ELKHORN SLOUGH TIDAL MARSH RESTORATION PROJECT – PHASE III

Request for Incidental Harassment Authorization

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SECTION 1
Description of Specified Activity

1.1 Overview

The Elkhorn Slough Tidal Marsh Restoration Project (project), proposed to be completed in three phases, would restore approximately 122 acres of tidal salt marsh, in Monterey County, California (Figure 1). Phase I of the project, which was completed in late 2018, restored 61 acres of tidal marsh adjacent to Elkhorn Slough. An Incidental Harassment Authorization (IHA) for Level B harassment of Pacific harbor seals (*Phoca vitulina richardii*) during Phase I construction was issued by the National Marine Fisheries Service (NOAA Fisheries) in March 2017.[1] Phase II of the project, which is anticipated to be complete by September 2021, will restore an additional 29.4 acres of tidal marsh at the Minhoto-Hester Restoration Area adjacent to the Phase I restoration area (Figure 2). An IHA for Level B harassment of harbor seals during Phase II construction was issued by NOAA Fisheries in March 2020. The Phase II IHA was renewed on July 1, 2021 to cover an additional 60 days of construction work prior to May 31, 2022. This IHA request addresses Phase III of the project, which would restore 28.6 acres of tidal marsh at the Seal Bend Restoration Area, which is located adjacent to Elkhorn Slough and west of the Phase I and Phase II restoration areas (Figure 3).

1.2 Background

The Elkhorn Slough estuary is one of the largest estuaries in California and contains the State's largest salt marshes south of San Francisco Bay. The slough provides important habitat for an exceptionally broad range of resident and migratory birds, fish, and other wildlife, and plays a crucial role in the local estuarine and nearshore food web. The Elkhorn Slough watershed encompasses approximately 45,000 acres.

The slough system has historically faced substantial tidal wetland loss related to prior diking and marsh draining and is presently facing unprecedented rates of marsh degradation. Over the past 150 years, human activities have altered the tidal, freshwater, and sediment processes which are essential to support and sustain Elkhorn Slough's estuarine habitats. Fifty percent of the tidal salt marsh in Elkhorn Slough has been lost in the past 150 years. This habitat loss is primarily a result of two historic land use changes: (1) construction of a harbor at the mouth of the slough and the

[1] The U.S. Fish and Wildlife Service (USFWS) issued an IHA for Level B harassment of southern sea otter (*Enhydra lutris nereis*) during Phase I construction work in 2017 (IHA-2017-01). USFWS determined that an IHA will not be required for Phase II or Phase III of the project due to the very low level of impact to otters from Phase I, the continued lack of proposed vibratory driving, and CDFW's commitment to implement the same avoidance, minimization and monitoring requirements as in Phase I (Carswell pers. comm. 2019).

related diversion of the Salinas River, which lead to increased tidal flooding (and subsequent drowning of vegetation); and (2) past diking and draining of the marsh for use as pasture land. The act of draining wetlands led to sediment compaction and land subsidence from 1 to 6 feet. Decades later, the dikes began to fail, reintroducing tidal waters to the reclaimed wetlands. Rather than converting back to salt marsh, the areas converted to poor quality, high elevation intertidal mudflat, as the lowered landscape was inundated too frequently to support tidal marsh, and insufficient sediment supply was available in the tidal waters to rebuild elevation. The loss of riverine sediment inputs, continued subsidence of marsh areas, sea level rise, increased salinity, and increased nutrient inputs may also contribute to marsh loss (Watson et al. 2011). Bank and channel erosion in Elkhorn Slough are also leading to deepening and widening tidal creeks, causing salt marshes to collapse into the channel, and eroding sediments that provide important habitat and support estuarine food webs.

In 2004, the Elkhorn Slough National Estuarine Research Reserve (ESNERR) initiated a planning effort, the Tidal Wetland Project, to evaluate marsh dieback and tidal erosion in and adjacent to Elkhorn Slough and to develop restoration and management strategies. Experts from multiple disciplines agreed that without intervention, excessive erosion would continue widening the tidal channels and that salt marsh would continue to convert to mudflat. If left unabated, continued erosion at present rates could result in a significant loss of habitat function and decrease estuarine biodiversity. Habitat loss is expected to become more severe with accelerating sea level rise. As described more fully in the following subsections, the project proposes restoration to address these issues across a range of impacted tidal marshlands, including a subsided marsh area that now supports substantially less emergent marsh and more mudflat than was historically present.

1.3 Project Location and Land Management

The project is located in the Elkhorn Slough estuary, about 90 miles south of San Francisco and 20 miles north of Monterey in Monterey County, California (Figure 1). The Seal Bend Restoration Area includes about 28.6 acres of historic farmland adjacent to Elkhorn Slough and west of the Phase I and II restoration areas (Figure 2). The restoration area currently consists of subsided pickleweed (*Salicornia*) marsh, intertidal mudflats, tidal channels and remnant levees, including a perimeter levee that is showing severe signs of erosion. Regional access to the site is provided by U.S. Highway 101 (U.S. 101), State Route 1 (SR 1), State Route 156 (SR 156), and State Route 183 (SR 183). Local access is provided by Dolan Road and Via Tanques Road, as well as onsite farm roads.

The project is located within the Elkhorn Slough Ecological Reserve which is owned and managed by the California Department of Fish and Wildlife (CDFW) as fish and wildlife habitat. As part of the designated ESNERR, administrative and research funding is provided by the National Oceanic and Atmospheric Administration (NOAA) to CDFW through the Elkhorn Slough Foundation (ESF). The ESF is an accredited land trust that owns and manages easements on over 3,500 acres of land in the Elkhorn Slough watershed.

1.4 Project Goals and Objectives

The project's goals and objectives were developed by ESNERR staff and are listed below:

Goal 1: Increase the extent of tidal marsh in Elkhorn Slough

***Objective 1.1*:** Restore salt marsh ecosystem of historically diked and drained areas through adding sediment.

Goal 2: Reduce tidal scour in Elkhorn Slough

***Objective 2.1*:** Add sediment to historically diked and drained areas, thereby decreasing the tidal prism.

Goal 3: Protect and improve surface water quality in Elkhorn Slough

***Objective 3.1*:** Establish a permanent vegetated buffer to absorb upland sediment and contaminants.

Goal 4: Provide resilience to climate change to estuarine ecosystems in Elkhorn Slough

***Objective 4.1*:** Increase the extent of tidal marsh from one to two feet to be resilient to moderate sea level rise.

Goal 5: Increase understanding of how best to restore salt marsh

***Objective 5.1*:** Conduct a well-designed and monitored project so that lessons learned can inform future salt marsh restoration projects in the estuary.

1.5 Project Description

The Phase III project would restore 28.6 acres of tidal marsh habitat in four subareas (S1-S4) at the Seal Bend Restoration Area. As described below, project components to restore hydrologic function to the project area would include raising the subsided marsh plain, maintaining or re-excavating existing tidal channels, and restoring marsh plain, ecotone, and native grassland habitat within a borrow / upland buffer area.

Once complete, the project would improve marsh sustainability to sea level rise by increasing the elevation of the marsh plain and facilitating the accretion of organic material on the marsh plain after vegetation reestablishes. The project would also reduce the tidal prism in Elkhorn Slough, which would reduce the potential for ongoing tidal scour and associated marsh loss.

1.5.1 Restored Marsh Plain

Subsided former marsh plain (currently mostly too low to sustain vegetation) would be raised to an average height of 1.9 feet to allow emergent wetland vegetation to naturally reestablish and persist. This target elevation is based on vegetation-elevation data collected for the project (ESA 2013) and is the elevation anticipated to support a healthy growth of perennial pickleweed as well as a diverse high marsh community. Soil to raise the marsh plain would be obtained from a 38-acre upland borrow area adjacent to the Phase I and Phase II restoration areas (Figure 2; see Section 1.5.3 below). Sediment would be placed to a fill elevation slightly higher than the target

marsh plain elevation (i.e., 2.4 feet) to allow for settlement and consolidation of the underlying soils. In total, up to 133,346 cubic yards (CY) of soil from the upland borrow area would be placed at the Phase III restoration area to achieve the target marsh plain elevation (Table 1).

TABLE 1
VOLUME OF FILL REQUIRED BY SUBAREA

Subarea	Area (acres)	Fill Area (acres)	Estimated Fill Volume (CY)[1]
Sub-area S1	4.8	4.5	32,982
Sub-area S2	8.6	6.4	36,827
Sub-area S3	4.1	3.0	19,021
Sub-area S4	11.1	8.8	44,516
Total Phase III	**28.6**	**22.7**	**133,346**

[1] Volumes are mid-range estimates; actual volumes may be higher or lower.

The project would rely primarily on natural vegetation recruitment in the restored marsh areas after construction is complete.

1.5.2 Tidal Channels

Remnant historic channels onsite would generally be left in place or filled and re-excavated in the same place. As needed for marsh access, smaller channels may be filled. Avoidance of channel fill, temporary and permanent, is preferred. As much of the existing tidal channel network would be maintained as is feasible, and the post-project channel alignments would be similar to those under existing conditions. The density of channels (length of channel per acre of marsh) after restoration would be comparable to the density in natural reference marshes.

Low levees (less than 0.5 feet above the marsh plain) composed of fill material would be constructed along the larger channels to simulate natural channel levees. Fill would be placed as close to the edge of the channel as possible to simulate the form and function of a natural channel bank.

Borrow ditches that date from the times of historical wetland reclamation would be blocked or filled completely if fill is available after raising the marsh plain. Blocking borrow ditches would route more flow through the natural channels and slightly increase hydraulic resistance, which may achieve benefits from reducing tidal prism and associated scour in Elkhorn Slough marshes.

1.5.3 Marsh, Ecotone and Grasslands in the Buffer Area

As noted above, fill material to raise marsh plain elevations would be obtained from a 38-acre upland borrow area upland borrow area south of the Minhoto-Hester Restoration Area, portions of which were utilized to implement the Phase I and Phase II projects (Figure 2). Once complete, the slopes of the borrow area would be graded to increase marsh area and create a gently sloping ecotone band along the edge of the Phase I and II sites.

1.6 Construction Methodology

1.6.1 Construction Timing and Duration

Construction of the Phase III project would start in September 2021, pending receipt of an IHA from NOAA Fisheries. Construction is anticipated to take up to 12 months to complete.

1.6.2 Access Routes

Construction crews and equipment would access the restoration area from Dolan Road via existing dirt farm roads located alongside the existing agricultural fields (Figure 3). Access within the restoration area would be dispersed and facilitated with low-ground pressure construction equipment.

1.6.3 Construction Equipment

Construction equipment would include haul trucks and heavy earthmoving equipment, such as dozers, backhoes, loaders, and excavators, to transport dry material out onto the marsh. Where possible and appropriate, low-ground pressure equipment would be used to access the marsh.

Heavy equipment may operate up from sunrise to sunset, typically five days a week. Construction noise would be typical of heavy equipment and limited to in-air sounds. No pile driving, non-explosive impulsive [e.g., seismic air guns], or intermittent [e.g., scientific sonar] noise sources would be utilized.

Table 2 summarizes noise levels for representative construction equipment that may be used during Phase III restoration work. Typical noise levels are summarized from the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM), as described in the Construction Noise Handbook. Noise levels are expressed as L_{max}, or the maximum sound level during a measurement period or noise event, at 50 feet. The loudest equipment likely to be used on site would be a bulldozer with an actual measured L_{max} of 82 dBA.

TABLE 2
CONSTRUCTION EQUIPMENT NOISE LEVEL AT 50 FEET

Equipment Type	Actual Measured L_{max} (dBA)
Backhoe	78
Dozer	82
Dump Truck	76
Excavator	81
Source: FHWA 2006	

1.6.4 Working and Staging Areas

Equipment and construction personnel would be staged along existing roads and levees, or in the upland borrow area south of the Phase II Minhoto-Hester Restoration Area.

