Wetlands & Habitat Restoration Plan

Cannibal Island Restoration Project

CalTrout

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→ **The Power of Commitment**

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Cannibal Island Restoration Project

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1. Introduction

This Wetland & Habitat Restoration Plan (WHRP) has been prepared for the Cannibal Island Restoration Project ("Project") for the U.S. Army Corps of Engineers (USACE), the North Coast Regional Water Quality Control Board (NCRWQCB), and the California Coastal Commission (CCC). This WHRP summarizes the findings from various environmental studies that documented existing wetlands, Sensitive Natural Communities (SNC), sensitive plant species, and sensitive wildlife species (and associated habitat), within the Project Area. This WHRP summarizes potential temporary impacts within the Project Area, and documents that the Project will not result in a loss of wetlands or other regulated waters. Sensitive resources potentially considered Environmentally Sensitive Habitat Areas (ESHA) under the Coastal Act § 30107.5 and 30121 are pursuant to agency determination.

The Project is exempt from California Environmental Quality Act (CEQA) consideration through the California Department of Fish and Wildlife (CDFW) Statutory Exemption for Restoration Projects (SERP) (Public Resources Code § 21080.56). Due to the nature and extent of the restoration, the Project team is seeking approval for environmental compliance through various permitting pathways recently developed in an effort to streamline implementation of restoration projects. The Project's permitting pathways are summarized in **Table 1.4-1**.

1.1 Project Location

The Project Area is located three miles west of the town of Loleta, California in the Eel River estuary, within the Cannibal Island USGS 7.5-minute quadrangle (**Appendix A, Figure 1**). The 794-acre Project Area is at the western-most extent of the Eel River delta and estuary approximately 1 mile inland and northeast of the Eel River mouth. Cannibal Island is located in the northern portion of the Eel River estuary and is bounded by Sevenmile Slough on the north and east, North Bay Slough on the west and Mosley Slough on the southwest (**Appendix A, Figure 2**).

The northern and western portion of the Project Area (approximately 462 acres) is owned by CDFW and managed as part of the of the Eel River Wildlife Area (ERWA) Cannibal Island Unit (APNs 310-043-001, 310-033-004, and 310-021-003, 310-021-004). The remaining 332 acres are privately owned by Hansen (APNs 310-043-003 and 310-051-001) and Pedrazzini (APNs 310-043-004, -005, -006). Approximately 220 acres of the private property are held in Wetland Conservation Easements by the Natural Resources Conservation Service (NRCS) Wetlands Reserve Easement Program (WRP) (**Appendix A, Figure 3**).

1.2 Project Purpose & Need

The Project Area is hydrologically connected to the Eel River estuary, which is a mosaic of open water, dune, and wetland habitats that connects and drains the Eel River watershed into the Pacific Ocean. The estuary supports hundreds of thousands of resident and migratory waterfowl, as well as numerous aquatic species (including those considered state and federally sensitive). The watershed as a whole has sustained habitat and water quality degradation from a variety of historic and modern-day activities, including conversion of diverse coastal wetland habitats to agricultural land, as is the case within the Project Area. This degradation has affected habitat quality for numerous species of flora and fauna, whose health and vitality are tied to a complex trophic web that extends from the mouth of the Eel River to the headwaters.

The purpose of the Project is to return full tidal amplitude (natural tidal inundation range and hydraulics) to a historic slough network and restore function and connectivity of historic tidal wetlands to North Bay. The Project will enhance and establish full tidal exchange to approximately 500 acres of former tidal marsh habitat including construction of tidal channels and tidal marsh features (hummocks). Restoration will support broader native plant, fish, wildlife, and benthic infauna diversity within estuarine and freshwater marsh habitats, and in wetland ecotones. Improvement to the tidal channel networks will accommodate physical processes such as sediment transport and marsh plain sediment accretion that will promote the marsh's ability to keep pace with sea level rise.

1.3 Project Description

The proposed Project will enhance (widen and deepen) existing tidal slough channels within the limits of Project disturbance (**Appendix A, Figure 4**). Construction activities will include the removal of outdated water control structures, excavation of slough channels to accelerate the formation of high-quality aquatic habitat for listed fish species, and placement of excavated fill in appropriate locations to mimic natural marsh topography (natural levees and hummocks or tidal marsh ridges), and enhance wetland vegetation diversity through controlled treatment of invasive dense-flowered cordgrass (*Spartina densiflora*). Excavated soils from the channels will be placed in low hummocks approximately 2-feet high adjacent to the channels. These hummocks are anticipated to retain wetland parameters as they will not exceed marsh plain elevation, and will not constitute conversion to uplands. Placement of ¼ ton rock will occur along a section of channel to provide inset channel grade control to manage the tidal prism. This grade control is anticipated to be beneficial to manage tidal prism until the site elevations increase to be representative of a system with full tidal amplitude, which is expected to occur over 10-20 years. The rock would be placed over a 20-foot-long section where a former road crossing is located and failing culvert is proposed for removal. This area is a suitable location for the inset channel grade control because it likely already contains compacted sediment (from previous infrastructure), and will be disturbed via the road crossing and culvert removal anyway. Much of the existing dike network within the Project Area will be reconfigured or removed. New setback levees will be constructed to protect agricultural land from tidal inundation as full amplitude is restored, including one newly constructed setback levee in the eastern portion of the Project Area. Raising of Cannibal Island Road in the southern portion of the Project Area is also proposed. Sediment excavated during construction will be beneficially reused within the Project Area and will not be hauled off-site.

1.4 Project and Regulatory Background

This is a restoration Project that is exempt from the requirements of CEQA pursuant to SERP (Public Resources Code § 21080.56). No National Environmental Policy Act (NEPA) compliance is required as there is no federal nexus with the Project above and beyond the permits displayed in Table 1.4-1.

The Project Area includes wetlands within the jurisdiction of the USACE, the NCRWQCB, State Lands Commission and the CCC. Required permits and approvals are listed in **Table 1.4-1**.

Table 1.4-1 Permits Required for Project

Permit	Agency
Clean Water Act (CWA) Section 404—Nationwide Permit (NWP) 27	USACE
Endangered Species Act (ESA) Section 7—Salmonids	National Oceanic & Atmospheric Administration Restoration Center (NOAA RC) Programmatic Biological Opinion (PBO)
ESA Section 7—Tidewater Goby	U.S. Fish and Wildlife Service (USFWS) PBO
CWA Section 401—Statewide Restoration General Order (SRGO)	NCRWQCB
Coastal Development Permit (CDP)	CCC
Conditional Use Permit	County of Humboldt—Planning Department
Encroachment Permit	County of Humboldt—Public Works Department
Lake and Streambed Alteration Agreement (LSAA) and California Endangered Species Act (CESA) Compliance	CDFW
Lease	California State Lands Commission

2. Baseline Information

2.1 Studies within the Project Area

Several environmental studies were conducted to assess baseline environmental conditions within the Project Area, and include the following:

- Upland/Wetland Delineation Report (GHD 2022a, **Appendix B**)
- Special Status Plants and Sensitive Natural Communities/ESHA Mapping (GHD 2022b, **Appendix C**)
- Baseline Conditions Aquatic, Terrestrial and Avian Species Memo (GHD 2022c, **Appendix D**)

These studies evaluate the potential for special status plants, wildlife species, SNCs, ESHA, or aquatic resources to occur, and document the existence and condition thereof as observed in the Project Area, along with a general analysis of potential impact. All species, vegetation communities, and aquatic resources identified in the Project Area are listed in these studies. The accompanying data collected from these studies has been used to inform post-construction conditions based on proposed Project design components and modelling, and are summarized in the following technical analyses:

- Wetlands Fill Analysis (GHD 2023a, **Appendix E**)
- Habitat Conversion Analysis (GHD 2023b, **Appendix F**)

The following subsections summarize the findings of the studies and analyses, including location and extent of existing special status plants, wildlife species (and associated habitat), SNCs, ESHA, or aquatic resources in the Project Area, and discuss anticipated temporary impacts that may result from implementation of the Project.

2.1.1 Environmental Sensitive Habitat Areas

The Project Area is within the California Coastal Zone, with primary permitting jurisdiction by the California Coastal Commission (CCC) for a Coastal Development Permit. Environmentally Sensitive Habitat Areas (ESHAs) are defined by the Coastal Commission as follows (CCC 2022):

> *"Environmentally sensitive area means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments."* (Pub. Resources Code, § 30107.5)

The CCC's designation of ESHA generally includes vegetation alliances listed in CDFW's California Sensitive Natural Communities List with a S1- S3 ranking. The CCC's ESHA category is broadly defined, and it also includes habitat for special-status species, wetlands, riparian areas, and other areas that provide important ecosystem functions (CCC 2013). While there is not a specific list of habitats considered to be ESHA for the State or County, the CCC through the Coastal Act and counties or municipalities through the Local Coastal Program (LCP) are the jurisdictional agencies that exert authority in identifying and protecting ESHA during project activities.

Sensitive resources within the Project Area may be considered ESHA pending agency determination.

2.1.1.1 Eel River Area Plan of the Humboldt County Local Coastal Program

Permitting within the Coastal Zone for Humboldt County occurs in compliance with the Eel River Area Plan (HCPD 2014). The Eel River Area Plan (enacted 1982) uses the California Coastal Act definition of wetlands, and states "No land use or development shall be permitted in areas adjacent to coastal wetlands, called Wetland Buffer Areas, which degrade the wetland or detract from the natural resource value" (p.47). The Eel River Area Plan provides specific examples of ESHA within the County coastal zone (p. 44):

> *1. Environmentally sensitive habitats within the Eel River Planning Area include:*
>
> *a. Rivers, creek, and associated riparian habitats;*

b. Estuaries, sloughs, and wetlands;

c. Rookeries for herons and egrets;

d. Harbor seal pupping areas;

e. Critical habitats for rare or endangered species listed on State or Federal Lists.

2.2 Existing Jurisdictional Wetlands in the Project Area

GHD completed a wetland delineation in 2020 to determine the extent of aquatic resources, including wetlands and Other Waters of the U.S./State ("Other Waters"), within the Project Area, with a follow up delineation in 2022 for an area of the Project that was expanded (**Appendix B)**. To define a wetland, the USACE requires that vegetation, soil, and hydrology (three parameters) all show wetland attributes (USACE 1987; USACE 2010). In addition, the CCC requires only one wetland parameter to be present (hydric soils, wetlands vegetation, or wetlands hydrology) for a habitat to qualify as a wetland (i.e., one-parameter wetlands). The Classification of Wetlands and Deepwater Habitats of the United States (FGDC 2013), based on Cowardin et al. (1979), states that wetlands must have at least one of the three wetland attributes: predominantly hydrophytic vegetation, predominantly hydric soil, and hydrology. However, they state that all available information should be used, and all three attributes should be considered if they are present (FGDC 2013). The wetland delineation used USACE criteria from the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (USACE 2010).

The delineation in its entirety was conducted within the approximately 794-acre Project Area. The vast majority of the Project Area is regularly flooded and comprised of jurisdictional wetlands and Other Waters (**Appendix A, Figure 5).** Wetlands and Other Waters within the Project Area include Palustrine Emergent Wetlands, Estuarine Emergent Wetlands, Estuarine Subtidal Waters, Estuarine Intertidal Unconsolidated Shore, and Estuarine Intertidal Aquatic Beds. Levees and other higher-elevation areas of the Project Area were investigated for potential uplands, defined herein as areas that do not meet Army Corps of Engineers (USACE 2020) three-parameters wetland definition based on hydrophytic vegetation, hydric soils, and wetland hydrology. Due to the location of the Project Area within the Coastal Zone boundary, the areas that did not meet the USACE three-parameter wetland definition were also investigated to determine whether they meet CCC one-parameter wetland definition.

The wetland delineation determined potential upland areas that do not meet the USACE three-parameter wetland definition, covering a total of 16.93 acres. Uplands consisted of levees, historical fill and concrete foundations, pasture, a public access road, and a semi-natural berm. Three of the areas mapped as uplands were dominated by hydrophytic vegetation (FAC or FACW), and therefore these two-parameter uplands may be considered one-parameter wetlands subject to CCC jurisdiction (**Table 2.2-1**).

Results of the 2020 and 2022 investigations and datasheets documenting conditions observed during the investigations are included in **Appendix B** (GHD 2022a).

Table 2.2-1. Jurisdictional Wetlands in Project Area

Feature Type	Area (acres)	Jurisdiction
3-Parameter Wetlands	777.89	USACE, RWQCB, CCC
3-Parameter Uplands	11.15	None
2-Parameter Uplands	5.78	Potential CCC Wetlands

Three-parameter Wetlands within the Project Area

Several distinct wetland types were identified in the Project Area based on results from the wetland delineation (**Appendix B**) and vegetation mapping (**Appendix C**). **Table 2.2-2** summarizes the wetland types mapped in the Project Area during the wetland delineation and the vegetation communities associated with those wetland types

(GHD 2022b, **Appendix C**). Two categories are a mix of upland and wetland types (Agricultural Pasture, Ruderal) because most uplands were associated with levees, non-native agricultural pasture, and areas dominated by non-native vegetation (but were not functioning as grazing pasture). Some of these areas were characterized as a certain vegetation type, but contained both uplands and wetlands (i.e., non-native pasture that contained both uplands and wetlands).

Table 2.2-2. Wetland Types and Corresponding Vegetation Communities

Cowardin Wetland Type[1]	Vegetation Mapping Unit[2]	Area (acres)	Total Area (acres)
Estuarine Subtidal Aquatic Bed (E1AB3)	Eelgrass Beds	0.6	16.7
Estuarine Subtidal (E1UB)	Subtidal Sloughs (Unvegetated)	16.1	
Estuarine Intertidal Aquatic Bed/ Unconsolidated Shore (E2AB1/E2US3)	Mudflats/Estuarine Intertidal Shore	93.4	93.4
Estuarine Intertidal Emergent Wetland (E2EM1)	Pickleweed Salt Marsh	287.7	360.4
	Gum Plant Patches	28.7	
	Salt Rush Swales	26.2	
	Salt Grass Flats	17.8	
Estuarine Intertidal Emergent Wetland (E2EM1)	Dense-Flowered Cordgrass	61.6	61.6
Upland and Palustrine Emergent Vegetation (PEM1)	Non-Native Pasture	208.7	208.9
	Pale spike rush marsh	0.15	
Palustrine Scrub Shrub (PSS3)	Coastal Willow Thickets	0.4	0.4
Upland and Palustrine Emergent Vegetation (PEM1)	Non-native Vegetation (not functioning as pasture)	43.0	43.0
Upland	Coastal Brambles	2.9	2.9
Upland	Developed (pervious/impervious surfaces)	7.9	7.9

1. Cowardin wetland types are based on Cowardin nomenclature from the *Classification of Wetlands and Deepwater Habitats of the United States* (FGDC 2013).
2. Vegetation was characterized in the botanical studies of the Project Area, and mapped into discrete vegetation units based on Rapid Assessment protocol (CNPS 2022a**)** and mapped according to CNPS *The Manual of California Vegetation Online* (Sawyer et. al. 2009) at the Alliance level.

