CALIFORNIA COASTAL COMMISSION
South Coast District Office
301 E Ocean Blvd., Suite 300
Long Beach, CA 90802-4302
(562) 590-5071

W16a

5-12-263-A1 (Los Angeles World Airports)

December 15, 2021

EXHIBITS

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Exhibit 1 – Project Location

Exhibit 2 – Conditions of CDP No. 5-12-263

STANDARD CONDITIONS

This permit is granted subject to the following standard conditions:

1. Notice of Receipt and Acknowledgment. The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. Expiration. If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. Interpretation. Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.

4. Assignment. The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. Terms and Conditions Run with the Land. These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

SPECIAL CONDITIONS

This permit is granted subject to the following special conditions:

1. Landscaping Plan

A. PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the applicant will submit, for the review and written approval of the Executive Director, a plan for landscaping that is compatible with habitat restoration within the El Segundo Blue Butterfly preserve. A qualified biologist or licensed landscape architect, with expertise in dune restoration, shall prepare the plan. The plan shall include the following:

1. Vegetation planted on the site will consist of native plants typically found in Southern California coastal dunes and prairies. The seeds and cuttings employed shall be from sources in and adjacent to the El Segundo Dunes. If other Southern California sources are used, the locations of the seed/ cutting sources and the approximate number of plants and/or amount of seeds/cuttings from each source shall be reported to the Executive Director.

2. No non-native or invasive species will be employed on the site. Invasive plants are those identified in the California Native Plant Society, Los Angeles -- Santa Monica Mountains Chapter handbook entitled

Recommended List o(Native Plants for Landscaping in the Santa Monica Mountains. January 20, 1992, those species listed by the California Exotic Plant Pest Council on any of their watch lists as published in 1999, and those otherwise identified by the Department of Fish and Game or the United States Fish and Wildlife Service.

3. Planting will maintain available views of the beach and ocean.
4. The site will be stabilized immediately with jute matting, straw wattles, or other BMPs to minimize erosion during the raining season (November 1 to March 31) if plantings have not been fully established.
5. No permanent irrigation system shall be allowed. Temporary above ground irrigation to allow the establishment of the plantings is allowed if a temporary above ground irrigation system is used, then once all plantings have been established, the temporary irrigation system shall be removed.

B. The plan shall include, at a minimum, the following components:
    1. A map showing the types, size, and locations of all plant materials that will be on the site, the temporary irrigation system, topography of the developed site, and all other landscape features;
    2. A schedule for installation of native plants/removal of non-native plants;
    3. An identification of seed sources and plant communities of the plants planned to be employed;

C. Five years from the date of issuance of Coastal Development Permit No. 5-12-263, the applicant shall submit for the review and approval of the Executive Director, a monitoring report, prepared by a licensed biologist, landscape architect or qualified resource specialist that assesses whether the on-site landscaping is in conformance with the landscaping plan approved pursuant to this special condition and provides no less than 80% relative coverage of planted area and resists invasion by exotic plant species. The monitoring report shall include photographic documentation of plant species, plant coverage and an evaluation of the conformance of the resultant landscaping with the requirements of this special condition.

    If the landscape monitoring report indicates the landscaping is not in conformance with or has failed to meet the performance standards specified in the landscaping plan approved pursuant to this permit, the applicant, or successors in interest, shall submit a revised or supplemental landscape plan for the review and approval of the Executive Director. The revised landscaping plan must be prepared by a licensed landscape architect or a qualified resource specialist and shall specify measures to remediate those portions of the original plan that have failed or are not in conformance with the original approved plan.

D. The permittee shall undertake development in accordance with the approved final plan and schedule and other requirements. Any proposed changes to the approved final plan shall be reported to the Executive Director. No changes to the approved final plan shall occur without a Commission amendment to this

coastal development permit unless the Executive Director determines that no amendment is required.

2. Erosion Control.

A. Prior to Issuance of the Coastal Development Permit, the applicant shall submit, for review and approval of the Executive Director, a plan for erosion and drainage control.

1) Erosion and Drainage Control Plan

a. The erosion and drainage control plan shall demonstrate that:

- During construction, erosion on the site shall be controlled to avoid adverse impacts on adjacent properties, undisturbed native vegetation areas, and surrounding public streets.
- The following temporary erosion control measures shall be used during construction: temporary sediment basins (including debris basins, desilting basins or silt traps), temporary drains and swales, sand bag barriers, silt fencing, stabilize any stockpiled fill with geofabric covers or other appropriate cover, install geotextiles or mats on all cut or fill slopes, and close and stabilize open trenches as soon as possible.
- Permanent erosion and drainage control measures shall be installed, if necessary, to ensure the stability of the site, adjacent properties, and public streets.
- All drainage shall be directed toward the street into suitable collection and discharge facilities.

b. The plan shall include, at a minimum, the following components:

- A narrative report describing all temporary run-off and erosion control measures to be used during construction and all permanent erosion control measures to be installed for permanent erosion control.
- A site plan showing the location of all temporary erosion control measures.
- A schedule for installation and removal of the temporary erosion control measures.
- A written review and approval of all erosion and drainage control measures by the applicant's engineer and/or geologist.
- A written agreement indicating where all excavated material will be disposed and acknowledgement that any construction debris disposed within the coastal zone requires a separate coastal development permit.

c. The plan shall also include temporary erosion control measures should grading or site preparation cease for a period of more than 30 days, including but not limited to: stabilization of all stockpiled fill, access roads, disturbed soils, and cut and fill slopes with geotextiles and/or mats, sand bag barriers, and/or silt fencing; and include temporary drains and swales and sediment basins. These temporary erosion control measures shall be monitored and maintained until grading or construction operations resume.

