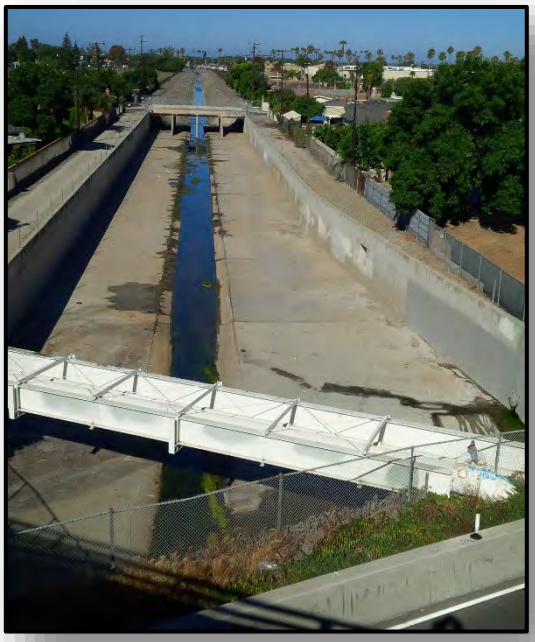
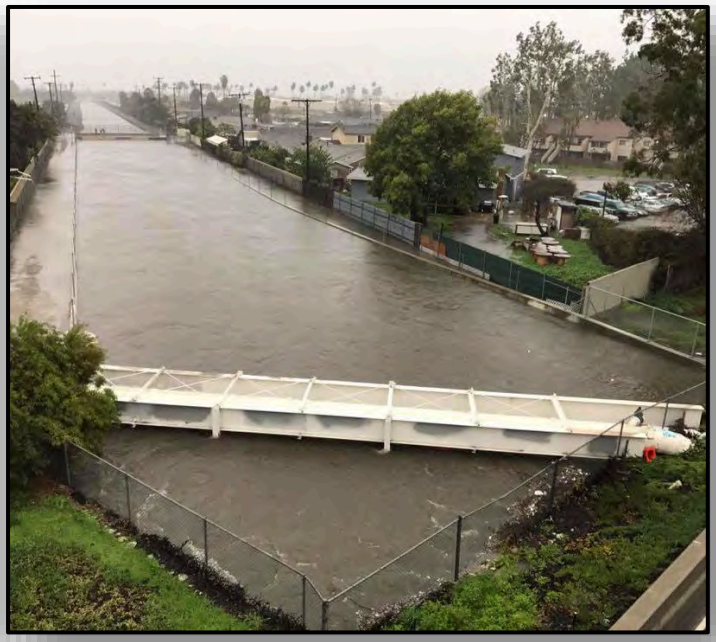
APPENDIX L – ENVIRONMENTAL CONSIDERATIONS

For

WESTMINSTER, EAST GARDEN GROVE

FLOOD RISK MANAGEMENT STUDY





December 2019

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Table of Contents

1.0 Affected Environment Additional Information
2.0 Affected Environment: Historic Structures and Buildings
3.0 404(b)(1) Analysis
4.0 Preliminary Compendium Report for Water Quality and Sediment in the C05 (Garden Grove-Wintersburg Channel), Westminster, California
5.0 Westminster, East Garden Grove, CA Flood Risk Management Study Decision on Implementation of the Full Tidal Basin Spillover
6.0 Jurisdictional Determination
7.0 Biological Evaluation

Appendix L – Environmental Considerations

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1.0 Affected Environment Additional Information

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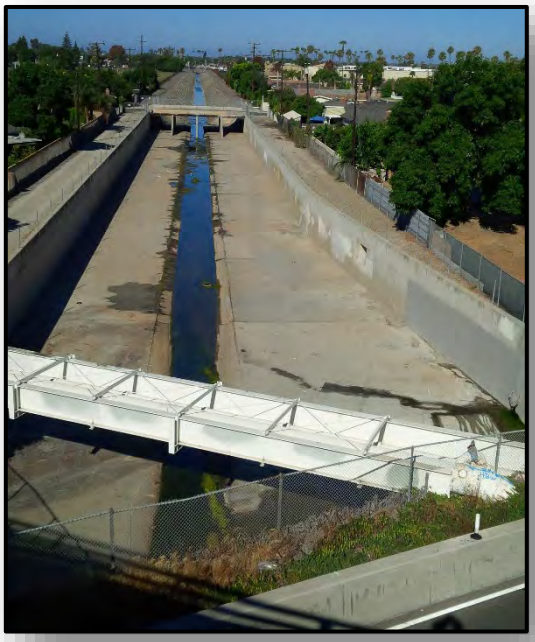
AFFECTED ENVIRONMENT ADDITIONAL INFORMATION

For

WESTMINSTER, EAST GARDEN GROVE

FLOOD RISK MANAGEMENT STUDY



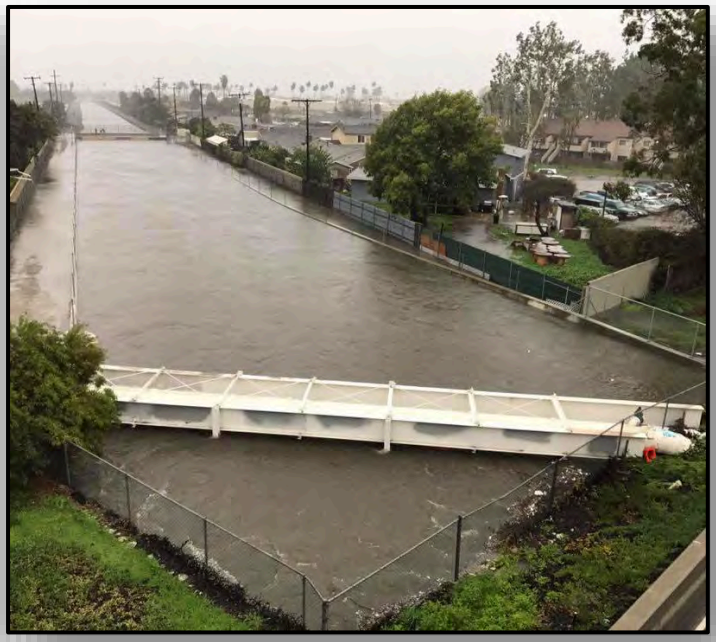


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Table of Contents

1.0 Affected Environment Additional Information 5
1.1 Biological Resources 5
(1) Animal Resources 5
(2) State Listed Species and Species of Special Concern 25
1.2 Aethetic Resources 55
1.3 Bibliography 76

Appendix L – Environmental Considerations

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1.0 Affected Environment Additional Information

This section includes species' lists that were summarized in the Westminster, East Garden Grove Flood Risk Management Study Draft main report.

1.1 Biological Resources

(1) Animal Resources

Watercourses within the project boundary include flood control channels. These watercourses are dynamic, high-energy systems and typically form the active part of the channel. They are generally devoid of vegetation either as a result of scouring, or from flood control channel maintenance activities. The specific wildlife species associated with the channels depends on the location and type of channel (e.g., earthen versus concrete, natural stream versus man-made drainage channel, etc.), intermixing with upland, ornamental landscapes, wetland communities, and availability of perennial and ephemeral water sources. Flood control channels with perennial and ephemeral water provide habitat (e.g., forage, movement corridor, etc.) for common species such as California king snake (*Lampropeltis getula californiae*), California striped racer (*Coluber lateralis lateralis*), Pacific ring-necked snake (*Diadophis punctatus amabilis*), southwestern pond turtle (*Actinemys pallida*), western toad (*Anaxyrus boreas*), Pacific treefrog (*Pseudacris regilla*), mallard (*Anas platyrhynchos*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and coyote (*Canis latrans*).

While the flood control channels, which comprise a majority of the proposed project's action area, provide primarily low quality habitat for common species in a highly urbanized area, there are higher quality areas that are adjacent to the proposed project's action area. Those higher quality areas are the Bolsa Chica Ecological Reserve (BCER) and the Seal Beach National Wildlife Refuge (SBNWR). The below sections generally describe the flora and fauna that have been observed within these adjacent higher quality areas.

Bolsa Chica Ecological Reserve

The BCER contains remnants of a once extensive wetland system. A tributary of the Santa Ana River called Freeman Creek flowed into the wetlands, creating a mixture of fresh and saltwater marsh, tidal sloughs, and swampland that supported dense vegetation; tulles, arroyo willows and thickets. Beginning in 2004, more than 500 acres (202.3 hectares) of the Bolsa Chica Lowlands were reconstructed to pre-urbanization conditions (approximately 1800s). The restoration has and will continue to gradually improve the habitat quality of Bolsa Chica.
The California Department of Fish and Wildlife (CDFW) provided the following list of plants, and the plant communities that they are associated with, that are found at the BCER (*Table 1*).

Table 1: List of plant species found within the Bolsa Chica Ecological Reserve (Source: CDFW)

Common Name	Scientific Name		Common Name	Scientific Name
Seagrass Beds				
eelgrass	*Zostera marina*			
Salt Marsh				

Common Name	Scientific Name		Common Name	Scientific Name
alkali heath	*Frankenia salina*		alkali weed	*Cressa truxillensis*
cordgrass	*Spartina foliosa*		marsh jaumea/salty Susan	*Jaumea carnosa*
Pacific pickleweed	*Salicornia pacifica*		Parry's pickleweed	*Arthrocnemum subterminale*
saltgrass	*Distichlis spicata*		saltwort	*Batis maritime*
California seablite[a,b]	*Suaeda californica*		sea lavender/marsh rosemary	*Limonium californicum*
shoregrass/salt cedargrass	*Distichlis littoralis*		spiny rush	*Juncus acutus*
woolly seablite	*Suaeda taxifolia*		estuary seablite[b]	*Suaeda esteroa*
Coastal Strand/Sand Dune				
beach evening primrose	*Carnissonia cheiranthifolia*		miner's lettuce	*Claytonia perfoliata*
coast woolly-heads[b]	*Nemecaulis denudata var. denudata*		salt heliotrope/seaside heliotrope	*Heliotropium curassavicum*
pink sand verbena	*Abronia umbellata*		red sand verbena	*Abronia maritima*
beach morning glory	*Calystegia soldanella*		western ragweed	*Ambrosia psilostachya*
silver beach bur	*Ambrosia chamissonis*			
Coastal Sage Scrub				
ashy-leaf buckwheat	*Eriogonum cinereum*		bush monkeyflower	*Mimulus aurantiacus*
black sage	*Salvia mellifera*		bladderpod	*Cleome isomeris, Isomeris arborea*
California boxthorn	*Lycium californicum*		seacliff buckwheat	*Eriogonum parvifolium*
California buckwheat	*Eriogonum fasciculatum*		California poppy	*Eschscholzia californica*
coastal sagebrush	*Artemisia californica*		coast goldenbush	*Isocoma menziesii*
coastal bush sunflower	*Encelia californica*		coastal cholla	*Opuntia prolifera*
deerweed	*Acmispon glaber*		purple sage	*Salvia leucophylla*
coastal prickly pear	*Opuntia littoralis*		coyote bush	*Baccharis pilularis*
fourwing saltbush	*Atriplex canescens*		fascicled tarplant	*Deinandra fasciculata*
Santa Barbara milkvetch	*Astragalus trichopodus*		telegraph weed	*Heterotheca grandiflora*
saltbush	*Atriplex lentiformis*		southern tarplant[b]	*Centromadia parryi ssp. australis*
Douglas nightshade	*Solanum douglasii*		yarrow	*Achillea millefolium*
white sage	*Salvia apiana*			
Freshwater Wetlands				

Common Name	Scientific Name		Common Name	Scientific Name
California bulrush	*Schoenoplectus californicus*		common cattail	*Typha latifolia*
salt marsh fleabane	*Pluchea odorata*		mulefat	*Baccharis salicifolia*
yerba mansa	*Anemopsis californica*		cocklebur/common cocklebur	*Xanthium strumarium*
Riparian Woodland				
arroyo willow	*Salix lasiolepis*		black willow	*Salix gooddingii*
western sycamore	*Platanus racemosa*			

Sources: CDFW 2018 and California Native Plant Society 2018.
[a] federal listed – endangered
[b] California Rare Plant

The Bolsa Chica Wetlands host numerous species of wildlife. The wetlands are an especially important migratory stop as well as nesting grounds for many avian species. Out of 420 bird species recorded for Orange County, California, 321 of those species have been sighted at Bolsa Chica in the past decade (http://bolsachica.org/the-wetlands/animals/). Bird species frequently sighted at Bolsa Chica are found in *Table 2*. Less frequently sighted bird species at Bolsa Chica are found in *Table 3*.

Table 2: Frequently observed bird species at Bolsa Chica Ecological Reserve (Source: CDFW).