1.6.5 Construction Approach

Construction sequencing would begin with water management and/or turbidity control measures installed around the work area prior to placing material on the marsh (discussed more fully in the subsections below). After fill placement on the marsh, any temporary features, such as water management berms, would be removed. The following sections describe each of these steps.

1.6.5.1 Water Control and Turbidity Management

Work areas on the remnant marsh plain would for the most part be isolated from the tides and dewatered to allow construction in non-tidal conditions. Water control structures such as temporary berms would be utilized to isolate the fill placement area during the construction period. Existing berms would be used, where possible. Tidal channels into such areas would be blocked. The isolated work areas would be drained using a combination of gravity and pumps. Water levels within the blocked areas would be managed to keep them mostly free of water and to allow fill placement at all stages of the tides. To reduce the potential for fish to become entrained in isolated ponded areas, blocking of tidal channels would occur at low tide. When sediment placement is complete, the berms would be lowered to the target marsh elevation, reintroducing tidal inundation. Any blocked tidal channels would be re-excavated.

1.6.5.2 Material Placement

Once water control and/or turbidity measures are in place, sediment would be transported from the upland borrow area to the restoration area using earthmoving equipment. All heavy equipment used to transport dry material out onto the marsh would be low ground pressure to prevent sinking in the mud. Mats would be temporarily placed on the marsh, as needed, to spread the weight of the equipment. At the end of construction in each cell/stage, any elevated haul roads and/or berms constructed to aid in material placement would be excavated to design grades, with the resulting earth used to fill adjacent restoration areas.

1.6.5.3 Tidal Channels

To limit trip distances onto the marsh and to facilitate access across tidal channels within the marsh, the project would construct temporary tidal channel crossings and/or temporarily fill existing tidal channels; these channels would be re-excavated after marsh plain restoration is complete. If re-excavation of smaller channels proves infeasible, these channels may be permanently filled, the resulting channel extent consisting of the larger channels only. In all cases, the resulting channel extent would be sufficient to provide drainage and tidal exchange to support natural marsh functions.

The number and locations of channel crossings would depend on the tradeoff between haul distances and the ease of installing and removing the crossings. Where tidal channels were maintained in place, turbidity control measures (i.e., best management practices [BMP], such as hay bales or weed free straw wattles) could be staked down in or adjacent to the channels to be preserved. Bulldozers would push fill up to the hay bales and wattles, but not into the channels. Channel crossings and BMPs would be removed at project completion.

1.7 Activities that May Result in Take

Project activities that have the potential to result in take of harbor seals include construction activities within 300 meters of tidal waters, where seals may transit or otherwise haul out. Specifically, construction equipment may generate noise or create a visual disturbance as they move to and within the restoration area. Similarly, marine mammal monitors may create a visual disturbance as they conduct monitoring activities.

Project activities that would not have the potential to result in take of harbor seals include operation of heavy equipment more than 300 meters from tidal waters, including along portions of project haul routes and/or within portions of the borrow area (Figure 4).

SECTION 2

Dates, Duration, and Specified Geographic Region

2.1 Dates and Duration

It is anticipated that construction would begin in September 2021, after receipt of an IHA from NOAA Fisheries. Construction would last for up to 12 months, and may be continuous depending on weather and site conditions. The construction period assumes that the construction contractors would work from sunrise to sunset, Monday through Friday.

Given the proximity of the Seal Bend Restoration Area to Elkhorn Slough, it is assumed that take of harbor seals could occur anytime heavy equipment is operating at the restoration site (i.e., the entire site is within 300 meters of tidal waters); when soil is being borrowed from the northern portions of the upland borrow area (i.e., where portions of the borrow area are within 300 meters of tidal waters); and along portions of the haul route (i.e., where heavy equipment would transit within 300 meters of tidal waters). Over a 12 month construction period, this would conservatively represent up to 240 days of work.

2.1.1 Extended Construction Duration

The Phase II IHA originally issued in March 2020 covered restoration work at both the Minhoto-Hester Restoration Area (Phase II project) and the Seal Bend Restoration Area (Phase III project). That IHA described 180 days of total construction at both sites over an 11 month work period, based on preliminary estimates provided by the project engineer and construction contractor. Ultimately, that preliminary estimate did not adequately account for variable weather conditions experienced during construction (wet weather and soils required extensive reworking of fill); the amount of time to haul material from the borrow area to the fill location; or contractor availability (a smaller construction crew than originally anticipated was assigned to the project). As a result, the Phase II renewal process was utilized to cover completion of work at the Minhoto-Hester Restoration Area within the originally authorized 180 day construction period. Work at the Seal Bend Restoration Area, which would occur after that 180 day construction period, is considered in this separate IHA review process.

The Phase III construction duration – 12 month construction period and up to 240 days of work – accounts for similar, anticipated construction constraints at the Seal Bend Restoration Area including likely wet winter weather, the distance between the borrow area and restoration site, and limited contractor availability.

2.2 Geographic Setting and Land Use History

The information contained in this section is from the Final Elkhorn Slough Tidal Marsh Restoration Project Existing Conditions Report (ESA 2014). The biotic conditions were assessed by H.T. Harvey & Associates via a review of existing information, supplemented with a reconnaissance-level survey of the project vicinity conducted in January 2013.

The geographic setting and land use history within Elkhorn Slough and the larger Pajaro-Elkhorn-Salinas basin are primary drivers of both physical conditions and biological communities within and adjacent to the project site. This section describes both regional and site-scale geography and land use history.

2.2.1 Elkhorn Slough

The Elkhorn Slough system is a network of intertidal marshes, mudflats, and subtidal channels located at the center of the Monterey Bay shoreline. Like many estuarine systems along the Central Coast, tidal marshes in the slough only contain high marsh pickleweed vegetation communities, not the low marsh cordgrass (*Spartina*) communities found in other tidal marsh systems such as those in San Francisco Bay. The Slough has a complex geologic and human history that is explained in detail by a number of documents published by ESNERR scientists and others (Van Dyke and Wasson 2005; PWA et al. 2008; Watson et al. 2011; and many more). Prior to European colonization, the system contained broad expanses of tidal marsh, fresh-brackish marsh, and related habitats throughout Elkhorn, Parsons, Moro Cojo, Bennett, and Tembladero Sloughs. Major anthropogenic modifications to the Slough commenced in the late 1800s with the diking and draining of marshes in Moro Cojo and Tembladero Sloughs. Around the same time, the Union Pacific Railroad was constructed along the Slough's eastern edge. In the early 1900s, large portions of tidal wetlands within Elkhorn and Parsons Slough were reclaimed for agriculture, duck hunting, and other uses, and the Salinas and Pajaro Rivers were diverted from the slough. These activities significantly decreased both fluvial flows and tidal prisms within the Elkhorn Slough system, leading to increased shoaling and periodic closure of the slough mouth near Moss Landing (Woolfolk pers. comm. *in* ESA 2014). The diversion of the Salinas and Pajaro Rivers also eliminated a likely significant source of sediment from the Slough (Watson et al. 2011). The construction of Moss Landing Harbor in 1946-1947, and associated channel deepening, dramatically altered the hydrodynamics in Elkhorn Slough by permanently opening the system to the full range of the tides. The increased tidal range resulted in the increased inundation of the Slough's remaining salt marsh habitats, which has been compounded by shallow subsidence, a sediment deficit, and sea level rise (Callaway et al. 2012). Overall, human activities have led to the loss and/or degradation of over 2/3 of the former marsh habitats in Elkhorn Slough, severely impacting the Slough's ecosystem (Van Dyke and Wasson 2005).

Existing habitats within the estuarine portion of the Slough include areas of open water, mudflats, salt flats, diked marsh, and tidal marsh. Many of the tidal marshes in lower Elkhorn Slough and Parsons Slough are in various stages of degradation from the recent history of human activities described above.

2.2.2 Seal Bend Restoration Area

The Seal Bend Restoration Area (28.6 acres) is located on Elkhorn Slough, west of the Phase I and II restoration areas, as well as the upland borrow area (Figures 2 and 3). It is a low-lying area consisting of low-quality subsided pickleweed marsh, intertidal mudflats, tidal channels, and remnant levees. The area has been divided by multiple cross-levees and includes the heavily eroded remnants of a perimeter levee along its outboard (Elkhorn Slough) side. A large borrow channel is located adjacent to the interior of the perimeter levee. Dendritic channel networks drain the area; many of these channels exhibit evidence of historic dredging, straightening, and/or rerouting.

2.2.3 Upland Borrow Area

The borrow area is located south of the Phase II Minhoto-Hester Restoration Area on gently sloping uplands adjacent to the historic tidal marsh (Figure 2). Historically, this area was used to grow crops such as strawberries and artichokes as well as bulb/flower production (Woolfolk, pers. comm. *in* ESA 2014). Since 2012, the area has been kept fallow; it has been mowed and disked annually and at times been planted with sterile annual barley or triticale to prevent erosion of sediment into the Slough. A portion of this upland area was used to as a stockpile storage and upland borrow site for Phase I and II restoration work.

2.3 Habitats in the Project Area

The following provides a description of the habitat types that occur in the project area. Habitat types were developed using a combination of described habitats and vegetation alliances as per Holland (1986), Sawyer et al. (2009), and Kutcher (2008). The habitat types are based upon hydrology, land use, and vegetation, and are consistent with those previously described for Elkhorn Slough (Zimmerman and Caffrey 2002; ESTWPT 2007). The four habitat types found within the project area are subtidal, intertidal mudflat, intertidal salt marsh, and formerly cultivated field/ ruderal grassland.

2.3.1 Subtidal/Aquatic

Subtidal channels connect to the main channel of Elkhorn Slough and provide tidal exchange to intertidal mudflats and intertidal salt marsh at the site. Subtidal channel habitats occur below the elevation of the low tidemark or mean lower low water (MLLW) where the substrate is continuously submerged. Tidal creeks form networks that serve an important function of water conveyance and drainage onto and off mudflat and marsh surfaces as well as the transfer of sediment and nutrients between marshes and the main estuarine channel (ESTWPT 2007). The corresponding National Estuarine Research Reserve System (NERRS) classification for the subtidal/aquatic habitat type is Estuarine Subtidal Haline Unconsolidated Bottom Mud.

Elkhorn Slough channel habitats have substrates largely composed of material such as organic matter, mud, sand, and gravel. The fine-grained materials are often cohesive, as a result of unconsolidated material eroding away over several decades. Channel depth averages about

9.8 feet (ESTWPT 2007). Water temperatures range from 10 to 22°C, with an average temperature of approximately 13.5°C (MBARI LOBO data).

Recent water quality assessments indicate that channels in the estuary overall are moderately eutrophic, indicating excessive nutrient enrichment (Johnson 2010; Hughes et al. 2011). Elkhorn Slough is surrounded by intensely cultivated/chemically fertilized farmlands and the estuary receives substantial agricultural run-off. Nitrate concentrations in the estuary often exceed values found in the nutrient-rich waters of Monterey Bay by nearly 20-fold (Johnson 2010). Dissolved oxygen concentrations fluctuate much more widely in Elkhorn Slough than in most other estuaries, likely attributable to the high rates of primary productivity induced by external inputs of nitrogen, the physical configuration of the slough, and the general lack of non-tidal water input. Degraded water quality is strongly affecting environmental conditions for organisms dwelling in subtidal habitats in Elkhorn Slough (Wasson et al. 2012).

Many of the slough channels in the project area have a natural, sinuous form, however there are also numerous linear human-constructed channels (e.g., borrow ditches). The constructed channels reduce slough channel topographic complexity relative to the natural marsh condition and thereby likely reduce plant and animal community diversity.