B. The permittee shall undertake development in accordance with the approved final plans. Any proposed changes to the approved final plans shall be reported to the Executive Director. No changes to the approved final plans shall occur without a Commission amendment to this coastal development permit unless the Executive Director determines that no amendment is required.

3. Future Development. By the acceptance of this permit the applicant agrees that this permit is only for the development described in coastal development permit No. 5-12-263. Pursuant to Title 14 California Code of Regulations Section 13253(b)(6), the exemptions otherwise provided in Public Resources Code section 3061 0(b) shall not apply to any of the parcel, generally depicted in Exhibit No. 3. Accordingly, any future improvements to the property, including but not limited to repair and maintenance identified as requiring a permit in Public Resources Section 30610(d) and Title 14 California Code of Regulations Sections 13252(a)-(b), which are proposed within the area shall require an amendment to Permit No. 5-12-263 from the Commission or shall require an additional coastal development permit from the Commission or from the applicable certified local government.

Revised Ecological Landscape Plan For the Los Angeles International Airport Coastal Dunes Improvement Project City of Los Angeles, California

April 2021

Prepared for: Los Angeles World Airports and the California Coastal Commission
Prepared by: The Bay Foundation, Coastal Restoration Consultants, and California Botanic Garden

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1.0 Introduction

The Coastal Dunes Improvement Project (CDIP) is a habitat maintenance and restoration project in the 48-acre dune area on the northernmost edge of the Los Angeles International Airport / El Segundo Dunes (LAX Dunes; Figure 1). The project developed out of the 2006 LAX Master Plan Stipulated Settlement Agreement, which required Los Angeles World Airports (LAWA) to develop a plan to remove some existing pavement from abandoned streets and sidewalks and plant appropriate native vegetation in the northern portion of the Dunes.

Figure 1. Northern LAX Dunes (48-acres) and CDIP project area.

On 10 January 2013, the California Coastal Commission (CCC) granted LAWA the Coastal Development Permit (No. 5-12-263) necessary to implement the Coastal Dunes Improvement Project to remove selected abandoned streets covering approximately four acres in the project area, perform habitat maintenance and restoration work to reduce non-native invasive plants, and plant approximately six acres of native coastal dune and coastal prairie vegetation. Following the submittal and approval of an Ecological Landscape Plan, restoration activities began on 27 June 2013 (KMA 2013). The Coastal Development Permit further required that five-years after its issuance,

LAWA must show that it met performance requirements of the Ecological Landscape Plan by submitting a five-year monitoring report.

Between 2014 and 2017, LAWA attempted to perform the required habitat maintenance and restoration work on its own and through community volunteer efforts. LAWA was only able to dedicate two landscaping staff on a part-time basis to perform habitat maintenance and restoration work in the project area. In 2017, LAWA staff determined that the habitat maintenance and restoration work would not meet the Coastal Development Permit performance standards and that additional expertise and effort would be needed to meet the five-year deadline.

To address the deficiencies in habitat maintenance and restoration work, on 2 November 2017, LAWA entered into a one-year agreement with The Bay Foundation (TBF). Services included further removal of invasive plant species, habitat maintenance, recruitment of volunteer workers, data collection and monitoring of restoration efforts. Under the agreement, TBF also prepared the five-year Ecological Monitoring Report (2018) that LAWA submitted to the CCC on 25 June 2018. LAWA did not expect that TBF would be able to complete the restoration work to meet the standards set forth in the Coastal Development Permit in just one year and a letter dated 4 December 2018 from the CCC determined that the habitat in the CDIP area did not meet the performance standards specified in the permit and the approved Ecological Landscape Plan (2013).

The CCC commended LAWA for the comprehensiveness of TBF's report and noted that the quality of the report demonstrated LAWA's commitment to restoring the area. The letter from the CCC required that LAWA continue habitat maintenance and restoration in the area and submit a revised or supplemental Ecological Landscape Plan by 15 May 2019 for review and approval by the CCC. The Coastal Commission issued a 'Condition Compliance' in response to the Ecological Monitoring Report five-years post 2013 restoration implementation. The 'Condition Compliance' requested a Revised Ecological Landscape Plan to include an updated plant palette, revised plan for habitat establishment, and invasive species control and monitoring plan. TBF, Coastal Restoration Consultants, and California Botanic Garden, in partnership and consultation with LAWA and Coastal Commission, drafted this Revised Ecological Landscape Plan to meet those objectives.

1.1 Project Goals and Objectives

The overarching purpose of the project is to restore native dune habitats where pavement was removed and in adjacent degraded areas of the site. The following goals and objectives were developed for the project based on guidance in the CDIP's Coastal Development Permit and in consultation with dune restoration experts.

1. Restore Southern Foredune, Southern Dune Scrub, and Coastal Sage Scrub habitat in the six-acre project area.
    a. Divide the project site into habitat areas based on soil characteristics (e.g., texture and grain size).

   b. Restore Southern Foredune and Southern Dune Scrub habitat where appropriate native sandy soils exist.
   c. Restore Coastal Sage Scrub and Southern Dune Scrub habitat where native soils have been altered.
   d. Ecotones between patches will likely support plants from adjacent communities.
2. Restore habitats that are resistant to invasion by invasive non-native plants.
   a. Establish high cover of native shrubs in Southern Dune Scrub and Coastal Sage Scrub areas to help outcompete invasive annual species.
   b. Establish natural low cover of Southern Foredune and Southern Dune Scrub species on native soils that are naturally resistant to invasive non-native annual species.
   c. Eradicate perennial weeds from the project site and within appropriate buffers around the site.
   d. Control annual weeds within the project site and within appropriate buffers around the site.

These goals and objectives were added to the 2021 revision to this document, expanding on the 2019 draft edition. The rest of this document lays out the process for achieving these goals and objectives by 1) outlining the actions that will be needed to restore target habitats, 2) setting quantitative success criteria, and 3) providing a plan for measuring achievement of success criteria.

