% cover of Ammophila arenaria and not dominated by Lupinus arboreus are included as dune mat. High non-vascular cover (~30%), low vascular cover near fence, where it is less invaded.

Disturbance code / Intensity (L,M,H): 05/M 02/L 03/M ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Dune mat

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Ammophila arenaria / W, Lupinus arboreus / S, E

Confidence in Alliance identification: L (M) H Explain: Edges of Ammophila arenaria & Lupinus arboreus dom.

Phenology (E,P,L): Herb ___ Shrub ___ Tree ___ Other identification or mapping information: not clearly defined

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

SPECIES SHEET

Database #: NORDCOS

IV. VEGETATION DESCRIPTION

% NonVasc cover: 15 **Total % Vasc Veg cover:** 30

% Cover - **Conifer tree / Hardwood tree:** — / — **Regenerating Tree:** — **Shrub:** 1 **Herbaceous:** 30

Height Class - Conifer tree / Hardwood tree: — / — **Regenerating Tree:** — **Shrub:** 2-3 **Herbaceous:** 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
H	Abronia latifolia	5		
H	Eriogonum latifolium	6		
H	Polygonum paronychia	6		
H	Cardionema ramosissimum	3		
H	Rumex acetosella	3		
H	Ammophila arenaria	10		
H	Lupinus bicolor	2		
H	Anthoxanthum odoratum	3		
H	Calandrinia ciliata	<1		
H	Briza maxima	2		
H	Clarkia davyi	1		
H	Bromus diandrus	1		
H	Plantago erecta	2		
H	Hypochaeris glabra	1		
H	Armeria maritima	1		
S	Lupinus arboreus	1		
H	Festuca myuros	1		

Unusual species: Gilia millefoliata - 1

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or RA

Database #:	Date:	Name of recorder: Kelsey McDonald
NMMP001	11/5/20	Other surveyors:
	UID:	Location Name: Nardi: Proposed Restoration - Harbor Dist.

GPS name: Cos Arrow 1 — For Relevé only: Bearing°, left axis at ID point____ of Long / Short side

UTME _____ UTMN _____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ___.___ LONG ___.___

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME _____ UTMN _____

Camera Name: iphone Cardinal photos at ID point: NESW: 9:50AM

Other photos:

narrow, oblong site

Stand Size (acres): (<1,) 1-5, >5 | Plot Area (m²): 100 / _____ | Plot Dimensions 10 x 30 m | RA Radius ____ m

Exposure, Actual °: _____ NE NW SE SW Flat (Variable) | Steepness, Actual °: _____ 0° 1-5° (>5-25°) >25

Topography: Macro: top upper mid (lower) bottom | Micro: convex flat concave (undulating)

Geology code: _____ Soil Texture code: sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: 90 (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H₂0: BA Stems: 70 Litter: 20 Bedrock: Boulder: Stone: Cobble: Gravel: Fines: 10 =100%

% Current year bioturbation _____ Past bioturbation present? Yes / No | % Hoof punch _____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Stabilized invaded backdunes w/ high cover of annual grasses, iceplant, & lupine. GPS'd boundaries up to European beach grass dominance. Good potential gilia habitat.

Disturbance code / Intensity (L,M,H): ___/___ ___/___ ___/___ ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Lupinus arboreus alliance

Field-assessed Association name (optional): _____

Adjacent Alliances/direction: Ammophila arenaria / W, Road / E

Confidence in Alliance identification: L (M) H Explain: Invaded former dune mat

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

Database #: _____ SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 15 **Total % Vasc Veg cover:** 75

% Cover - **Conifer tree / Hardwood tree:** ____/____ **Regenerating Tree:** ____ **Shrub:** 10 **Herbaceous:** 65

Height Class - Conifer tree / Hardwood tree: ____/____ **Regenerating Tree:** ____ **Shrub:** ____ **Herbaceous:** ____

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
S	Lupinus arboreus	10		
H	Hirshfeldia incana	4		
H	Briza maxima	10		
H	Bromus diandrus	10		~47% annual grasses
H	Bromus hordeaceus	10		
H	Festuca cf bromoides	2		
H	Aira praecox? (small ann. grass)	15		
H	Rumex acetosella	2		
H	Solidago spathulata	1		
H	Cardionema ramosissimum	2		
H	Eriogonum latifolium	1		
H	Artemisia pycnocephalus	1		~10% dune mat
H	Moss sp.	3		
H	Claydonia/other lichen sp.	1		
H	Armeria maritima	1		
H	Clarkia sp.	<1		
H	Abronia cf. latifolia	3		some small senesced abronia present, not ID'd
H	Carpobrotus cf. edulis	5		Carpo. carpets north end/NW end
H	Polygonum paronychia	<1		
H	Lathyrus littoralis	<1		higher quality dune mat to N.
H	Cammissoniopsis cheiranthifolia	<1		