Subtidal macroalgal species in Elkhorn Slough include *Ulva lactuca*, *U. expansa*, and *U. lobata*. Floating macroalgal mats occur in the water column, dominated primarily by *U. intestinalis*, but also include *Rhizoclonium riparium* and *Chaetomorpha* sp.

2.3.2 Intertidal Mudflat/Aquatic

Intertidal mudflats occur between channel and marsh habitats, typically between the elevations of MLLW and Mean High Water (MHW). Mudflats are generally inundated during high tide and exposed during low tide. While mudflats serve an important function in estuarine chemical cycles (ESTWPT 2007), it is not clear that mudflats in the project area (caused by historic diking and draining of salt marsh), serve those same functions. The corresponding NERRS classification for the intertidal mudflat/aquatic habitat type is Estuarine Intertidal Haline Unconsolidated Shore Mud.

The mudflats in the project area are devoid of salt marsh vegetation but do support diatoms and macroalgae. Peak months of macroalgal productivity are in the summer, when blooms can completely cover intertidal mudflats in Elkhorn Slough. Dense macroalgal blooms are an indicator of high nutrient loading and eutrophication, which can facilitate microbial decomposition causing hypoxic and anoxic conditions and lead to an overall loss in biodiversity. Macroalgal species documented on intertidal mudflats in Elkhorn Slough include *U. lactuca, U. intestinalis, R. riparium, Chaetomorpha* sp., and *Gracilariopsis andersonii* (Hughes et al. 2010).

Because the mudflats within the project area are much higher than natural mudflats, they are devoid of large benthic invertebrates such as large clams and worms that typical characterize healthy mudflats in Elkhorn Slough.

2.3.3 Intertidal Salt Marsh

Intertidal salt marsh occurs from approximately +4 feet North American Vertical Datum of 1988 (NAVD88) (~1 feet below MHW) to approximately +7 feet NAVD 88 (~1.3 feet above Mean Higher High Water [MHHW]). Intertidal salt marshes in Elkhorn Slough are highly saline. The corresponding NERRS classification for the intertidal salt marsh habitat type is Estuarine Intertidal Haline Emergent Wetland Persistent.

Vegetation in intertidal salt marsh is dominated by a single native species, perennial pickleweed (*Salicornia pacifica*), as is characteristic of high elevation intertidal salt marshes in the region. Both the percent cover and the height of pickleweed are generally lower at lower elevations of the project area where the marsh transitions to mudflat. The diversity of the native plant community increases at slightly higher elevations, as on remnant interior berms, and at the upper marsh edge where a few other native species are found occurring with pickleweed; these include saltgrass (*Distichlis spicata*), marsh jaumea (*Jaumea carnosa*), alkali heath (*Frankenia salina*), and coast gumplant (*Grindelia stricta*).

2.3.4 Formerly Cultivated Field/Ruderal Grassland

The upland borrow area is comprised of a formerly cultivated field (fallowed since 2009). Soils are described as fine sandy loam; moderately deep soils that formed in material weathered from soft sandstone (NRCS 2013). The corresponding NERRS classification for the cultivated field/ruderal grassland habitat type is Upland Inland Herbaceous Upland Grassland.

After it was removed from cultivation, the upland borrow area was seeded annually with sterile annual barley (*Hordeum vulgare*) as an erosion protection measure, and weeds controlled as needed by disking (Woolfolk pers. comm. 2013 *in* ESA 2014). In 2018, 5 acres adjacent to the borrow area were planted in native plants and grasses and an additional 12 acres were planted in a cover crop. The rest of the site was seeded in sterile Merced rye. Portions of the remaining 12 acres are currently being used as borrow sites for the Phase II restoration project.

In a few areas, there is a narrow fringe of ruderal grassland species including poison hemlock (*Conium maculatum*), annual grasses, and mallow (*Malva* sp.), as commonly occurs adjacent to agricultural lands in the Elkhorn Slough watershed (Wasson and Woolfolk 2011; Woolfolk pers. comm. 2013 *in* ESA 2014). Native shrub coyote brush (*Baccharis pilularis*) and a single small coast live oak tree (*Quercus agrifolia*) occur within the ruderal grassland margin.

Because the field has been tilled regularly, small mammals are likely present in low numbers; however, California ground squirrel (*Otospermophilus beecheyi*) burrows are present in the field.

2.4 Ambient Noise Conditions

Ambient noise monitoring has not been conducted for the project. However, noise levels were monitored at the adjacent Parson's Slough during construction of a restoration project in that area in 2010 and 2011. Background noise at that site was approximately 57dBC $L_{max.}$ as measured at

20 and 40 meters northeast of the pile installation site and approximately 1.5 meters above the ground (ESNERR 2011). Ambient noise levels in the project area are likely similar to those at the Parson's Slough site, if not lower due to the additional distance between the project area and the Union Pacific Railroad tracks. Approximately 15 to 20 trains pass along the Union Pacific Railroad tracks each day (Vinnedge Environmental Consulting 2010a), which is located within 400 feet of the eastern-most portion of the Phase I restoration area but over 2500 feet from the Phase III restoration area. Noise levels from trains were monitored during construction of the Parson's Slough Project and estimated at 108 dBC $L_{max.}$ Other proximate sources of ambient noise include the Pick-n-Pull, a vehicle dismantling yard and recycling yard that is located southeast of the Phase I project area, and agricultural equipment that travel across adjacent agricultural lands and along nearby levees.

SECTION 3
Species and Numbers of Marine Mammals

One species of marine mammal under NOAA Fisheries jurisdiction, Pacific harbor seal, may be impacted by implementation of the project.

3.1 Harbor Seal

Harbor seals use Elkhorn Slough for hauling out, resting, socializing, foraging, molting and reproduction. Counts of harbor seals in the greater Elkhorn Slough began in 1975 and at that time averaged about 30 seals per day (Harvey et al. 1995; Oxman 1995). Counts conducted by Osborn (1985) in 1984 averaged 35, and during 1991, maximum counts reported by Oxman (1995) were five times greater. Oxman also reported a 20 percent increase between 1990 and 1991, from 150 to 180 seals. Average counts remained comparable from 1994 through 1997, with peaks coinciding with pupping and molting seasons. A count of 339 seals was reported in 1997 (Jones 2002; Richman 1997). The population in the Slough is estimated at 300 to 500, but numbers can vary seasonally based on prey availability, molting and reproduction (McCarthy 2010). Harbor seal count data as reported are collected from a variety of sources using various methodology. Data sources include former graduate student research, occasional counts by Jim Harvey et al. at Moss Landing Marine Labs, and ESNERR staff observations, including monitoring data collected by the Reserve Otter Monitoring Project.

Harbor seals have utilized Elkhorn Slough as a resting site since the 1970s, but the first births of pups were not recorded until 1991 (Maldini et al. 2010). From 1995 through 1997, there was a significant annual increase in pups, from 14 in 1995 to 29 in 1997 (Richman 1997). Marine mammal research scientists speculate that this increase was due to removal of public restrooms from the Seal Bend area in the early 1990s (Maldini pers. comm. *in* Vinnedge Environmental Consulting 2010b). The pupping/breeding season in Elkhorn Slough peaks in April/May (Harvey pers. comm. 2019).

Females that remain in Elkhorn Slough during the pupping/breeding season seek quiet isolated locations to rest and nurse away from main haul out areas; Parsons Slough is considered a preferred resting area for mothers and pups (Harvey pers. comm. 2019). At its closest, Parsons Slough is over 2,000 feet east of the eastern edge of the upland borrow area, and 4,500 feet away from the Seal Bend Restoration Area. Seals that depart Elkhorn Slough during the pupping/breeding season likely head 25 kilometers south to Cypress Point, Carmel, or 60 kilometers north to Año Nuevo to pup and breed (Osborn 1992, Oxman 1995). No births have been noted in any of the areas targeted for restoration under the larger project.

Table 3 summarizes the status of the California stock of harbor seals as of 2019.

TABLE 3
PACIFIC HARBOR SEAL – CALIFORNIA STOCK ASSESSMENT (2019)

Common Name	Stock	ESA/MMPA Status	Known Spatially / Temporally Important Areas	Stock Abundance[1]	PBR	Annual M/SI	Stock Status Factors
Pacific Harbor Seal	California	None / Non-Strategic Stock	None identified	30,968	1,641	43	Commercial fishery mortality

Source: Carretta et. al. 2020

[1] CV=n/a, Nmin = 27,348, most recent abundance survey = 2012

SECTION 4
Affected Species Status and Distribution

4.1 Harbor Seal

The harbor seal is one of 33 species of phocids found throughout the world. It is one of the most widely distributed pinnipeds, occurring along temperate, sub-Arctic and Arctic coasts of the Pacific and Atlantic in the northern hemisphere (Trumble 1995). They usually inhabit nearshore waters, and are commonly found in rivers and estuaries (Oxman 1995). Harbor seals haul out onto beaches, rocks and other substrates to rest, whelp and molt (Hanan 1996). They haul out more often and for longer periods in summer, when they are molting, than in autumn and winter (Stewart and Yochem 1994). They are central place foragers, tend to exhibit strong site fidelity within-season and across years, generally forage close to haul-out sites, and may repeatedly visit specific foraging areas (Grigg et al. 2012). In the Eastern Pacific, breeding populations range from San Quintin Bay, Baja California to Nome, Alaska (Gunvalson 2011).

Historically, management and conservation of pinnipeds was difficult due to heavy exploitation. Harbor seals in California were commercially hunted until 1938, and between 1938 and 1972 sport and commercial fisherman would harass and kill harbor seals that interfered with fishing operations (Trumble 1995). Since the passage of the Marine Mammal Protection Act in 1972 (MMPA), the U.S. coastal population has been increasing by 5 to 7 percent per year. They are now common in their range with a total population of approximately 400,000-500,000 and California coastal estimates of around 30,968 (Carretta et. al. 2020).

4.1.1 Status in Elkhorn Slough

Harbor seals inhabit Elkhorn Slough year-round and occur individually or in groups. They usually occupy areas just beyond the mouth of the Slough in the Moss Landing harbor, in the Salinas River channel south of the Moss Landing bridge, and the lower portion of the Slough extending up to Parsons Slough and Rubis Creek. As stated in Section 3.1, the seal population in Elkhorn Slough is estimated to be between 300 and 500 individuals, but numbers can vary. Figure 4 depicts existing haul out areas used by harbor seals proximate to the project area.

Harbor seals mainly use the Slough as a staging area for foraging in Monterey Bay, but there is also a limited amount of foraging in the Slough (McCarthy 2010). They typically use the corridor from the mouth of Slough through the Moss Landing Harbor entrance for nightly feeding in the Bay. In a harbor seal diet study conducted in Elkhorn Slough between 1995 and 1997, diets included 35 species including topsmelt, white croaker, spotted cusk-eel, night smelt, bocaccio,

Pacific herring, a brachyuran crustacean, and 4 genera of mollusks (Harvey et al. 1995 *in* McCarthy 2010).

Harbor seal abundance may change seasonally depending on prey, abundance, molt, and reproduction (McCarthy 2010). Pupping can occur throughout the year but generally starts in late March peaking in May (McCarthy 2010). During the pupping/breeding season, some seals may depart to other breeding areas outside of Elkhorn Slough. Harbor seals have used Elkhorn Slough for reproduction for the past two decades. Females tend to remove themselves from the group to give birth and return within a week (McCarthy 2010). In 2010, 50 pups were observed in Elkhorn Slough (J. Harvey unpublished data *in* McCarthy 2010).

4.1.2 Project Area Distribution

Data on harbor seal use near the project area is derived from marine mammal monitoring data collected by the Reserve Otter Monitoring Project (ESNERR 2018) and Phase I and II construction monitoring (Fountain et. al. 2019, Fountain pers. comm. 2021).