2.0 Current Conditions

After construction activities ended in 2014, the majority of the six-acre CDIP site was vegetation-free. Early restoration efforts included seeding (at a low rate), irrigating, and weeding. By 2019, when the site was surveyed by TBF, targets set in the 2013 Ecological Landscape Plan were largely being met, but there were several areas that were challenged by non-native invasion. TBF and LAWA have conducted weeding of the site, primarily though community restoration events and some maintenance activities by LAWA staff, since 2014. While cover of non-native annuals remains higher than desirable, the CDIP area is almost entirely free of invasive perennial non-natives such as *Carpobrotus* spp. (iceplant) and *Acacia cyclops* (wattle). *Euphorbia terracina* (carnation weed), which is scattered in some parts of the site, is the primary invasive perennial in need of control. In general, the limited seeding and subsequent weeding efforts have moved the project towards success, but further introductions of native plants and continued weeding will be needed to restore natural, self-sustaining dune communities. Detailed information on the current conditions of the six-acre restoration area are detailed in the Ecological Monitoring Report (2018) and the 2020 Annual Progress Report (TBF 2020). The areas shown in Figures 2 and 3 are representative of current conditions, with *Acmispon glaber* (deerweed) as the dominant shrub surrounded by patchy non-native annuals.

Figure 2. Existing vegetation in the CDIP restoration site (23 August 2018). The shrubs are mostly native *Acmispon glaber* (deer weed) and the majority of the low-growing vegetation is non-native *Erodium* spp. (filaree).

Figure 3. Existing vegetation in the backdune (Pope St) portion of the CDIP restoration site (23 August 2018). The shrubs are mostly *Acmispon glaber* (deer weed) and the majority of the low-growing vegetation is *Erodium* spp. (filaree) and *Bromus* spp. (Brome grass).

3.0 Supplemental Landscape Planting Plan

The supplemental landscape planting plan is designed to address non-conformities identified by the CCC in their Condition Compliance letter in response to the Los Angeles International Airport Coastal Dunes Improvement Project Ecological Landscape Report (2018).

3.1 Target Habitats

Based on an analysis of historic aerial photos and herbarium specimens, professional scientific judgement indicates that the project area consisted primarily of Southern Foredune and Southern Dune Scrub habitats, both of which are now regionally rare. The project site provides some of the best opportunities for large-scale restoration of these habitats in southern California.

Each of these habitats requires specific soil conditions for their establishment and persistence. Many areas of soils at the project site have been altered significantly by development. The initial phase of restoration did not include any large-scale alterations of the soil to restore them to specific conditions for habitat targets. As such, these target habitats will need to be restored where soil conditions are appropriate now, as opposed to where they likely occurred before large-scale disturbances.

3.1.1 Southern Foredune

Southern Foredune habitat (sometimes also referred to as Dune Mat) is dominated by perennial species with a high proportion of suffrutescent (slightly woody at base) plants that form a low canopy up to 30 cm tall. The total percent cover of plants in this community is typically low (<25%). This habitat occurs on soils that consist almost entirely of sand (i.e., very low levels of silt and clay). The well-drained sandy soil tends to be very low in organic matter and nutrients and blowing sand and wave overwash can bury or damage plants. The plant species that characterize this habitat are specifically adapted to these stressors, including: *Camissoniopsis cheiranthifolia* (beach evening primrose), *Abronia umbellata* (pink sand verbena), *Abronia maritima* (red sand verbena), *Ambrosia chamissonis* (beach bur), *Calystegia soldanella* (beach morning glory) (Holland 1986), and *Atriplex leucophylla* (beach salt bush). The species composition of this community varies as distance increases from the most seaward dunes, where stressors like blowing sand and wave overwash are strongest. Most annual non-native plant species that are invasive in other terrestrial habitats in southern California cannot tolerate the conditions in Southern Foredune habitat. Several perennial non-native species can be invasive in dunes, especially *Carpobrotus* spp. (iceplant), *A. cyclops*, *E. terracina*, and *Ehrharta* spp. (veldt grass).

Before the area was altered by development, the majority of the six-acre CDIP restoration site would have been characterized as Southern Foredune habitat. Some of the species characteristic of this habitat are found within and adjacent to the restoration site today, however, most of the soil has been altered by the addition of fines (silt and clay) due to previous development and annual and perennial non-native species are abundant.

3.1.2 Southern Dune Scrub

Southern Dune Scrub is typically found in areas landward of Southern Foredune habitats. Areas suitable for Southern Dune Scrub are characterized by sandy soils that have accumulated some fine sediments and organic matter. Stressors like blowing sand and wave overwash are absent. Any of the species characteristic of Southern Foredunes can occur in Southern Dune Scrub, however the typical dominants include: *Lupinus chamissonis* (silver dune lupine), *Isocoma menziesii* (coast goldenbush), Ericameria *ericoides* (mock heather), *Croton californicus* (California croton), *Opuntia littoralis* (coast prickly pear), *Distichlis spicata* (Salt grass), *Rhus integrifolia* (lemonade berry) (Holland 1986), *Eriogonum parvifolium* (coast buckwheat), and *Eriogonum fasciculatum* (California buckwheat). A wide range of invasive non-native plants can be found in Southern Dune Scrub, including most of the typical non-native annuals and those listed in Section 3.1.1 above.

Southern Dune Scrub was likely present historically within the project area. Several areas within the 48-acre northern dunes section support this habitat today. Areas within the project site that historically supported Southern Foredune habitat but have had their soil altered by development, might be expected to support Southern Dune Scrub habitat now.