Common Name	Scientific Name		Common Name	Scientific Name
brant[f]	*Branta bernicla*		black tern[f]	*Chlidonias niger*
Canada goose[a]	*Branta canadensis*		common tern	*Sterna hirundo*
gadwall[a]	*Anas strepera*		Forester's tern[a]	*Sterna forsteri*
American wigeon	*Ana Americana*		royal tern[a]	*Thalasseus maximus*
mallard[a]	*Anas platyrhynchos*		elegant tern[a,g]	*Thalasseus elegans*
blue-winged teal[a]	*Anas discors*		black skimmer[a,f,h]	*Rynchops niger*
cinnamon teal[a]	*Anas cyanoptera*		rock pigeon[a]	*Columba livia*
northern shoveler	*Anas clypeata*		Eurasian collared-dove	*Streptopelia decaocto*
northern pintail[a]	*Anas acuta*		mourning dove[a]	*Zenaida macroura*
green-winged teal	*Anas carolinensis*		barn owl	*Tyto alba*
redhead[a,f]	*Aythya americana*		great horned owl[a]	*Bubo virginianus*
greater scaup	*Aythya marila*		burrowing owl[a,f,h,i]	*Athene cunicularia*
lesser scaup	*Aythya affinis*		Vaux's swift[f]	*Chaetura vauxi*
surf scoter	*Melanitta perspicillata*		white-throated swift	*Aeronautes saxatalis*
bufflehead	*Bucephala albeola*		black-chinned hummingbird	*Archilochus alexandri*
red-breasted merganser	*Mergus serrator*		Anna's hummingbird[a]	*Cal*
ruddy duck[a]	*Oxyura jamaicensis*		rufous hummingbird	*Selaphorus rufus*
red-throated loon	*Gavia stellate*		Allen's hummingbird[a]	*Selaphorus sasin*
Pacific loon	*Gavia pacifica*		belted kingfisher	*Megaceryle alcyon*

Common Name	Scientific Name		Common Name	Scientific Name
common loon[f]	*Gavia immer*		Nuttall's woodpecker	*Dryobates nuttallii*
pied-billed grebe[a]	*Podilymbus podiceps*		downy woodpecker	*Dryobates pubescens*
horned grebe	*Podiceps nigricollis*		northern flicker	*Colaptes auratus*
eared grebe[a]	*Podiceps nigricollis*		olive-sided flycatcher[f,h]	*Contopus cooperi*
western grebe	*Aechmophorus occidentalis*		western wood-peewee	*Contopus sordidulus*
Clark's grebe	*Aechmophorus clarkia*		willow flycatcher[b,h,k]	*Empidonax traillii*
double-crested cormorant[a]	*Phalacrocorax auritus*		Pacific-slope flycatcher	*Empidonax difficilis*
American white pelican[a,f]	*Pelevanus erythrorhynchos*		black phoebe[a]	*Sayornis nigricans*
California brown pelican[f]	*Pelecanus occidentalis*		Say's phoebe[a]	*Sayornis saya*
American bittern	*Botaurus lentiginosus*		ash-throated flycatcher	*Myiarchus cinerascens*
least bittern[a,f,h]	*Ixobrychus exilis*		Cassin's kingbird	*Tyrannus vociferans*
great blue heron[a,j]	*Ardea herodias*		western kingbird	*Tyrannus verticalis*
great egret[j]	*Ardea alba*		loggerhead shrike[a,f,h]	*Lanius ludovicianus*
snowy egret	*Egretta thula*		warbling vireo	*Vireo gilvus*
reddish egret	*Egretta rufescens*		American crow[a]	*Corvus brachyrhynchos*
green heron[a]	*Butorides virescens*		common raven[a]	*Corvus corax*
black-crowned night heron[a]	*Nycticorax*		horned lark[a]	*Eremophila alpestris*
white-faced ibis[g]	*Plegadis chihi*		tree swallow	*Tachycineta bicolor*
turkey vulture	*Cathartes aura*		violet-green swallow	*Tachycineta thalassina*
osprey[g,j]	*Pandion haliaetus*		northern rough-winged swallow	*Stelgidopteryx serripennis*
white-tailed kite[a,e,i]	*Elanus leucurus*		cliff swallow[a]	*Petrochelidon pyrrhonota*
northern harrier[a]	*Circus hudsonius*		barn swallow[a]	*Hirundo rustica*
sharp-shinned hawk	*Accipiter striatus*		bushtit[a]	*Psaltriparus minimus*
Cooper's hawk[a,g]	*Accipiter cooperii*		house wren[a]	*Troglodytes aedon*
red-shouldered hawk	*Buteo lineatus*		marsh wren[a]	*Cistothorus palustris*
red-tailed hawk[a]	*Buteo jamaicensis*		blue-grey gnatcatcher	*Polioptila caerulea*
American kestrel[a]	*Falco sparverius*		coastal California gnatcatcher[a,c,f]	*Polioptila californica*
merlin[g]	*Falco columbarius*		ruby-crowned kinglet	*Regulus calendula*
peregrine falcon[a,e,h,j]	*Falco peregrinus*		western bluebird	*Sialia mexicana*

Common Name	Scientific Name		Common Name	Scientific Name
Virginia rail[a]	*Rallus limicola*		Swainson's thrush	*Catharus ustulatus*
sora[a]	*Porzana carolina*		hermit thrush	*Catharus guttatus*
common gallinula	*Porphyrio martinica*		American robin	*Turdus migratorius*
American coot[a]	*Fulica americana*		northern mockingbird[a]	*Mimus polyglottos*
black-bellied plover	*Pluvialis squatarola*		European starling[a]	*Sturnus vulgaris*
Pacific golden-plover	*Pluvialis fulva*		American pipit	*Anthus rubescens*
snowy plover[a]	*Charadrius alexandrines*		cedar waxwing	*Bombycilla cedrorum*
semipalmated plover	*Charadrius semipalmatus*		orange-crowned warbler	*Oreothlypis celata*
killdeer[a]	*Charadrius vociferous*		Nashville warbler	*Oreothlypis ruficapilla*
black-necked stilt[a]	*Himantopus mexicanus*		MacGillivray's warbler	*Oporornis tolmiei*
American avocet[a]	*Recurvirostra americana*		common yellowthroat	*Geothlypis trichas*
spotted sandpiper	*Actitis macularius*		yellow warbler	*Dendroica petechial*
solitary sandpiper	*Tringa solitaria*		yellow-rumped warbler	*Dendroica coronate*
greater yellowlegs	*Tringa melanoleuca*		black-throated gray warbler	*Setophaga nigrescens*
willet	*Tringa semipalmata*		Townsend's warbler	*Dendroica townsendii*
lesser yellowlegs	*Tringa flavipes*		Wilson's warbler	*Cardellina pusilla*
whimbrel	*Numenius phaeopus*		spotted towhee	*Pipilo maculatus*
long-billed curlew[g,h]	*Numenius americanus*		California towhee[a]	*Melozone crissalis*
marbled godwit	*Limosa fedoa*		Brewer's sparrow[h]	*Spixella breweri*
ruddy turnstone	*Arenaria interpres*		vesper sparrow	*Pooecetes gramineus*
surfbird	*Aphriza virgata*		lark sparrow	*Chondestes grammacus*
red knot	*Calidris canutus*		common savannah sparrow	*Passerculus sandwichensis*
sanderling	*Calidris alba*		Belding's savannah sparrow[a,b]	*Passerculus sandwichensis beldingi*
semipalmated sandpiper	*Calidris pusilla*		California least tern[b,d,e]	*Sternula antillarum browni*
western sandpiper	*Calidris mauri*		fox sparrow	*Passerella iliaca*
least sandpiper	*Calidris minutilla*		song sparrow[a,f]	*Melospiza melodia*
Baird's sandpiper	*Calidris bairdii*		Lincoln's sparrow	*Melospiza lincolnii*
pectoral sandpiper	*Calidris melanotos*		white-crowned sparrow	*Zonotrichia leucophrys*

Common Name	Scientific Name		Common Name	Scientific Name
dunlin	*Calidris alpine*		golden-crowned sparrow	*Zonotrichia atricapilla*
stilt sandpiper	*Calidris himantopus*		dark-eyed junco	*Junco hyemalis*
short-billed dowitcher	*Limnodromus griseus*		western tanager	*Piranga ludoviciana*
long-billed dowitcher	*Limnodromus scolopaceus*		black-headed grosbeak	*Pheucticus melanocephalus*
Wilson's snipe	*Gallinago delicate*		blue grosbeak	*Passerina caerulea*
Wilson's phalarope	*Phalaropus tricolor*		lazuli bunting	*Passerina amoena*
red-necked phalarope	*Phalaropus lobatus*		red-winged blackbird[a]	*Agelaius phoeniceus*
Bonaparte's gull	*Chroicocephalus philadelphia*		western meadowlark	*Sturnella neglecta*
Heermann's gull	*Larus heermanni*		Brewer's blackbird	*Euphagus cyanocephalus*
ring-billed gull	*Larus delawarensis*		great-tailed grackle	*Quiscalus mexicanus*
western gull	*Larus occidentalis*		brown-headed cowbird	*Molothrus ater*
California gull[g]	*Larus californicus*		hooded oriole[a]	*Icterus cucullatus*
herring gull	*Larus argentatus*		Bullock's oriole	*Icterus bullockii*
Thayer's gull	*Larus thayeri*		house finch[a]	*Carpodacus mexicanus*
glaucous-winged gull	*Larus glaucescens*		lesser goldfinch[a]	*Carduelis mexicanus*
least tern[a]	*Sternula antillarum*		American goldfinch	*Spinus tristis*
gull-billed tern[f,h]	*Gelochelidon nilotica*		house sparrow	*Passer domesticus*
Caspian tern[a,h]	*Hydroprogne caspia*		western snowy plover[c,f,h]	*Charadrius nivosus*
light-footed Ridgway's Rail[b,d,e]	*Rallus obsoletus levipes*			

[a] Species that have nested at Bolsa Chica Ecological Reserve
[b] state listed - endangered
[c] federal listed - threatened
[d] federal listed – endangered
[e] CDFW fully protected species
[f] CDFW species of special concern
[g] CDFW watch list
[h] USFWS birds of conservation concern
[i] BLM sensitive species
[j] CDF sensitive species
[k] USFS sensitive species

Table 3: Less Frequently Observed Bird Species at Bolsa Chica Ecological Reserve (Source: CDFW).

Common Name	Scientific Name		Common Name	Scientific Name
fulvous whistling duck[e]	*Dendrocygna bicolor*		yellow-billed cuckoo	*Coccyzus americanus*
greater white-fronted goose	*Anser albifrons*		short-eared owl[e]	*Asio flammeus*
snow goose	*Chen caerulescens*		common poorwill	*Phalaenoptilus nuttallii*
Ross's goose	*Chen rossii*		black swift[e,f]	*Cypseloides niger*
cackling goose	*Branta hutchinsii*		Costa's hummingbird[f]	*Calypte costae*
wood duck	*Aix sponsa*		calliope hummingbird	*Stellula calliope*
Eurasian wigeon	*Anas Penelope*		red-breasted sapsucker	*Sphyrapicus ruber*
canvasback	*Aythya valisineria*		hairy woodpecker	*Picoides villosus*
common pochard	*Aythya ferina*		least flycatcher	*Empidonax minimus*
ring-necked duck	*Aythya collaris*		Hammond's flycatcher	*Empidonax hammondii*
harlequin duck[e]	*Histrionicus histrionicus*		gray flycatcher	*Empidonax wrightii*
white-winged scoter	*Melanitta deglandi*		dusky flycatcher	*Empidonax oberholseri*
black scoter	*Melanitta americana*		eastern phoebe	*Sayornis phoebe*
long-tailed duck	*Clangula hyemalis*		vermilion flycatcher[e]	*Pyrocephalus*
common goldeneye	*Bucephala clangula*		tropical kingbird	*Tyrannus melancholicus*
Barrow's goldeneye[e]	*Bucephala islandica*		Bell's vireo	*Vireo bellii*
hooded merganser	*Lophodytes cucullatus*		Cassin's vireo	*Vireo cassinii*
common merganser	*Mergus merganser*		curlew sandpiper	*Calidris ferruginea*
red-necked grebe	*Podiceps grisegena*		buff-breasted sandpiper	*Tryngites subruficollis*
red-tailed tropicbird	*Phaethon rubricauda*		Hutton's vireo	*Vireo huttoni*
magnificent frigatebird	*Fregata magnificens*		red-eyed vireo	*Vireo olivaceus*
Brandt's cormorant	*Phalacrocorax penicillatus*		purple martin[e]	*Progne subis*
pelagic cormorant	*Phalacrocorax pelagicus*		bank swallow[c,g]	*Riparia riparia*
little blue heron	*Egretta caerulea*		verdin	*Auriparus flaviceps*
tricolored heron	*Egretta tricolor*		red-breasted nuthatch	*Sitta canadensis*