4.1.2.1 Reserve Otter Monitoring Project – Marine Mammal Monitoring

The Reserve Otter Monitoring Project has been monitoring otter movement and behavior in Elkhorn Slough since 2011. This effort has been a collaboration between ESNERR, Monterey Bay Aquarium, the United States Geologic Survey and University of California Santa Cruz. In January of 2018, the Reserve Otter Monitoring Project added seals to their observations, with biologists conducting weekly monitoring at nine locations along Elkhorn Slough and five locations in Moss Landing Harbor (Figure 5). Seal and otter counts are completed every Tuesday, every half hour on the hour and half hour, from 10am-12pm to provide consistency for a long-term monitoring program. Eight teams are positioned concurrently throughout the estuary using high-powered binoculars and scopes to see otters and seals. Data collected includes weather, observation time, tide, the number and species of marine mammal sited, and the location they were observed. All monitoring is completed by or under the supervision of a qualified biologist previously approved by USFWS and NOAA Fisheries for marine mammal monitoring.

As shown on Figure 5 the “Seal Bend” observation area is most representative of seal use at the Seal Bend Restoration Area. Additional monitoring locations that may support seals that transit or haul out near the proposed Phase III restoration area include “Wildlife” and “Moon Glow”. Other monitoring locations within Elkhorn Slough and generally proximate to the Seal Bend Restoration Area include: “Harbor”, “Hester”, “Main Channel” and “Yampah” (Figure 5).

Figure 6 and Table 4 summarize the average (of five half-hour counts) number of seals observed at seven monitoring locations over a 16-month observation period between January 2018 and April 2019, as well as the maximum number of seals observed at any given location during the same period. The seven monitoring locations include the three most proximate to the Phase III restoration area, as well as the four other locations within Elkhorn Slough. Table 4 also summarizes the highest daily count of seals observed in Elkhorn Slough on a specific day (i.e., 417 seals on June 19, 2018). These data are consistent with previous population estimates by McCarthy (2010), which estimated the population of seals in Elkhorn Slough at 300 to 500, with

seasonal variability based on prey availability, molting and reproduction. These data also illustrate that seals tend to move between areas proximate to each other. For example, when large numbers of seals were observed in Parsons Slough ("Avila") in the summer of 2018, there was a comparable decline in the number of seals observed at Seal Bend (Figure 6).

These data are representative of recent harbor seal use near the project area and are used to inform the approximate number of seals likely to be present near the restoration area for the purposes of estimating take (see Section 6 below).

TABLE 4
HARBOR SEAL COUNTS BY RESERVE OTTER MONITORING PROJECT

Location[1]	Highest Daily Count[2]	Count[3]	
		Maximum	Average
Harbor	88	--	--
Wildlife	59	106	41
Seal Bend	56	86	24
Moonglow	0	87	16
Hester	0	33	5
Main Channel	93	100	30
Yampah	1	81	18
Avila	120	122	32
Total	**417**	**615**	**166**

[1] See Figure 5 for location of observation area. "Harbor" includes incidental counts outside of formal observation areas.
[2] Represents highest count of seals recorded on a single day during hourly counts.
[3] Represents maximum and average number or seals observed during an hourly count at any location between January 2018 and April 2019 by Reserve Otter Monitoring Project. Counts at each location may occur on different days.

4.1.2.2 Phase I Construction Monitoring

Marine mammal monitoring during Phase I project construction recorded marine mammal use near Phase I work areas. The following generally summarizes marine mammal monitoring data collected during the 9-month construction window (December 2017-August 2018). As required by the project IHA for Phase I, marine mammal monitoring was required during all in-water work; during work within 100 feet of tidal waters; and during work north of a specific line demarcating the likely disturbance area. Monitoring of work in other areas was required for at least the first 3 days of construction, and until there were 3 successive days of no observed disturbance. Monitoring was required to resume if there was a significant change in activities or the location of activities, or if there was a gap in construction activities of more than one week. Phase I monitoring included hourly counts of animals hauled out and in the water (starting 30 minutes prior to the start of construction and ending 30 minutes after construction was complete), as well as counts of any construction-related reactions by marine mammals. Refer to the Hester

Marsh Annual Report (Fountain et. al 2019) for additional detail on monitoring protocols and results.

During the 9-month Phase I construction window, marine mammal monitoring was required and implemented (see above) on 89 days (976 hours monitoring). Harbor seal counts recorded by the marine mammal monitors during the daytime (6AM to 6PM) ranged from 0 to 72 in and immediately adjacent to the restoration area, and 0 to 257 individuals in the entire observation area. The average number of seals per hourly count was 8.44 seals/hour in and immediately adjacent to the restoration area and 55.94 seals/hour in the entire observation area (Fountain et al. 2019).

Table 5 summarizes the maximum number of pups observed during hourly counts by month over the duration of Phase I construction. This metric conservatively represents the highest number of pups that were present near work areas during Phase I construction and that could have been disturbed by project-related activities (including monitoring).

TABLE 5
MAXIMUM NUMBER OF PUPS OBSERVED DURING HOURLY COUNTS BY MONTH (PHASE I CONSTRUCTION)

Month	No. Pups
2017	
December	5
2018	
January	6
February	9
March	4
April	7
May	15
June	5
July	9
August	9
Source: Fountain et al. 2019	

4.1.2.3 Phase II Construction Monitoring

Restoration work at the Minhoto-Hester Restoration Area began on August 6, 2020. Between August 2020 and May 2021 (an approximate 9 month period), the construction contractor worked a total of 118 days (Fountain pers. comm. 2021). The IHA for Phase II construction established a 300 meter Level B Harassment Zone of all construction activities, and required a marine mammal monitor be present: (1) every other day when construction activities occurred in water or at the tidal restoration area; or (2) every fifth day when construction activities were near the borrow area, unless the borrow area was more than 300 meters from where marine mammals have been observed.

Marine mammal monitoring was implemented on 85 of the 118 construction days (Fountain pers. comm. 2021). The 85 monitoring days include five days in late August 2020 when work was limited to disking the borrow area. Although the majority of that work was further than 300 meters from tidal waters, CDFW used it as an opportunity to train staff on the monitoring protocol and reporting requirements. All other work in the borrow area that required monitoring coincided with work in the restoration area that also required monitoring. The 85 monitoring days also included all days where site containment work was occurring, rather than every other day as required by the IHA.

Daily harbor seal counts recorded by the marine mammal monitors within the 300 meter Level B Harassment Zone ranged from 0 to 118. The average number of seals per hourly count in the Level B Harassment Zone was 5.87 seals per hour (Fountain pers. comm. 2021).

SECTION 5

Type of Incidental Taking Authorization Requested

The purpose of this document is to address the requirements of the MMPA as it relates to harbor seals in the vicinity of the Phase III project area. Activities addressed in this request include actions that may temporarily result in non-lethal take described as Level B harassment under the MMPA, such as noise or visual disturbance associated with construction equipment or monitoring personnel. As provided in the IHAs for Phase I and II for the project, Level B harassment includes movement and/or flushing of seals as a result of construction activities.

Take authorization for Level A harassment is not requested or anticipated.

SECTION 6

Take Estimates for Marine Mammals

6.1 Harbor Seal Abundance In and Around Project Area

As described in Section 4.1, data collected by the Reserve Otter Monitoring Project is representative of recent harbor seal use near the project area. Figure 6 and Table 4 summarize the average number of seals observed at monitored locations in Elkhorn Slough between January 2018 and April 2019, including the "Seal Bend" monitoring location which is most proximate to the restoration area. The highest daily count of seals observed at the Seal Bend monitoring location during that period was 56 seals; the highest daily count of seals observed throughout Elkhorn Slough on a specific day was 417 seals.

Harbor seal counts recorded by the marine mammal monitors during Phase I construction ranged from 0 to 72 in and immediately adjacent to the restoration area, and 0 to 257 individuals in the entire observation area. Harbor seal counts within the 300 meter Level B Harassment Zone for Phase II construction ranged from 0 to 118 individuals.

With respect to tide height and time of day, monitoring in 2013 indicated the number of seals hauled out in the Minhoto Marsh Complex increased at a 2- to 4-foot range in tide height, and progressively throughout the morning, peaking in the afternoon and declining toward sunset (Beck 2014). These results are consistent with several previous studies (Ainley et al, 1977, Fancher 1979, Allen et al. 1984), including the published results from marine mammal monitoring competed for the Parsons Slough Complex in 2009-2010 (Maldini et. al. 2010) and Phase I of the Elkhorn Slough Restoration Project in 2017-2018 (Fountain et al. 2019). The decline in numbers toward sunset is in line with findings that harbors leave the Slough in the evening to forage in Monterey Bay (Oxman 1995). These patterns may vary if a very low tide opens areas for seals to haul out that aren't typically available, or if a very high tide displaces seals from a preferred site (Fountain pers. comm. 2021).

6.2 Level B Harassment During Phase I and Phase II

6.2.1 Phase I Harbor Seal Disturbance

As described in the annual monitoring report for the Phase 1 project (Fountain et. al. 2019), an average of 75 seals were recorded by marine mammal monitors in the observation area at any given time, and up to 257 individual seals were observed near the Phase I restoration area in a

given day. A total of 36 disturbance incidents, impacting 140 individual seals, were also recorded by monitors over the eight-month Phase I construction window. Specifically:

- Twenty-five (25) disturbance incidents were associated with use or mobilization of construction equipment, which resulted in seals alerting, moving, or flushing. A total of 92 individual seals were impacted by these incidents.
- Five (5) disturbance incidents were associated with marine mammal monitoring – e.g., monitors walking the site to ensure seals would not be harmed by construction equipment. A total of 17 individual seals were impacted by these incidents.
- The remaining six (6) incidents were not-related to the project – i.e., animals were flushed by private boats transiting the project vicinity, or large groups of birds leaving nearby mudflats. A total of 48 individual seals were impacted by non-project related disturbance.

Construction was the most frequent source of disturbances for seals, and when Level B harassment occurred (i.e., movement or flushing), it was always when seals were within 300 meters of the disturbance source. Most of the seal flushes were when the distance between the disturbance source and the flushed animals was 100 meters or less (Fountain et. al. 2019).

Table 6 summarizes all occasions where monitors observed seal pups reacting to Phase I project-related activities. As provided in the table, there were limited number of occasions where seal pups reacted to either a monitor or construction activities (typically sound). A total of eight (8) harbor seal pups reacted (flushed, alerted) to construction noise and/or a visual disturbance (construction equipment, monitor).

TABLE 6
PHASE I HARBOR SEAL PUP DISTURBANCE DATA

Date	Reaction	Trigger	Distance (meters)	Total No. Seals Present	Total No. Seals Reacted[1]	No. Pups Reacted
4/11/18	Flush	Monitor (Visual)	100	18	6	3
4/11/18	Flush	Construction (Sound)	100	12	2	1
4/11/18	Flush	Construction (Sound)	100	10	2	1
4/11/18	Flush	Construction (Sound)	100	10	2	1
4/12/18	Alert	Construction (Sound & Visual)	100	17	2	1
5/1/18	Flush	Monitor (Visual)	100	3	3	1

[1]Includes all seals (adults, pups) that reacted to project-related disturbance

6.2.2 Phase II Harbor Seal Disturbance

As described in Section 4.1.2.2, marine mammal monitoring was implemented on 85 of the 118 construction days associated with the Phase II implementation. Fifteen (15) incidents of Level B harassment of harbor seals (flushing or movement) were recorded by the monitors. Of these, nine

(9) incidents representing harassment of 16 individual seals were attributed to construction activities; the remaining six (6) incidents representing harassment of 20 seals were attributed to marine mammal monitoring activities (Fountain pers. comm. 2021) (Table 7). One incident of Level B harassment was of a pup that responded to a visual or noise disturbance associated with construction activities. The marine mammal monitors also recorded seventeen (17) incidents of alerting due to either construction activities (10 incident; 23 seals) or marine mammal monitor presence (7 incidents; 11 seals) (Table 7). At no time during construction were the shutdown protocols necessary due to the proximity of seals.