Potential CCC One-Parameter Wetlands

Two-parameter uplands, which may be considered one-parameter wetlands by the CCC, did not have wetland soils or hydrology, but they passed the Dominance Test for hydrophytic vegetation (facultative or wetter). GHD recommends that the CCC considers areas dominated by facultative species with no other wetland indicators to be uplands. Facultative (FAC) species are defined as equally likely to occur in wetlands and uplands (34-66 percent occurring in

wetlands) (Lichvar & Gillrich 2011). Facultative plants are equally likely to act as hydrophytes growing in saturated conditions as non-hydrophytes growing in dry conditions. The Environmental Protection Agency (EPA) and USACE define wetlands as “Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (40 CFR 232.2).” Without any evidence of hydric soil or hydrology, facultative plants on their own should not be considered sufficient to indicate the presence of wetlands. Upland soils and the lack of hydrological indicators provide evidence that plants are not growing in water or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content, and therefore the plants are not acting as hydrophytes. Based on the principle that FAC-dominated uplands do not qualify as wetlands, Upland-11 and Upland-13 should not be considered wetlands (dominated by FAC species), while Upland-10 might be considered a one-parameter wetland with a predominance of FACW species (66-99 percent probability of occurring in wetlands) (Lichvar & Gillrich 2011). See **Appendix B** for the full delineation report, and associated appendices for datasheets.

2.3 Existing Sensitive Vegetation Communities

There is one SNC located outside of wetlands within the Project Area. All other SNCs are within three-parameter wetlands, but will be discussed individually in the sections that follow.

Sensitive Natural Communities

Protocol-level botanical surveys and vegetation characterization and mapping occurred in 2020-2022 (GHD 2022b). Potentially sensitive vegetation was mapped at the Alliance level (**Appendix A, Figure 6**) and are summarized in **Table 2.3-1**.

Sensitive Natural Communities characterized within the Project Area include Northern Coastal Salt Marsh (an SNC as defined by Holland 1986) which occurs within and outside the muted tidal prism, and include the following sensitive vegetation alliances (defined according to Sawyer et al. 2009, CNPS 2022a):

- Low marsh dominated by pickleweed (G4 S3),
- High marsh dominated by gum plant (G2 S2), and
- Brackish marsh dominated by salt rush (G3 S2).

Additionally, 0.6 acres of eel grass beds (GNR S3) are anchored in subtidal slough bottom near McNulty Slough, to the west and outside of the existing dike. Coastal brambles dominated by California blackberry (*Rubus ursinus*), which may be classified as a SNC (G4 S3), occur along and adjacent to upland dikes. Because coastal brambles occur as linear features along existing dikes and contain a substantial proportion of non-native species, we recommend that this alliance not be considered a protected SNC in this context. A discrete patch of coastal willow thickets (G4 S3) dominated by *Salix hookeriana* is at the far east boundary of the Project Area bordering Sevenmile Slough.

Table 2.3-1. Acreage of Existing Sensitive Natural Communities within the Project Area

Vegetation Mapping Unit	Global and State Rank[1]	Area (acres)
Pickleweed salt marsh	G4 S3	287.7
Gum plant patches	G2 S2	28.7
Salt rush swales	G3 S2	26.2
Eelgrass beds	GNR S3	0.6
Coastal brambles[2]	G4 S3	2.9
Coastal willow thickets	G4 S3	0.4

1. Sensitive natural communities are those listed as Sensitive in CNDDB. These vegetation alliances are ranked 1 through 5 based on NatureServe's (2022) methodology, with those alliances ranked globally (G) or state-wide (S) with status of 1 through 3 considered to be critically imperiled, imperiled, or vulnerable, respectively (NatureServe 2022). Some species or communities may have a GNR designation (globally not rated) but are considered sensitive within the state (have a State ranking of 1 through 3).

2. Coastal brambles Alliance SNC is not recommended for SNC protection given the pattern of presence (legacy of disturbance) and high occurrence of non-native species intermixed with individuals.

2.4 Existing Sensitive Plant Species

Floristic surveys were conduction in 2020 and 2022 (GHD 2022b, **Appendix C**). Three California Rare Plant Rank (CRPR) special status plant species (CRPR 1 or 2) were observed during floristic surveys of the Project Area: Lyngbye's sedge (*Carex lyngbyei,* CRPR 2B.2), Humboldt Bay owl's clover (*Castilleja ambigua* ssp. *humboldtiensis,* CRPR 1B.2), and Point Reyes bird's beak (*Chloropyron maritimum* ssp. *palustre,* CRPR 1B.2). Additionally, seacoast angelica (*Angelica lucida*, CRPR 4.2), a limited distribution plant, was widespread in the Project Area (**Appendix A, Figure 7**). Special status species and their estimated population size in the Project Area are summarized in **Table 2.4-1**. No federal special status plant species were detected in the Project Area.

Lyngbye's sedge (*Carex lyngbyei*), CRPR 2B.2

Lyngbye's sedge is a rare perennial rhizomatous sedge that occurs in coastal salt marshes and brackish marshes along the Pacific Coast of North America from California to Alaska, as well as in Greenland and Iceland (CNPS 2022b). Although NatureServe ranks the sedge as secure throughout its range (Global Rank G5), it is considered vulnerable in California (State Rank S3). CNPS ranks the sedge as rare or endangered in California, where it is threatened by non-native species, habitat disturbance, and grazing (CNPS 2022b). Lyngbye's sedge occurred in dense patches along sloughs on the outside of the dike and sparsely scattered among invasive dense-flowered cordgrass on the outside of the dikes. The densest populations of Lyngbye's sedge can be found along the slough outside the dikes where brackish water exits the failed culvert. Lyngbye's sedge occurred along external sloughs and was not found within the muted tidal prism.

Humboldt Bay owl's clover (*Castilleja ambigua* ssp. *humboldtiensis*), CRPR 1B.2

Humboldt Bay owl's clover is a rare hemi-parasitic annual herb endemic to the North Coast of California (Baldwin et al. 2012). NatureServe ranks the sub-taxon as imperiled throughout its range (G4T2 S2), and CNPS ranks it as rare or endangered in California and elsewhere (CNPS 2022b). Humboldt Bay owl's clover was widespread in high marsh on the outside of the dikes, and some can be found on the interior around the dike breach. A total of 5,000-10,000 plants were estimated by roughly counting and visually estimating the number of individuals. Less than 100 of these were inside the dikes at the breach.

Point Reyes bird's beak (*Chloropyron maritimum* ssp. *palustre*), CRPR 1B.2

Point Reyes bird's beak is a rare annual hemi-parasitic herb that occurs in coastal salt marshes from Central California to Southern Oregon (Baldwin et al. 2012). Point Reyes bird's beak typically occurs in diverse mixed high marsh habitats (USFWS 2022). A total of 7,000-10,000 plants occurred around the outside of the dikes and around the breach. Less than 100 were in inside the dikes around the breach where over-wash regularly occurs. Populations of Point Reyes bird's beak overlapped with Humboldt Bay owl's clover, occupying native high marsh habitat outside the dikes.

Seacoast angelica (*Angelica lucida*), CRPR 4.2

Seacoast angelica is a limited distribution plant (CRPR 4).Although it is considered vulnerable in California (S3), it is secure throughout its global range (G5). Seacoast angelica was widespread on dikes, berms, and other higher-elevation microhabitats throughout the Project Area. The population is estimated to be approximately 1000 plants throughout the Project Area, all located on or within the dikes.

Table 2.4-1 Special Status Plant Species in Project Area

Common Name	Scientific Name	CNPS Rare Plant Rank (CRPR)[1]	Population Estimate	Population Area (acres)
Humboldt Bay Owl's Clover	*Castilleja ambigua ssp. humboldtiensis*	1B.2	5,000-10,000	1.44
Point Reyes Bird's Beak	*Chloropyron maritimum ssp. palustre*	1B.2	7,000-10,000	2.03
Lyngbye's Sedge	*Carex lyngbyei*	2B.2	Not Estimated	0.542
Seacoast angelica	*Angelica lucida*	4.2	~1000	Widespread, Not Calculated.

1. California Rare Plant Ranking (CRPR) rare plants are those on the California Native Plant Society's (CNPS) Lists 1 and 2. Plant species on CNPS Lists 1 and 2 are considered eligible for state listing as Endangered or Threatened pursuant to the California Fish and Game Code, and CDFW has oversite of these special status plant species as a Trustee Agency. Plants on CNPS Lists 3 and 4 do not have formal protection under CEQA but may merit consideration in certain circumstances.

2.5 Existing Sensitive Wildlife & Habitat

The Project Area is within the Eel River estuary and includes approximately 24 square miles of delta lands, wetlands, and estuarine channels that receive runoff from 3,700 square miles of the Eel River Basin. It is one of the most significant estuaries along the California coast, with a mosaic of tidal flats, sloughs, marshes, and seasonal wetlands that support resident and migratory birds (Grassetti et al. 2011).

Native northern coastal salt marsh, eelgrass beds, mudflats, and sloughs are habitat types classified in the Project Area that comprise portions of the three-parameter wetlands delineated in the Project Area (see **Section 2.2**, and the Project Upland/Wetland Delineation Report, GHD 2022a, **Appendix B**). Several of these provide important habitat features for special status wildlife species. A fisheries sampling survey was conducted in the Project Area across four sampling events in 2020 (Loomis 2020), and a reconnaissance field survey was conducted in the Project Area by a qualified Wildlife Biologist in 2021 (GHD 2022c, **Appendix D**). An assessment of wildlife species potential to be inhabiting the Project Area was based on data collected across all biological studies in the Project Area (fisheries sampling, wetland delineation, and vegetation mapping) in addition to field surveys. The potential to occur assessment is embedded in the wildlife report (GHD 2022c, **Appendix D**). A summary of species observed in the Project Area across wildlife surveys is included in **Table 2.5-1**.

Table 2.5-1. Sensitive Wildlife Species Detected in Project Area

Scientific Name	Common Name	FESA	CESA	GRank[2]	SRank[2]	Other Status	Habitat Requirements[1]	Detections in Project Area
Ardea alba	Great Egret	None	None	G5	S4	CDF_S-Sensitive | IUCN_LC-Least Concern	Colonial nester in large trees. Rookery sites located near marshes, tide-flats, irrigated pastures, and margins of rivers and lakes.	Over a dozen individuals observed on-site including during October 2020 soil sampling field work and the May 2021 field survey.

Scientific Name	Common Name	FESA	CESA	GRank[2]	SRank[2]	Other Status	Habitat Requirements[1]	Detections in Project Area
Ardea herodias	Great Blue Heron	None	None	G5	S4	CDF_S-Sensitive | IUCN_LC-Least Concern	Colonial nester in tall trees, cliffsides, and sequestered spots on marshes. Rookery sites in close proximity to foraging areas: marshes, lake margins, tide-flats, rivers and streams, wet meadows.	Several individuals observed on-site including during October 2020 soil sampling field work and the May 2021 field survey.
Circus hudsonius	Northern Harrier	None	None	G5	S3	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern	Coastal salt & freshwater marsh. Nest and forage in grasslands, from salt grass in desert sink to mountain cienagas. Nests on ground in shrubby vegetation, usually at marsh edge; nest built of a large mound of sticks in wet areas.	Several individuals observed on-site during both October 2020 soil sampling field work and the May 2021 field survey.
Elanus leucurus	White-tailed Kite	None	None	G5	S3S4	BLM_S-Sensitive | CDFW_FP-Fully Protected | IUCN_LC-Least Concern	Rolling foothills and valley margins with scattered oaks & river bottomlands or marshes next to deciduous woodland. Open grasslands, meadows, or marshes for foraging close to isolated, dense-topped trees for nesting and perching.	Observed on-site during both October 2020 soil sampling field work and the May 2021 field survey.
Rana aurora	Northern Red-legged Frog	None	None	G4	S3	CDFW_SSC-Species of Special Concern | IUCN_LC-Least Concern | USFS_S-Sensitive	Humid forests, woodlands, grasslands, and streamsides in northwestern California, usually near dense riparian cover. Generally, near permanent water, but can be found	There are two records from Cannibal Island, including a record of 28 egg masses within the Project Area in 2009, and a record of 72

Scientific Name	Common Name	FESA	CESA	GRank[2]	SRank[2]	Other Status	Habitat Requirements[1]	Detections in Project Area
							far from water, in damp woods and meadows, during non-breeding season.	egg masses in 2009 mapped at the western edge of the Project Area within Mosley Slough (CDFW 2021a).
Eucyclogobius newberryi	Tidewater Goby	FE	None	G3	S3	AFS_EN-Endangered | IUCN_VU-Vulnerable	Brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River. Found in shallow lagoons and lower stream reaches, they need fairly still but not stagnant water and high oxygen levels.	Known to occur in the Project Area as recently as 2020 based on CDFW fish sampling efforts (recorded three out of the four sampling days; Loomis 2020). The Project Area overlaps designated critical habitat (USFWS 2021).

Footnotes:

[1] General habitat, and microhabitat column information, reprinted from CNDDB.

[2] Rankings from CNDDB.

Column Header Categories and Abbreviations:

FESA: Listing status under the federal Endangered Species Act (FESA)

FE = Federal Endangered; FT = Federal Threatened; FC = Federal Candidate; FD = Federally Delisted

CESA: Listing status under the California state Endangered Species Act (CESA)

SE = State Endangered; ST = State Threatened.

GRank: Global Rank from NatureServe's Heritage Methodology (NatureServe 2022)

SRank: State Rank from NatureServe's Heritage Methodology (NatureServe 2022)

Other Statuses (other federal or state listings may include)**:**

AFS_EN (American Fisheries Society Threatened):"a taxon that is in imminent danger of becoming endangered throughout all or a significant portion of its range" (Jelks et al. 2008).