Common Name	Scientific Name		Common Name	Scientific Name
cattle egret	*Bubulcus ibis*		white-breasted nuthatch	*Sitta carolinensis*
bald eagle[a,b,f,g,h,i,j]	*Haliaeetus leucocephalus*		rock wren	*Salpinctes obsoletus*
ferruginous hawk[k]	*Buteo regalis*		Bewick's wren	*Thryomanes bewickii*
rough-legged hawk	*Buteo lagopus*		Pacific wren	*Troglodytes pacificus*
prairie falcon[f,k]	*Falco mexicanus*		mountain bluebird	*Sialia currucoides*
clapper rail	*Rallus longirostris*		sage thrasher	*Oreoscoptes montanus*
lesser sand plover	*Charadrius mongolus*		California thrasher	*Toxostome redivivum*
Wilson's plover	*Charadrius wilsonia*		red-throated pipit	*Anthus cervinus*
mountain plover[e,f,g]	*Charadrius montanus*		phainopepla	*Phainopepla nitens*
wandering tattler	*Tringa incana*		lapland longspur	*Calcarius lapponicus*
white-rumped sandpiper	*Calidris fuscicollis*		chestnut-collared longspur	*Calcarius ornatus*
sharp-tailed sandpiper	*Calidris acuminate*		ovenbird	*Seiurus aurocapilla*
curlew sandpiper	*Calidris ferruginea*		northern waterthrush	*Parkesia noveboracensis*
buff-breasted sandpiper	*Tryngites subruficollis*		black-and-white warbler	*Mniotilta varia*
ruff	*Philomachus pugnax*		palm warbler	*Dendroica palmarum*
red phalarope	*Phalaropus fulicarius*		yellow-breasted chat	*Icteria virens*
black-legged kittiwake	*Rissa tridactyla*		green-tailed towhee	*Pipilo chlorurus*
Sabine's gull	*Xema sabini*		Cassin's sparrow	*Peucaea cassinii*
laughing gull[k]	*Leucophaeus atricilla*		chipping sparrow	*Spizella passerine*
Franklin's gull	*Leucophaeus pipixcan*		clay-colored sparrow	*Spizella pallida*
mew gull	*Larus canus*		black-throated sparrow	*Amphispiza bilineata*
lesser black-backed full glaucous gull	*Larus fuscus*		Nelson's sparrow	*Ammodramus nelson*
sooty tern	*Onychoprion fuscatus*		white-throated sparrow	*Zonotrichia albicollis*
bridled tern	*Onychoprion anaethetus*		summer tanager[e]	*Piranga rubra*
arctic tern	*Sterna paradisaea*		rose-breasted grosbeak	*Pheucticus ludovicianus*
sandwich tern	*Thalasseus sandviciensis*		bobolink	*Dolichonyx oryzivorus*

Common Name	Scientific Name		Common Name	Scientific Name
pomarine jaeger	*Stercorarius pomarinus*		tricolored blackbird[d,e,f,g]	*Agelaius tricolor*
parasitic jaeger	*Stercorarius parasiticus*		yellow-headed blackbird[e]	*Xanthocephalus xanthocephalus*
spotted dove	*Streptopelia chinensis*		red crossbill	*Loxia curvirostra*
white-winged dove	*Zenaida asiatica*		pine siskin	*Cardeulis pinus*
common ground dove	*Columbina passerina*		Lawrence's goldfinch	*Carduelis lawrencei*

[a] state listed – endangered
[b] federally delisted - recovered
[c] state listed - threatened
[d] state candidate – threatened or endangered
[e] CDFW species of special concern
[f] USFWS birds of conservation concern
[g] BLM sensitive species
[h] CDF sensitive species
[i] CDFW fully protected species
[j] USFS sensitive species
[k] CDFW watch list

The Bolsa Chica wetlands serve as a nursery for many fish and shark species. Approximately 80 species of fish inhabit southern California bays and estuaries. The CDFW provided a list of fish species that have been documented currently at the BCER (*Table 4*).

Table 4: List of fish species documented at Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
bonefish	*Albula vulpes*		bay goby	*Lepiodogobius lepidus*
topsmelt	*Atherinops affinis*		California butterfly ray	*Gymnura marmorata*
jacksmelt	*Atherinopsis californiensis*		salema	*Xenistius californiensis*
California grunion	*Leuresthes tenuis*		sargo	*Anisotremus davidsonii*
specklefin midshipman	*Porichthys myriaster*		zebra perch sea chub	*Hermosilla azurea*
California needlefish	*Strongylura exilis*		striped bass	*Morone saxatalis*
bay blenny	*Hypsoblennius gentilis*		striped mullet	*Mugil cephalus*
speckled sanddab	*Citharichthys stigmaeus*		bat ray	*Myliobatis californica*
jack mackerel	*Trachurus japonicas*		California halibut	*Paralichthys californicus*
gray smoothhound shark	*Mustelus californicus*		thornback ray	*Platyrhinoidis triseriata*
leopard shark	*Triakis semifasciata*		diamond turbot	*Hypsopsetta guttulata*

Common Name	Scientific Name		Common Name	Scientific Name
giant kelpfish	*Heterostichus rostratus*		hornyhead turbot	*Pleuronichthys verticalis*
Pacific sardine	*Sardinops sagax*		giant sea bass	*Stereolepis gigas*
Pacific herring	*Clupea pallasi*		blacksmith	*Chromis punctipinnis*
threadfin shad	*Dorosoma petenense*		shovelnose guitarfish	*Rhinobatos productus*
staghorn sculpin	*Leptocottus armatus*		queenfish	*Seriphus politus*
California tonguefish	*Symphurus atricauda*		white seabass	*Atractoscion nobilis*
diamond stingray	*Dasyatis brevis*		yellowfin croaker	*Umbrina roncador*
barred surfperch	*Amphistichus argenteus*		white croaker	*Genyonemus lineatus*
shiner surfperch	*Cymatogaster aggregata*		spotfin croaker	*Rondacor stearnsii*
pile surfperch	*Damalichthys vacca*		California corbina	*Menticirrhus undulates*
walleye surfperch	*Hyperprosopon argenteum*		black croaker	*Cheilotrema saturnum*
dwarf surfperch	*Micrometrus minimus*		chub mackeral	*Scomber japonicas*
black surfperch	*Embiotoca jacksoni*		spotted scorpionfish	*Scorpaneana guttata*
northern anchovy	*Engraulus mordax*		spotted sand bass	*Paralabrax maculatofasciatus*
deep body anchovy	*Anchoa compressa*		barred sand bass	*Paralabrax nebulifer*
slough anchovy	*Anchoa delicatissima*		kelp bass	*Paralabrax clathratus*
California killifish	*Fundulus parvipinnis*		California barracuda	*Sphyraena argentea*
opaleye	*Girella nigricans*		barred pipefish	*Syngnathus auliscus*
arrow goby	*Clevelandia ios*		bay pipefish	*Syngnathus leptorhynchus*
shadow goby	*Quietula y-cauda*		kelp pipefish	*Syngnathus californiensis*
cheekspot goby	*Ilypnus gilbert*		snubnose pipefish	*Cosmoscampus arctus*
longjaw mudsucker	*Gillichthys mirabilis*		round stingray	*Urobatis halleri*
yellowfin goby	*Acanthogobius flavimanus*			

Numerous marine invertebrates inhabit Bolsa Bay and provide a food source for the plethora of avian species that come to the wetlands. Additionally, fish that breed and spawn in the Bolsa Chica wetlands also depend on these organisms as a food source. The CDFW provided the following list of native invertebrates that live in the BCER (*Table 5*). The list includes copepods, amphipods, mussels, clams, horn snails, worms, and crabs. Non-native species that are found

within the ecological reserve include oriental shrimp (*Palaemon macrodactylus*), burrowing Australasian isopod (*Sphaeroma quoyanum*), a bryozoan (*Zoobotryon verticillatum*), chain sea squirt (*Botrylloides* spp.), leathery tunicate (*Styela plicata*), Pacific oyster (*Cassostrea gigas*), ribbed horse mussel (*Geukensia demissa*), Japanese mussel (*Musculista senhousia*), and Mediterranean mussel (*Mytilus galloprovincialis*).

Table 5: List of aquatic invertebrates documented at Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
acorn barnacle	*Balanus glandula*		barrel shell	*Acteon punctocaelatus*
crab	*Cancer sp.*		brown sea hare	*Aplysia californica*
California bay shrimp	*Crangon franciscorum*		black sea hare	*Aplysia vaccaria*
Pacific sponge crab	*Cryptodromiopsis larraburei*		Pacific calico scallop	*Argopecten ventricosus*
hermit crabs	Family Paguridae		bubble snail	*Bulla gouldiana*
crenulated fiddler crab	*Gelasimus crenulatus*		California horn snail	*Cerithidea californica*
yellow shore crab	*Hernigrapsus oregonensis*		chione clams	*Chione sp.*
California green shrimp	*Hippolyte californiensis*		American slipper limpet	*Crepidula fornicate*
kelp humpback shrinp	*Hippolyte clarki*		Pacific stomach wing	*Gatropteron pacificum*
black-clawed crab	*Lophopanopeus bellus*		Kellet's whelk	*Kelletia kelleti*
burrowing crab	*Malacoplax californiensis*		egg cockle	*Laevicardium substriatum*
bay ghost shrimp	*Neotrypaea californiensis*		wavy top turban snail	*Lithopoma undosum*
lined shore crab	*Pachgrapsus crassipes*		owl limpet	*Lottia gigantean*
pink shrimp	*Pandalus sp.*		California lyonsia	*Lyonsia californica*
brown shrimp	*Panaeus californicus*		rough limpet	*Maclintokia scabra*
swimming crab	*Portunus xantussii*		Lion's melibe	*Melibe leonine*
shield-backed kelp crab	*Pugettia product*		bay mussel	*Mytilus trossulus*
American spider crab	*Pyromaia tuberculata*		covered-lip nassa	*Nassarius tegula*
furrowed rock crab	*Romelean branneri*		navanax	*Navanax inermis*
bryozoan	*Bugula sp.*		Lewis' moon snail	*Neverita lewisii*
bryozoan	*Lichenopora sp.*		smooth brown turban	*Norrisis norrisi*
bryozoan	*Thalamoporella californica*		two-spot octopus	*Octopus bimaculoides*
solitary tunicate	Order Ascidiacea		olympia oyster	*Ostreola conchaphila*

Common Name	Scientific Name		Common Name	Scientific Name
colonial tunicate	Order Ascidiacea		Taylor's sea hare	*Phyllapylsia taylori*
moon jelly	*Aurelia sp.*		black dorid	*Polycera atra*
anemone	Class Anthozoa		clam	*Protothaca sp.*
bell jelly	*Polyorchis sp.*		rosy jackknife clam	*Solen rostriformis*
comb jelly	*Phylum Ctenophora*		jackknife clam	*Tagelus californianus*
sand dollar	*Dendraster excentricus*		black turban snail	*Tegula funebralis*
white sea urchin	*Lytechnius anamesus*		clam	*Tellina sp.*
ochre sea star	*Pisaster ochraceus*		yellow sponge	Phylum Porifera
purple sea urchin	*Strongylocentrotus purpuratus*			

Terrestrial invertebrates also utilize the BCER as documented by the CDFW (*Table 6*). The non-native brown widow spider (*Latrodectus geometricus*) has also been documented at the ecological reserve.

Table 6: List of terrestrial invertebrates documented at the Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
wandering skipper	*Panoquina errans*		mudflat tiger beetle	*Cicindela trifasciata sigmoidea*
common hairstreak butterfly	*Strymon melinux*		salt marsh moth	*Estigmene acrea*
fiery skipper butterfly	*Hylephila phyleus*		western black widow spider	*Latrodectus hesperus*
monarch butterfly[a]	*Danaus plexippus*		funnel spider/grass spider	*Agelenopsis spp.*
flame skimmer dragonfly	*Libellula saturata*			

[a] USFS sensitive species

Reptiles may also often be seen at Bolsa Chica. Lizards may be seen on the ground or along the wooden fences, basking in the sunlight. Snakes are seen less frequently, but are occasionally spotted from the walking trails. Rattlesnakes are also present at Bolsa Chica. There is also one amphibian that has been documented at the ecological reserve. The CDFW provided a list of common reptiles and amphibian that have been observed at the BCER (*Table 7*).

Table 7: List of reptiles documented at the Bolsa Chica Ecological Reserve by the California Department of Fish and Wildlife.

Common Name	Scientific Name		Common Name	Scientific Name
southern Pacific rattlesnake	*Crotalus oreganus helleri*		foothill alligator lizard	*Gerrhonotus multicarinatus*
western rattlesnake	*Crotalus viridis helleri*		western fence lizard	*Sceloporus occidentalis*
common king snake	*Lampropeltis getulus*		side-blotched lizard	*Uta stansburiana*
gopher snake	*Pituophis melanoleucus*		western skink	*Eumeces skiltonianus*
two-striped garter snake[b,c,d]	*Thamnophis hammondii*		garden slender salamander	*Batrachoseps major major*
California legless lizard[a,c]	*Anniella pulchra pulchra*		green turtle[a]	*Chelonia mydas*

[a] federal listed - threatened
[b] BLM sensitive species
[c] CDFW species of special concern
[d] USFS sensitive species

Several species of mammals may be seen at Bolsa Chica. *Table 8* shows animals that have been observed at the ecological reserve by the CDFW. A non-native mammal that has been observed at the ecological reserve is the Virginia opossum (*Didelphis virginiana*).