Using these data, it is estimated that project construction resulted in the take of 36 seals in 85 monitoring days, or less than 1 (0.42) seal per day. If this estimate of take is applied to the 33 construction days when monitoring did not occur (i.e., 0.42 x 33), an additional 13.9 seals may also have been subject to Level B harassment, for a total take of up to 49.9 seals (rounded to 50 seals).

TABLE 7
PHASE II HARBOR SEAL DISTURBANCE DATA

Incident No.	Date	Trigger	Distance (meters)	Number of Seals Reacted			Total Seals in Vicinity	Total Seals within 300 meters
				Level 1 (Alert)	Level 2 (Movement)	Level 3 (Flush)		
1	9/2/20	Construction (sound)	300 m	1	0	0	1	1
2	9/8/20	Construction (visual and sound)	150 m	3	0	0	14	20
3	9/8/20	Construction (sound)	150 m	2	0	0	4	20
4	9/9/20	Construction (visual and sound)	60 m	6	0	0	9	15
5	9/10/20	Construction (visual and sound)	60 m	2	0	0	6	16
6	9/15/20	Construction (visual and sound)	60 m	1	0	1	2	2
7	9/21/20	Construction (visual and sound)	60 m	1	0	0	4	35
8	9/21/20	Construction (visual and sound)	60 m	0	0	2	4	35
9	11/9/20	Construction (sound)	300 m	2	1	0	3	3
10	3/17/21	Construction (sound)	200 m	0	1	4	5	5
11	3/24/21	Construction (visual and sound)	60 m	0	0	1	1	1
12	3/24/21	Construction (visual and sound)	60 m	0	0	1	1	4
13	4/5/21	Construction (visual and sound)	80 m	4	0	2	6	8
14	4/5/21	Construction (visual and sound)	60 m	1	0	1	2	14
15	4/14/21	Construction (visual and sound)	80 m	0	0	2	2	45
		Subtotal Construction		**23**	**2**	**14**	**64**	**224**
16	9/2/20	Observer (visual)	60 m	4	0	0	4	4
17	9/3/20	Observer (visual)	20 m	0	0	1	1	6
18	9/8/20	Observer (visual)	80 m	0	0	8	8	8
19	9/9/20	Observer (visual)	40 m	1	0	0	1	23
20	9/16/20	Observer (visual)	100 m	1	0	1	1	4
21	9/22/20	Observer (visual)	40 m	1	0	0	1	1

Incident No.	Date	Trigger	Distance (meters)	Number of Seals Reacted			Total Seals in Vicinity	Total Seals within 300 meters
				Level 1 (Alert)	Level 2 (Movement)	Level 3 (Flush)		
22	10/19/20	Observer (visual)	40 m	0	0	2	2	2
23	10/28/20	Observer (visual)	100 m	1	0	0	1	1
24	11/5/20	Observer (visual)	60 m	1	0	0	1	1
25	12/3/20	Observer (visual)	80 m	0	0	1	1	1
26	12/16/20	Observer (visual)	60 m	0	0	7	7	10
27	5/4/21	Observer (visual)	80 m	2	0	0	20	29
		Subtotal Observers		**11**	**0**	**20**	**48**	**90**
		TOTAL		**34**	**2**	**34**	**112**	**314**

6.3 Phase III Take Estimate

Potential take of harbor seals during Phase III restoration activities would be associated with construction-related noise and/or visual disturbance within 300 meters of tidal waters. Specifically, construction equipment may generate noise or create a visual disturbance that would cause harbor seals to move or flush. Similarly, marine mammal monitors may disturb seals when they monitor the work area. Project activities that would not have the potential to result in take of harbor seals include operation of heavy equipment more than 300 meters from tidal waters, including along portions of project haul routes and/or within portions of the borrow area (Figure 4).

As summarized in Table 2, the loudest equipment anticipated to operate in the restoration area would be a dozer with an L_{max} noise level of 82 dBA at 50 feet (15 meters). This noise level would be below the in-air acoustic threshold for behavioral disruption of harbor seals – 90 dB (NOAA Fisheries 2021). As a result, Level B harassment from construction noise disturbance would not be anticipated unless heavy equipment operates within 15 meters of harbor seals. Construction measures to reduce the impacts of construction noise on seals include requiring the contractor to start construction activities gradually each day (i.e., ramp up by moving around the project area and starting equipment sequentially); limitations on when certain activities can start or must be shut down; and the required presence of a visual monitor every other day when work is occurring within 300 meters of tidal waters.

6.3.1 Phase III Take Estimate

The incidental take estimate for the Phase III restoration work uses the same conservative methodology and assumptions applied by NOAA Fisheries for the Phase II IHA. Specifically, NOAA Fisheries calculated take for Phase II based on the total number of seals taken during Phase I construction (i.e., 62 seals) divided by the sum of the daily average number of seals observed hourly in Minhoto Marsh during Phase I. That percentage (8.79 percent) was rounded to 9 percent and used to calculate the daily take estimate. The daily take estimate is a product of the average percentage of seals taken in a day (9 percent) during Phase I construction and the number of seals that could be exposed to disturbance daily, based on the sum of the highest daily count of seals observed by the Reserve Otter Monitoring Project at all observation areas between January 2018 and April 2019 (i.e., 417; see Table 4). Thus, the daily take estimate is 37.53, and the take estimate for the 240-day construction window would be 9,008 seals.

Monitoring data for Phase II was not used for this take estimate for several reasons. The sum of the average number of seals observed hourly during Phase II construction is estimated at about 4,990 seals. Dividing the total number of seals taken during Phase II construction (i.e., 36 seals) by this number results in a daily take estimate of 0.7 percent, which is lower (less conservative) than the 9 percent number used for the Phase II take estimate. Using the more conservative percentage also allowed for consistent application of a daily take estimate across restoration projects.

SECTION 7
Anticipated Impact of the Activity

7.1 Phase I Restoration Activities

As described above, during the 9-month construction window associated with Phase I construction, marine mammal monitoring was required and implemented on 89 days. During this period there were 19 incidents of Level B harassment of harbor seals (flushing or movement) that were recorded by the monitors. Of these, 16 incidents, representing harassment of 62 individual seals, were attributed to construction activity or marine mammal monitoring; the remaining 3 incidents were unrelated to the project (e.g., seals flushing as a result of a passing boat in Elkhorn Slough). When Level B harassment occurred, it was always when seals were within 300 meters of the disturbance source; most were when distances were 100 meters or less (Fountain et. al. 2019). In addition, not all seals located in the vicinity of the disturbance flushed or moved during each discrete incident; for example, in 9 incidents, less than one third of the seals present in the area flushed.

7.2 Phase II Restoration Activities

Preliminary monitoring data for the Phase II restoration activities were collected on 85 days of the 118 day construction period. Fifteen (15) incidents of Level B harassment of harbor seals (flushing or movement) were recorded by the monitors. Of these, nine (9) incidents representing harassment of 16 individual seals were attributed to construction activities; the remaining six (6) incidents representing harassment of 20 seals were attributed to marine mammal monitoring activities. One incident of Level B harassment was of a pup that responded to a visual or noise disturbance associated with construction activities.

7.3 Anticipated Construction Impacts for Phase III Restoration Activities

Similar to the other phases of restoration, Phase III construction activities have the potential to directly affect harbor seals that may be hauling out, resting, foraging, or engaging in other activities near the project area. These seals may be temporarily disturbed or harassed by construction noise or human presence. As described in Section 6.2.2, it is conservatively estimated that up to 37.53 seals per day could be disturbed by construction activities, for a total potential take of 9,008 seals over the 240-day construction window. Seals that move or flush are likely to use other areas of the slough available as haul out sites.

Short-term displacement of resting harbor seals from known haul out locations near the work area is likely to occur as a result of project construction, but is not anticipated to affect the overall fitness of any individual animal because there is an abundance of suitable resting habitat available in the greater Elkhorn Slough estuary (Figure 4).

During the breeding/pupping season, harbor seal pups could be impacted by construction activities if they are unduly stressed or inadvertently separated from their mother during a flushing event. As described in Section 3.1, mothers prefer quiet isolated places away from the main haul out areas to rest and nurse. If exposed to a somewhat constant presence of construction activities, females are likely to move their pups to another area. Because there are many areas within the estuary for mothers/pups to move to (including the preferred resting area at Parsons Slough over 2,000 feet east of the upland borrow area), a short term disturbance is not anticipated to substantially impact pup health (Harvey pers. comm. 2019). It is also unlikely that pups would be permanently separated from their mothers during a flushing event. Anecdotal accounts during harbor seal tagging (where mothers and pups may be physically separated from each other in nets) indicate that a mother and pup typically reunite within minutes of being returned to the water (Harvey pers. comm. 2019). Their ability to quickly reunite is attributed in part to "..mutual smelling and the rapidly acquired tendency for newborn pups to follow their mothers…" (Stein 1989). The only informally documented separation was a newborn pup that did not have a chance to bond before the disturbance and handling (Lambourn pers. comm 2019). Given that a flushing event would likely move a mother and pup into the water together (and would presumably be much less traumatic and disruptive than a handling event associated with tagging), it is highly unlikely that a project-related activity would permanently or consequentially separate a mother and pup from each other.

SECTION 8

Anticipated Impacts on Subsistence Uses

Not Applicable. There are no relevant subsistence uses of marine mammals implicated by this action.

SECTION 9
Anticipated Impacts on Habitat

Outside of initial site containment work, restoration activities would be completed when the work area is isolated from tidal waters which would minimize construction-related turbidity and other impacts on water quality. As described in Section 7, harbor seals do not currently haul out in the Phase III restoration area, but are known to haul out in the high marsh to the west of the project area (Seal Bend monitoring location; Figure 5). As a result, up to 56 seals (i.e., highest daily count recorded at this location between January 2018 and April 2019; see Table 4) could be temporarily displaced during construction by increased noise and activity levels. These displacements would be short-term and would not affect the availability or quality of haul-out sites after the project is complete. In addition, construction activities within the restoration area would not impact harbor seal access to that haul out area because the site containment berm would be located to the east of the high marsh areas seals are known to use (Figure 4). As a result, impacts on seal habitat would be indirect (short-term degradation due to construction noise and activity) and temporary.

Once complete, the project would benefit harbor seal habitat by improving water quality, increasing their prey base, and increasing habitat available for resting and foraging. Conversion of mudflat back to tidal marsh is expected to have an overall beneficial effect on the Elkhorn Slough system. By raising the elevation of the marsh, and increasing the extent of tidal marsh, the tidal prism would be reduced. This reduction would slow erosion and sediment and marsh loss within the slough system. The project is also expected to reduce the loss of soft sediment habitat within the slough that support prey species of marine mammals. Increasing the extent of tidal marsh would also improve water quality by establishing a buffer to absorb upland contaminants and agricultural runoff coming from the Old Salinas River mouth.

SECTION 10

Anticipated Effects of Habitat Impacts on Marine Mammals

As noted in Section 9, short-term habitat impacts would be limited to temporary construction disturbances of haul out areas near the Phase III restoration site (i.e., along the southern edge of Elkhorn Slough west of the restoration site). Although seals could still access this haul out area, they may choose to utilize a different haul out location, which could increase or decrease the distance they need to travel to rest depending on the alternate location they choose. Once construction is complete, the same haul-out areas will once again be available (Figure 4). In addition, there will remain an abundance of other areas to haul out on during construction both to the north, west and east of the project area (Figure 4).

Construction-related impacts on water quality would be minimized through site isolation, so seals would not be exposed to excessive turbidity or adverse water quality conditions resulting from ground disturbing activities.