3.1.3 Coastal Sage Scrub

Coastal Sage Scrub is dominated by moderately sized shrubs (0.5 – 2.0 m tall) that form a more-or-less closed canopy. This vegetation community occurs on a variety of well-drained soil types in coastal southern California. Species composition of this community varies by soil type, slope aspect, distance from the coast, and fire history. Typical species near the coast in Los Angeles County include *Artemisia californica* (California sagebrush), *I. menziesii*, *E. fasciculatum*, *E. cinereum* (ashyleaf buckwheat), *E. parvifolium* (sea cliff buckwheat), *Eriophyllum confertiflorum* (golden yarrow), *Leptosyne gigantea* (giant coreopsis), *Encelia californica* (bush sunflower), *A. glaber* (deerweed), *Salvia apiana* (white sage), *S. leucophylla* (purple sage), *S. mellifera* (black sage), *O. littoralis*, and *R. integrifolia* (Holland 1986). Mature stands of this plant community that have not experienced soil disturbance are able to resist invasion by most annual non-native plants. However, where soil has been disturbed and in most restoration settings, a wide range of invasive annual non-native species can become dominant in this habitat; the most common of which include *Bromus* spp. (brome grass), *Hirschfeldia incana* (summer mustard), *Brassica tournefortii* (Saharan mustard), *Raphanus sativus* (wild radish), and *Erodium* spp. (filaree).

It is unlikely that this plant community occurred on site prior to disturbance due to the sandy soils that were present historically, though it very likely occurred on nearby bluffs. Many of the species associated with this community might be expected to thrive in parts of the site where soils have more fine sediments with better moisture and nutrient retention than they did historically. Several of these species occur on site currently.

3.2 Planting Areas and Revised Plant Palettes

The growing conditions, especially those related to soil, are not consistent throughout the CDIP area. Soils that are very sandy with very low amounts of silt and clay (fine sediments) are probably representative of historic conditions before the area was developed. Development likely brought new soil to the site to provide foundations for houses and roads and to support landscaping. The result is a mosaic of soils with higher amounts of fines, compacted layers, and other material (gravel, cobble, construction debris) in many areas within the project site.

3.2.1 Soil Characterization

To better understand soil and sand conditions, dozens of soil cores (to approximately 40 cm deep) were examined from throughout the site. Soil composition varied greatly across the CDIP site. From this analysis, it was determined that the CDIP area should be divided into different planting areas based on differences in soil characteristics.

In addition, a more detailed lab analysis measuring Nitrate, Phosphorus, percent moisture, and percent sand was conducted on nine soil samples (Table 1). Six soil samples were collected from areas within the CDIP site that had loamy soil (samples 1-4, 6, & 7) and one sample (#5) was collected from an area with natural dune soil. Samples were also collected from two reference sites, one on-site area dominated by *L. chamissonis* with low non-native cover (#8) and one from natural dunes at nearby Venice Beach, dominated by *A. chamissonis* (#9).

Table 1. Selected results of soil analyses. Other nutrients, pH, and salinity were generally similar between all sites. Asterisk (*) indicates lab was not able to perform analysis.

Sample #	Nitrate (lbs/ac-ft)	Phosphorus (lbs/ac-ft)	% Moisture	% Sand
1	6.0	82	1.2	92.3
2	6.8	55	0.8	95
3	11.2	73	1.0	94.8
4	8.4	92	2.9	87.3
5 (dune soil)	3.6	27	0.4	*
6	4.4	73	2.9	89.8
7	6.0	64	1.6	*
8 (reference site)	11.2	46	0.2	99.4
9 (reference site)	8.8	37	0.1	97.3

Laboratory analyses confirmed the difference among individual samples in soil percent sand (Table 1). The percent moisture was greater in samples collected in loamy soils than the samples collected in sandy soils. The loamy soils also had more phosphorus than the sandy soils. Nitrate levels were similar overall, but sample #8 and sample #3 tied for the highest level (11.2 pounds per acre-foot). This may be due to the high cover of nitrogen fixing plants (e.g., *L. chamissonis*). Site #5 had the lowest nitrate levels (<3.6 pounds per acre-foot). This result, along with the low soil moisture at this location, are probably the primary reasons this area has low non-native cover and supports native

dune species. The relatively higher nutrients and soil moisture in the loamy areas are likely the reasons annual non-native species can thrive there. These important soil differences support the idea of using different planting palettes in sandy areas and loamy areas. The loamy areas will not support Southern Foredune habitat but will support other target habitats outlined in this plan.

3.2.2 Plant Communities

Figure 4 displays the four Plant Community planting areas. The natural sandy soils in Plant Community A will support both Southern Foredune and Southern Dune Scrub habitats. Other soils will support a mixture of species from both Coastal Sage Scrub and Southern Dune Scrub habitats (Plant Community B and Special Plant Communities C and D).

Figure 4. CDIP Plant Community four planting areas (i.e., Plant Community A-D).

A mixture of seeding and planting from nursery stock will be used to increase native plant cover at the site. Two different planting palettes and planting strategies were developed for the different planting areas based on soil conditions (Tables 2 and 3). Plant Community A, with the most natural soil conditions, will be seeded with Southern Foredune and Southern Dune Scrub species (Table 2). Seeding is most efficient in this

area because weed density is very low due to the very sandy, well-drained, low-nutrient soils (see Table 1). Seeds should be applied by hand and gently raked into the sand with rock rakes. Seeds should be introduced in the winter between November and February. Getting seeds in the ground before the first rains is ideal.

Plant Community B will be planted with nursery stock grown in small containers (2-inch rose pots, standard 4-inch pots, or liners). The focus will be on species that will grow well in the relatively sandy or loamy soil and compete well against invasive non-native species (Table 3). Experimental planting and seeding will be utilized for Special Plant Communities C and D. Special Plant Community C has a compacted hardpan layer at or near the surface. Special Plant Community D has a clay layer that is generally present about 30 cm below the surface. These features will require tweaking of planting strategies and using a sub-set of the Plant Community B palette. An additional planting palette, comprised of annual species, was also developed (Table 4). Species in Table 4 will be introduced where appropriate to increase native diversity.