BLM_S (Bureau of Land Management Sensitive): "(1) species listed or proposed for listing under the Endangered Species Act (ESA), and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species." (CDFW 2021b);

CDF_S: (California Department of Forestry and Fire Protection Sensitive): "those species that warrant special protection during timber operations" (CDFW 2021b);

CDFW_FP (CDFW Fully Protected Animal): "This classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Lists were created for fish, amphibians and reptiles, birds and mammals. Most of the species on these lists have subsequently been listed under the state and/or federal endangered species acts." (CDFW 2021b);

Scientific Name	Common Name	FESA	CESA	GRank[2]	SRank[2]	Other Status	Habitat Requirements[1]	Detections in Project Area

CDFW_SSC (CDFW Species of Special Concern): "It is the goal and responsibility of the Department of Fish and Wildlife to maintain viable populations of all native species. To this end, the Department has designated certain vertebrate species as 'Species of Special Concern' because declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction. The goal of designating species as 'Species of Special Concern' is to halt or reverse their decline by calling attention to their plight and addressing the issues of concern early enough to secure their long-term viability" (CDFW 2021b);

IUCN_LC (International Union for Conservation of Nature Least Concern): "when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened" (IUCN 2012);

IUCN_VU (International Union for Conservation of Nature Vulnerable): "when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable…, and it is therefore considered to be facing a high risk of extinction in the wild" (IUCN 2012).

Habitat Supporting Sensitive Wildlife

Habitat that supports federally listed species is also considered in environmental review. Critical habitat for Tidewater Goby is present within the Project Area. Critical habitat and Essential Fish Habitat (EFH) are present adjacent to the Project Area for several species. Critical habitat and EFH are described below. See **Table 2.5-2** for a summary of species and the location of habitat within or adjacent to Project Area.

Critical Habitat

The ESA of 1973 (16 USC 1531 et seq.) establishes a national policy that all federal departments and agencies provide for the conservation of threatened and endangered species and their ecosystems. Critical habitat is defined by the ESA as a specific geographic area containing features essential for the conservation of an endangered or threatened species. Under Section 7 of the ESA, critical habitat should be evaluated if designated for federally listed species that may be present.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. 1801 et seq.) provides the federal government with the authority to manage fisheries in the U.S. Exclusive Economic Zone (EEZ) (from state waters which end three nautical miles offshore to a distance of 200 nautical miles). In addition, the Act mandates inter-agency cooperation in achieving protection, conservation, and enhancement of Essential Fish Habitat (EFH). The Act defines EFH as "Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity."

EFH is designated for species managed in Fisheries Management Plans (FMP) under the MSFCMA. Under the MSFCMA, the Eel River Delta (including the North Bay, Mosley Slough, and Sevenmile Slough) is designated as EFH within the Pacific Coast Salmon Fisheries Management Plan (FMP) (Chinook, Coho, and Pink Salmon; NOAA Fisheries 2021a).

The Pacific Coast Salmon FMP (as amended) was created to manage commercial and recreational salmon fisheries along the west coast of the U.S. In addition, the plan designates Habitat Areas of Particular Concern (HAPC) including complex channels and floodplains, thermal refugia, spawning habitat, estuaries, and marine and estuarine submerged aquatic vegetation (NOAA Fisheries 2021b). Some of these HAPCs are present in the North Bay and Mosley Slough (adjacent to the Project Area), and Sevenmile Slough (adjacent and within the Project Area). The North Bay, Mosley Slough, and Sevenmile Slough are part of the Eel River estuary and contain floodplains and estuarine submerged aquatic vegetation.

The North Bay of the Eel River Delta which borders the Project Area on the western side is designated within the Coastal Pelagic Species FMP and within the Pacific Coast Ground Fish FMP (85 species).

The Coastal Pelagic Species FMP (as amended) was created to promote efficient, sustainable, and profitable fishery practices and to prohibit the harvest of krill species. No HAPCs for the Coastal Pelagic Species FMP have been designated.

The Pacific Coast Groundfish FMP (as amended) prohibits activities such as bottom trawling and dredging that could result in long-term damage to the ocean floor. In addition, the plan designates HAPC including estuaries, canopy kelp, seagrass (i.e., eelgrass), rocky reefs, and areas of interest (NOAA Fisheries 2021b). Two of these HAPCs are present in the North Bay and Mosley Slough (adjacent to the Project Area), and Sevenmile Slough (adjacent and within the Project Area). Specifically, the North Bay, Mosley Slough, and Sevenmile Slough are part of the Eel River estuary, and eelgrass has been documented as present in the Project Area.

Table 2.5-2. Critical Habitat/EFH within or Adjacent to Project Area & Associated Species

Species	Critical Habitat Present in Project Area	Critical Habitat Present Adjacent to Project Area	EFH Present in Project Area	EFH Present Adjacent to Project Area	Location Within or Adjacent to Project Area
Tidewater Goby	**Yes**	No	No	No	**Critical Habitat:** Within the Project Area, part of the Eel River North Area Subunit-4a and includes approximately 16 acres (78 FR 8746).
Green Sturgeon (southern DPS)	No	**Yes**	No	No	**Critical Habitat:** Coastal waters directly adjacent to the Project Area. However, the Eel River estuary is excluded from designation.
Coho Salmon (SONCC ESU)	No	**Yes**	No	**Yes**	**Critical Habitat/EFH:** Eel River Delta including the North Bay, Mosely Slough, and Sevenmile Slough at the boundaries of the Project Area.
Steelhead (northern California DPS)	No	**Yes**	No	No	**Critical Habitat:** Eel River Delta including the North Bay, Mosely Slough, and Sevenmile Slough at the boundaries of the Project Area.
Chinook Salmon (Coastal California ESU)	No	**Yes**	No	**Yes**	**Critical Habitat/EFH:** Eel River Delta including the North Bay and Sevenmile Slough at the boundaries of the Project Area.

2.6 Summary of Existing Habitat Value and Function

The Project Area is within the Eel River watershed in the Eel River estuary, part of the Salt River-Eel River Hydrologic Unit (HUC10: 1801010511). The vegetation in the north and western portions of the Project Area is primarily comprised of herbaceous halophytic (salt-tolerant) and hydrophytic vegetation that are characteristic of coastal salt and brackish marsh, and brackish pasture. Vegetation in the eastern and southern portion of the Project Area contains freshwater pasture species. Very few shrubs are growing within the Project Area. Much of the Project Area has been grazed pastureland for over a century but has increasingly converted to saltwater wetlands and hydrophytic vegetation less suitable for grazing. The entirety of the Project Area is within the Coastal Zone. The wetland delineation of the Project Area identified a total of 777.89 acres of three-parameter wetlands, and 5.78 acres of two-parameter uplands

that may be considered one-parameter wetlands pending jurisdictional agency review. Thirteen discrete vegetation communities are described in the Project Area, of which six were identified as SNC (state rank of S1-S3). A total of 110 plant species are documented in the Project Area, of which 57 (51%) are native species and 53 (48%) are non-native. Three state listed special status plant species (CRPR List 1 and 2) are within the Project Area, and one CRPR List 4 species.

A total of 31 mammal and bird species, and 13 fish species are documented in the Project Area. No special status mammals were observed during the May 2021 wildlife survey. A total of 26 avian species, including several state special status species as well as common, protected migratory birds, were observed in or flying over the Project Area during the May 2021 field survey. Numerous small unidentified fish were observed within some of the areas of standing water within the Project Area during the May 2021 field survey. CDFW conducted fish sampling within the Project Area across four sampling days in 2020. These sample efforts were primarily aimed at documenting the fish assemblages within the Project Area, waters within the interior of the levee system, while some sampling occurred on the exterior side of the main tide gate. Sampling methods included fine-meshed seines and baited minnow traps. Numerous (55) Tidewater Gobies were captured across three of the 2020 sampling days. No salmonids were captured during 2020 sampling efforts. No special status amphibians were observed during the May 2021 field survey; however, there are two records of Northern Red-legged Frog from Cannibal Island, including a record of 28 egg masses within the Project Area in 2009, and a record of 72 egg masses in 2009 mapped at the western edge of the Project Area within Mosley Slough (CDFW 2021a).

3. Project Impact Analyses

The data collected and organized from Project studies has been used to inform post-construction conditions based on proposed Project design components, and are summarized in the following sections. Results are transcribed from the following technical analyses:

- Wetlands Fill Analysis (GHD 2023a, **Appendix E**)
- Habitat Conversion Analysis (GHD 2023b, **Appendix F**)

3.1 Project Impacts to Jurisdictional Wetlands

The nature of direct temporary and permanent impacts are entirely for the purpose of habitat restoration and improvement. Based on the current design, the Project will permanently impact approximately 4.61 acres of three-parameter jurisdictional wetlands to (1) construct the proposed setback levee, (2) increase the footprint of the roadway prism to raise Cannibal Island Road, (3) construct a new parking lot for public recreational access, and (4) due to placement of rock riprap along a 20-foot segment of channel at the existing road crossing in the interior of Cannibal Island at Senestraro Lane (**Appendix A**, **Figure 8**). The Project will establish approximately 7.48 acres of three-parameter wetlands from existing uplands within the Project Area at the time of construction. The designed Project topography is variable via the tidal ridges and hummocks, to accrete sediment in a heterogeneous manner which will result in a mosaic of habitat features including intertidal mudflat, low, medium and high salt marsh habitat, and freshwater-brackish marsh habitat. See the Wetlands Fill Analysis for details regarding methods and results of the analysis (GHD 2023a, **Appendix E**).

Temporary impacts include the placement of materials such as large woody debris, root wads, and erosion control materials, all of which occur below the High Tide Line (HTL) mark. All erosion control materials will be organic, i.e., no plastic or non-compostable materials will be utilized. Other temporary impacts include construction and use of staging areas, temporary access roads, and disturbed edges of the elevated road prism and the newly constructed parking lot.

Under existing conditions, the Project Area is generally isolated from estuary water levels by an earthen dike that was constructed for agricultural purposes during reclamation. The earthen dike is located at the perimeter of the Project Area. Culverts with tide gates were installed through the dike to prevent saltwater inflow and allow drainage or rainfall runoff outflow. The dikes have reduced the frequency of riverine flood and tidal inundation and consequent sediment

accumulation throughout the Project Area, and as a result the interior land elevations have subsided up to three feet relative to the exterior land elevations exposed to riverine and tidal suspended sediments. Following Project implementation, full tidal range will be restored to the Project Area which is expected to promote recovery and maintenance of tidal marsh habitats that support native fish, invertebrates, wildlife, and plant species while enabling marsh elevations to keep pace with sea level rise. Although there will be temporary and permanent impacts, the functional improvement of the tidal marsh will increase substantially through the transition from muted tidal inundation to restored full tidal inundation. Impacts to wetlands will result in a less than significant impact.

3.1.1 Conversion of Vegetation Types

A Habitat Conversion Analysis (GHD 2023b, **Appendix F**) used field surveys, ground elevations, and modelling of surface water levels within the Project Area to estimate the Project's existing tidal conditions relative to proposed conditions. This analysis helped evaluate how habitat types may transition in the Project Area once full tidal influence is restored. The following habitat elevation ranges (NAVD88) were used for proposed conditions and compared to existing habitat mapping (**Appendix A, Figure 9**):

- <2.5 ft – aquatic (subtidal channel and sloughs)
- 2.5-6 ft – intertidal channel and mudflats
- 6-8 ft – coastal salt marsh and brackish marsh
- >8 ft – generally no change in habitat, depending on the location and extent of existing habitat.

The majority of the Project Area is comprised of three-parameter wetlands. As summarized in **Section 2.2**, only 11.15 acres within the Project Area are three-parameter uplands, which consist primarily of the tops of the existing perimeter dike, concrete pads, or raised ground around areas that were historically developed. Sensitive and non-sensitive vegetation assemblages are components of the various wetland types. These vegetation assemblages and wetland types host habitat for, and presence of, both sensitive and non-sensitive plant and wildlife species. Only one SNC exists outside of three-parameter wetlands (Coastal brambles SNC).

The intent of the conversion analysis was to crosswalk the existing mapped vegetation assemblages with broad habitat groupings to better document and assess the potential shifts to these habitat types and individual species following Project implementation. **Table 3.1-1** provides a crosswalk between the vegetation communities characterized during botanical surveys and the broader habitat category they fit within. These broad groupings were estimated based on the topography and habitat relationship established for unmuted areas. **Table 3.1-2** summarizes the existing broad habitat groupings and how they are predicted to shift post-construction.

Table 3.1-1. Broad Habitat Types and Associated Wetland Types/Vegetation Communities

Broad Habitat Type for Use in Conversion Analysis[1]	Cowardin Wetland Type[2]	Vegetation Mapping Unit[3]	Area (acres)	Total Area (acres)
Aquatic (Subtidal Channel and Sloughs)	Estuarine Subtidal Aquatic Bed (E1AB3)	Eelgrass Beds	0.6	16.7
	Estuarine Subtidal (E1UB)	Subtidal Sloughs (Unvegetated)	16.1	
Intertidal Channel and Mudflats	Estuarine Intertidal Aquatic Bed/ Unconsolidated Shore (E2AB1/E2US3)	Mudflats/Estuarine Intertidal Shore	93.4	93.4
Coastal Salt Marsh and Brackish Marsh	Estuarine Intertidal Emergent Wetland (E2EM1)	Pickleweed Salt Marsh	287.7	360.4
		Gum Plant Patches	28.7	
		Salt Rush Swales	26.2	
		Salt Grass Flats	17.8	

Broad Habitat Type for Use in Conversion Analysis[1]	Cowardin Wetland Type[2]	Vegetation Mapping Unit[3]	Area (acres)	Total Area (acres)
Dense-flowered Cordgrass Marsh	Estuarine Intertidal Emergent Wetland (E2EM1)	Dense-Flowered Cordgrass	61.6	61.6
Agricultural Pasture	Upland and Palustrine Emergent Vegetation (PEM1)	Non-Native Pasture	208.7	208.9
		Pale spike rush marsh	0.15	
Coastal Willow Thickets	Palustrine Scrub Shrub (PSS3)	Coastal Willow Thickets	0.4	0.4
Ruderal	Upland and Palustrine Emergent Vegetation (PEM1)	Non-native Vegetation (not functioning as pasture)	43.0	43.0
Coastal Brambles	Upland	Coastal Brambles	2.9	2.9
Ruderal	Upland	Developed (pervious/impervious surfaces)	7.9	7.9

1. Broad habitat groupings were used to assist in analyses to predict shifts in vegetation as a result of full tidal influence. The full analysis is provided in the Habitat Conversion Analysis (GHD 2023b, **Attachment F**).

2. Cowardin wetland types are based on Cowardin nomenclature from the *Classification of Wetlands and Deepwater Habitats of the United States* (FGDC 2013).

3. Vegetation was characterized in the botanical studies of the Project Area, and mapped into discrete vegetation units based on Rapid Assessment protocol (CNPS 2022a**)** and mapped according to CNPS *The Manual of California Vegetation Online* (Sawyer et. al. 2009) at the Alliance level.