SECTION 11

Mitigation Measures to Protect Marine Mammals and Their Habitat

The following conservation measure shall be implemented to avoid and/or reduce impacts to marine mammals:

1. A NOAA Fisheries approved biologist (see Section 13.2) shall conduct mandatory biological resources awareness training for construction personnel. The awareness training shall be provided to all construction personnel to brief them on the need to avoid effects on marine mammals. If new construction personnel are added to the project, the contractor shall ensure that the personnel receive the mandatory training before starting work.
2. A NOAA Fisheries biological monitor will monitor for marine mammal disturbance within a 300 meter Level B Harassment Zone:
    a. Consistent with the IHA for Phase II restoration work, a marine mammal monitor will be present: (1) every other day when construction activities occur in water or at the tidal restoration area; or (2) every fifth day when construction activities are within the Level B Harassment Zone (i.e., when the haul route or borrow location is within 300 meters of a tidal waters).
    b. The biological monitor will have the authority to stop project activities if marine mammals approach or enter the Level B Harassment Zone, or at any time for the safety of any marine mammal.
    c. A 30-minute pre-clearance observation period will occur prior to the start of construction activities. Construction may not start until the work area is cleared by the biological monitor. Monitoring will occur until 30 minutes after construction is complete.
3. To reduce the risk of potentially startling marine mammals with a sudden intensive sound, the construction contractor will begin construction activities gradually each day by moving around the project area and starting tractor one at a time.
4. In-water construction work shall occur only during daylight hours when visual monitoring of marine mammals can be implemented. No in-water work will be conducted at night.
5. Construction activities will not be initiated, or will be stopped, in the following situations:
    a. Construction activities will not be initiated if a marine mammal is within 10 meters of where heavy equipment will operate. Work will not be initiated until the seal has moved outside the 10 meter buffer, or has not been observed for 15 minutes.
    b. If a marine mammal comes within 10 meters of operating heavy equipment, operations will stop. Operations will not be reinitiated until the seal has moved outside the 10 meter buffer, or has not been observed for 15 minutes.
    c. Construction activities may not be initiated (1) within 300 meters of a mom/pup pair that is hauled out; or (2) within 100 meters of a mom/pup pair in the water.
    d. If a pup less than one week old comes within 20 meters of where heavy machinery is working, construction activities in that area will be shut down or delayed until the pup has left the area. In the event that a pup less than one week old remains within

those 20 meters, NOAA Fisheries will be consulted to determine the appropriate course of action.

6. If marine mammals are present within the work area, or proximate to the work area as described in (5) above, they will be allowed to leave on their own volition.
7. Fuel storage and all fueling and equipment maintenance activities will be conducted at least 100 feet from subtidal and intertidal habitat.

SECTION 12

Mitigation Measures to Protect Subsistence Uses

Not Applicable. The proposed activity will take place in Elkhorn Slough, and no activities will take place in or near a traditional Arctic subsistence hunting area. Therefore, there are no relevant subsistence uses of marine mammals implicated by this action.

SECTION 13
Monitoring and Reporting

13.1 Phase III Construction Monitoring

Phase III construction monitoring will follow the same general protocol as Phase II, which is summarized in Appendix A.

In summary, a NOAA Fisheries approved biological monitor will monitor for marine mammal disturbance during construction within the Level B Harassment Zone, which includes work within 300 meters of tidal waters. Monitoring will occur (1) every other day when construction activities occur in water or at the tidal restoration area; or (2) every fifth day when construction activities are within the Level B Harassment Zone (i.e., when portions of the borrow area being used are within 300 meters of tidal waters). Monitoring locations are depicted in Figure A-1. The biological monitor will have the authority to stop project activities if marine mammals approach or enter the Level B Harassment Zone. Biological monitoring will begin 30 minutes before work begins and continue until 30 minutes after construction is complete. When a biological monitor is onsite, work will only commence with approval of the biological monitor to ensure that no marine mammals are present in the exclusion zone.

Throughout construction activities that require a monitor, the biological monitor will maintain a log that documents numbers of marine mammals present before, during, and at the conclusion of daily activities (See Appendix A for a detailed description of the monitoring protocol). The monitor will record basic weather conditions and marine mammal behavior. A final report shall be submitted to NOAA Fisheries within 90 days of the conclusion of monitoring efforts. The report shall detail the monitoring protocol, summarize the data recorded during monitoring, and contain an estimate of the number of marine mammals harassed.

NOAA Fisheries approved biologists will have qualifications consistent with those of NMFS Protected Species Observers as follows:

1. Independent observers (i.e., not construction personnel) are required.
2. At least one observer must have prior experience working as an observer.
3. Other observers may substitute education (undergraduate degree in biological science or related field) or training for experience.
4. Where a team of three or more observers are required, one observer should be designated as lead observer or monitoring coordinator. The lead observer must have prior experience working as an observer.

Submission and approval of observer CVs by the NOAA Fisheries is required. Other important qualifications:

1. Ability to conduct field observations and collect data according to assigned protocols.
2. Experience or training in the field identification of marine mammals, including harbor seals, and the identification of their behaviors.
3. Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
4. Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior.
5. Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

13.2 Post-construction Monitoring

Additional monitoring may occur (if funding allows) consisting of a monthly census of marine mammals during peak occupational times and tidal cycles for six months post-construction. Funding will depend on construction costs. Data collected after the first 30 days of post-construction monitoring will be reported as an addendum.

SECTION 14

Suggested Means of Coordination

All marine monitoring data collected before, during and after construction of the project would be made available to NOAA Fisheries, USFWS, and the general public.

SECTION 15
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FIGURES

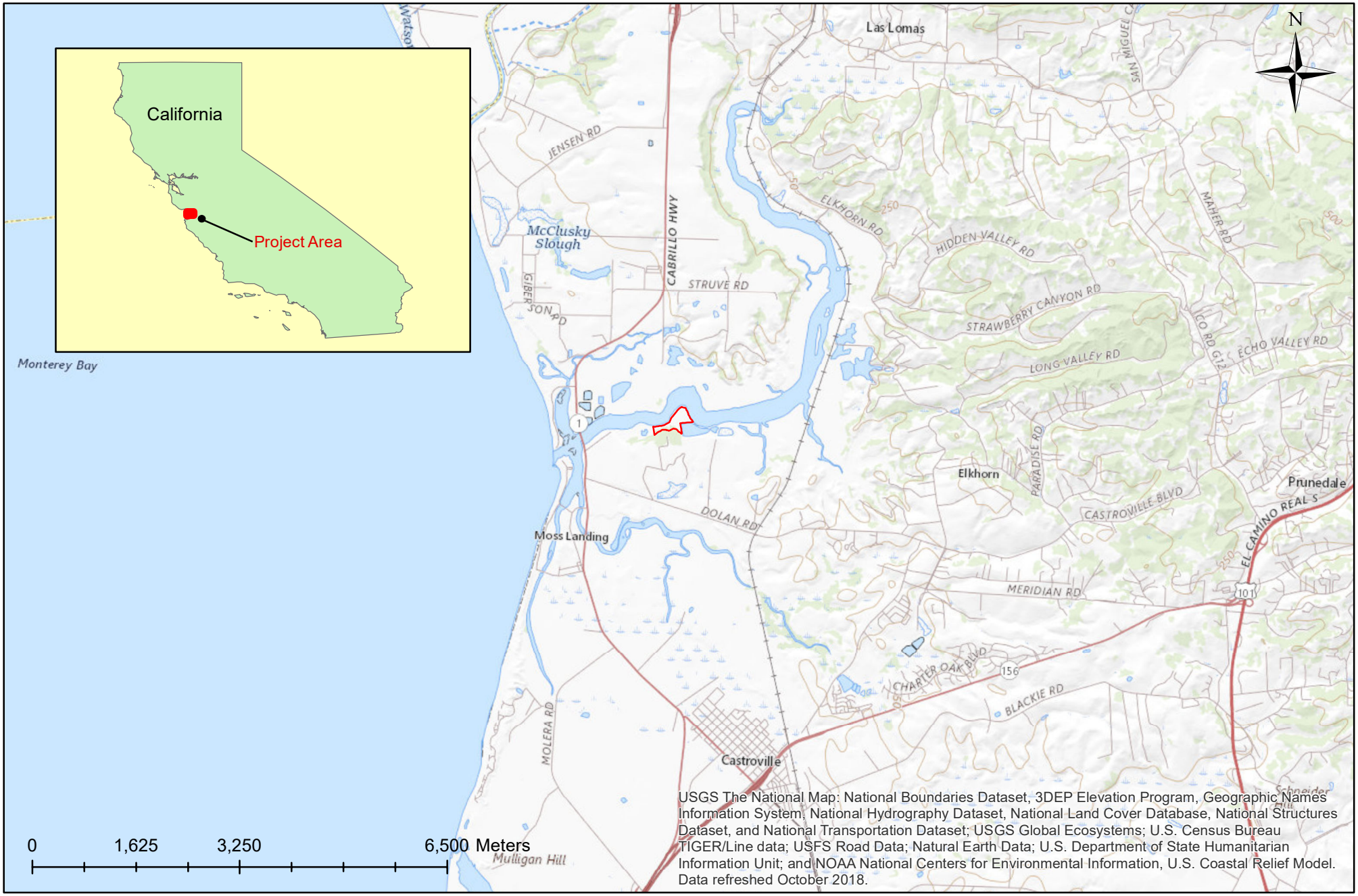


Figure 1. Project Vicinity

Elkhorn Slough Tidal Marsh Restoration Project - Phase III

Applicant: California Department of Fish and Wildlife
Location: Monterey County, California
Lat / Long: 36.813117, -121.766990
Date Prepared: June 30, 2021
Prepared by: Ducks Unlimited, Inc.