Table 8: List of mammals documented at the Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
northern raccoon	*Procyon lotor*		Mexican free-tailed bat	*Tadarida brasiliensis*
Audubon's cottontail	*Sylvilagus auduboni*		Yuma myotis bat[a]	*Myotis yumanensis*
California ground squirrel	*Otospermophilus beechii*		western red bat[b]	*Lasiurus blossevillii*
pocket gopher	*Thomomys bottae*		California myotis bat	*Myotis californicus*
California vole	*Microtus californicus*		coyote	*Canis latrans*
striped skunk	*Mephitis mephitis*			

[a] BLM sensitive species
[b] CDFW species of special concern

Seal Beach National Wildlife Refuge

The SBNWR was established in 1972 and is administered by the U.S. Fish and Wildlife Service (USFWS). The 965 acre refuge is located within the Naval Weapons Station Seal Beach in Orange County. The refuge serves as a critical stopover and wintering habitat for thousands of birds that migrate up and down the Pacific Flyway each year. It also serves as an island of habitat in the midst of a dense urban setting for a wide variety of fish, wildlife, and plants. *Figure 1* shows the habitat types found within the NWR.

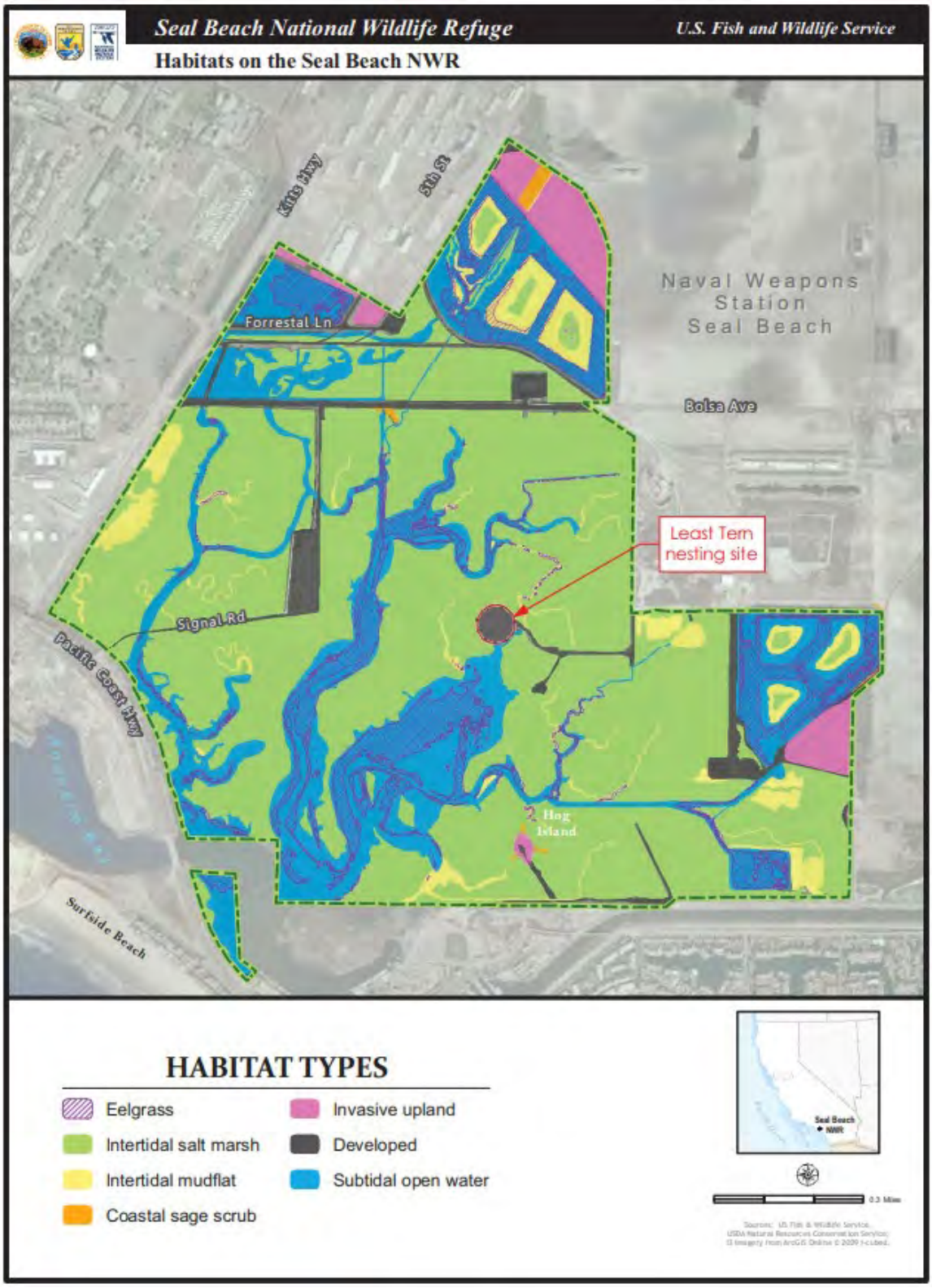

Figure 1: Habitat Types on the Seal Beach NWR (Map from USFWS 2018)

The north coast of Orange County supports some of the most important remnant wetlands in southern California. Up until the early 1900s, this area was a vast network of coastal marshes. Today, portions of this coast are included in the Orange Coast Wetlands Important Bird Area (IBA). This IBA protects some of southern California's most extensive wetlands, and is most notable for its number of breeding terns. Huge flocks of migrating shorebirds (15-20,000 in fall, winter and spring, Page and Shuford 2000) and waterfowl, wintering geese, and foraging raptors travel freely up and down the coast here. Included in the IBA is SBNWR.

Two federally endangered bird species are known to breed at SBNWR, the California least tern and light-footed Ridgway's rail. In regards to the California least tern, between 1986 and 1998 the NWR supported an average of 150 breeding pairs. The light-footed Ridgway's rail used to have more breeding pairs at Seal Beach NWR; however, only about seven pairs remain currently (down from several dozen in the mid-1990's). Other bird species that are considered USFWS birds of conservation concern, BLM sensitive species, and/or CDFW fully protected species/watchlist may be observed utilizing the habitat at Seal Beach NWR. The extensive grassland and open country habitat types present at SBNWR, along with the other wetlands included in the Orange Coast Wetlands IBA, represent a majority of the raptor habitat along the immediate coast of the Los Angeles Basin, with the hawk and owl community of SBNWR potentially being the largest and most diverse. Ferruginous hawk, prairie falcon, and short-eared owl are scarce, but regular winter residents of SBNWR. Burrowing owl nests in weep holes in the weapons storage units of Naval Weapons Station Seal Beach (one of two breeding colonies in coastal southern California). The sparse, flat grassland at SBNWR is one of just four sites in the U.S. that supports wintering Pacific golden-plover, and a handful of mountain plover has recently rediscovered the SBNWR as a wintering area. Hundreds of geese, representing all four regularly-occurring species, winter at SBNWR, the largest concentration in coastal southern California. *Table 9* includes a list of bird species that have been observed at the SBNWR.

Table 9: Birds Observed at Seal Beach National Wildlife Refuge.

Common Name	Scientific Name		Common Name	Scientific Name
brant[f]	*Branta bernicla*		California gull[g]	*Larus californicus*
greater white-fronted goose	*Anser albifrons*		ring-billed gull	*Larus delawarensis*
Canada goose[a]	*Branta canadensis*		western gull	*Larus occidentalis*
cackling goose	*Branta hutchinsii*		red-necked phalarope	*Phalaropus lobatus*
snow goose	*Chen caerulescens*		Bonaparte's gull	*Chroicocephalus philadelphia*
Ross's goose	*Chen rossii*		herring gull	*Larus argentatus*
tundra swan	*Cygnus colmbianus*		glaucous-winged gull	*Larus glaucescens*
mute swan	*Cygnus olor*		glaucous gull	*Larus hyperboreus*
gadwall[a]	*Anas strepera*		California least tern[a,d]	*Sternula antillarum browni*
American wigeon	*Ana americana*		Caspian tern[a,h]	*Hydroprogne caspia*
Eurasian wigeon	*Anas penelope*		black tern[f]	*Chlidonias niger*
mallard[a]	*Anas platyrhynchos*		common tern	*Sterna hirundo*
blue-winged teal[a]	*Anas discors*		Forester's tern[a]	*Sterna forsteri*

Common Name	Scientific Name		Common Name	Scientific Name
cinnamon teal[a]	*Anas cyanoptera*		royal tern[a]	*Thalasseus maximus*
northern shoveler	*Anas clypeata*		elegant tern[a,g]	*Thalasseus elegans*
northern pintail[a]	*Anas acuta*		black skimmer[a,f,h]	*Rynchops niger*
green-winged teal	*Anas carolinensis*		rock pigeon[a]	*Columba livia*
redhead[a,f]	*Aythya americana*		mourning dove[a]	*Zenaida macroura*
ring-necked duck	*Aythya collaris*		spotted dove	*Spilopelia chinensis*
greater scaup	*Aythya marila*		common ground dove	*Columbina passerine*
lesser scaup	*Aythya affinis*		barn owl	*Tyto alba*
canvasback	*Aythya valisineria*		great horned owl[a]	*Bubo virginianus*
long-tailed duck	*Clangula hyemalis*		short-eared owl[e]	*Asio flammeus*
surf scoter	*Melanitta perspicillata*		burrowing owl[a,f,h,i]	*Athene cunicularia*
bufflehead	*Bucephala albeola*		lesser nighthawk	*Chordeiles acutipennis*
common goldeneye	*Bucephala clangula*		white-throated swift	*Aeronautes saxatalis*
hooded merganser	*Lophodytes cucullatus*		black-chinned hummingbird	*Archilochus alexandri*
common merganser	*Mergus merganser*		Anna's hummingbird[a]	*Calypte anna*
red-breasted merganser	*Mergus serrator*		Costa's hummingbird[h]	*Calypte costae*
ruddy duck[a]	*Oxyura jamaicensis*		rufous hummingbird	*Selaphorus rufue*
red-throated loon	*Gavia stellata*		Allen's hummingbird[a]	*Selaphorus sasin*
Pacific loon	*Gavia pacifica*		belted kingfisher	*Megaceryle alcyon*
common loon[f]	*Gavia immer*		red-breasted sapsucker	*Sphyrapicus ruber*
pied-billed grebe[a]	*Podilymbus podiceps*		downy woodpecker	*Dryobates pubescens*
horned grebe	*Podiceps auritus*		northern flicker	*Colaptes auratus*
red-necked grebe	*Podiceps grisegena*		western wood-peewee	*Contopus sordidulus*
eared grebe[a]	*Podiceps nigricollis*		Hammond's flycatcher	*Empidonax hammondii*
western grebe	*Aechmophorus occidentalis*		Pacific-slope flycatcher	*Empidonax difficilis*
Clark's grebe	*Aechmophorus clarkia*		black phoebe[a]	*Sayornis nigricans*
double-crested cormorant[a]	*Phalacrocorax auritus*		Say's phoebe[a]	*Sayornis saya*
pelagic cormorant	*Phalacrocorax pelagicus*		ash-throated flycatcher	*Myiarchus cinerascens*

Common Name	Scientific Name		Common Name	Scientific Name
Brandt's cormorant	*Phalacrocorax penicillatus*		Cassin's kingbird	*Tyrannus vociferans*
American white pelican[a,f]	*Pelecanus erythrorhynchos*		western kingbird	*Tyrannus verticalis*
California brown pelican[f]	*Pelecanus occidentalis*		horned lark[a]	*Eremophila alpestris*
American bittern	*Botaurus lentiginosus*		tree swallow	*Tachycineta bicolor*
great blue heron[a,j]	*Ardea herodias*		violet-green swallow	*Tachycineta thalassina*
great egret[j]	*Ardea alba*		northern rough-winged swallow	*Stelgidopteryx serripennis*
cattle egret	*Bubulcus ibis*		cliff swallow[a]	*Petrochelidon pyrrhonota*
little blue heron	*Egretta caerulea*		barn swallow[a]	*Hirundo rustica*
snowy egret	*Egretta thula*		bushtit[a]	*Psaltriparus minimus*
tricolored heron	*Egretta tricolor*		house wren[a]	*Troglodytes aedon*
reddish egret	*Egretta rufescens*		marsh wren[a]	*Cistothorus palustris*
green heron[a]	*Butorides virescens*		rock wren	*Salpinctes obsoletus*
black-crowned night heron[a]	*Nycticorax nycticorax*		Bewick's wren	*Thryomanes bewickii*
white-faced ibis[g]	*Plegadis chihi*		blue-grey gnatcatcher	*Polioptila caerulea*
turkey vulture	*Cathartes aura*		ruby-crowned kinglet	*Regulus calendula*
osprey[g,j]	*Pandion haliaetus*		mountain bluebird	*Sialia currucoides*
white-tailed kite[a,e,i]	*Elanus leucurus*		western bluebird	*Sialia mexicana*
bald eagle[b,e,h,i,j,k]	*Haliaeetus leucocephalus*		hermit thrush	*Catharus guttatus*
golden eagle[e,g,h,i,j]	*Aquila chrysaetos*		American robin	*Turdus migratorius*
northern harrier[a]	*Circus hudsonius*		northern mockingbird[a]	*Mimus polyglottos*
sharp-shinned hawk	*Accipiter striatus*		European starling[a]	*Sturnus vulgaris*
Cooper's hawk[a,g]	*Accipiter cooperii*		American pipit	*Anthus rubescens*
red-shouldered hawk	*Buteo lineatus*		sage thrasher	*Oreoscoptes montanus*
red-tailed hawk[a]	*Buteo jamaicensis*		California scrub jay	*Aphelocoma californica*
Ferruginous hawk[g]	*Buteo regalis*		American crow[a]	*Corvus brachyrhynchos*
Swainson's hawk	*Buteo swainsoni*		common raven[a]	*Corvus corvax*
American kestrel[a]	*Falco sparverius*		cedar waxwing	*Bombycilla cedrorum*
merlin[g]	*Falco columbarius*		loggerhead shrike[a,f,h]	*Lanius ludovicianus*
prairie falcon[g,h]	*Falco mexicanus*		warbling vireo	*Vireo gilvus*