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION

Database #:	Date:	Name of recorder: Kelsey McDonald	circle: Relevé or RA
NWMP003	11/5/20	Other surveyors:	
	UID:	Location Name: Nordic Proposed Restoration - MCSD	

GPS name: Eos Arrow — For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side

UTME _____ UTMN _____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ____.____ LONG ____.____

GPS within stand? (Yes) / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID _____ Projected UTMs: UTME _____ UTMN _____

Camera Name: phone Cardinal photos at ID point: NESW : 1-18

Other photos:

Stand Size (acres): <1, (1-5), >5 | Plot Area (m²): 100 / ____ | Plot Dimensions ____ x ____ m | RA Radius (30) m

Exposure, Actual °: ____ NE NW SE SW Flat (Variable) Steepness, Actual °: ____ 0° 1-5° (>5-25°) (>25)

Topography: Macro: top (upper) (mid) lower bottom | Micro: convex flat concave (undulating)

Geology code: _____ Soil Texture code: Sand | (Upland) or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H_2O: BA Stems: Litter: Bedrock: Boulder: Stone: Cobble: Gravel: Fines: =100%

% Current year bioturbation ____ Past bioturbation present? Yes / No | % Hoof punch ____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Dune mat with some shore pine. Good cover of native species, but lots of iceplant & annual grasses. Some lupine & ammophila, one pampas

Disturbance code / Intensity (L,M,H): ___/___ ___/___ ___/___ ___/___ ___/___ "Other" _____/___

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), (T2 (1-6" dbh)), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), (S3 mature (1-25% dead)), S4 decadent (>25% dead)

Herbaceous: (H1 (<12" plant ht.)), H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Dune mat

Field-assessed Association name (optional): Solidago spathulata / Armeria maritima

Adjacent Alliances/direction: Juncus breweri / W . Ammophila arenaria / E

Confidence in Alliance identification: L M H Explain: _____

Phenology (E,P,L): Herb (Shrub (Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form
(Revised March 27, 2018)

Database #: _____ SPECIES SHEET

IV. VEGETATION DESCRIPTION

% NonVasc cover: 3 **Total % Vasc Veg cover:** 70

% Cover - **Conifer tree / Hardwood tree:** 2/___ **Regenerating Tree:** <1 **Shrub:** <1 **Herbaceous:** ~70

Height Class - Conifer tree / Hardwood tree: 3/___ **Regenerating Tree:** 1 **Shrub:** 2 **Herbaceous:** +

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular
% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
T	Pinus contorta ssp. contorta	2		
S	Lupinus arboreus	<1		
H	Carpobrotus cf. chilensis	20		
	Cortaderia jubata	<1		
	Ammophila arenaria	<1		
	Briza maxima	15		
	Bromus diandrus	3		20% annual grasses
	Festuca bromoides	2		
	Solidago spathulata	15		
	Armeria maritima	10		
	Cardionema ramosissimum	2		
	Eriogonum latifolium	3		
	Lathyrus littoralis	1		~35% dune mat
	Cammissoniopsis cheiranthifolia	<1		
	Artemisia pycnocephalus	1		
	Festuca rubra	1		
	Poa macrantha	1		
	Juncus breweri	<1		
	Rumex acetosella	<1		
	moss	2		
	Cladonia/other lichen	1		

Unusual species: _____

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

For Office Use:	Final database #:	Final vegetation type:	Alliance Association

I. LOCATIONAL/ENVIRONMENTAL DESCRIPTION — circle: Relevé or RA

Database #:	Date:	Name of recorder: Kelsey McDonald
NMMPOCH	11/5/20	Other surveyors:
	UID:	Location Name: Nordic Proposed Restoration-Lanphere

GPS name: EOSAcrow — For Relevé only: Bearing°, left axis at ID point ____ of Long / Short side