Table 3.1-2. Existing Habitats and Proposed Conversions Post-Construction

Habitat Type	Existing Area (acres)	Proposed Area (acres)	Change in Habitat (acres)[1]
Agricultural Pasture	208.7	90.4	-118.3
Aquatic (Subtidal Channel and Sloughs)	16.7	30.4	13.7
Coastal Grassland	0	25.0	25.0
Coastal Salt Marsh and Brackish Marsh (Full)	89.3	315.3	226.0
Coastal Salt Marsh and Brackish Marsh (Muted)	332.8	0	-332.8
Coastal Brambles	2.9	1.9	-1.1
Coastal Willow Thickets	0.4	0.4	0.0
Developed	6.8	2.6	-4.2
Intertidal Channel and Mudflats (Full)	4.6	319.3	314.7
Intertidal Channel and Mudflats (Muted)	88.7	0	-88.7
Ruderal	43.0	10.1	-32.9
Uncategorized[2]	1.1	0.1	-1.0
Total	795.2	795.2	0.0

1. Red text denotes a negative change in area calculations (i.e., a net loss of that habitat type).

Habitat Type	Existing Area (acres)	Proposed Area (acres)	Change in Habitat (acres)[1]

2. Uncategorized Habitat Type includes small areas that were left over from digitization of field data into the geospatial data collection software that don't include any habitat types.

Based on modelling of elevation and topographic changes (**Appendix A, Figure 10**), vegetation is hypothesized to change as follows when the area is opened to full tidal influence:

- Reduction of dense-flowered cordgrass marsh
- Increase in Subtidal Channel and Sloughs,
- Increase in full tidal Intertidal Channel and Mudflat,
- Increase in full tidal Coastal Salt Marsh and Brackish Marsh and associated rare plants,
- Reduction in muted tidal habitats,
- Reduction in habitats dominated by non-native species (Agricultural Pasture and Ruderal), and restoration of this habitat type to full tidal Coastal Salt Marsh and Brackish Marsh; and,
- Reduction in uplands and Coastal Brambles (dominated by Coastal Brambles intermixed with upland non-native species).

It is expected that the Project will result in a loss of muted tidal habitats (muted Coastal Salt Marsh and Brackish Marsh, and muted Intertidal Channel and Mudflats), which do not host the density of sensitive plant species detected in the Project Area. Additionally, dense-flowered cordgrass marsh was mapped primarily outside of the dikes, in areas of full tidal influence. Dense-flowered cordgrass will be treated during Project implementation, thereby opening the habitat up to be restored to full tidal influence. The proposed Project will restore full tidal influence to a variety of habitat types, and based on modelled changes in topography and elevation in relation to tidal fluctuations within the Project Area, will result in a net increase of full tidal Subtidal Channels and Sloughs (+13.7 acres), Intertidal Channel and Mudflats (+314.7), and Coastal Salt Marsh and Brackish Marsh (+226 acres).

Full tidal range restoration is expected to promote recovery and maintenance of tidal marsh habitats that support native fish, invertebrates, wildlife, and plant species, while also enabling marsh elevations to keep pace with sea level rise. Notably, 60.1 acres of Dense-flowered Cordgrass Marsh, 90.4 acres of Agricultural Pasture primarily dominated by non-native grasses, and 10.1 acres of Ruderal comprised of upland non-native species, will be restored to Coastal Salt Marsh and Brackish Marsh, thereby expanding this valuable habitat type, and shrinking low quality habitat types. Additionally, a net increase (13.7 acres) of Subtidal Channels and Sloughs will create more habitat for existing eelgrass populations to expand and provide additional fish habitat.

3.1.2 No Net Loss of Wetlands

A goal of the Project, from a regulatory standpoint, is no net loss of wetlands. Both the state and the federal government have no-net-loss (functional) wetlands mandates (although some restoration projects are approved by regulatory agencies that contain a loss of wetlands). The Project will result in no net loss of wetlands.

In the Project Area, all wetland areas proposed to be excavated would remain wetlands (slough excavation) and tidal marsh ridges and marsh plain hummocks would not be built taller than elevation 7.5 feet (NAVD88), therefore would also remain wetlands. Excess excavated soils not used for hummocks would be placed in areas of discrete wetland fill, including the created setback levee, raising of Cannibal Island Road, and construction of the new parking lot.

The planting plan and seed mix to revegetate disturbed areas from construction will include vegetation appropriate to the ecology of the planting site, and will contain species that would naturally colonize these areas.

3.2 Project Impacts to Rare Plant Populations

A portion of the slough channel connecting the interior of Cannibal Island with North Bay will be graded to support restoration of the dendritic channel network that once connected the interior salt marsh of Cannibal Island with tidal influence from North Bay. This grading, in addition to treatment of dense-flowered cordgrass, will impact areas of Humboldt Bay owl's clover, Lyngbye's sedge, Point Reyes bird's beak, and seacoast angelica (**Appendix A**, **Figure 11.1 and 11.2**). As mentioned in **Section 2.4**, seacoast angelica is a CRPR 4 species, which does not typically require mitigation but should be avoided, where possible. As dikes in the west of the Project Area are graded and lowered, a small area of Humboldt Bay owl's clover, Lyngbeye's sedge, Point Reyes bird's beak, and seacoast angelica will be impacted (**Appendix A**, **Figure 11.3,** and **Table 3.2-1**). Small, discrete populations of Humboldt Bay owl's clover will be impacted by grading of the existing dike, and discrete populations of seacoast angelica will be impacted by spreading excavated soils in the interior marsh plain to provide habitat variability and increased complexity (**Appendix A**, **Figure 11.4,** and **Table 3.2-1**).

The proposed Project condition will increase full tidal Coastal Salt Marsh and Brackish Marsh by 226 acres (**Appendix A, Figure 10**), thereby restoring habitat for Humboldt Bay owl's clover, Lyngbye's sedge, and Point Reyes bird's beak. Seacoast angelica populations will be affected by the grading of upland dikes they are currently inhabiting. Although individual plants will be impacted by grading of the dikes, the population in the Project Area is not likely to be substantially affected. Additionally, the proposed setback levee will provide new habitat for seacoast angelica. Treatment of dense-flowered cordgrass will open the area currently inhabited by this invasive species to native species replacement.

Table 3.2-1. Project Impacts to Rare Plant Populations

Scientific Name	Common Name	Listing Status	Approximate Number of Individuals	Population Area (acres)	Area Affected by Project (acres / square feet)	Area of Habitat Restored by Project (acres or linear feet)[1]
Angelica lucida	sea-watch	CRPR 4.2	~1000	Widespread, not calculated.	N/A	226 acres
Carex lyngbyei	Lyngbye's sedge	CRPR 2B.2	Not estimated	0.54	0.24 / 10,365	~24,000 feet*
Castilleja ambigua ssp. *humboldtiensis*	Humboldt Bay's owl-clover	CRPR 1B.2	5,000-10,000	1.44	0.23 / 10,012	226 acres
Chloropyron maritimum ssp. *palustre*	Point Reyes bird's beak	CRPR 1B.2	7,000-10,000	2.03	0.16 / 6,804	226 acres
Zostera maritima	Eelgrass	EFH	unknown	0.6	None	13.7 acres

1. The areas shown in this column reflect the potential habitat zones that these species may naturally recruit to and establish within, but are not limited to this extent.

   *Approximation of linear feet of slough channel that will be influenced by a full tidal regime, including both existing and created channels.

Note: California Rare Plant Ranking (CRPR) lists 1A, 1B and 2 and are considered eligible for state listing as Endangered or Threatened pursuant to the California Fish and Game Code.

EFH = Essential Fish Habitat

3.3 Project Impacts to Sensitive Wildlife Species

The Project is seeking ESA Section 7 coverage through Programmatic Biological Opinions for listed fish species, administered by 1) the NOAA Restoration Center and USACE for salmonids and green sturgeon (NMFS 2022), and 2) the USFWS for Tidewater Goby (USFWS 2022). Numerous avoidance and minimization measures required within the PBOs will be implemented for the Project pre-construction, during construction, and post-construction. These measures are broad enough to protect all wildlife species potentially present in the Project Area during construction, and also include specific and stringent fish handling and relocation measures to minimize impacts to listed fish species. No CESA listed species were observed in the Project Area during surveys. CDFW will file a memo under Fish and Game Code § 1001 authority for CESA compliance during construction and monitoring.

4. Maintenance and Monitoring Approach

The Project is designed to be self-mitigating. Following initial construction, the restoration area is expected to be self-maintaining and dynamic over the long term. The restoration of tidal influence will restore floodplain habitat. An Operations and Maintenance Plan (OMP) has been developed to provide an outline for maintaining Project infrastructure to ensure success (GHD 2023c, **Appendix G**).

The Project will restore full tidal amplitude to currently muted tidal habitats over a substantial portion of the Project Area. It is anticipated that existing vegetation communities will shift in response to the restoration of a full tidal regime. During Project construction, vegetation disturbance will be avoided and minimized to the extent practicable. Treatment of non-native dense-flowered cordgrass is a component of the Project, which will occur prior to, during, and after Project construction. Disturbed areas above 7.5 ft NAVD88 will be revegetated with plant species appropriate to the site, and the area below 7.5 ft NAVD88 is anticipated to revegetate passively. Disturbance to existing grades and native vegetation shall be limited to the actual site of the Project, necessary access routes, and staging areas.

The Project occurs in a setting where marsh plain inundation occurs on a regular basis. Channels will be constructed to accommodate higher volumes and flows between the restoration area and the Eel River estuary. Channel and habitat evolution is expected and desired, specifically to promote channel complexity and natural estuarine processes preferred by listed species. Immediately following construction, the creation of tidal ridges and marsh plain hummocks and additional slough channel is anticipated. Over time, it is anticipated that these areas would adjust in response to tidal influence, sediment deposition and routing, and scour. The post-construction habitats east of the new setback levee and on the inboard side of the existing dikes are anticipated to evolve with sediment deposition associated with the increased tidal range and exposure to higher sediment loads throughout the year, culminating in the restoration of approximately 500 acres of unmuted salt and brackish marsh and intertidal channel and mudflats. For this reason, holding the Project accountable to maintain static habitat type outcomes would not be applicable and could limit more meaningful ecological outcomes (dynamic and complex habitat). As discussed above in **Section 3.1.3**, there will be no net loss of wetlands or Other Waters, just conversion from one wetland type to another (and associated vegetation community conversion), with the goal of increasing native vegetation communities that will support a diversity of native wildlife.

California Trout and CDFW desire to achieve success of revegetated areas for an initial period of survival; however, constraining plant survival to habitat type would be at odds with Project objectives, which include a self-maintaining and dynamic system complex enough to benefit anadromous salmonids and other aquatic species.

4.1 Revegetation

Native seed mix will be applied to all disturbed areas above 7.5 feet (NAVD 88). There will be three seed mixes for three distinct areas (**Table 4.1-1**):

1. East edge of newly constructed setback levee and ditch, and south edge of raised road prism on Cannibal Island Road. These areas are remaining grazing pasture, and will be treated with a seed mix compatible for the use (“Organic Pasture Seed Mix”).
2. West edge of newly constructed setback levee, north edge of raised road prism, all staging areas, temporary access roads, and slopes of the recreation trail:
    a. between elevation 7.5 – 9 ft. (“High Marsh Ecotone Seed Mix”).
    b. above elevation 9 ft. (“Freshwater Seed Mix”).

Table 4.1-1 Seed Mix for Revegetation of Disturbed Areas Above 7.5 feet (NAVD88)

Scientific Name	Common Name	WMVC Indicator Status[1]	Unit
Organic Pasture Seed Mix			
Trifolium alexandrinum	berseem clover	UPL	seed
Lotus corniculatus	birdsfeet trefoil	FAC	seed
Trifolium pratense	barduro red clover	FACU	seed
Trifolium repens	white clover (ladino type)	FAC	seed
Trifolium fragiferum	Salina clover	FAC	seed
Hordeum brachyantherum	meadow barley	FACW	seed
High Marsh Ecotone Seed Mix			
Deschampsia cespitosa ssp. *cespitosa*	tufted hairgrass	FACW	seed
Elymus X *triticum*	regreen hybrid wheatgrass	--	seed
Hordeum brachyantherum	meadow barley	FACW	seed
Festuca rubra	red fescue	FAC	seed
Elymus glaucus	blue wild rye	FACU	seed
Atriplex prostrata	fat hen	FAC	seed
Grindelia stricta	gumweed	FACW	seed
Limonium californicum	marsh rosemary	OBL	seed
Bolboschoenus maritimus ssp. *paludosus*	alkali bulrush	FACW	seed
Freshwater Seed Mix			
Bromus sitchensis ssp. *carinatus*	California brome	UPL	seed
Deschampsia cespitosa ssp. *cespitosa*	tufted hairgrass	FACW	seed
Elymus glaucus	blue wild rye	FACU	seed
Elymus X Triticum	regreen hybrid wheatgrass	--	seed
Festuca rubra	red fescue	FAC	seed
Hordeum brachyantherum	meadow barley	FACW	seed
Scirpus microcarpus	panicled bulrush	FACW	seed

1. The suggested planting lists follow along with the most current reference, *National USACE 2020 Wetland Plant List* as defined by the USACE 2020 Western Valleys, Mountain, and Coasts (WMVC) designation.

4.2 Monitoring

The result of restoration is a net increase of full tidal subtidal channels and sloughs, intertidal channel and mudflats, and coastal salt marsh and brackish marsh. The Project will enhance native plant communities and promote expansion of rare plant habitat through the treatment and control of non-native dense-flowered cordgrass.

Pre- and post-Project photo monitoring in accordance with CDFW photo-monitoring guidelines will occur prior to Project implementation and at least once in the year following implementation, via drone imagery and/or established photo points. Post-project photo monitoring would demonstrate that the Project Area achieved Project objectives (restoration of full tidal influence). Pre-project photo monitoring will be submitted to the NCRWQCB, CCC, USACE, NOAA RC, and USFWS field office with as-built design plans, and post-Project photo monitoring will include captioned photographs with comparative pre- and post-Project imagery with text highlighting observed changes within the Project Area. The photo monitoring report will be submitted to agencies within 18 months following Project completion. Voluntary monitoring will be ongoing post-implementation and as funding allows, and may include fisheries sampling, vegetation sampling, hydrology monitoring, and/or additional photogrammetry and drone monitoring. These voluntary monitoring events are not proposed as conditions of permit agreements and are described in the Operations and Management Plan (**Appendix G**).