Common Name	Scientific Name		Common Name	Scientific Name
peregrine falcon[a,e,h,j]	*Falco peregrinus*		orange-crowned warbler	*Oreothlypis celata*
clapper rail	*Rallus crepitans*		Nashville warbler	*Oreothlypis ruficapilla*
Virginia rail[a]	*Rallus limicola*		common yellowthroat	*Geothlypis trichas*
light-footed Ridway's rail[b,d]	*Rallus longirostris levipes*		yellow warbler	*Dendroica petechia*
sora[a]	*Porzana Carolina*		yellow-rumped warbler	*Dendroica coronata*
American coot[a]	*Fulica Americana*		black-throated gray warbler	*Setophaga nigrescens*
Black-Bellied Plover	*Pluvialis squatarola*		Townsend's warbler	*Dendroica townsendii*
Pacific Golden-Plover	*Pluvialis fulva*		hermit warbler	*Setophaga occidentalis*
Snowy Plover[a]	*Charadrius alexandrinus*		Wilson's warbler	*Cardellina pusilla*
Mountain Plover[f,h,i]	*Charadrius montanus*		green-tailed towhee	*Pipilo chlorurus*
Semipalmated Plover	*Charadrius semipalmatus*		spotted towhee	*Pipilo maculatus*
Killdeer[a]	*Charadrius vociferous*		California towhee[a]	*Melozone crissalis*
Black Oystercatcher	*Haematopus bachmani*		chipping sparrow	*Spizella passerina*
Black-Necked Stilt[a]	*Himantopus mexicanus*		lark sparrow	*Chondestes grammacus*
American Avocet[a]	*Recurvirostra americana*		common savannah sparrow	*Passerculus sandwichensis*
Greater Yellowlegs	*Tringa melanoleuca*		Belding's savannah sparrow[a,b]	*Passerculus sandwichensis beldingi*
Willet	*Tringa semipalmata*		large-billed savannah sparrow	*Passerculus sandwichensis rostratus*
Lesser Yellowlegs	*Tringa flavipes*		Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*
Wanderling Tattler	*Tringa incana*		fox sparrow	*Passerella iliaca*
Whimbrel	*Numenius phaeopus*		song sparrow[a,f]	*Melospiza melodia*
Long-Billed Curlew[g,h]	*Numenius americanus*		Lincoln's sparrow	*Melospiza lincolnii*
Marbled Godwit	*Limosa fedoa*		white-crowned sparrow	*Zonotrichia leucophrys*
Ruddy Turnstone	*Arenaria interpres*		golden-crowned sparrow	*Zonotrichia atricapilla*

Common Name	Scientific Name		Common Name	Scientific Name
Black Turnstone	*Arenaria melanocephala*		western tanager	*Piranga ludoviciana*
Surfbird	*Aphriza virgate*		black-headed grosbeak	*Pheucticus melanocephalus*
Red Knot	*Calidris canutus*		blue grosbeak	*Passerina caerulea*
Sanderling	*Calidris alba*		lazuli bunting	*Passerina amoena*
Spotted Sandpiper	*Actitis macularius*		lapland longspur	*Calcarius lapponicus*
Western Sandpiper	*Calidris mauri*		house sparrow	*Passer domesticus*
least sandpiper	*Calidris minutilla*		red-winged blackbird[a]	*Agelaius phoeniceus*
Baird's sandpiper	*Calidris bairdii*		tricolored blackbird	*Agelaius tricolor*
pectoral sandpiper	*Calidris melanotos*		western meadowlark	*Sturnella neglecta*
dunlin	*Calidris alpine*		yellow-headed blackbird[f]	*Xanthocephalus xanthocephalus*
stilt sandpiper	*Calidris himantopus*		Brewer's blackbird	*Euphagus cyanocephalus*
ruff	*Philomachus pugnax*		brown-headed cowbird	*Molothrus ater*
short-billed dowitcher	*Limnodromus griseus*		hooded oriole[a]	*Icterus cucullatus*
long-billed dowitcher	*Limnodromus scolopaceus*		Bullock's oriole	*Icterus bullockii*
common snipe	*Gallinago gallinago*		house finch[a]	*Carpodacus mexicanus*
Wilson's phalarope	*Phalaropus tricolor*		lesser goldfinch[a]	*Carduelis psaltria*
red phalarope	*Phalaropus fulicarius*		American goldfinch	*Spinus tristis*
Heermann's gull	*Larus heermanni*		northern red bishop	*Euplectes franciscanus*

[a] Species that have nested at Bolsa Chica Ecological Reserve
[b] state listed - endangered
[c] federal listed - threatened
[d] federal listed – endangered
[e] CDFW fully protected species
[f] CDFW species of special concern
[g] CDFW watch list
[h] USFWS birds of conservation concern
[i] BLM sensitive species
[j] CDF sensitive species
[k] USFS sensitive species

In 2013, benthic invertebrate surveys were conducted within Anaheim Bay, including portions of Seal Beach NWR. During the surveys a total of 56 species were captured, and of these, 20 species were captured within the vicinity of Seal Beach NWR. Abundant species over the length of the surveys included the bubble snail (*Bulla gouldiana*), green shrimp/grass shrimp (*Hippolyte californiensis*), broken back shrimp (*Heptacarpus sp.*), and speckled scallop (*Argopecten ventricosus*). Also observed on the NWR in previous surveys was the California brackish water

snail (*Tryonia imitator*), a species identified by the State of California as imperiled. *Table 10* shows the benthic species captured during the 2013 surveys.

Table 10: Benthic Invertebrates Observed within Vicinity of Seal Beach NWR during 2013 surveys.

Phylum	Scientific Name	Common Name
Bryozoa	*Zoobotryon verticillatum*	spaghetti bryozoan
Mollusca	*Arcularia tiarula*	mud dog whelk
	Argopectem ventricosus	speckled scallop
	Bulla gouldiana	bubble snail
	Caesia perpinguis	western fat dog whelk
	Cerithidea californica	California hornsnail
	Crepidula sp.	slipper shell
	Kelletia kelletii	Kellet's whelk
	Laevicardium substriatum	Pacific egg cockle
	Navanax inermis	navanax
Arthoropoda	*Cancer oregonensis*	pygmy rock crab
	Emerita sp.	mole crab
	Farfantepenaeus californiensis	brown shrimp
	Hemigrapsus oregonensis	yellow shore crab
	Heptacarpus sp.	broken back shrimp
	Hippolyte sp.	grass shrimp
	Pachygrapsis crassipes	lined shore crab
	Palaemon macrodactylus	oriental shrimp
	Portunus xantusii	Xantu's swimming crab
	Pugettia producta	northern kelp crab

Source: USFWS 2014

In 2013, fish surveys were also conducted within Anaheim Bay, including portions of Seal Beach NWR. A total number of 57 fish species were captured during the surveys, with 36 species identified within the vicinity of Seal Beach NWR. Abundant species over the length of the surveys included topsmelt (*Atherinop affinis*), northern anchovy (*Engraulis mordax*), and queenfish (*Seriphus politus*). *Table 11* shows the fish species captured during the 2013 surveys.

Table 11: Fish Species Observed within Vicinity of Seal Beach NWR during 2013 surveys.

Scientific Name	Common Name
Atherinop affinis	topsmelt
Engraulis mordax	northern anchovy
Seriphus politus	queenfish
Cymatogaster aggregata	shiner surfperch
Paralabrax nebulifer	barred sand bass
Urobatis halleri	round stingray
Ilypnus gilberti	cheekspot goby
Leuresthes tenuis	California grunion
Leptocottus armatus	staghorn sculpin
Sardinops sagax	Pacific sardine
Syngnathus leptorhynchus	bay pipefish

Scientific Name	Common Name
Heterostichus rostratus	giant kelpfish
Clevelandia ios	arrow/shadow goby
Paralichthys californicus	California halibut
Paralabrax clathratus	kelp bass
Roncador stearnsii	spotfin croaker
Paralabrax maculatofasciatus	spotted sand bass
Umbrina roncador	yellowfin croaker
Fundulus parvipinnis	California killifish
Hyperprosopon argenteum	walleye surfperch
Hypsoblennius gentilis	bay blenny
Acanthogobius flavimanus	yellowfin goby
Porichthys myriaster	specklefin midshipman
Anisotremus davidsonii	sargo
Xenistius californiensis	salema
Syngnathus auliscus	barred pipefish
Atractoscion nobilis	white seabass
Mustelus californicus	gray smooth-hound shark
Anchoa compressa	deepbody anchovy
Strongylura exilis	California needlefish
Atherinops californiensis	jacksmelt
Embiotoca jacksoni	black surfperch
Symphurus atricaudus	California tonguefish
Gymnura marmorata	California butterfly ray

Source: USFWS 2014

(2) State Listed Species and Species of Special Concern

The Seal Beach, Anaheim, and Newport Beach U.S. Geological Survey 1:24,000-scale, 7.5-minute by 7.5-minute quadrangle maps were queried for state protected species that could occur within the study area using the CDFW's California Natural Diversity Database (CNDDB). There are approximately 42 state special status species that could potentially occur within the study area. *Table 12* lists only those species that were listed for the Seal Beach, Anaheim, and Newport Beach quandrangles on the CNDDB. The CDFW, in a letter dated January 12, 2018, listed the following specific state-listed species and state sensitive species and habitats as occurring within the BCER, which is within the project area: western snowy plover (*Charadrius nivosus nivosus*), Ridgway's rail (*Rallus obsoletus levipes*), California least tern (*Sternula antillarum browni*), Belding's savannah sparrow (*Passerculus sandwichensis beldingii*), peregrine falcon (*Falco peregrinus*), burrowing owl (*Athene cunicularia*), coastal California gnatcatcher (*Polioptila californica californica*), Cooper's hawk (*Accipiter cooperii*), osprey (*Pandion haliaetus*), black skimmer (*Rynchops niger*), white-faced ibis (*Plegadis chihi*), California seablite (*Suaeda californica*), estuary seablite (*Suaeda esteroa*), coastal woolly-heads (*Nemacaulis denudata var. denudata*), southern tarplant (*Centromadia parryi ssp. australis*), and green turtle (*Chelonia mydas*). Per the letter, sensitive marine resources include eelgrass (*Zostera marina*) beds, beach habitat, intertidal and subtidal habitat, nesting/spawning habitat (including grunion, *Leuresthes tenuis*, habitat), mud flats, sand flats, dunes, coastal strand, and salt marsh.

Appendix L – Environmental Considerations

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Table 12: State protected species for the Seal Beach (3311861), Anaheim (3311778), Los Alamitos (3311871) and Newport Beach (3311768) quadrangles (CNDDB 2018).