When possible, seed will be sustainably sourced from within the LAX Dunes. The seed plant palette tables indicate the likely source by species using the following key:

- S-1: Seed will be sourced from the northern dune area not including the six-acre CDIP restoration site.
- S-2: Seed will be sourced from the larger LAX Dunes complex, outside of the northern area.
- S-3: Seed will be sourced from a seed provider specialized in habitat restoration projects. When possible, seed source will be local or regional, and the source of seed will be documented.

Additionally, seed sourced from S-1 or S-2 methods may require seed bulking when current populations cannot support the approximate quantity of seed required. Seed bulking will be conducted by a nursery specialized in habitat restoration. Seeds will not be collected from native plants established as part of the six-acre CDIP restoration site but may be collected in areas of the northern dunes outside the restoration site. Seed collection protocols will be advised by botanists specialized in habitat restoration and will include best management practices to sustainably harvest seed, nursery protocols for seed bulking, and methods to avoid plant contamination and spread of *Phytophthora* species.

When local seed collection and/or seed bulking are not possible, seed may be supplemented through outside sources (S-3). Native species marked with an asterisk (*) in the following tables indicate that these species are either not available or have limited availability for seed collection in the LAX Dunes and will likely be sourced from an outside seed provider specialized in habitat restoration. Seeds and plants will rely primarily on winter rains to germinate. Supplementary manual watering may be considered based on winter rainfall amount.

Monitoring will inform sustainable seed collection and because the seed donor populations are not fully quantified at this time, actual seed collected may vary from the proposed rates. It will be important to follow best management protocols established for the sustainable harvest of seed by population and plant (e.g., based on an evaluation of seeding individual plants, seed collected from no more than 10% of individuals within a population, etc.).

Table 2. Plant Community A – Southern Foredune and Southern Dune Scrub Plant Palette. Asterisk (*) indicates species that will be sourced from an outside seed provider due to limited availability in the LAX Dunes.

Scientific Name	Common Name	Approximate Quantity (lbs/acre)	Type	Source
*Abronia maritima**	red sand verbena	10.0	perennial herb	S-3
Abronia umbellata	pink sand verbena	10.0	perennial herb	S-1/S-2/S-3
Ambrosia chamissonis	beach bur	5.0	subshrub	S-1/S-2/S-3
Camissoniopsis cheiranthifolia	beach evening primrose	1.0	subshrub	S-1/S-2
Croton californicus	California croton	3.0	subshrub	S-1/S-2/S-3
Eschscholzia californica var. maritima	coast California poppy	2.0	perennial herb	S-1/S-2
	Total	31.0		

Table 3. Plant Community B – Coastal Sage Scrub and Southern Dune Scrub Plant Palette. Nursery stock will be planted on ~1.2-meter centers. Asterisk (*) indicates species that will be sourced from an outside seed provider due to limited availability in the LAX Dunes.

Scientific Name	Common Name	Approximate Quantity (plants/acre)	Type	Source
Abronia umbellata	pink sand verbena	350	perennial herb	S-1/S-1
Ambrosia chamissonis	beach bur	350	subshrub	S-1/S-1
Artemisia californica	California sagebrush	25	shrub	S-2
*Atriplex lentiformis**	quailbush	10	shrub	S-2/S-3
Calystegia macrostegia	island morning glory	50	perennial herb	S-2
Camissoniopsis cheiranthifolia	beach evening-primrose	300	subshrub	S-1/S-2

Scientific Name	Common Name	Approximate Quantity (plants/acre)	Type	Source
Croton californicus	California croton	175	subshrub	S-1/S-2
Dudleya lanceolata	lanceleaf liveforever	50	perennial herb	S-2
Ericameria ericoides	mock heather	350	shrub	S-2
Erysimum suffrutescens	Suffrutescent wallflower	125	perennial herb	S-2
Eschscholzia californica var. maritima	coast California poppy	125	perennial herb	S-1/S-2
*Isocoma menziesii**	coast goldenbush	225	shrub	S-3
Leptosyne gigantea	giant coreopsis	75	shrub	S-2
Lupinus chamissonis	silver dune lupine	250	shrub	S-1/S-2
Opunita littoralis	coast prickly pear	20	shrub (succulent)	S-1/S-2
Peritoma arborea	bladderpod	175	shrub	S-2
Phacelia ramosissima	Branching phacelia	250	subshrub	S-1/S-2
*Rhus integrifolia**	lemonade berry	25	shrub	S-1/S-2/S-3
	Total	5,120		

Table 4. Supplemental Annual Plant Palette. Asterisk (*) indicates species that will be sourced from an outside seed provider due to limited availability in the LAX Dunes.

Scientific Name	Common Name	Type	Source
Acmispon americanus	Spanish lotus	herb	S-2
Camissoniopsis lewisii	Lewis's evening primrose	herb	S-1/S-2
Chaenactis glabriuscula var. glabriuscula	yellow pincushion	herb	S-1/S-2
Cryptantha clevelandii var. florosa	Cleveland's cryptantha	herb	S-1/S-2
Cryptantha intermedia var. intermedia	clearwater cryptantha	herb	S-1
*Lupinus bicolor**	bicolored lupine	herb	S-2/S-3
Stephanomeria diegensis	San Diego milk aster	herb	S-1/S-2

3.3 Variation from 2013 Ecological Landscape Planting Plan

This supplemental Ecological Landscape Plan builds on and expands upon the prior 2013 plan in several ways. First, an analyses of soil conditions throughout the CDIP area was carried out to fine-tune plant palettes in different planting areas based on the current on-site conditions. Second, the Coastal Prairie or Valley Needlegrass Grassland community is no longer being considered for the CDIP site due to the lack of appropriate soil conditions. And third, success criteria and monitoring plans were refined.