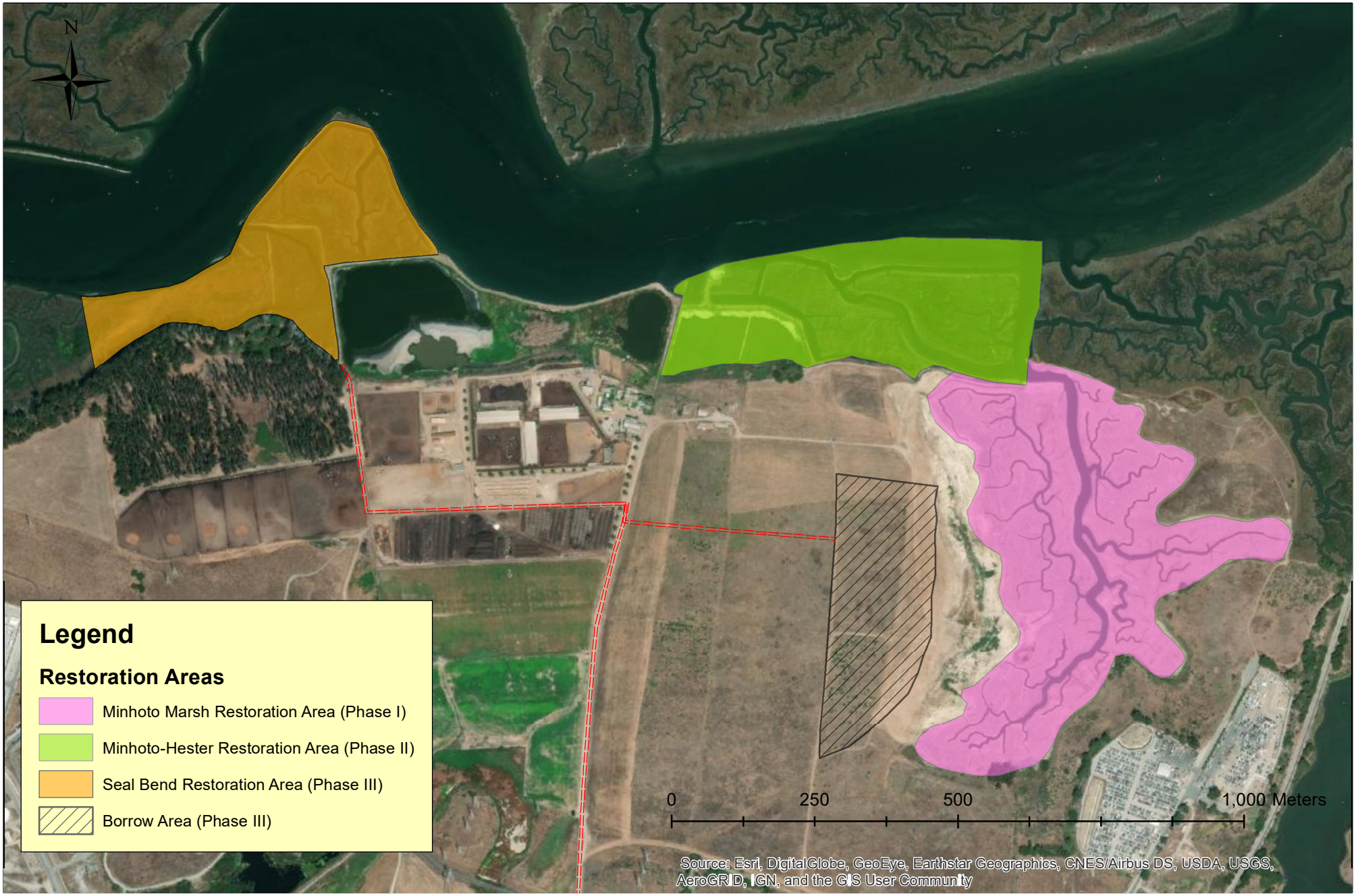


Figure 2. Restoration Plan Overview

Elkhorn Slough Tidal Marsh Restoration Project - Phase III

Applicant: California Department of Fish and Wildlife
Location: Monterey County, California
Lat / Long: 36.813117, -121.766990
Date Prepared: June 30,2021
Prepared by: Ducks Unlimited, Inc.

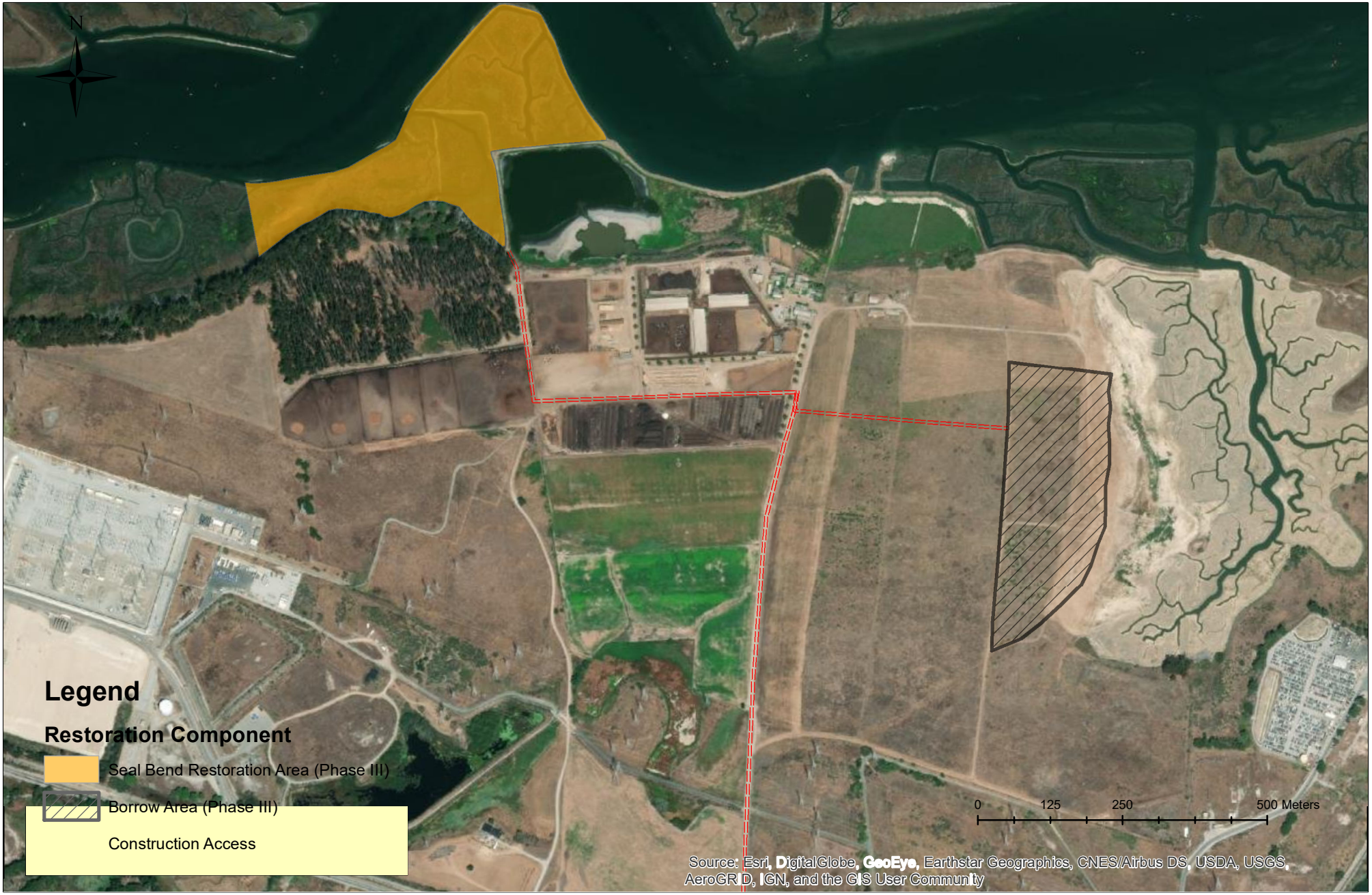


Figure 3. Seal Bend Restoration Area

Elkhorn Slough Tidal Marsh Restoration Project - Phase III

Applicant: California Department of Fish and Wildlife
Location: Monterey County, California
Lat / Long: 36.813117, -121.766990
Date Prepared:June 30, 2021
Prepared by: Ducks Unlimited, Inc.

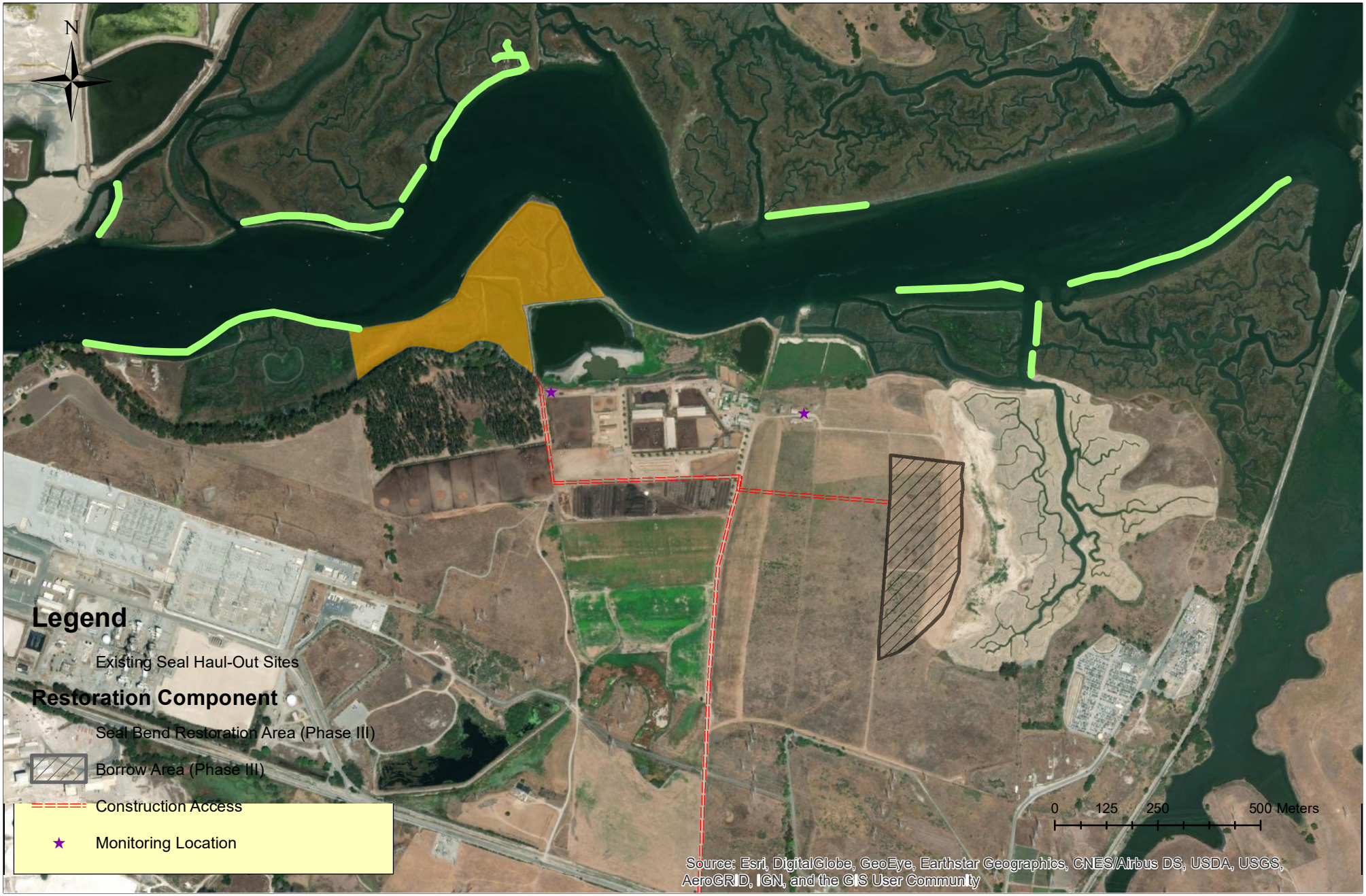


Figure 4. Existing Seal Haul Out Locations

Elkhorn Slough Tidal Marsh Restoration Project - Phase III

Applicant: California Department of Fish and Wildlife
Location: Monterey County, California
Lat / Long: 36.813117, -121.766990
Date Prepared: June 30, 2021
Prepared by: Ducks Unlimited, Inc.