Pre-project photo documentation of general site conditions is included in **Appendix H.**

4.2.1 Invasive Species Management

Ground disturbance and creation of new tidal areas could result in the expansion of dense flowered cordgrass, which could affect the expansion of native communities and SNCs in wetlands. Control of dense-flowered cordgrass in the Project Area using mowing, grinding, excavation, herbicide application, and/or flaming methods will occur prior to construction, during construction, and post-construction, as funding allows, to support current regional eradication efforts. Continued control of new invasive plant populations during the maintenance period of the Project will ensure that newly created tidal habitat will not be invaded. See the Operations and Maintenance Plan (**Appendix G**) for a description of proposed maintenance of dense-flowered cordgrass, and monitoring triggers.

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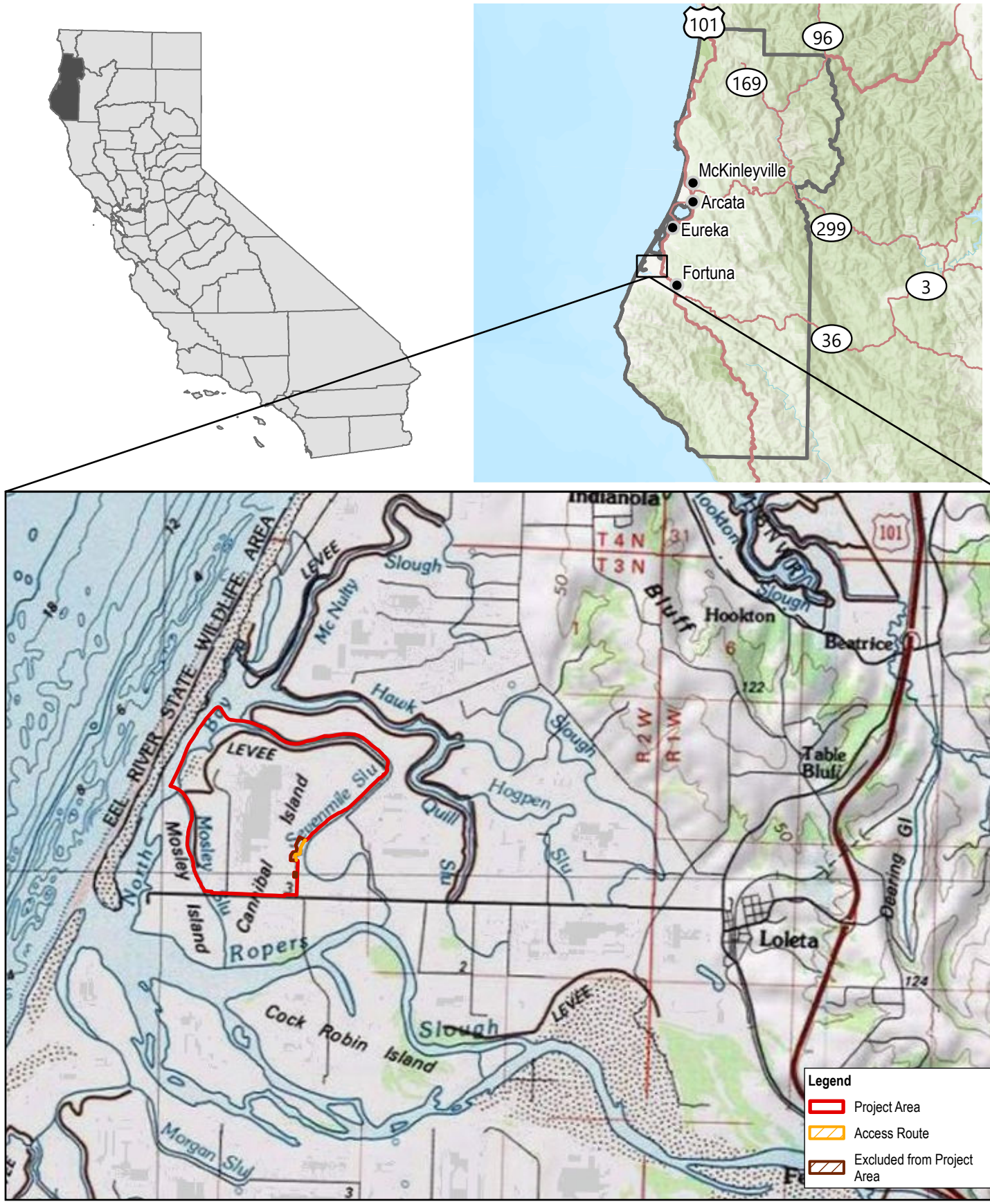
Appendices

Appendix A

Figures



Paper Size ANSI A

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Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **21 Nov 2022**

Vicinity Map

FIGURE 1

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_EIR\11206383_EIR.aprx - 11206383_002-1_Vicinity_RevB
Print date: 21 Nov 2022 - 16:00

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **Nov 2022**

Project Area

FIGURE 2

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_EIR\11206383_EIR.aprx - 11206383_002-2_ProjectArea_RevB
Print date: 21 Nov 2022 - 15:51

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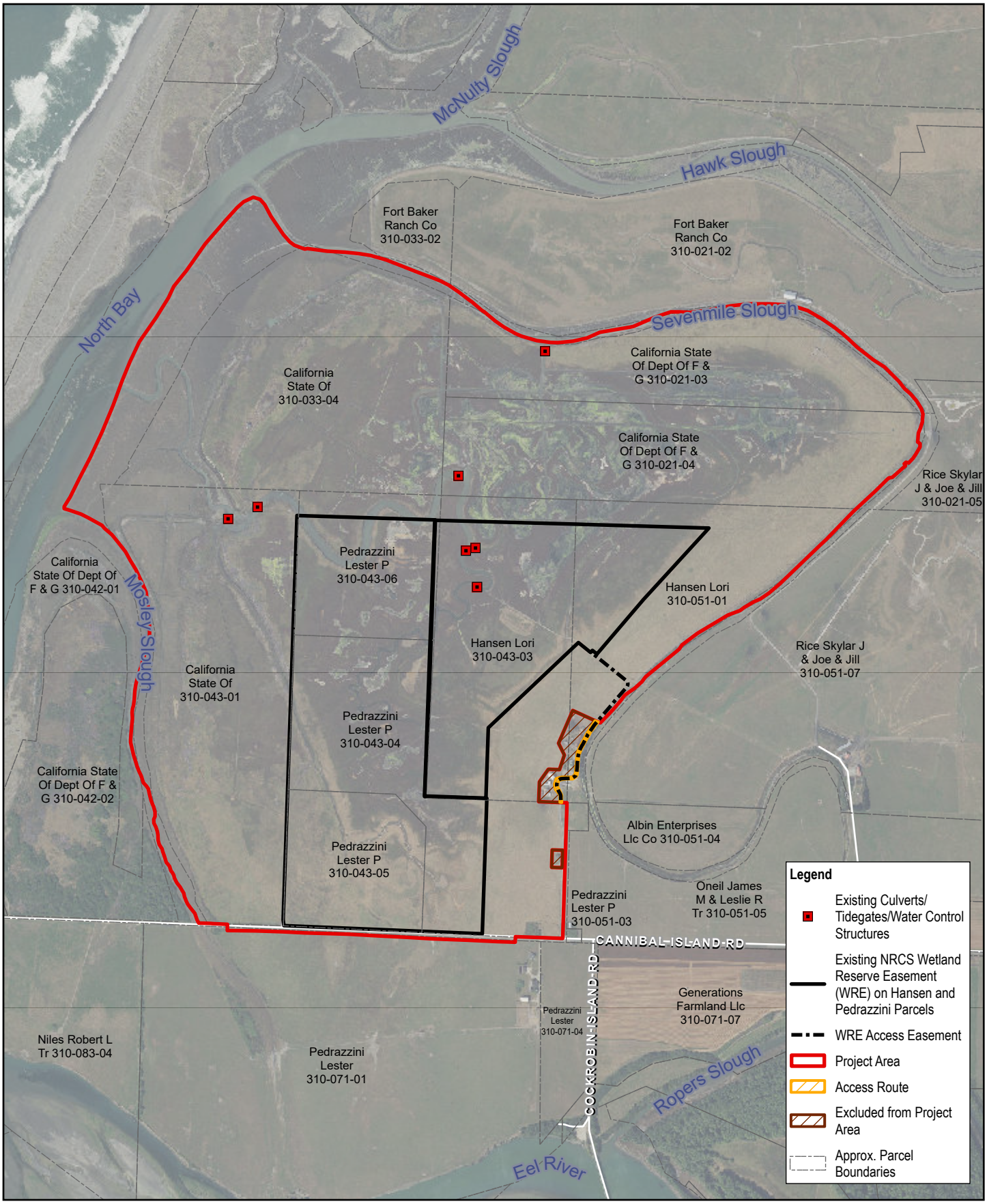

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **Nov 2022**

Ownership Boundaries

FIGURE 3

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_EIR\11206383_EIR.aprx - 11206383_002-3_OwnershipBoundaries_RevB
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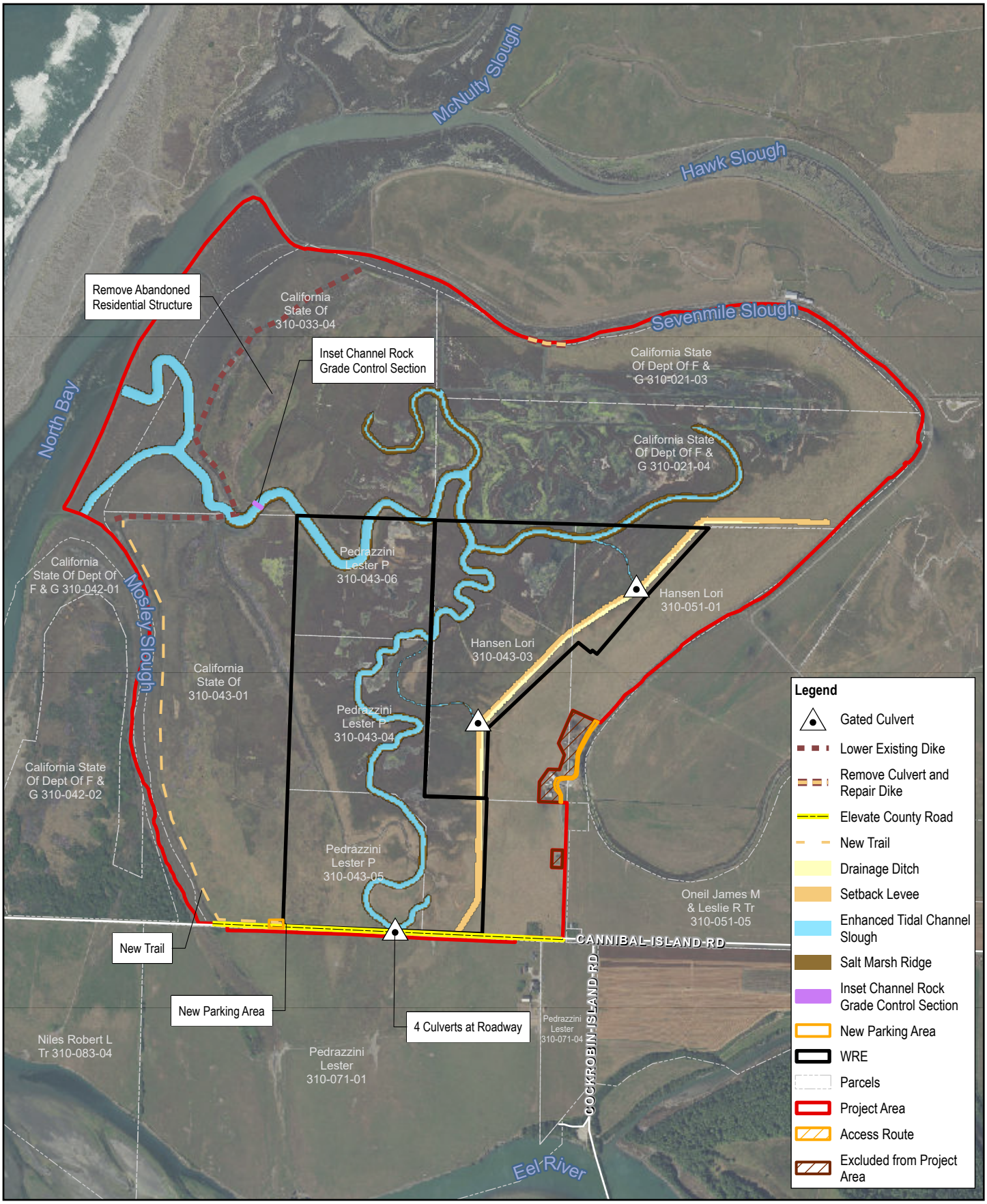

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **Aug 2023**

Project Area and Components

FIGURE 4

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_EIR\11206383_EIR.aprx - 11206383_002-8_ProjectComponents_RevF
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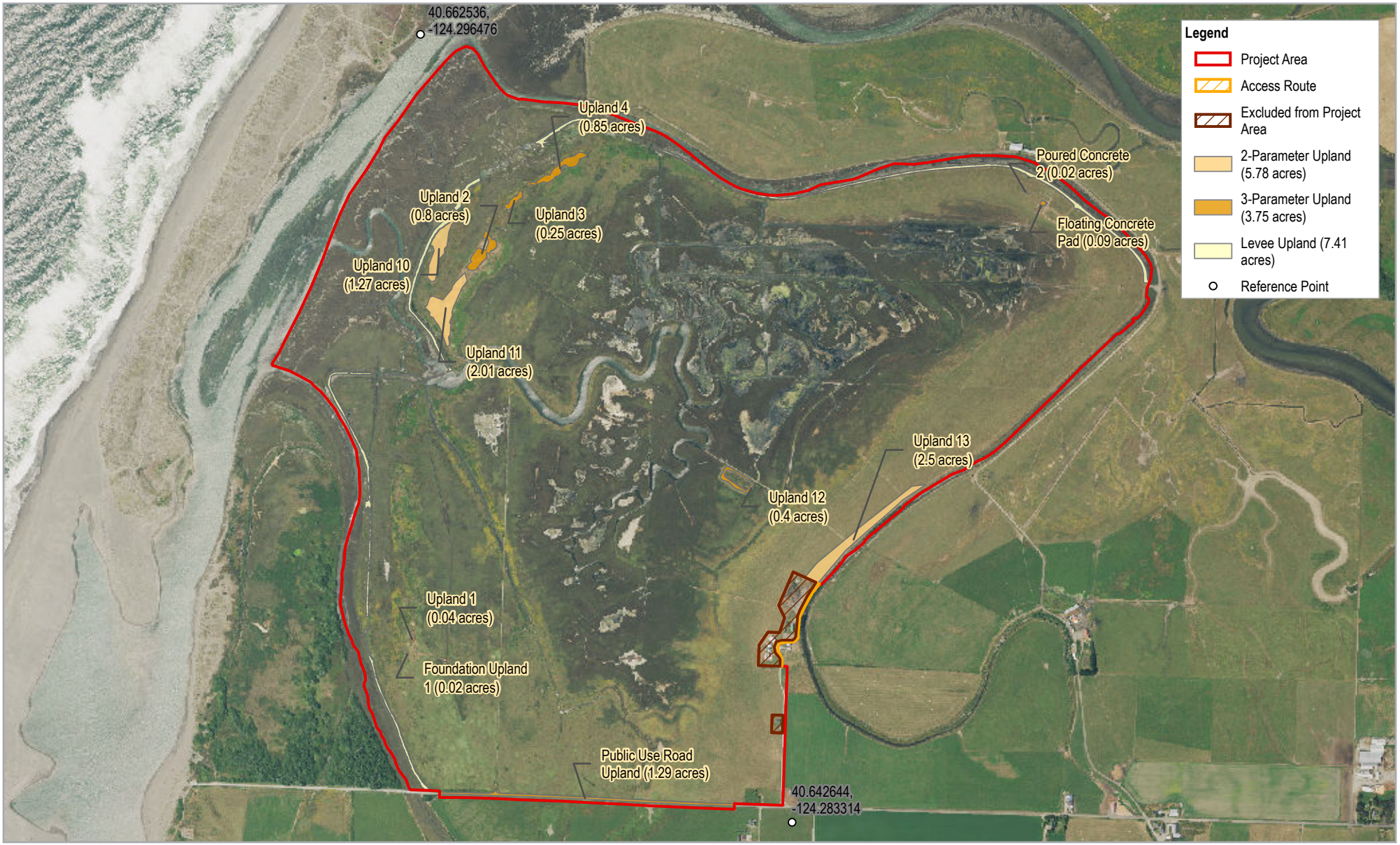
Data source: Project Area, GHD June 2022; Humboldt county parcels, Dec 2019; . Created by: jclark2