One consideration identified by the Coastal Commission in response to the Ecological Monitoring Report (2018) was that the 22 May 2014 Construction Summary Report reflected a higher quantity of *E. californica* in the coastal dune hydroseed mix than was specified in the approved (revised) plant palette. The supplemental landscape planting plan will address this concern by not including *E. californica* in the supplemental seed mix. Furthermore, recent monitoring data from 2018 show very limited amounts of *E. californica* present within the six-acre restoration area. The highest percent cover of *E. californica* in the northern dunes is outside of the six-acre hydroseeded area and along the northern fence perimeter.

An additional consideration identified by the Coastal Commission in response to the Ecological Monitoring Report (2018) was that the 22 May 2014 Construction Summary Report reflected the addition of *Heterotheca grandiflora* (telegraph weed) into the coastal prairie/grassland and coastal dune seed mix. The presence of *H. grandiflora* in southern areas of the LAX Dunes and portions of the northern dunes that were not seeded indicate that there is some extent of local seed bank present. Multiple specimens of *H. grandiflora* in the LAX Dunes have been recorded in the Consortium of California Herbaria dating as far back as 1944. *H. grandiflora* will not be included in the supplemental seed mix.

4.0 Habitat Maintenance Program

Habitat maintenance will include the continuation of non-native vegetation management through the community volunteer program, LAWA maintenance staff, TBF and partners, or other LAWA contractors. Habitat maintenance shall occur for a minimum of three years following approval of the Revised Ecological Landscape Plan or until project success criteria are met for a minimum of one year.

The goal of the habitat maintenance program will be to control annual non-native species while native species are establishing and to eradicate most invasive perennial non-natives from the CDIP area. Because the CDIP area has a high edge to core ratio, non-native removal will need to occur in zones adjacent to the project area (buffers) to limit re-invasion of the project site. The width of buffers may be fixed or based somewhat on non-native species (i.e., species with longer-dispersing seeds or that are more invasive may need wider buffers than other species). It will be desirable to totally eradicate some invasive non-native species within and adjacent to the CDIP area. Such

species include *A. cyclops, Ehrharta* spp (veldt grass)*,* and *Carpobrotus* spp, which are present in the northern dunes but generally in low densities. *E. terracina*, which is scattered throughout the CDIP area, will be a high priority for short-term management and future eradication, as continued long-term hand removal may be necessary to deplete the seed bank.

Annual non-native species should be controlled throughout the CDIP area and buffers by hand-pulling, spraying, hula hoeing, etc. To the extent possible, efforts should be focused in the early part of the growing season (the first month or so after the first soaking rain). This allows for removal of plants when they are small and have not produced viable fruits. Early removal also allows for a potential second round of non-native germination within the same wet season, which will help deplete the seed bank and reduce efforts into the future. This maintenance approach will require flexibility in the timing of efforts depending on rainfall patterns and timing of planting.

4.1 Non-native Removal by Species

While additional non-native species are present on-site, vegetation surveys by TBF have identified the following species to be prevalent and invasive in the CDIP Area and surrounding northern dunes, and will thus be the focus of non-native vegetation removal efforts. Community restoration events will use manual removal methods only; TBF staff and partners may employ multiple methods of non-native vegetation control including manual, weed whacking, mowing, and or/ herbicide application. The following species have been categorized as high priority for eradication*, high priority for control**, and lower priority for control*** within the CDIP Area.

Acacia cyclops (wattle)*

This shrub typically blooms from April to May and can become large, making it increasingly important to remove when plants are small (CalFlora 2018). Removal can be done by hand if the plant is small, while large plants will require tools to remove. TBF will continue coordinating with LAWA and the LA Zoo to re-use *A. cyclops* for animal feed prior to disposing in green waste.

Brassica tournefortii (Saharan mustard)**

This annual herb typically blooms from December to June (Calflora 2018). This species has a shorter growth form than black mustard and is typically about three feet tall. If plants are small, hand removal can be an efficient removal method, and any flowering material should be bagged and removed from site. If plants or populations are too large, an early herbicide application may be preferred in the winter months. An early cotyledon-stage glyphosate application has been tested as a successful method of eradication (Holt and Barrows 2014).

Bromus diandrus (brome grass)**

This annual grass typically blooms from April through June (Calflora 2018). Hand removal can be utilized if populations are not too large and extensive. In areas of the back dunes, where large patches of *Brome* species exist with low presence of native species, application with a grass-specific herbicide like Fusilade DX may be applied before the flowering period. Mowing (weed whacking) combined with a grass-specific

herbicide will provide large-scale control, cost-savings, and minimal disturbance to native plants.

Carpobrotus spp. (iceplant)*

This perennial herb typically blooms almost year-around, from February through October (Calflora 2018). Therefore, there is a narrow window for removal prior to seed production. In addition, if left uncontrolled, this plant can grow into large mats that will cover all soil surfaces. Moreover, because of its cover, it can change the composition of the soil, making it harder for subsequent native plant colonization. TBF and project partners including the Los Angeles Conservation Corp (LACC) and (Friends of the LAX Dunes) FOLD have targeted and removed over five tons of iceplant on-site in the CDIP Area. TBF will continue to employ manual methods of iceplant removal, bagging, and coordinating with LAWA maintenance staff to remove vegetation material off-site. Monitoring of iceplant removal areas will ensure proper follow-up maintenance is conducted and opportunistic non-natives are promptly removed.