UTME ____ UTMN ____ Zone: 11 NAD83 GPS error: ft./ m./ PDOP ____

Decimal degrees: LAT ____ . ____ LONG ____ . ____

GPS within stand? Yes / No If No, cite from GPS to stand: distance (m) ____ bearing ° ____ inclination ° ____

and record: Base point ID ____ Projected UTMs: UTME ____ UTMN ____

Camera Name: phone Cardinal photos at ID point: NESW 3:06pm

Other photos:

Stand Size (acres): <1, 1-5, >5 | Plot Area (m²): 100 / ____ | Plot Dimensions ____ x ____ m | RA Radius 30 m

Exposure, Actual °: ____ NE NW SE SW Flat Variable | Steepness, Actual °: ____ 0° 1-5° >5-25° >25

Topography: Macro: top upper mid lower bottom | Micro: convex flat concave undulating

Geology code: ____ Soil Texture code: ____ | Upland or Wetland/Riparian (circle one)

% Surface cover: (Incl. outcrops) (>60cm diam) (25-60cm) (7.5-25cm) (2mm-7.5cm) (Incl sand, mud)

H_2O: BA Stems: Litter: Bedrock: Boulder: Stone: Cobble: Gravel: Fines: =100%

% Current year bioturbation ____ Past bioturbation present? Yes / No | % Hoof punch ____

Fire evidence: Yes / No (circle one) If yes, describe in Site history section, including date of fire, if known.

Site history, stand age, comments: Area of extensive lupine invasion has been target of annual Lupine bash. Increased nitrogen has led to encroaching coyotebrush and annual grasses.

Disturbance code / Intensity (L,M,H): ____/____ ____/____ ____/____ ____/____ ____/____ "Other" ____/____

II. HABITAT DESCRIPTION

Tree DBH : T1 (<1" dbh), T2 (1-6" dbh), T3 (6-11" dbh), T4 (11-24" dbh), T5 (>24" dbh), T6 multi-layered (T3 or T4 layer under T5, >60% cover)

Shrub: S1 seedling (<3 yr. old), S2 young (<1% dead), S3 mature (1-25% dead), S4 decadent (>25% dead)

Herbaceous: H1 (<12" plant ht.), H2 (>12" ht.)

Desert Riparian Tree/Shrub: 1 (<2ft. stem ht.), 2 (2-10ft. ht.), 3 (10-20ft. ht.), 4 (>20ft. ht.)

Desert Palm/Joshua Tree: 1 (<1.5" base diameter), 2 (1.5-6" diam.), 3 (>6" diam.)

III. INTERPRETATION OF STAND

Field-assessed vegetation Alliance name: Dune mat

Field-assessed Association name (optional): Solidago spathulata - Eriogonum latifolium

Adjacent Alliances/direction: Baccharis pilularis / N, E. Juncus breweri / W

Confidence in Alliance identification: L M H Explain: Highly invaded, encroaching scrub

Phenology (E,P,L): Herb L Shrub L Tree ____ Other identification or mapping information:

Combined Vegetation Rapid Assessment and Relevé Field Form

(Revised March 27, 2018)

SPECIES SHEET

Database #: _____

IV. VEGETATION DESCRIPTION

% NonVasc cover: 18 **Total % Vasc Veg cover:** 60

% Cover - **Conifer tree / Hardwood tree:** <1 / ___ **Regenerating Tree:** <1 **Shrub:** 7 **Herbaceous:** 53

Height Class - Conifer tree / Hardwood tree: 3 / ___ **Regenerating Tree:** 2 **Shrub:** 23 **Herbaceous:** 1

Height classes: 1=<1/2m, 2=1/2-1m, 3=1-2m, 4=2-5m, 5=5-10m, 6=10-15m, 7=15-20m, 8=20-35m, 9=35-50m, 10=>50m

Stratum categories: T=Tree, A = SApling, E = SEedling, S = Shrub, H= Herb, N= Non-vascular

% Cover Intervals for reference: r = trace, + = <1%, 1-5%, >5-15%, >15-25%, >25-50%, >50-75%, >75%

Stratum	Species	% cover	C	Final species determination
T	Pinus contorta	<1		
S	Baccharis pilularis	5		7% encroaching forest
S	Lupinus arboreus	2		
H	Solidago spathulata	20		
	Eriogonum latifolium	6		~35% Dune mat
	Achillea millefolium	1		
	Polygonum paronychia	1		
	Festuca rubra	1		
	Poa macrantha	1		
	Bromus diandrus	10		
	Briza maxima	1		~22% annual grasses
	Festuca bromoides	10		
	Aira praecox	1		
	Polypodium glycyrrhiza	<1		
	Rumex acetosella	1		
	Moss	8		
	Claydonia/Other lichen	10		

Unusual species: Erysimum menziesii

Appendix E. Photo Index

Photo 1. Rare annual dark-eyed gilia (*Gilia millefoliata*) May 5, 2020.