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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **Jun 2022**

Wetland Delineation Overview

FIGURE 5

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_WetlandDelineation_2022.aprx - 11203183_002_WetDel_Overview_RevF
Print date: 08 Jun 2022 - 09:08

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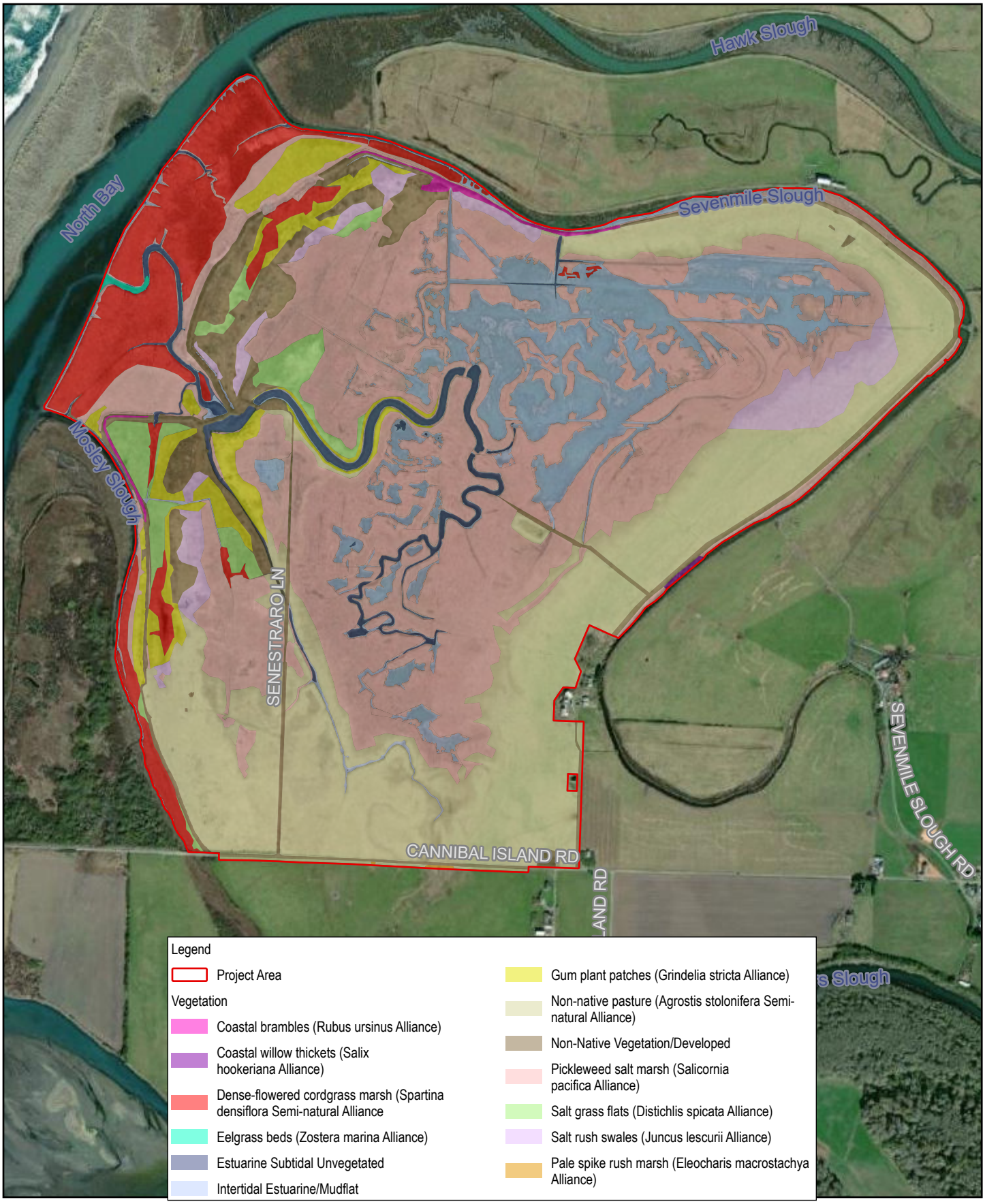

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **17 Apr 2023**

Existing Vegetation Communities

FIGURE 6

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_002_Vegetation_RevA
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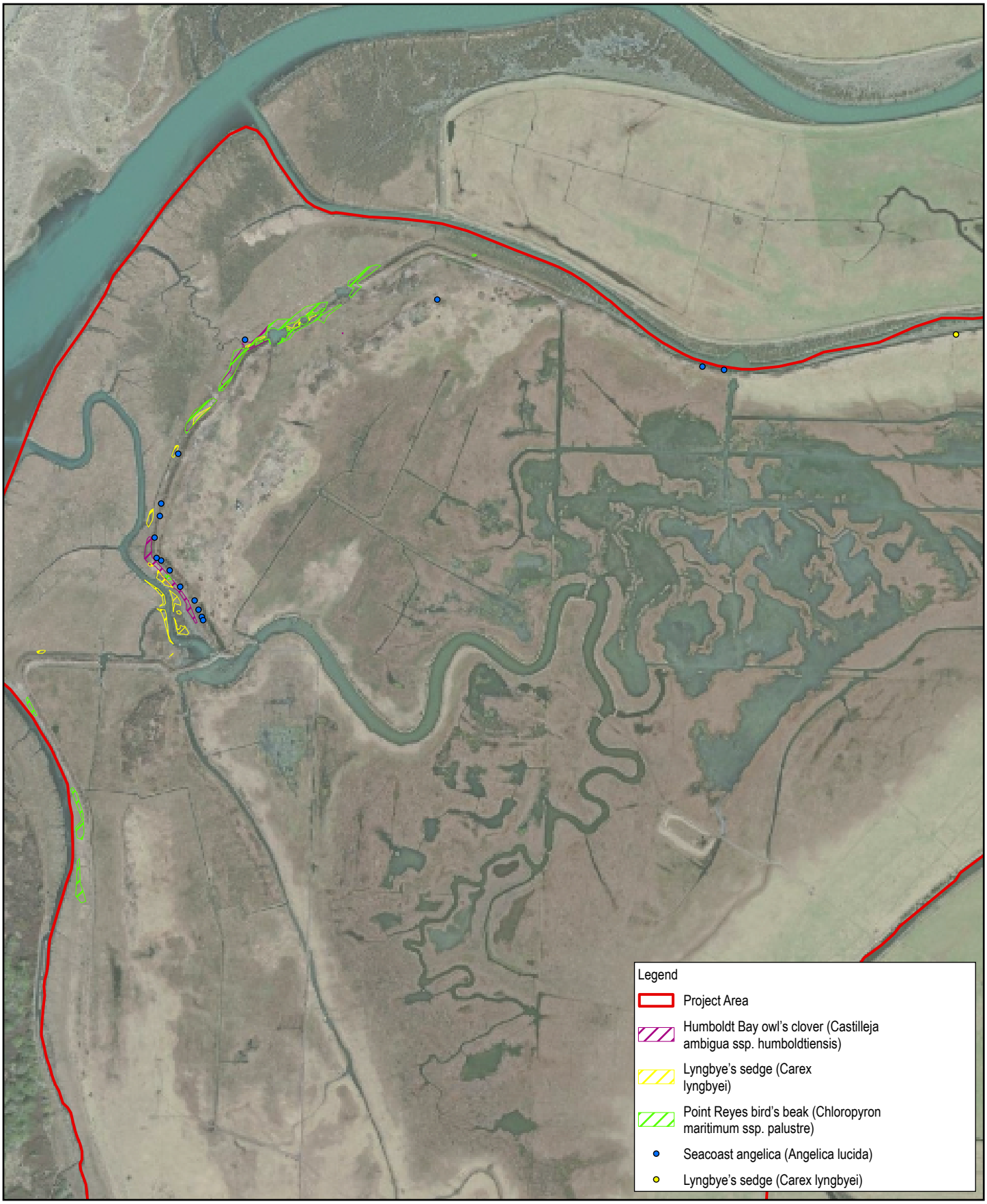

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

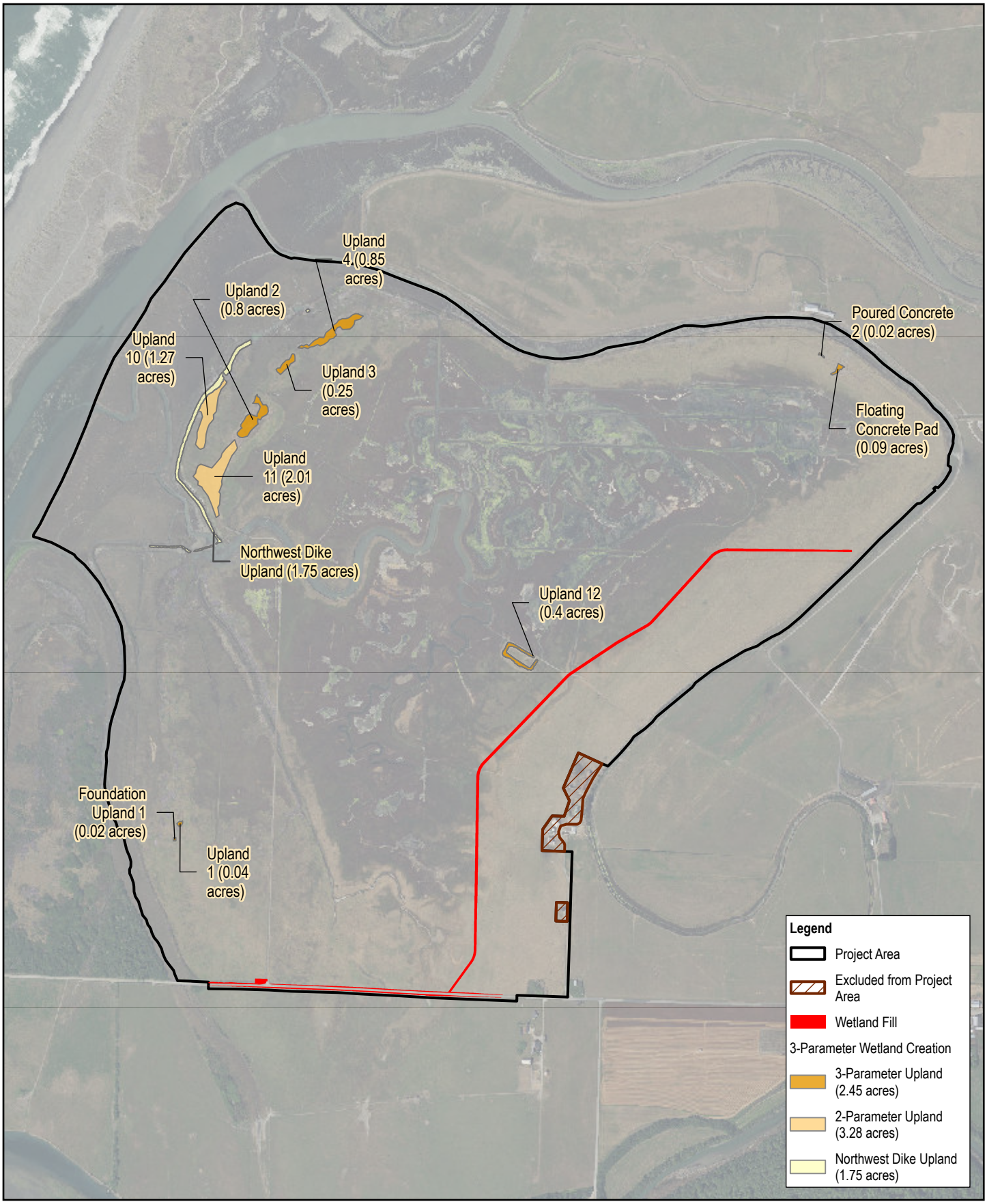
Project No. **11206383**
Revision No. **-**
Date **27 Apr 2023**

Rare Plants

FIGURE 7

\\ghdnet\ghd\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_003_RarePlants_RevC
Print date: 27 Apr 2023 - 16:39