Erodium botrys (filaree)**

This perennial herb typically blooms from February to March (Calflora 2018). It can grow to become a very dense mat, so removing a few individuals can clear out a very large area. It can be removed fairly easily by hand, but only when green. Once it begins to set seed, it becomes brown and hard to remove. The species will continue to be removed using manual methods during community restoration events and by TBF and partners. Herbicide application to areas with high invasion may be considered.

Euphorbia terracina (carnation weed)**

This perennial herb typically blooms from March through July (Calflora 2018). Hand pulling can be the primary method of removal if there is not a large infestation. Removal may need to be repeated every two to three weeks during the growing season. *E. terracina* that is deeply rooted, in areas that are hard to remove, and in areas where natives are minimally present (i.e., roads) will be controlled with herbicide application.

Hirschfeldia incana (short pod mustard)***

This perennial herb is known to bloom year-round, so it is vital to check frequently for flowering (Calflora 2018). Manual removal before seeds develop can be an effective option for small population eradication. Herbicides are not as effective; thus, manual removal is preferred.

Raphanus sativus (wild radish)***

This annual or biennial herb typically blooms from February to July (Calflora 2018). The first year of its growth is mainly vegetative, so timing of removal may not be essential, but should still be done quickly, to avoid possible seeding. This species will be removed using manual methods.

Salsola tragus (Russian thistle) ***

This annual herb typically blooms from July to October (Calflora 2018). This plant has relatively small flowers, so careful observations should be taken on removal timing. Roots are typically not deep, and this species will continue to be removed using manual methods.

5.0 Success Criteria and Monitoring Program

Based on results of vegetation monitoring conducted in 2018, the Coastal Commission requested that the 2013 Ecological Landscape Plan be revised to lay out revised strategies for increasing native vegetation cover and diversity, decreasing non-native plant cover, and setting success criteria including a monitoring program to evaluate progress towards achieving those criteria. Recognized methods for measuring the success of vegetation establishment in restoration projects is to estimate characteristics such as percent cover and species richness over time at the restoration site and compare those values to results from reference sites. The larger LAX Dunes complex includes several areas that can serve as reference sites for dune-related habitats. These areas have low cover of non-native plants and relatively high cover of the native species that will be introduced in the CDIP area. Per CDP requirements, monitoring will include documenting restoration efforts and vegetation monitoring to assess project success. Additional monitoring actions will include georeferenced photo monitoring and may also include components of vertebrate, invertebrate, and rare plant surveys.

5.1 Reference Sites

Eight reference site vegetation monitoring transects were established outside the CDIP restoration area and within the larger LAX Dunes complex. These reference sites will be used in assessing restoration success. The protocol will generate information which can be summarized using descriptive statistics for each transect and target habitat type. Vegetation will be described using several categories: absolute percent cover (by species and total native and non-native), species richness (native and non-native), and percent bare ground. Reference sites will inform success criteria (see Section 5.3)

Four 50-meter reference transects were selected for each of the two target habitat types: Southern Foredune/Southern Dune Scrub and Coastal Sage Scrub/Southern Dune Scrub (8 total reference transects). All transects had well-established native plants and relatively low non-native plant cover. A 1 X 1m quadrat will be placed at 2-meter intervals along the transects (50 meters), to generate 25 quadrat sample areas per transect, and 100 quadrat sample areas per reference habitat type. Figure 5 displays example photos of one transect from each reference habitat type.

Figure 5. Example photo of Coastal Sage Scrub/Southern Dune Scrub reference transect (top) and Southern Foredune/Southern Dune Scrub reference transect (bottom).

5.2 Compliance Monitoring

Per CDP requirements, monitoring will include documenting restoration efforts and vegetation monitoring to assess project success (compliance monitoring). The following monitoring plan will be used to assess how similar the restoration site is to the nearby reference sites in terms of native cover and richness and non-native cover.

A minimum of ten additional 50-meter transects will be surveyed within the CDIP restoration area. At least two will be targeted in Plant Community A, at least six in Plant Community B, and at least one in each of Special Plant Community C and D. Transect start points and bearings will be randomly generated within each Plant Community area for each round of monitoring. Similar to reference site transects, CDIP transects will be surveyed at 2-meter intervals, using a 1 X 1m quadrat. Absolute percent aerial cover by species and bare ground will be estimated to the nearest percent. Monitoring for the CDIP area and reference areas should occur at least annually in the spring, with semi-annually recommended for spring and fall to capture highest and lowest non-native annual cover, respectively. Total percent absolute native and non-native cover and native species richness will be calculated for restoration and reference transects by averaging all quadrats across a given Plant Community or habitat type.

5.3 Success Criteria

Plant Community A and B will each be compared to the reference site transects for the corresponding habitat type. Special Plant Community C and D will each be considered separately and compared to the Coastal Sage Scrub/Southern Dune Scrub reference sites. The CDIP restoration effort will be considered successful when native and non-native absolute plant cover and native plant species richness are similar to reference sites. For the purposes of this assessment, “similar” is defined as not substantially differentiating from the reference site based on averages and errors that are assessed statistically ($p < 0.05$). Percent cover and species richness will be estimated at each restoration and reference transect as outlined in Sections 5.1 and 5.2 above. To be considered successful, each Plant Community will need to achieve the following:

1) Achieve absolute native plant cover and species richness similar to the mean of values measured in reference sites for the corresponding habitat type,
2) Achieve absolute non-native plant cover that is similar to or less than the mean of values measured in reference sites for the corresponding habitat, and
3) Include no plants listed as “zero tolerance” species in Table 5.

Monitoring can be discontinued once all Plant Community areas meet the success criteria above, following which management actions can change to maintenance level activities (see Section 5.5). Additionally, adaptive management in the form of supplemental seeding or planting of native species may occur. If monitoring indicates that goals are not being met, adaptive management actions will be developed and implemented (e.g., additional non-native removal, additional seeding).