Figure 5 **Reserve Otter Monitoring Project – Monitoring Locations (Source: ESNERR 2018). Note: "Upper Dairy" is referred to as "Main Channel" in this document.**

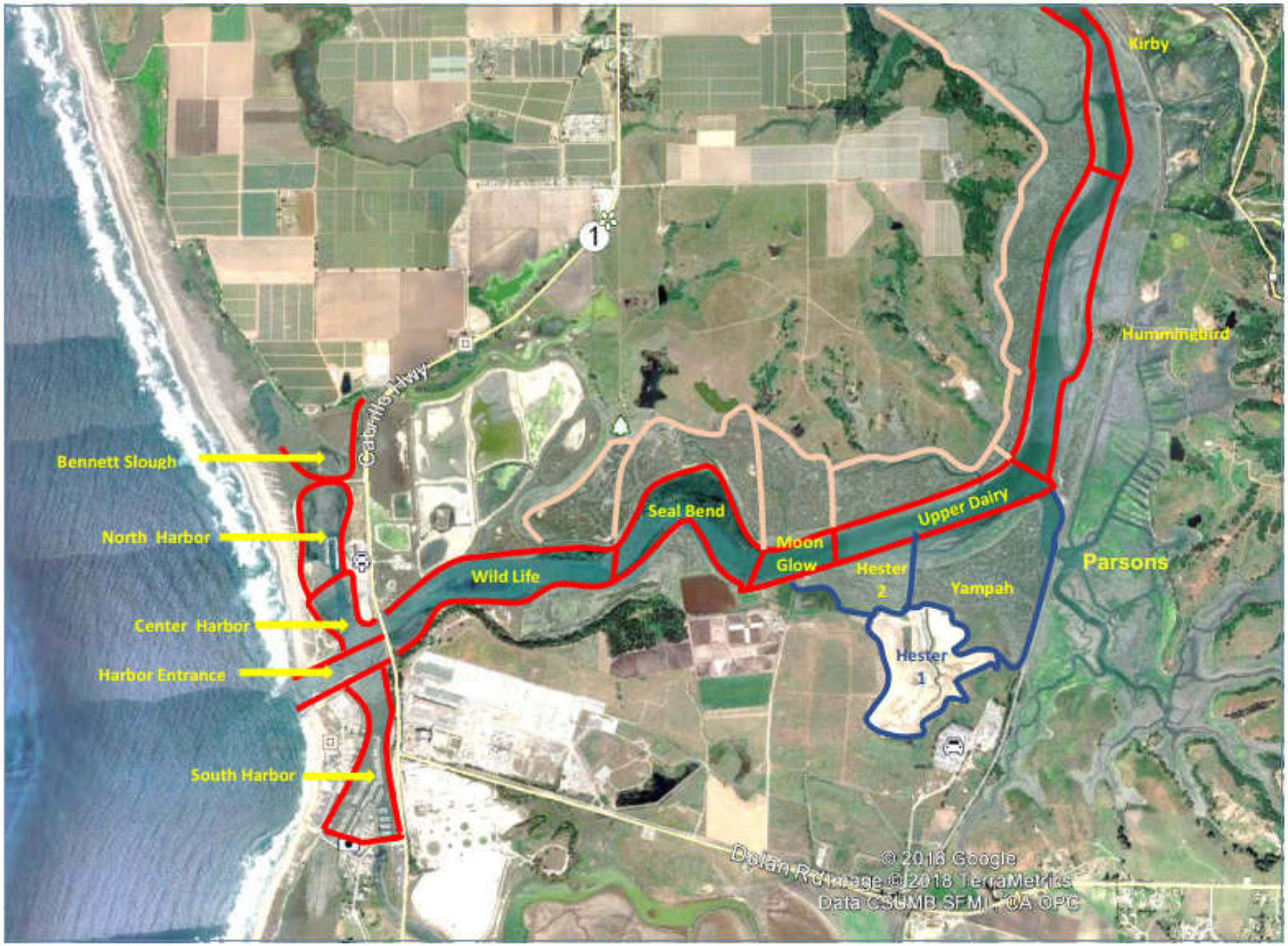
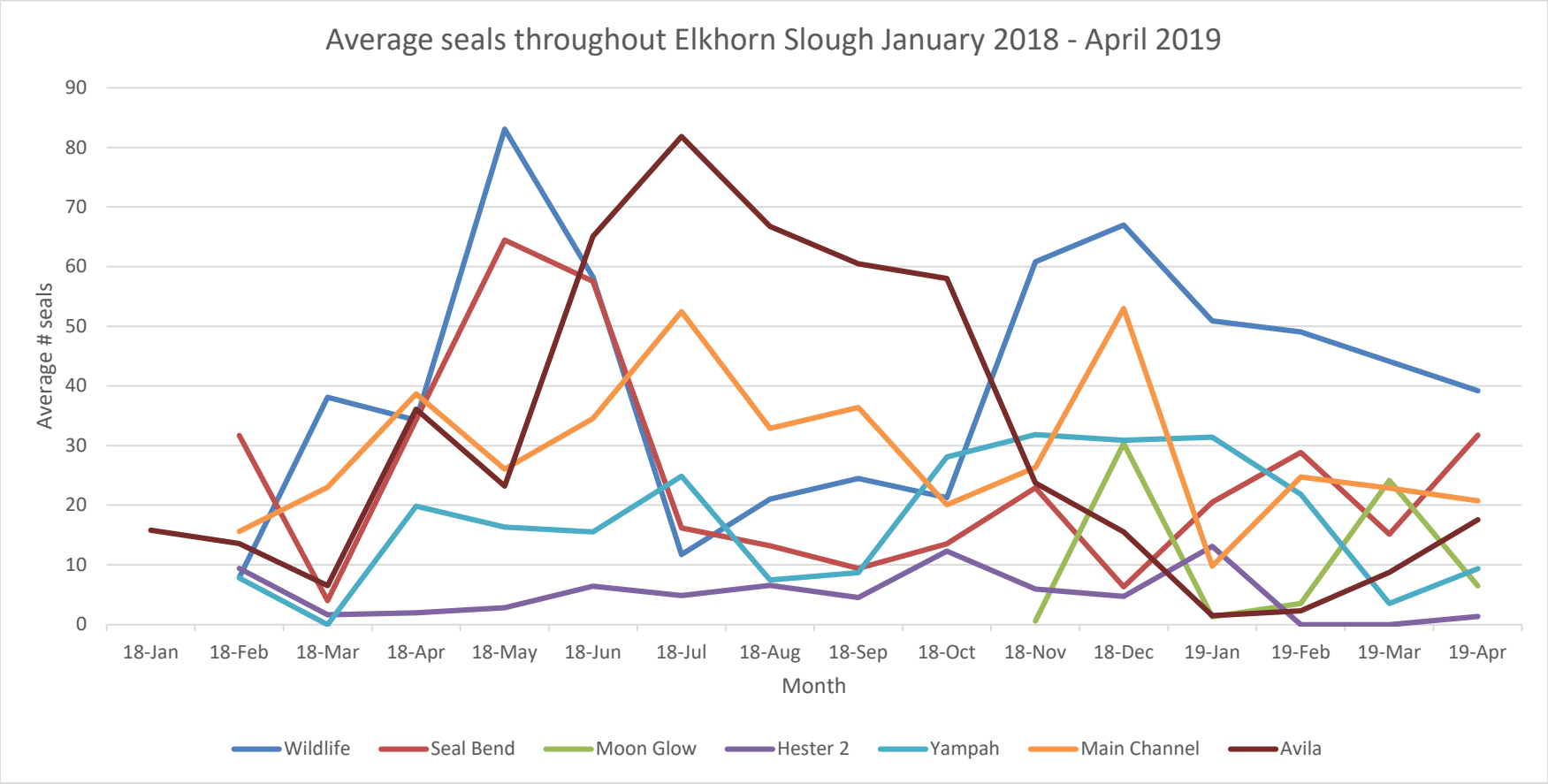


Figure 6 **Average seal counts from Reserve Otter Monitoring Project at locations relevant to Phase II restoration areas.**



APPENDIX A – MONITORING PROTOCOL

Elkhorn Slough Tidal Marsh Restoration
Marine Mammal Monitoring Protocol

Goals

1. Ensure that marine mammals are not subject to injury under the Marine Mammal Protection Act.
2. Collect field data about the movement and activity of marine mammals during construction monitoring, which will inform NOAA Fisheries on marine mammal sensitivity to disturbance and provide reference for future construction projects.

Objectives

1. Ensure that construction activity is not initiated: (1) when a marine mammal is within 10 meters of where heavy equipment will operate; (2) when construction activities are within 300 of a mom/pup pair that is hauled out; or (3) within 100 meters of a mom/pup pair in the water.
2. Ensure that,during site containment activities, heavy machinery does not approach closer than 100 meters of where mothers and pups are actively hauled out.
3. Ensure that construction activity is halted: (1) if a marine mammal comes within 10 meters of operating heavy equipment; or (2) a pup less than one week old comes within 20 meters of where heavy machinery is working.
4. Ensure that presence, distribution, movement and behavior of harbor seals and sea otters within the project area and surrounding vicinity is recorded when there is a reasonable possibility that marine mammals will experience behavioral harassment.

Observation locations

Monitoring during construction will occur from an elevated area near the entrance to the restoration area and northwest of the borrow area (Figure A-1). The observation area for the restoration area shall be accessed by foot and used to provide a vantage point of the construction area and main channel of Elkhorn Slough. This observation area includes all restoration areas within 300 meters of tidal waters. A monitoring location will also be located near the barn northwest of the borrow area to observe work within the borrow area when it occurs within 300 meters of tidal waters (Figure A-1)

Monitoring protocol

A NOAA Fisheries approved biological monitor will monitor for marine mammal disturbance during construction within the Level B Harassment Zone, which includes work within 300 meters of tidal waters (Figure A-1). Monitoring will occur (1) every other day when construction activities occur in water or at the tidal restoration area; or (2) every fifth day when construction activities are within the Level B Harassment Zone (i.e., when portions of the borrow area being used are within 300 meters of tidal waters).

The biological monitor will have the authority to stop project activities if marine mammals approach or enter the exclusion zone. Biological monitoring will begin 0.5-hour before work begins and continue until 0.5-hour after construction stops. Work will commence only with

approval of the biological monitor to ensure that no marine mammals are present in the exclusion zone. In addition, biological monitors will, to the extent feasible, monitor for fish, including listed species that may occur within the project site.

Pre and post construction daily censuses - A census of marine mammals in the project area and the area surrounding the project will be conducted 30 minutes prior to the beginning of construction on monitoring days, and again 30 minutes after the completion of construction activities. Data collected during the pre- and post-construction daily censuses will include:

- Environmental conditions (weather condition, tidal conditions, visibility, cloud cover, air temperature and wind speed)
- Numbers of each marine mammal species spotted
- Location of each species spotted, including distance from construction activity
- Status (in water or hauled out)
- Behavior

Hourly counts - Conduct hourly counts of animals hauled out and in the water.

- Data collected will include:
    - Numbers of each species
    - Location of species, including whether inside the Level B harassment zone; whether hauled out or in the water; and distance from construction activities
    - Time
    - Tidal conditions
    - Time construction activities start and end
    - Primary construction activities occurring during past hour
    - Any noise or visual disturbance
    - Number of mom/pup pairs and neonates observed
    - Notable behaviors, including foraging, grooming, resting, aggression, mating activity, and others

- Notes may include any of the following information to the extent it is feasible to record:
    - Age-class
    - Sex
    - Unusual activity or signs of stress
    - Any other information worth noting

Construction related reactions- Record reaction observed in relation to construction activities including:

    - Tally of each reaction
    - Time of reaction

- Concurrent construction activity (including duration) and assumed cause (whether related to construction activities or not) and whether observer feels the disturbance was visual or acoustic.
- Location of animal during initial reaction and distance from the noted disturbance
- Direction of movement
- Activity before and after disturbance
- Status (in water or hauled out) before and after disturbance
- Coded reaction (Levels 1-3; see below)

Code reactions:

Level	Type of response	Definition
1	Alert	Head orientation or brief movement in response to disturbance, which may include turning head towards the disturbance, craning head and neck or (in the case of seals) craning head and neck while holding the body rigid in a u-shaped position, changing from a lying to a sitting position, or brief movement of less than twice the animal's body length. Alerts would be recorded, but not counted as a 'take'.
2	Movement	Movements away from the source of disturbance, ranging from short withdrawals at least twice the animal's body length to longer retreats, or if already moving a change of direction of greater than 90 degrees. **These movements would be recorded and counted as a 'take'.**
3	Flush	**All retreats (flushes) to the water. Flushing into the water would be recorded and counted as a 'take'. For sea otters, any change from in-water resting to diving/swimming would also be considered a flush and counted as a 'take.'**

Steps for shutting down and resuming construction

1. Alert construction foreman of animal
2. Record the construction activity and the time of shutdown
3. Record the reaction and location of the animal
4. Give clearance for construction activities when animal is seen outside of exclusion zone and traveling away from the construction area, or when the animal is not spotted for 15 minutes
5. Record the time construction resumes

Figure A-1. Observation post for monitors to be able to observe 300 m around equipment and activities at borrow area. Monitors may move around for better visibility as needed depending on equipment location and tide.