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
Plants			
San Diego button-celery (*Eryngium aritulatum var. parishii*)	FE, CE, CRP (1B.1)	Coastal scrub, valley and foothill grassland, vernal pools.	**Not expected to occur**. There is no suitable habitat within the project area. The closest extant population is found in Newport Beach. In addition, correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019) regarding the project does not indicate that San Diego button-celery is within the project's action area. Therefore, the recommended project will not directly or indirectly impact this species.
Gambel's water cress (*Nasturtium gambelii*)	FE, CT, CRP (1B.1)	Freshwater or brackish marshes and swamps.	**Not expected to occur**. There is no suitable habitat within the project area. The closest extant populations are found in Newport Beach and Tustin. In addition, correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019) regarding the project does not indicate that Gambel's water cress is within the project's action area. Therefore, the recommended project will not directly or indirectly impact this species.
Ventura marsh milk-vetch (*Astragalus pycnostachyus var. lanosissimus*)	FE, CE, CRP (1B.1)	Coastal dunes, coastal scrub, marshes and swamps (edges, coastal salt, or brackish).	**Not expected to occur**. Limited suitable habitat exists within the project area. The species is presumed extirpated from the project area. In addition, correspondence

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019) regarding the project does not indicate that Ventura marsh milk-vetch is within the project's action area. Therefore, the recommended project will not directly or indirectly impact this species.
southern tarplant (*Centromadia parryi ssp. australis*)	CRP (1B.1)	Marshes and swamps (margins), valley and foothill grassland (vernally mesic), and vernal pools.	**Potential to occur**. Correspondence from CDFW (Sevrens 2018) indicates that the species is present in the muted tidal pocket of the BCER. Proposed compensatory mitigation as part of the recommended project includes building a hydraulic stoplog structure that would allow freshwater from the C05 channel to overflow into the muted tidal pocket. The outlet culvert of the muted tidal pocket would also be daylighted allowing more tidal influence into the area. These changes are not expected to directly impact the species. If habitat conversion occurred due to the addition of the hydraulic structures then there could be a potential indirect impact to southern tarplant.
salt marsh bird's-beak (*Chloropyron maritimum ssp. maritimum*)	FE, CE, CRP (1B.2)	Coastal dunes and coastal salt marshes and swamps.	**Not expected to occur**. According to the CNDDB, an extant population of salt marsh bird's-beak occurs within SBNWR. While the species appears to be present within the SBNWR, there is no indication that the species is present

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			in the project area. Correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019) regarding the project does not indicate that salt marsh bird's-beak is within the project's action area. Therefore, the recommended project will not directly or indirectly impact this species.
California orcutt grass (*Orcuttia californica*)	FE, CE, CRP (1B.1)	Vernal pools.	**Not expected to occur**. No vernal pool habitat is located within the project area. The closest population of California orcutt grass that is presumed extant is found in the Newport Beach quadrangle. In addition, correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019) regarding the project does not indicate that California orcutt grass is within the project's action area. Therefore, the recommended project will not directly or indirectly impact this species.
Laguna beach dudleya (*Dudleya stolonifera*)	FT, CT, CRP (1B.1)	Perennial stoloniferous herb.	**Not expected to occur.** No suitable habitat is present within the project area. In addition, correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019) regarding the project does not indicate that Laguna beach dudleya is within the project's action area. Therefore, the recommended project will not directly or indirectly impact this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
estuary seablite (*Suaeda esteroa*)	CRP (1B.2)	Coastal salt marshes and swamps.	**Not expected to occur**. This species is found within the vicinity of Rabbit Island in the BCER, however, the project does not include any features that would be implemented in this area or that would cause an indirect impact to species found on Rabbit Island. Therefore, the recommended project will not directly or indirectly impact this species.
California seablite (*Suaeda californica*)	FE, CRP (1B.1)	Coastal salt marshes and swamps.	**Not expected to occur**. This species is found within the vicinity of Rabbit Island in the BCER, however, the project does not include any features that would be implemented in this area or that would cause an indirect impact to species found on Rabbit Island. Therefore, the recommended project will not directly or indirectly impact this species.
coast woolly-heads (*Nemacaulis denudata var. denudata*)	CRP (1B.2)	Coastal dunes.	**Not expected to occur**. This species is found within the vicinity of Rabbit Island in the BCER, however, the project does not include any features that would be implemented in this area or that would cause an indirect impact to species found on Rabbit Island. Therefore, the recommended project will not directly or indirectly impact this species.
Birds			
California gull (*Larus californicus)*	WL	Reproduction: Primarily breed on sparsely vegetated islands and levees in inland lakes and rivers. Build nest on the	**Potential to occur**. This species is frequently observed at the BCER and is also observed at the SBNWR. To avoid

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		ground in the open or at base of small shrub. Habitat: In the winter they forage along the Pacific Coast, using mudflats, rocky shorelines, beaches, estuaries, and river deltas.	impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.
bank swallow (*Riparia riparia*)	CT	Reproduction: Nest in colonies on vertical banks or bluffs. Habitat: Line in low areas along rivers, streams, ocean coasts, and reservoirs. Territories usually include cliffs or	**Not expected to occur**. This species is infrequently observed at the BCER. Therefore, the recommended project would not directly or indirectly impact this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		banks. Forage in open areas and avoid places with tree cover.	
Cooper's hawk (*Accipiter cooperii*)	WL	Cover: Seldom found in areas without dense tree stands, or patchy woodland habitat. Reproduction: Usually nests in second-growth conifer stands, or in deciduous riparian areas, usually near streams. Habitat: Nesting and foraging usually occur near open water or riparian vegetation.	**Potential to occur**. This species is frequently observed at the BCER and is also observed at the SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
osprey (*Pandion haliaetus*)	WL	Cover: Uses large trees, snags, and dead-topped trees in open forest habitats for cover and nesting. Reproduction: Nests on platform of sticks at the top of large snags, dead-topped trees, on cliffs, or on human made structures. Habitat: Requires clear, open waters required for foraging. Uses large snags and open trees near large bodies of water.	**Potential to occur**. This species is frequently observed at the BCER. To avoid impacts to nesting and breeding birds within the BCER, construction activities adjacent to this area (i.e., C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.
Least bittern (*Ixobrychus exilis*)	CSC	Cover: Rests, roosts, and hides in dense, emergent vegetation.	**Potential to occur**. This species is frequently observed at the BCER. To avoid impacts to nesting and breeding

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		Reproduction: Nests are built low in tules or cattails, usually above water level. Usually near open water, or a small opening in vegetation. Additional: Uses dense, emergent vegetation for cover and nesting, and feeds in such vegetation, as well as in small openings. Often feeds along the edge of emergent vegetation, on the open-water side.	birds within the BCER, construction activities adjacent to this area (i.e., C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.
western snowy plover (*Charadrius alexandrines nivosus*)	FT, CSC	Cover: Crouches motionless on sandy substrate and relies on camouflage for cover. Reproduction: Requires a sandy, gravelly or friable soil substrate for nesting. Nests are shallow depressions	**Potential to occur**. This species is frequently observed at the BCER. To avoid impacts to nesting and breeding birds within the BCER, construction activities adjacent to this area (i.e., C05 Reach 1, tide gates, and Warner Avenue

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		in the sand or soil. Frequently located near or under objects such as driftwood, rocks, or defoliated bushes. Nests also may be on barren ground with no nearby cover. Additional: Nests, feeds, and takes cover on sandy or gravelly beaches along the coast, on estuarine salt ponds, and alkali lakes.	Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species. Refer to the Biological Evaluation (*Appendix L – Environmental Considerations*) prepared for the USFWS and NMFS which includes a more detailed discussion regarding potential impacts to this species.
mountain plover (*Charadrius montanus*)	CSC	Cover: Avoids high and dense cover. Uses open grasslands, plowed fields	**Not expected to occur**. This species is infrequently observed at the BCER and SBNWR. Therefore, the recommended

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		with little vegetation, and open sagebrush areas. Reproduction: Does not nest in California. Nests in high-elevation grassland, often blue grama and buffalo grass patches. Additional: Frequents open plains with low, herbaceous or scattered shrub vegetation.	project would not directly or indirectly impact this species.
Belding's savannah sparrow (*Passerculus sandwichensis beldingii*)	CE	Cover: Cover provided mostly by herbage in grasslands, wet meadows, salicornia wetlands, and by associated scattered shrubs and rocks. Requires dense ground cover in breeding season. In winter, seeks similar cover in a variety of moist and dry grasslands, croplands, and in low vegetation along beaches and shorelines. Reproduction: Nests in a hollow on ground; usually concealed by overhanging vegetation. Additional: Breeds mostly in dense, moist grasslands, wet meadows, and salicornia wetlands, with or without scattered shrubs or clumps of tall herbs. In winter, occupies moist and dry grasslands, but prefers dense, short ground cover; also occurs in low vegetation in croplands and along beaches and shorelines.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.
large-billed savannah sparrow (*Passerculus sandwichensis rostratus*)	CSC	Habitat: Live in grasslands with few trees, including meadows, pastures, grassy roadsides, sedge wetlands, and cultivated fields. Near oceans they inhabitat tidal saltmarshes and estuaries. Reproduction: Hide nests amid thick thatch of the prior season's dead grasses in densely vegetated areas. Nest is usually on the ground or low in grasses, goldenrod, saltmarsh vegetation, or low shrubs.	**Potential to occur**. This species is observed at the SBNWR. To avoid impacts to nesting and breeding birds within the SBNWR, construction activities adjacent to this area (i.e., C02 Reach 23) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, BCER, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			Therefore, the recommended project would have only less than significant indirect impacts to this species.
tricolored blackbird (*Agelaius tricolor*)	CT, CSC	Feeding: Forages on ground in croplands, grassy fields, flooded land, and along edges of ponds. Cover: Seeks cover in emergent wetland vegetation, especially in cattails and tules; also in trees and shrubs. Roosts in large flocks in emergent wetland or in trees. Reproduction: Usually nests in dense cattails or tules; also nests in thickets of willow, blackberry, wild rose, and tall herbs. Nest usually located a few feet over, or near, fresh water. Pattern: Frequents fresh emergent wetlands. Nest may be located up to 4 miles from foraging areas.	**Potential to occur**. This species is observed at the SBNWR and infrequently observed at the BCER. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			would have only less than significant indirect impacts to this species.
California brown pelican (*Pelecanus occidentalis californicus*)	FP	Feeding: Forages mainly in early morning or late afternoon, or when tide is rising. May completely, or only partially, submerge and water may be shallow or deep. Cover: Usually rests on water or inaccessible rocks (either offshore or on mainland), but also uses mudflats, sandy beaches, wharfs, and jetties. Reproduction: Nests on rocky, or low, brushy slopes of undisturbed islands; usually on ground, but less often in bushes. Pattern: Needs undisturbed islands adjacent to good marine fishing areas.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
black skimmer (*Rynchops niger*)	CSC	Feeding: Foraging takes place in calm, shallow water. In certain areas, may feed near river mouths and other water channels. Cover: Roosting takes place on sandy beaches or gravel bars. Reproduction: Nests primarily on gravel bars, low islets and sandy beaches, in unvegetated sites. Dredging spoils and dikes along coastal waterways provide important artificial nesting sites, especially where human disturbance prevents nesting on nearby beaches. Pattern: Requires shallow, calm water for foraging, and sand bars, beaches, or dikes for roosting and nesting.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.
California least tern	FE, CE, FP	Feeding: Feeds primarily in shallow estuaries or lagoons. Considerable	**Potential to occur**. This species is frequently observed at the BCER and

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
(*Sternula antillarum browni*)		feeding also takes place near shore in the open ocean, especially where lagoons are nearby, or at mouths of bays. Cover: Adult roosts primarily on the ground. Reproduction: Nests in loose colonies in areas relatively free of human or predatory disturbance. Nests on barren to sparsely vegetated site near water, usually on sandy, or gravelly substrate. Pattern: Prefers undisturbed nest sites on open, sandy or gravelly shores near shallow-water feeding areas in estuaries.	SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species. Refer to the Biological Evaluation (*Appendix L – Environmental Considerations*) prepared for the USFWS and NMFS which includes a more detailed discussion

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			regarding potential impacts to this species.
elegant tern (*Thalasseus elegans*)	WL	Feeding: Primarily feeds in shallow ocean waters beyond the turbulent breaker zone, but also may forage in protected bays and lagoons. Cover: Congregates on beaches and tideflats when not feeding. Tends to roost high up on beaches. Reproduction: While breeding, confined to Mexico and extreme southern California. Nests on dikes between salt ponds in association with Caspian tern in some areas. Elsewhere, nests in colonies on undisturbed island beaches. Pattern: Post-breeders frequent seacoasts, mudflats, bays, estuaries, and lagoons.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
American white pelican (*Pelecanus erythrorhynchos*)	CSC	Feeding: Feeds in water of various depths. Cover: Rests in day and roosts at night along edge of water, on beaches, sandbars, or old driftwood, but never in trees. Reproduction: Nests at large freshwater and salt water lakes, usually on small islands or remote dikes. Pattern: During breeding season, may travel as much as 184 miles each way from breeding grounds to foraging area; thus does not require nest site and food at same lake.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
double-crested cormorant (*Phalacrocorax auritus*)	WL	Feeding: Prefers water less than 30 feet deep with rocky or gravel bottom, but may catch fish as deep as 72 feet. Cover: Rests in daytime and roosts overnight beside water on offshore rocks, islands, steep cliffs, dead branches or trees, wharfs, jetties, or even transmission lines. Perching sites must be barren of vegetation. Reproduction: Requires undisturbed nest-sites beside water, on islands or mainland. Uses wide rock ledges on cliffs; rugged slopes; and live or dead trees, especially tall ones. Pattern: Suitable nest-site must be within 5-10 miles of dependable food supply.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to these areas (i.e., C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.
light-footed Ridgway's rail	FE, CE, FP	Habitat: Uses coastal salt marshes, lagoons, and maritime environments.	**Potential to occur**. This species is frequently observed at the BCER and

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
(*Rallus obsoletus levipes*)		Reproduction: Nest in the lower littoral zone of coastal salt marshes where dense stands of cordgrass are present. Feeding: Require shallow water and mudflats for foraging, with adjacent higher vegetation for cover during high water.	SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species. Refer to the Biological Evaluation (*Appendix L – Environmental Considerations*) prepared for the USFWS and NMFS which includes a more detailed discussion