Table 5. Invasive species that must be prevented from invading and/or eradicated from the CDIP area.

Zero Tolerance Invasive Species	
Scientific Name	**Common Name**
Acacia cyclops	wattle
Carpobrotus spp.	iceplant
Ehrharta calycina	perennial veldt grass
Ehrharta erecta	upright veldt grass
Nicotiana glauca	tree tobacco

5.4 Additional Monitoring

The following subsections summarize additional types of monitoring that will help quantify restoration activities and demonstrate other outcomes of the restoration project beyond vegetation cover and species richness.

5.4.1 Quantification of Restoration Efforts

Restoration effort monitoring will include documenting invasive vegetation removal efforts that occur within the CDIP area. Documentation of restoration efforts will include but are not limited to, the monitoring metrics listed in Table 6.

Table 6. Restoration activity monitoring.

Restoration Activity	Monitoring Metric
Invasive vegetation removal (LAWA)	Available maintenance logs and records
Invasive vegetation removal (Community restoration events – TBF)	# of bags, total weight, and species of invasive vegetation removed # of invasive trees and species removed # of participants; # of volunteer hours; # of events Area invasive vegetation removed
Native seed collection + planting (LAWA)	Available maintenance logs and records
Native seed collection + planting (TBF and partners)	Seed weight and species Area seeded / planted Area seed collected
Hard infrastructure removal	Available LAWA documentation

5.4.2 Photo Point

Photo point monitoring will occur to identify seasonal site changes and project-level changes resulting from restoration activities (e.g., native vegetation growth). The application of photo point survey protocols will yield qualitative data displayed as photographic site images over time. Survey methods are described in detail in SOP 7.2 Level 2 Photo Point (TBF 2015a).

5.4.3 Rare Plants

Rare plant surveys will be conducted on an as needed basis by qualified botany expert scientists, including Coastal Restoration Consultants and California Botanic Garden and

supported by TBF scientists. Rare plants will be identified to species, when possible, recorded on datasheets and using a high-resolution GPS, and the surrounding vegetation alliance and/or association will also be recorded. Additional information may include population status, existing or potential threats or disturbances, and/or sand grain size or other sediment characteristics. Rare plants will be surveyed in spring or the appropriate flowering time by species and will follow recommendations from California Botanic Garden's (formerly Rancho Santa Ana Botanic Garden) Report submitted to TBF in October 2018, including herbarium searches and historical data, adjacent habitat rare species (e.g., south dunes or Ballona dunes). Information on rare plants in the dunes is a very important metric for biological monitoring and could inform additional benefits to these species as part of ongoing restoration efforts for the site. Additionally, plants that are not classified as rare, but which support rare species (such as *Eriogonum parvifolium*, seacliff buckwheat, for El Segundo Blue Butterfly) will be monitored and geospatially tracked in a similar manner. Recommended species and detailed protocols are available upon request.

5.5 Long-term Maintenance

After compliance monitoring indicates the CDIP project is a success, long-term maintenance of the site will continue. LAWA and TBF staff will opportunistically conduct weeding of the site and it will continue to be targeted during community restoration events. Supplementary seeding and/or planting may also occur.

5.6 Ecological Monitoring Report

An ecological monitoring report will be prepared annually for a minimum of three years following approval of the Revised Ecological Landscape Plan or until project success criteria are met for a minimum of one year. Reports will include at least 1) a summary of planting, weeding, and monitoring activities over the year, 2) the results of compliance and other monitoring, 3) a discussion of progress towards (or lack of progress towards) success criteria, 4) a summary of lessons learned including from adaptive management activities (see Section 7.0), and 5) identify next steps including a discussion of how they will help lead to project success. Upon completion of all success criteria, a final report will replace the annual report.

6.0 Completion of Ecological Landscaping Requirements

6.1 Notification of Completion

The Final Ecological Monitoring Report will outline the success of the restoration plan in achieving success criteria and will include a statement of completion. The Coastal Commission will have ultimate authority to approve completion of the restoration effort.

6.2 Coastal Commission Confirmation

After notification of completion, a site visit(s) may be conducted by resource agency personnel, the project restoration scientists, and representatives from LAWA and other

interested federal, state, and local regulating agencies to confirm the completion of the restoration effort.

7.0 Contingency Measures / Adaptive Management

Adaptive management will be implemented to increase the success of the restoration effort through appropriate supplemental plantings and continued non-native vegetation management. Monitoring will be performed at specified intervals detailed in the monitoring section to inform the need for additional adaptive management actions and prioritize non-native vegetation management areas. TBF will include a summary of adaptive management for the project in annual reports.

8.0 Funding Mechanism / Responsible Party

All funding for planning, implementation, maintenance, and monitoring of this Revised Ecological Landscape Plan, and any identified contingency measures required to achieve the primary goal of restoring habitat as part of the Coastal Dunes Improvement Project shall be the responsibility of the LAWA. LAWA shall be responsible for implementing and monitoring contingency measures indicated as necessary to achieve the project's final success criteria.

9.0 References

(KMA) Kevin Merk Associates, LLC. 2013. Ecological Landscape Plan for the LAX Coastal Dunes Improvement Project, City of Los Angeles, California. Prepared for Los Angeles World Airports.

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TBF. 2015a. Level 2 Photo Point Standard Operating Procedures (SOP 7.2). Unpublished protocols. The Bay Foundation, Los Angeles, CA. 30 June 2015.

TBF. 2015b. Vegetation Cover Surveys Standard Operating Procedures (SOP 3.2). Unpublished protocols. The Bay Foundation, Los Angeles, CA. 30 June 2015.

TBF. 2015c. Vegetation Mapping Standard Operating Procedures (SOP 3.5). Unpublished protocols. The Bay Foundation, Los Angeles, CA. 30 June 2015.

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