Data source: Rare Plants, GHD, 2020; World Imagery: Maxar. Created by: jlopez4



Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **20 Jan 2023**

Wetland Fill Analysis

FIGURE 8

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_WetlandFillAnalysis\11206383_WetlandFillAnalysis.aprx - 11206383_002_WetlandFillAnalysis_RevA
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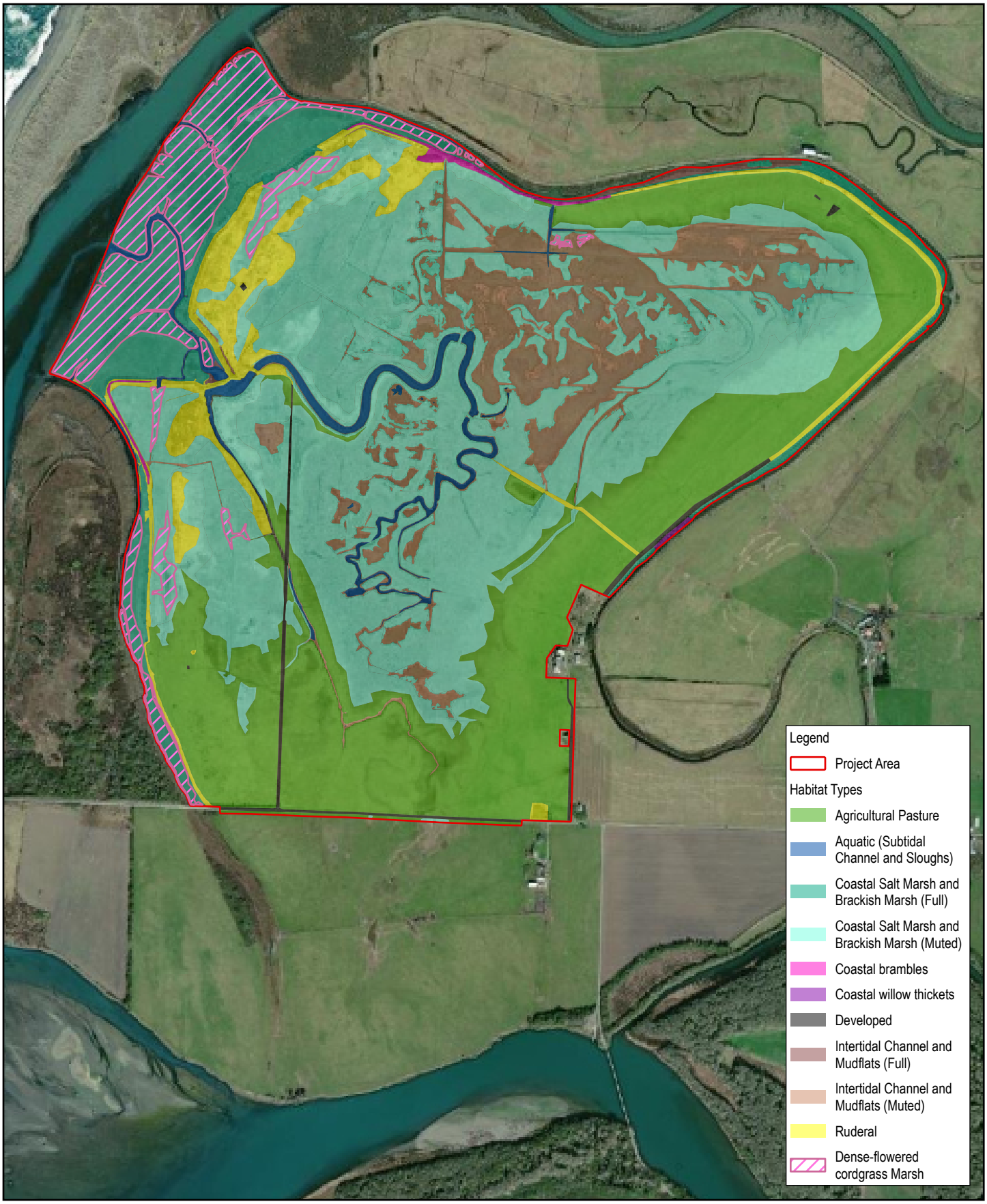

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

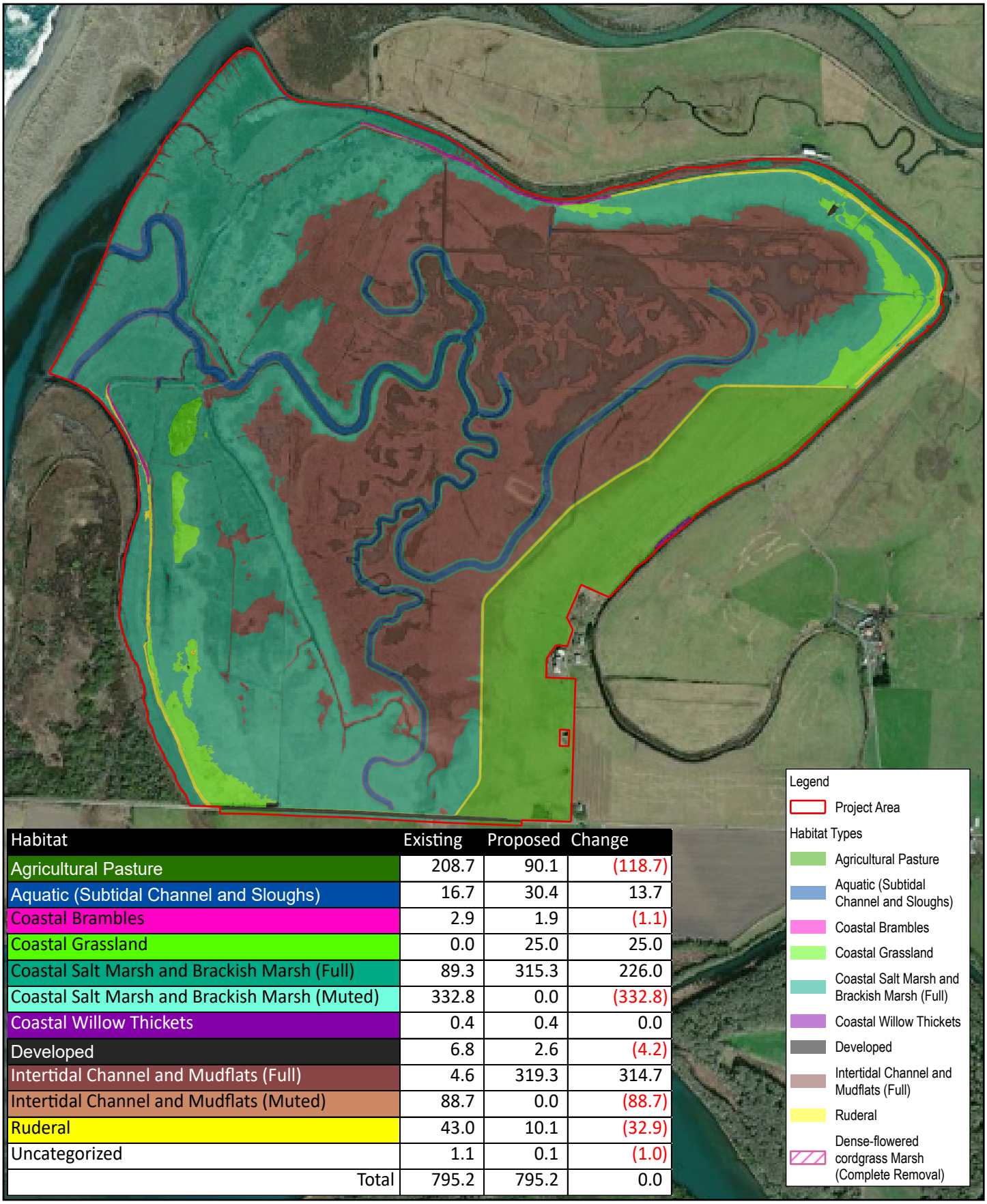
Project No. **11206383**
Revision No. **-**
Date **27 Apr 2023**

Existing Habitat

FIGURE 9

\\ghdnet\ghd\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_004_ExistingHabitat_RevC
Print date: 27 Apr 2023 - 16:37

Data source: APE, June 2, 2022, GHD; Habitat GHD, June 6 2022 grouped March 29, 2023; World Imagery: Maxar. Created by: jlopez4



Habitat	Existing	Proposed	Change
Agricultural Pasture	208.7	90.1	(118.7)
Aquatic (Subtidal Channel and Sloughs)	16.7	30.4	13.7
Coastal Brambles	2.9	1.9	(1.1)
Coastal Grassland	0.0	25.0	25.0
Coastal Salt Marsh and Brackish Marsh (Full)	89.3	315.3	226.0
Coastal Salt Marsh and Brackish Marsh (Muted)	332.8	0.0	(332.8)
Coastal Willow Thickets	0.4	0.4	0.0
Developed	6.8	2.6	(4.2)
Intertidal Channel and Mudflats (Full)	4.6	319.3	314.7
Intertidal Channel and Mudflats (Muted)	88.7	0.0	(88.7)
Ruderal	43.0	10.1	(32.9)
Uncategorized	1.1	0.1	(1.0)
Total	795.2	795.2	0.0

Paper Size ANSI A

0 300 600 900 1,200

Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. 11206383
Revision No. -
Date 03 May 2023

Habitat Post-Construction in Proposed Project

FIGURE 10

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_005_ProposedHabitat_RevE
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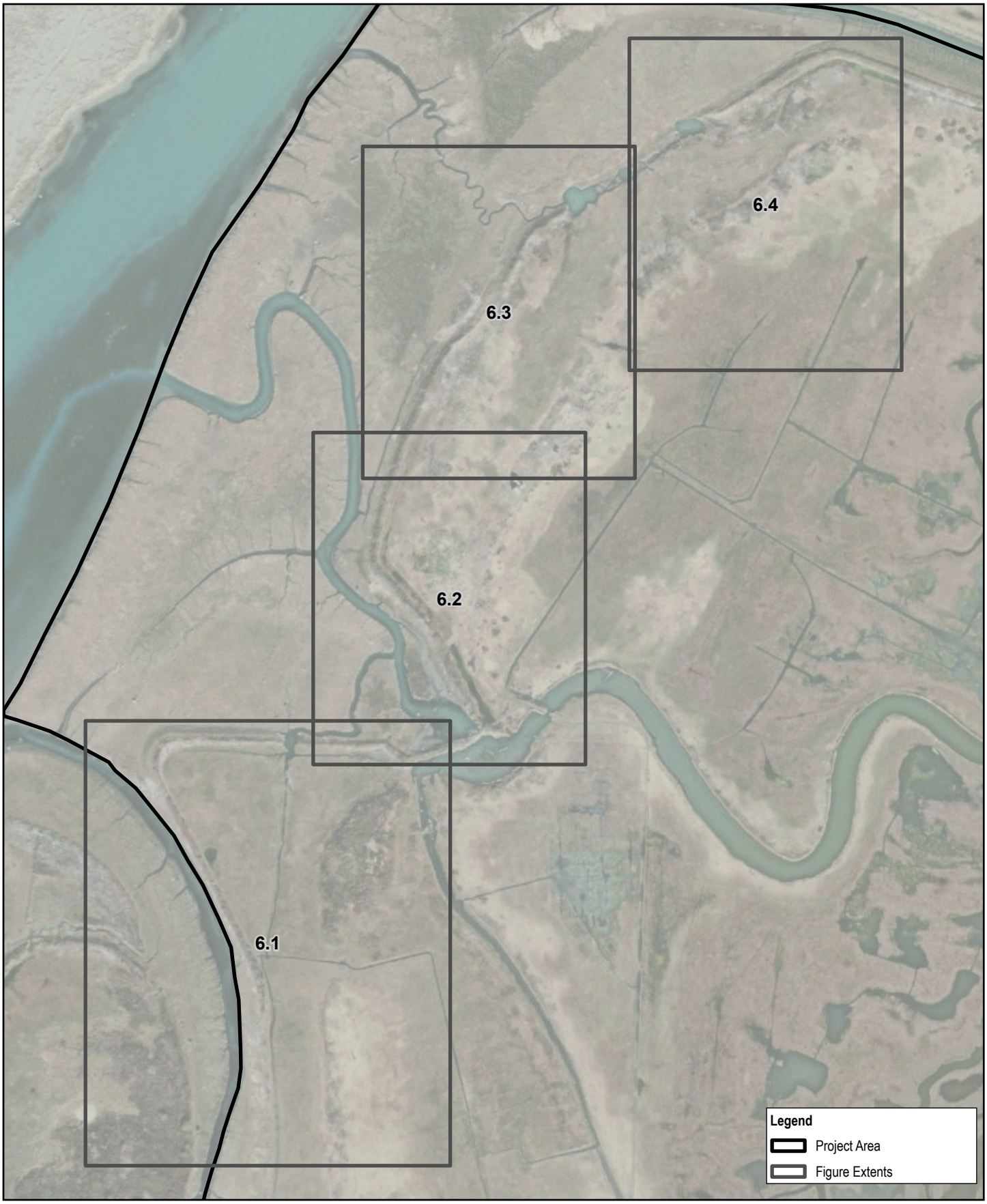

Paper Size ANSI A

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Map Projection: Lambert Conformal Conic
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Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **26 Apr 2023**

Rare Plant Impacts Overview

FIGURE 11

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_006_RarePlantImpacts_RevB
Print date: 26 Apr 2023 - 16:35

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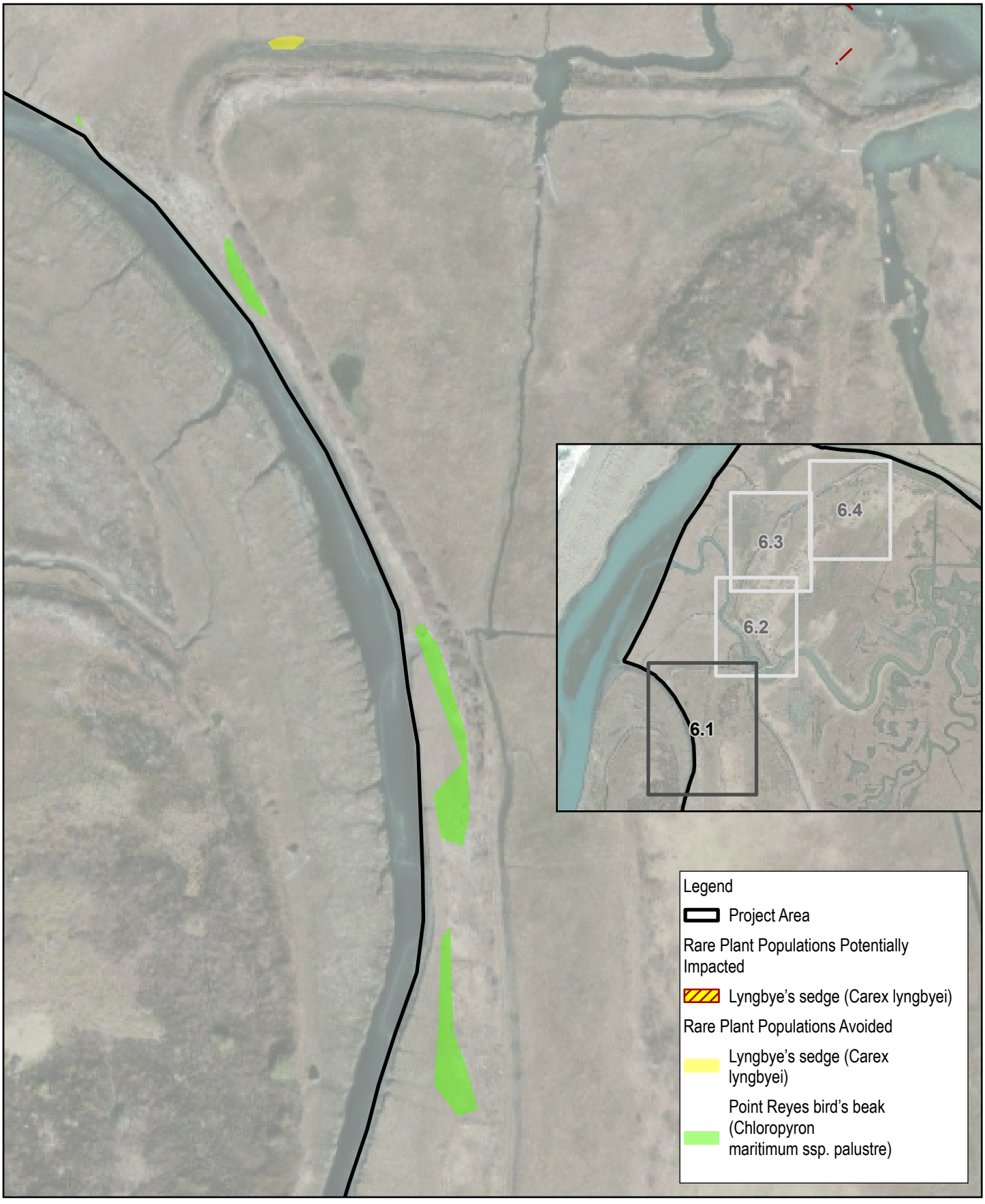