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			regarding potential impacts to this species.
long-billed curlew (*Numenius americanus*)	WL	Feeding: At times wades in belly-deep water and uses bill to probe deep into substrates for food or grabs food from mud surface. Cover: At coastal estuaries, requires high salt marsh, pastures, salt ponds for roosting during high tide periods. Reproduction: Breeds on grazed, mixed-grass and shortgrass prairies. Habitats on gravelly soils and gently rolling terrain are favored over others. Nest usually located in relatively flat areas with grass cover. In California, nests on elevated interior grasslands and wet meadows, usually adjacent to lakes or marshes. Pattern: Upland shortgrass prairies and wet meadows are used for nesting; coastal estuaries, open grasslands, and croplands are used in water.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
burrowing owl (*Athene cunicularia*)	CSC	Feeding: Hunts from a perch, hovers, hawks, dives, and hops after prey on ground. Cover: Uses rodent or other burrow for roosting and nesting cover. Reproduction: Usually nests in old burrow of ground squirrel, or other small mammal. May dig own burrow in soft soil. May use pipes, culverts, and nest boxes where burrows are scarce. Nests have also been observed in buildings. Pattern: Frequents open grasslands and shrublands with perches and burrows.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
coastal California gnatcatcher (*Polioptila californica californica*)	FT, CSC	Feeding: Gleans insects from shrubs, especially California buckwheat and coastal sage. Cover: Shrubs provide roosting, nesting, and other cover. Reproduction: Makes nest in shrub above ground. Pattern: Most numerous in low, dense coastal scrub habitat in arid washes, on mesas, and on slopes of coastal hills. California buckwheat, coastal sage, and patches of pricklypear are particularly favored.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species. Refer to the Biological Evaluation (*Appendix L – Environmental Considerations*) prepared

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			for the USFWS and NMFS which includes a more detailed discussion regarding potential impacts to this species.
peregrine falcon (*Falco peregrinus*)	CFP	Feeding: Feed along open habitat, barrier islands, mudflats, coastlines, lake edges, and mountain chains. Cover: Perch or nest on skyscrapers, water towers, cliffs, power pylons, and other tall structures. Reproduction: Breed in open landscapes with cliffs (or skyscrapers) for nest sites.	**Potential to occur**. This species is frequently observed at the BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			would have only less than significant indirect impacts to this species.
white-faced ibis (*Plegadis chihi*)	WL	Feeding: Feeds along mudflats, saltmarshes, etc. Cover: Found in salt marshes and other aquatic vegetation. Reproduction: Nest on the ground.	**Potential to occur**. This species is frequently observed at BCER and SBNWR. To avoid impacts to nesting and breeding birds within the BCER and SBNWR, construction activities adjacent to this area (i.e.,C02 Reach 23, C05 Reach 1, tide gates, and Warner Avenue Bridge) would occur outside of the bird nesting season (i.e., construction activities would occur between October 1 and February 28). Therefore, the recommended project would have no direct impacts to this species. Indirect impacts to this species could occur if construction activities inhibit this species from foraging within Outer Bolsa Bay and along the channels where construction would be occurring. However, there are numerous nearby areas where this species could forage (i.e., Pacific Ocean, SBNWR, Anaheim Bay, etc.), therefore, this is not expected to be a significant indirect impact. In addition, there would only be a temporary impact to foraging, lasting only the duration of construction. Therefore, the recommended project would have only less than significant indirect impacts to this species.

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
Mammals			
western mastiff bat (*Eumops perotis californicus*)	CSC	Feeding: Catches and feeds in flight over terrain. Cover: Crevices in cliff faces, high buildings, trees, and tunnels are required for roosting. Reproduction: Nursery roosts typically tight rock crevices or crevices in buildings. Pattern: Suitable habitat consists of extensive open areas with abundant roost locations provided by crevices in rock outcrops and buildings.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
south coast marsh vole (*Microtus californicus stephensi*)	CSC	Habitat: Occurs in a narrow band of wetland communities and associated grasslands in the immediate coastal zone from southern Ventura County to northern Orange County.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
southern California saltmarsh shrew (*Sorex ornatus salicornicus*)	CSC	Habitat: Confined to coastal salt marshes in Los Angeles, Orange, and Ventura counties.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
Fish			
Santa Ana sucker (*Catostomus santaanae*)	FT	Habitat: Species known fromo the Los Angeles River basin, San Gabriel River basin, and Santa Ana River basin. Prefer	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		small permanent streams with gravel, cobble, and boulder substrates. Prefer clear water but can tolerate turbidity.	not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
arroyo chub (Gila orcuttii)	CSC	Habitat: Native to the streams and rivers of the Los Angeles plain in souther California, including the Los Angeles, San Gabriel, San Luis Rey, Santa Ana, and Santa Margarita Rivers, and Malibu and San Juan Creeks. Most common in slow flowing or backwater areas with sand or mud substrate.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
Santa Ana speckled dace (*Rhinichthys osculus ssp. 3*)	CSC	Habitat: Prefer habitat that includes clear, well oxygenated water, with movement due to a current or waves. The fish thrive in areas with deep cover or overhead protection from vegetation or woody debris.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
steelhead (southern California DPS) (*Oncorhynchus mykiss irideus*)	FE	Habitat: Hatch in gravel-bottomed, fast-slowing, well-oxygenated rivers and streams. May stay in fresh water all their lives or may migrate to the ocean.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
Amphibians and Reptiles			
southern California legless lizard (*Anniella stebbinsi*)	CSC	Feeding: Usually forages at the base of shrubs or other vegetation either on the surface or just below it in leaf litter or sandy soil.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
		Cover: Sometimes seek cover under surface objects such as flat boards and rocks where they lie covered in loose soil. Often encountered buried in leaf litter and commonly burrow near the surface through loose soil. Water: Often found where substrates are slightly moist. Pattern: Found primarily in areas with sandy or loose organic soils or where there is plenty of leaf litter.	BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.
two-striped garter snake (*Thamnophis hammondi*)	CSC	Feeding: Highly aquatic, forage primarily in and along streams. Cover: Preferred nocturnal retreats are thought to be holes, especially mammal burrows, crevices, and surface objects. During the day often basks on streamside rocks or on densely vegetated stream banks. In milder areas, mammal burrows and surface objects serve as winter refuges. Reproduction: Young born in secluded sites such as under loose bark of rotting logs or in dense vegetation near pond or stream margins. Water: Normally found in the immediate vicinity of permanent or semi-permanent sources of water.	**Potential to occur**. This species has been observed at the BCER, however, the precise location of where the species has been observed within the reserve is not documented on the CNDDB. The recommended project is not expected to have a direct impact on this species, however, there could be an indirect impact. The species is highly aquatic and feeds primarily in and along streams. Construction activities associated with the recommended project could disrupt the feeding activities of this species. This would be a temporary impact, lasting only the duration of construction activities. In addition, the construction activities would not preclude the species from foraging in other parts of the BCER where construction is not occurring. Therefore, the recommended project

Name	Status	Habitat Requirements	Probability of Occurrence & Assessment of Impacts
			would have a less than significant indirect impact to this species.
coast horned lizard (*Phrynosoma blainvillii*)	CSC	Feeding: Horned lizards forage on the ground in open areas, usually between shrubs and often near ant nests. Cover: Often bask on the ground or on elevated objects such as low boulders and rocks. Burrow into loose soil to avoid predators and extreme heat. Periods of inactivity and winter hibernation are spent burrowed into the soil under surface objects such as logs or rocks, in mammal burrows, or in crevices. Reproduction: Eggs apparently constructed in loose soil. Pattern: Inhabits open country, especially sandy areas, washes, flood plains and wind-blown deposits in a wide variety of habitats.	**Not expected to occur**. Suitable habitat for this species is not found within the project area. In addition, this species was not noted as having been observed at the BCER or the SBNWR. Therefore, the recommended project would not directly or indirectly impact this species.

[a] Status Designations: FE – federally endangered, FT – federally threatened, FC – federal candidate species, FP – federal proposed species, SE – state endangered, ST – state threatened, SSC – state species of species concern, SC – state candidate species, WL – state watch list, CFP – CDFW fully protected species, and CRP – California Rare Plant (with Ranking of 1A, 1B, 2A, or 2B).

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1.2 Aethetic Resources

Aesthetic analysis considers the existing and future appearance, or perception of views, of the project site and areas surrounding the site, and viewer sensitivity. Scenic resources and scenic vistas are primarily located west of the study area where the coast line is. The Pacific Ocean is the area's most prominent scenic vista and scenic resource. Also west of the study area and a prominent scenic vista is Bolsa Chica State Beach which extends south from Warner Avenue to just north of Seapoint Street. Bolsa Chica State Beach offers views of the Pacific Ocean, the Ranchos Palos Verdes peninsula to the northwest, Catalina Island to the west, and the BCER to the east.

Views from the channel system are limited primarily to adjacent residential and commercial land uses, and areas where streets and highways cross over the channels (refer to *Figures 1* through *10*). Views are further limited by ornamental landscaping and chain-link fencing along the channel system.The various widths and lengths of the channels consist of a combination of earthen, riprap, and concrete lined channels through the cities of Fountain Valley, Garden Grove, Huntington Beach, Santa Ana, Seal Beach, and Westminster. The only grass-lined channel in the system is on C06 where it traverses Mile Square Park. The downstream reaches of the channels have tidal influence, but little vegetation present.

Appendix L – Environmental Considerations

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Figure 1: Photographs of the C02/C04 Drainage Channel System. (A1) C02-R23, view looking downstream towards Huntington Harbor near Edinger Avenue, (A2) C02-R23, view looking upstream near Edinger Avenue, (A3) C04-R20, view looking upstream near Edinger Avenue,

(A4) C04-R20/R23, view looking downstream near Bolsa Chica Street at Reach 23, (A5) C04-R20/R23, view looking upstream near Bolsa Chica Street, Towards confluence of C02/C04, (A6) C04-R20, view looking downstream from Edwards Street, (A7) C04-R20, view looking upstream from Edwards Street, (A8) C04-R21, view looking downstream from I-405, and (A9) C04-R21, view lookingupstream from I-405.

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Figure 2: Photographs of the C04 Drainage Channels. (B1) C04-R21, view looking downstream just west of Hazard Avenue, (B2) C04-R21, view looking upstream just west of Hazard Avenue, (B3) C04-R21, view looking downstream from Route 39, (B4) C04-R21, view looking

upstream from Route 39, (B5) C04-R22, view looking downstream from Route 39, (B6) C04-R22, view looking upstream from Route 39, (B7) C04-R22, view looking downstream from Magnolia Street, (B8) C04-R22, view looking downstream from Brookhurst Street, and (B9) C04-R22, view looking downstream near Westminster Avenue.

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Figure 3: Photographs of the C04 Drainage Channels. (C1) C04-R22, view looking downstream from Route 22, and (C2) C04-R22, view looking upstream from Route 22.

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Figure 4: Photographs of the C05 Drainage Channels. (D1) C05-R1, view looking downstream from just north of Warner Avenue, (D2) C05-R1, view looking downstream from just south of Warner Avenue, (D3) C05-R1, view looking upstream from just south of Warner Avenue, (D4) C05-R1/R2, view looking downstream between Edwards and Goldenwest Streets, (D5) C05-R1/R2, view looking upstream from between Edwards and Goldenwest Streets, (D6) C05-R2/R3, view looking downstream between Gothard Street and Route 39, (D7) C05-R2/3, view looking upstream between Gothard Street and Route 39, confluence of C05/C06, (D8) C05-R3, view looking downstream from I-405, and (D9) C05-R3, view looking upstream from I-405.

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Figure 5: Photographs of the C05 Drainage Channels. (E1) C05-R4, view looking downstream from I-405, (E2) C05-R4, view looking upstream from I-405, (E3) C05-R4, view looking downstream near Brookhurst Street, (E4) C05-R4, view looking upstream near Brookhurst Street, (E5) C05-R5, view looking downstream towards intersection of McFadden Avenue and Brookhurst Street, (E6) C05-R5, view looking upstream from intersection of McFadden Avenue and Brookhurst Street, (E7) C05-R5/R6, view looking downstream betwwen North Euclid and North Newhope Streets, and (E8) C05-R5/R6, view looking upstream between North Euclid and North Newhope Streets.

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Figure 6: Photographs of the C05 Drainage Channels. (F1) C05-R6/R7, view looking downstream from Rosita Park, (F2) C05-R6/R7, view looking upstream from Rosita Park, channel becomes concrete covered conduit, (F3) C05-R8, view looking downstream from intersection of Hazard Avenue and Hope Street, channel downstream is concrete covered conduit, (F4) C05-R8, view looking upstream from intersection of Hazard Avenue and Hope Street, (F5) C05-R8/R9, view looking downstream between Newhope Street and Harbor Boulevard, (F6) C05-R8/R9, view looking upstream between Newhope Street and Harbor Boulevard, (F7) C05-R9/R10, view looking downstream from Garden Grove Boulevard, and (F8) C05, R9/R10, view looking upstream from Garden Grove Boulevard, channel becomes concrete covered conduit.