Photo 2. Dark-eyed gilia in stabilized dune mat.

Photo 3. Dark-eyed gilia with invasive ripgut brome (*Bromus diandrus*).

Photo 4. Dune mat habitat characterized by yellow sand verbena (*Abronia latifolia*) in the area north of the fence, where dark-eyed gilia was concentrated.

Photo 5. Dark-eyed gilia in an open patch of sand surrounded by ripgut brome.

Photo 6. Dark-eyed gilia beginning to drop seeds in June 29, 2020.

Photo 7. Dune mat habitat near the clarifiers.

Photo 8. Dune mat habitat with beach sagewort (*Artemisia pycnocephala*) and dune goldenrod (*Solidago spathulata*) on the southeast side of the property.

Photo 9. High quality dune mat south of the fence

Photo 10. The intersection of high quality dune mat (left), European beach grass swards (right), and yellow bush lupine scrub in the distance to the east.

Photo 11. Yellow bush lupine scrub east of the clarifiers with high cover of non-native species.

Photo 12. Yellow bush lupine scrub on the southeast end of the property.

Photo 13. Coast willow (*Salix hookeriana*) thickets with Brewer's rush (*Juncus breweri*) (left), a small patch of dune mat (right), and Eurpean beach grass swards beyond it to the north.

Photo 14. Yellow bush lupine scrub and native coastal brambles along the ridge east of Vance Ave.

Photo 14. Dune mat also occurred along the east side of Vance Ave.

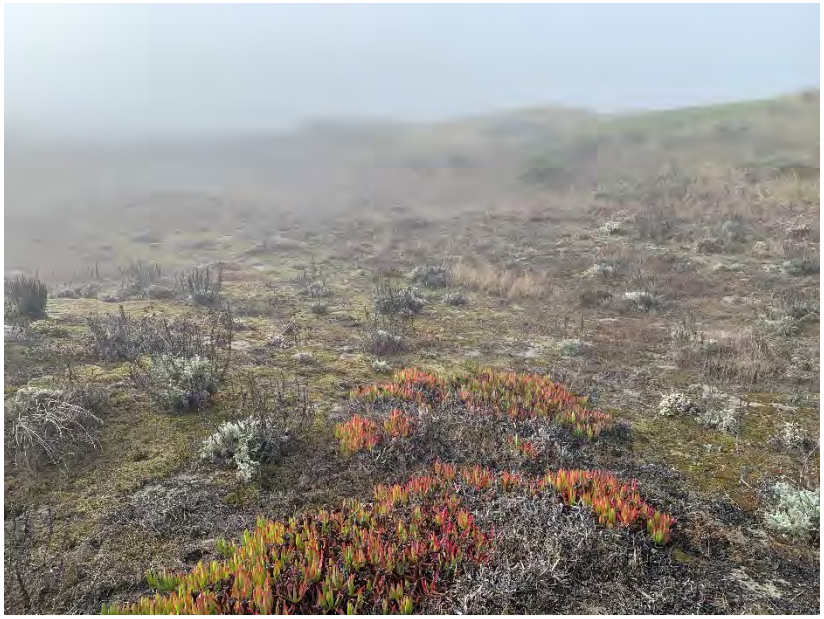

Photo 15. Humboldt Bay Harbor District restoration site, with invasive iceplant in the foreground.

Photo 16. Humboldt Bay Harbor District restoration site, with invasive grasses along New Navy Base Road.

Photo 17. Manila Community Services District Area A, with invasive grasses and iceplant.

Photo 18. Manila CSD Restoration Area B, burn site with trash to be removed.

Photo 19. The Friends of the Dunes property contained both invasive European beachgrass and invasive annual grasses in dune mat.

Photo 20. U.S. Fish and Wildlife Area A, with nitrogen-rich debris, regrowth of yellow bush lupine, and invasive grasses.

Photo 21. U.S. Fish and Wildlife Area B, with moderate cover of annual grasses.

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Kelsey McDonald
kelsey.mcdonald@ghd.com

Misha Schwarz
misha.schwarz@ghd.com

www.ghd.com