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **04 May 2023**

Rare Plant Impacts

FIGURE 11.1

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_006_RarePlantImpacts_MB_RevD
Print date: 04 May 2023 - 11:58

Data source: APE, June 2, 2022, GHD; Rare Plants GHD, May 2020 grouped March 24, 2023; LOD, GHD, Mar 24, 2023; World Imagery: Maxar, Microsoft
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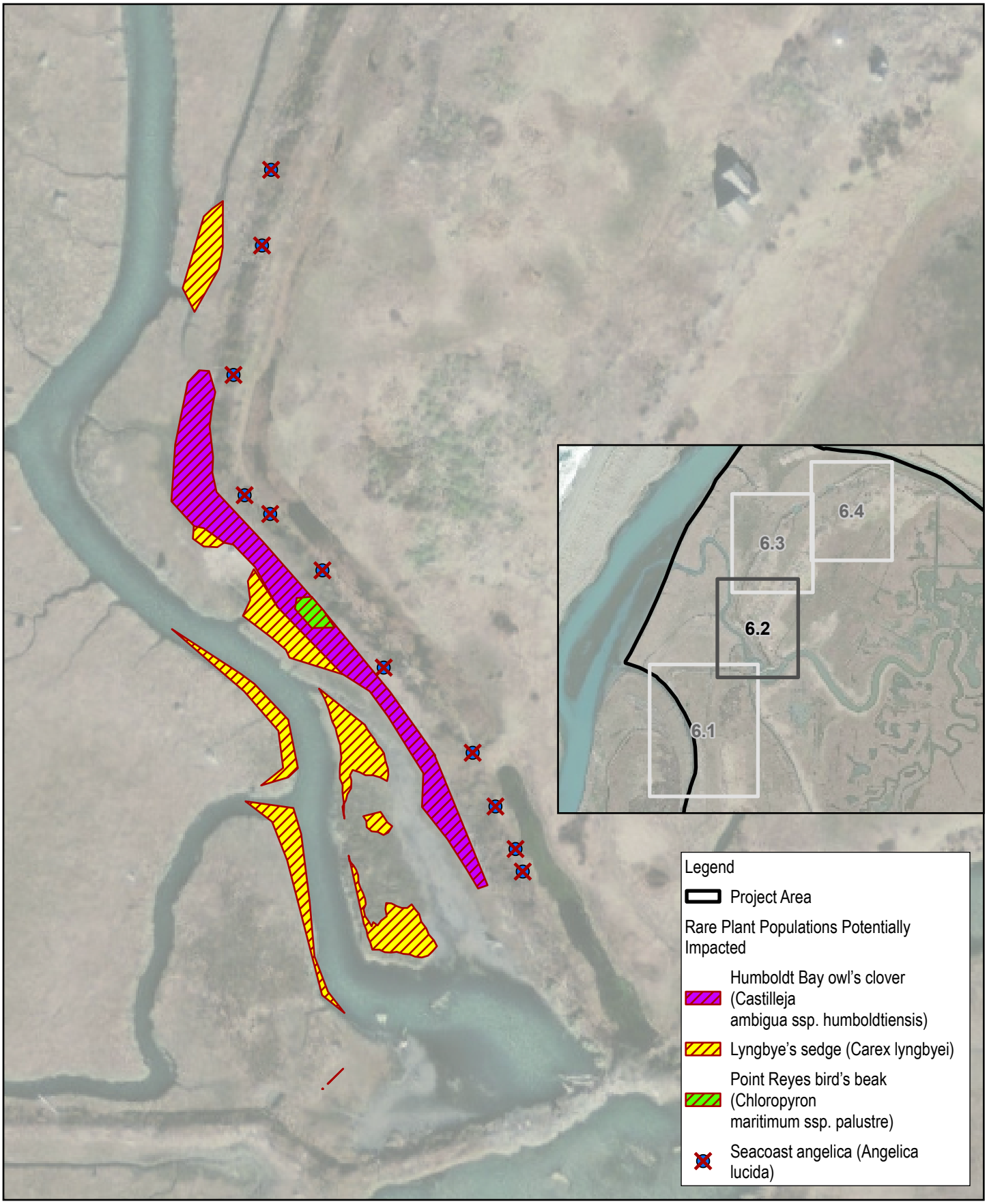

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **04 May 2023**

Rare Plant Impacts

FIGURE 11.2

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_006_RarePlantImpacts_MB_RevD
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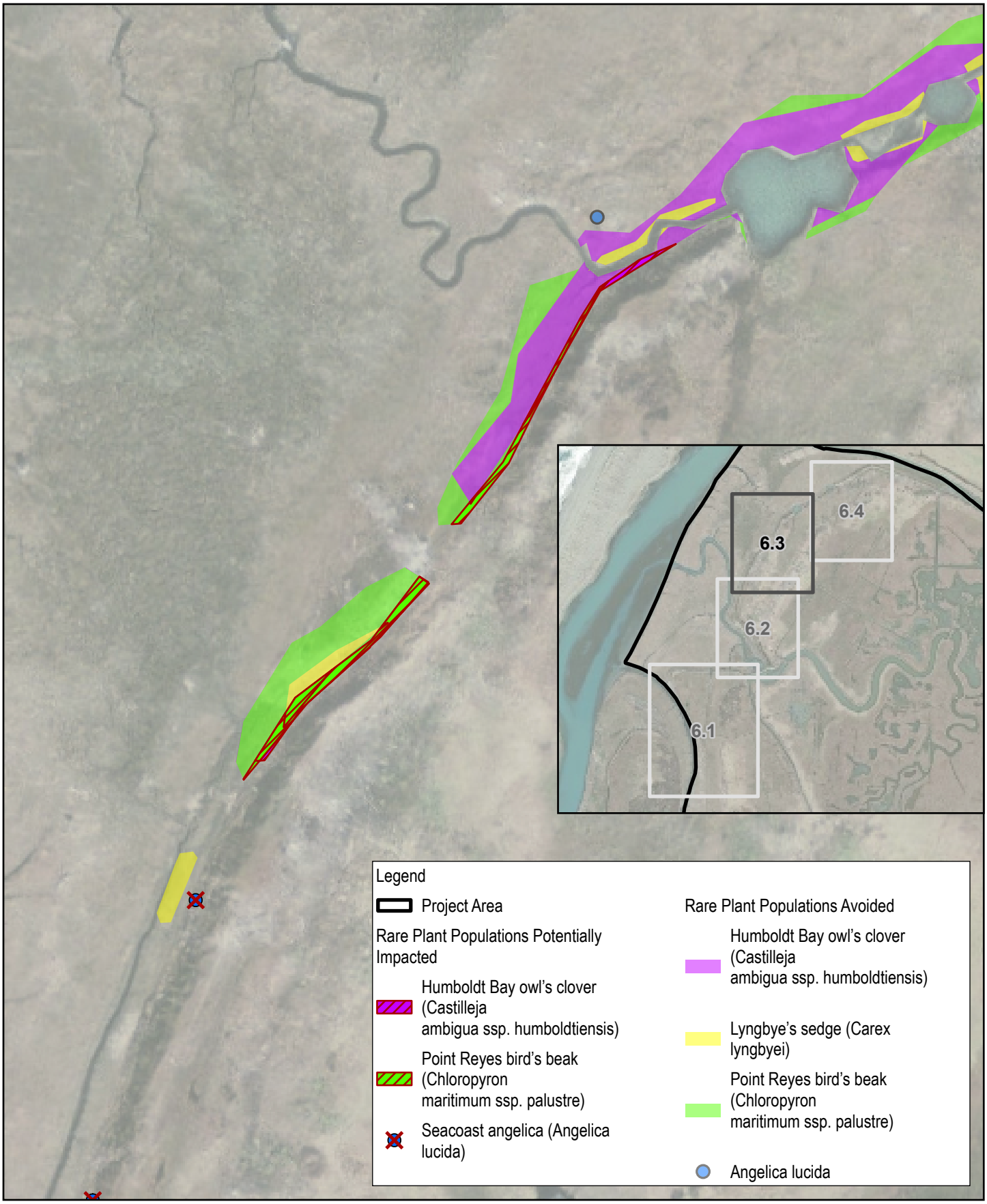

Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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GHD

CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **04 May 2023**

Rare Plant Impacts

FIGURE 11.3

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_006_RarePlantImpacts_MB_RevD
Print date: 04 May 2023 - 11:58

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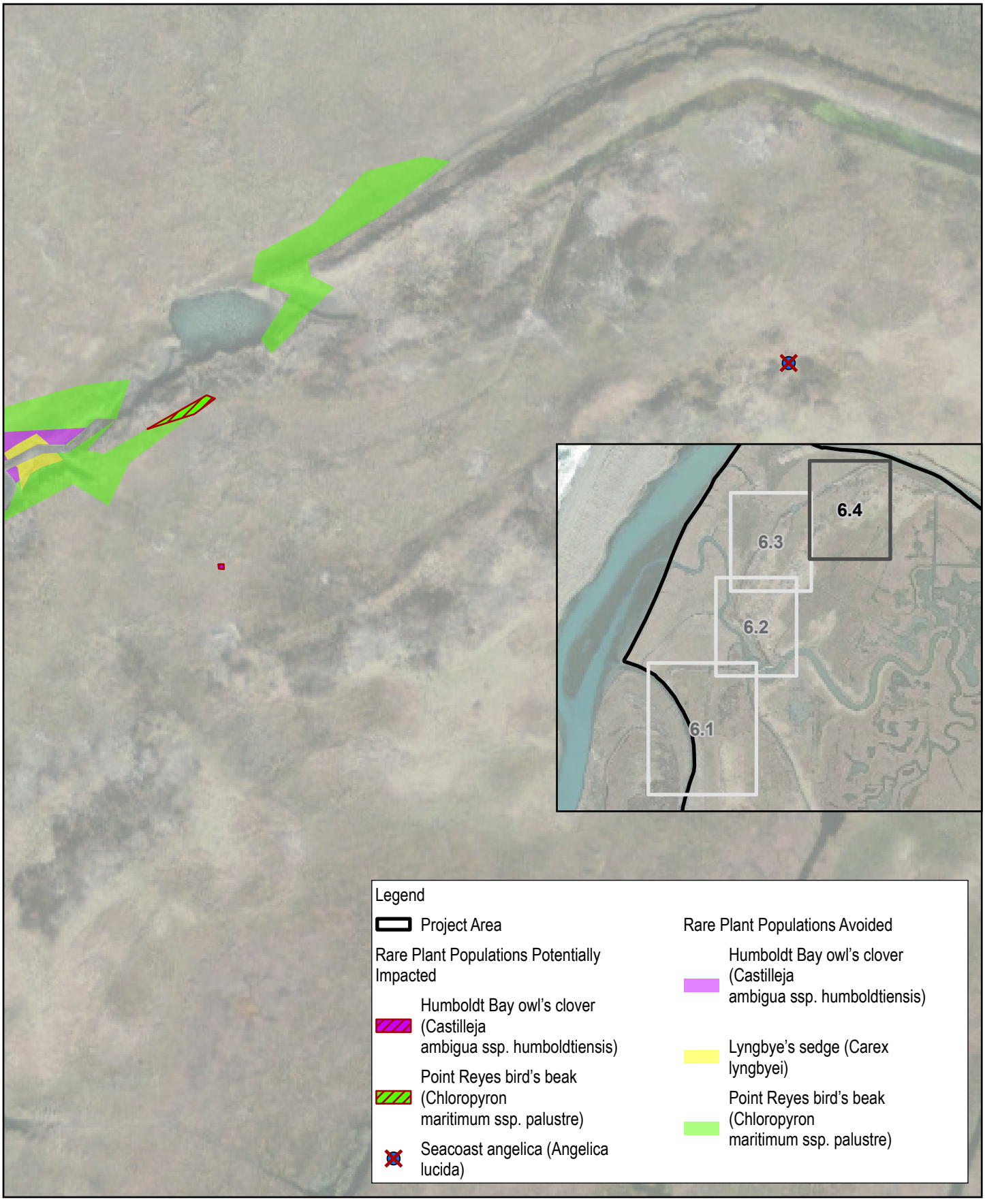
World Imagery: Maxar. Created by: jlopez4



Paper Size ANSI A

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Feet

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

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CalTrout
Cannibal Island Restoration Project

Project No. **11206383**
Revision No. **-**
Date **04 May 2023**

Rare Plant Impacts

FIGURE 11.4

N:\US\Eureka\Projects\561\11206383\GIS\Maps\Deliverables\11206383_HabitatConversionMemo.aprx - 11206383_006_RarePlantImpacts_MB_RevD
Print date: 04 May 2023 - 11:58

Data source: APE, June 2, 2022, GHD; Rare Plants GHD, May 2020 grouped March 24, 2023; LOD, GHD, Mar 24, 2023; World Imagery: Maxar, Microsoft
World Imagery: Maxar. Created by: jlopez4