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Figure 7: Photographs of the C05 Drainage Channels. (G1) C05-R10, view looking downstream near Aspenwood Lane (between Harbor Boulevard and Haster Street), channel becomes concrete covered conduit, (G2) C05-R10, view looking upstream near Aspenwood Lane (between Harbor Boulevard and Haster Street), (G3) C05-R11, outlet into Haster Basin, upstream reach is concrete covered conduit (G4) C05-R11/R12, view looking downstream between Haster and South Lewis Streets, channel is covered conduit, (G5) C05-R11/R12, view looking upstream between Haster and South Lewis Streets, (G6) C05-R12, view looking downstream near Crystal Cathedral, between Haster Street and South Lewis Street, and (G7) C05-R12, view looking upstream near Crystal Cathedral, between Haster Street and South Lewis Street, upstream channel becomes concrete covered conduit.

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Figure 8: Photographs of the C06 Drainage Channels. (H1) C06-R13, view looking downstream at confluence of C05/C06, (H2) C06-R13, view looking upstream from confluence of C05/C06, (H3) C06-R13, view looking downstream, (H4) C06-R13, view looking downstream, (H5) C06-R14, view looking downstream, (H6) C06-R14, view looking upstream, (H7) C06-R14/R15, view looking downstream between Newland and Magnolia Streets, and (H8) C06-R14/R15, view looking upstream between Newland and Magnolia Streets.

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Figure 9: Photographs of the C06 Drainage Channels. (I1) C06-R16, view looking downstream from I-405, (I2) C06-R16, view looking upstream from I-405, (I3) C06-R16/R17, view looking downstream west of Bushard Street, (I4) C06-R16/R17, view looking upstream towards Bushard Street, (I5) C06-R17, view looking upstream at Bushard Street, (I6) C06-R17, view looking downstream, (I7) C06-R17, view looking upstream, (I8) C06-R18, view looking downstream at Mile Square Park near Brookhurst Street, and (I9) C06-R18, view looking upstream at Mile Square Park near Brookhurst Street.

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Figure 10: Photographs of the C06 Drainage Channels. (J1) C06-R18, view looking downstream at Mile Square Park near Euclid Street, (J2) C06-R18, view looking upstream at Mile Square Park near Euclid Street, (J3) C06-R19, view looking downstream, (J4) C06-R19, view looking upstream, (J5) C06-R19, view looking downstream near Newhope Street, and (J6) C06-R19, view looking upstream near Newhope Street.

Appendix L – Environmental Considerations

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2.0 Affected Environment: Historic Structures and Buildings

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Westminster Flood Control Channel Improvements

Affected Environment: Historic Structures and Buildings

Prepared by Lauren McCroskey, program manager/senior architectural historian, U.S. Army Corps of Engineers, Technical Center of Expertise, Preservation of Historic Structures and Buildings

1. Summary

The preferred project will involve a resource fifty years of age, and therefore requires compliance with Section 106 of the National Historic Preservation Act, and the obligation to consider effects to properties eligible for listing in the National Register of Historic Places (National Register). This assessment concerns historic built environment resources only, and does not consider potential impacts to archaeological resources or properties of a religious or cultural nature, recommendations for which will be provided in a separate document. A suggested Area of Potential Effect (APE) would encompass the linear resource, and include vehicle crossings, tidal gate structures, and other integrated features built during the period 1956-1963.

Evaluation methods included the review of existing cultural resources data, specifically inventory recordation and National Register evaluation of Orange County bridges; California state recordation forms for historic structures; and historic contexts and documentation of related water conveyance systems in southern California focused in Orange County. Although time constraints did not allow field examination of all contributing channels and features, existing information was adequate for making credible recommendations about the likelihood of the resource's eligibility for listing in the National Register of Historic Places, as well as assessing potential project effects. Recommendations are provided by Lauren McCroskey, program manager/senior architectural historian, U.S. Army Corps of Engineers, Technical Center of Expertise, Preservation of Historic Structures and Buildings.

2. National Register Eligibility Recommendation

In terms of its public benefit and economic infusion, the Westminster Flood Control Channel has been no less impactful than other regional water management systems such as the Los Angeles River, a property identified as eligible for listing in the National Register of Historic

Places (National Register). Existing evaluation guidelines in fact confirm the Channel is a potentially eligible type of historic water conveyance infrastructure.[1] Under the area of significance Conservation, the series of canals embody the themes of flood control and water management supporting vital agricultural and industrial economies, as well as residential infrastructure. Such canals have a symbiotic role with the containment dams that modulate storm water and ensure consistent and metered supplies for downstream communities. When completed by the Orange County Flood Control District, the Channel was a successful governmental remedy that fully realized the county's public water service and conservation goals. Potential National Register eligibility under Criterion A is therefore supported during the period of significance 1953-1963.

The Westminster Flood Control Channel has not been shown to represent the important life work of a recognized individual and is therefore ineligible under Criterion B.[2] From the perspective of engineering, the trapezoidal earthen and concrete lined ditches and associated bridge crossings are ubiquitous and undistinguished structures, and are nearly as prevalent on the southern California landscape as highways and roads. Because the form and engineering design of channels have changed little throughout the past century, the Westminster system does not project an outward temporal association with a particular era and thereby lacks National Register eligibility under Criterion C.

Apart from potential eligibility under Criterion A, the resource must also possess essential integrity aspects of location, design, setting, materials, workmanship, feeling, and association. The threshold of integrity for a California water conveyance system is based upon several factors such as, ". . . the relationship between its current appearance and its appearance during the period of significance. For example, does the resource "Have the significant elements of design, materials, and workmanship been retained? Does the setting still evoke the important qualities of the water system? And does the property retain the feeling and associations needed to convey its significance?"[3]

Notwithstanding clear historical association with the area of significance, Conservation, the system does not meet the majority of essential aspects of integrity. Although the general design (trapezoidal or rectangular profile) remains, materials and workmanship have been altered in places with the application of concrete to previously earthen ditches, and the installation of

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[1] *WATER CONVEYANCE SYSTEMS IN CALIFORNIA - Historic Context Development and Evaluation Procedures, p*repared jointly by:
JRP Historical Consulting Services California Department of Transportation, Davis, CA 95616 Sacramento, CA 95814
December 2000, p. 95.

[2] The work of project engineer, J.P. Lippincott, is more appropriately memorialized in other historic properties such as the LA aqueduct.

[3] *WATER CONVEYANCE SYSTEMS IN CALIFORNIA - Historic Context Development and Evaluation Procedures,* p. 16.

sheet pile fortifications. The heavily urbanized area through which the canals pass has also dramatically changed the Channel's historic backdrop (setting, feeling, and association), as the majority of buildings and structures are contemporary and no longer evoke the period of significance.

Perhaps most critically, in a county-wide study and evaluation of bridges fifty years of age, the Channel's crossings were determined not eligible for listing in the National Register. As originally conceived and built, these bridges were significant contributing resources of the linear historic district. Their ineligibility compromises a major portion of the Channel's historic fabric and presentation, and further diminishes the overall integrity of the resource. Therefore, due to a loss of essential aspects of integrity – materials, design, setting, feeling, association – the Westminster Flood Control Channel is recommended not eligible for listing in the National Register of Historic Places.

Finally, this non-eligibility recommendation is consistent with the findings of a 2010 National Register evaluation of one section of the Westminster Flood Control Channel, the East Garden Grove-Wintersburg Channel (EGGWC). The assessment for which the California State Historic Preservation Officer concurred, found the EGGWC portion of the overall system not eligible for listing in the National Register of Historic Places.[4]

3. Historic Context: Flood Control in Orange County

The themes of water management and conservation are inseparable to the story of greater Los Angeles in the twentieth century. In spite of its reputation as an arid region, southern California has always been menaced by periodic floods from heavy rains and rapid winter snowmelt in the San Gabriel Mountains. However generous the water volumes they carry, storms historically offered little benefit to those living in the region, as water rushed on to the porous flood plain where it quickly disappeared underground. With no means of retention little water was available during droughts. Cattle raising in what is now Orange County persisted only until the mid-nineteenth century, until repeated dry years stressed herds and pushed the industry away.[5]

Water conservation measures such as weirs and earthen and rock lined ditches had first been implemented near Orange County in the mid-eighteenth century, mostly at the base of the

[4] Pamela Daly, *Historic Resources Assessment Report of East Garden Grove – Wintersburg Channel (EGGWC) Huntington Beach, CA*. Daly and Associates, Riverside, California: June 2010.

[5] Shawn Dewane, *A History of the Orange County Water District*, Orange County, California.

mountains where run-off was most precipitous. Spanish missionaries and rancho owners applied European principles of irrigation and water management, decreeing that no one individual had full right to a stream's flow. The cooperative approach, also practiced by German settlers around present day Anaheim, eventually died away as commercial enterprise monetized the precious resource shed by high elevations.[6]

Nineteenth century efforts to capture and control water left a tangible physical record on the landscape. State of California historic property records for Orange County include four recorded structures or systems dating from 1922 to 1945, as well as the Bee Canyon Wash Canal/Ditch built in 1945 and determined eligible in 1991. Tributaries feeding the Santa Ana River such as San Antonio Creek attracted corporate investment, including small hydroelectric plants and retention dams managed by private companies, evidence for which survive in isolated structures and foundation remnants.

As fragile canyon ecosystems became degraded from mining operations and other commercial activity, environmental organizations sought control over the output and quality of upland water. The San Antonio Water Company (SAWC) established in 1882 and the Pomona Valley Protective Association (PVPA) created in 1909, were strong advocates for natural resource conservation. In spite of their often conflicting goals and methods, as well as mutual law suits, these entities created a foundation for future county government management of water resources.[7] The public desire for a true governmental system of water management was complicated by the onset of World War I, as national funding priorities were briefly realigned.[8]

From the late 1800s through the 1940s, Orange County and the rest of southern California grew steadily mostly on the backs of citrus and oil, and eventually men returning from World War I entered the work force and built new lives. Oil fields discovered near Huntington Beach, offered attractive employment, creating new wealth and a major shipping industry along the coast south of Los Angeles at Huntington Beach. The influx of new workers and the spread of vast lemon and orange groves on to the flood plain stressed the area's limited water supply.

The problem of damaging floods continued to threaten the young economies and drought conditions from over-committed wells endangered commercial and agricultural growth. Major flooding of orchard crops in 1916 and again in 1927 was especially devastating to an industry

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[6] Ibid. pp. 5-8.

[7] Lauren McCroskey, *San Antonio Dam National Register Evaluation*, U.S. Army Corps of Engineers, Los Angeles District, September 2019.

[8] For example, Los Angeles County voters passed a $4,450,000 bond issue in 1917, federal sales for which were delayed by entrance of the United States into the War.

valued at over $28 million, as well as to a burgeoning population with acres of new tract homes. Although some water conservation projects had built near the mountains in the late nineteenth and early twentieth century, they offered little dependable protection and no reliable water supply for distant downstream communities.

With a watershed totaling 100 miles, the Santa Ana River drains 2,050 square miles, including mountains, foothills, and hills. Only 854 square miles lie on the valley floor, where gravels, sands, and silts, create a porous surface that historically absorbed much of the water. A state engineer's report prepared in December 1928 observed that 43% of storm run-off issuing from the mountains was discharged by the Santa Ana River. Remaining waters trickling out on to the flood plain seeped underground and were tapped by wells for crop irrigation and personal use. While water districts struggled to meet inland demand, high volumes of "waste" water escaped to the Pacific Ocean. The 1928 report detailed numerous proposals for flood containment dams, dikes, and canals to be constructed in Los Angeles, Orange, and Riverside counties, with the cautionary note that successful implementation would depend upon local funding support.[9]

A government foundation for flood management in Orange County was established in 1927 with the creation of the Orange County Flood Control District (OCFCD). Organization of the OCFCD was based upon a 1925 study by renowned hydraulic engineer, Joseph P. Lippincott, whose distinguished career included his appointment 1906 as chief engineer of the Los Angeles "aqueduct project."[10] Overseen by the County Board of Supervisors, the newly formed OCFCD championed construction of a Santa Ana River dam to capture and control escaping storm water and protect life and property.

The citrus and oil industries would supply the impetus to tackle the county's flood problem, but a series of costly floods was needed to seal the necessary political capital to build new infrastructure. Momentum for a dam on the Santa Ana River faltered briefly in 1929 with defeat of authorizing legislation, until the disastrous 1938 flood reinvigorated the project. That year, heavy rainfall sent the Los Angeles and San Gabriel Rivers over their banks, killing more than 100 people and driving construction of southern California's most iconic concrete floodway, the Los Angeles River Channel. In the waning years of the Depression the District's first project was finally completed, the Prado Dam of 1939.

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[9] Post, William S. *Bulletin No. 19 – Santa Ana Investigation, Flood Control and Conservation*. Department of Public Works, Division of Engineers and Irrigation, Sacramento, California: December, 1928.

[10] Sonya Ytuarte Nasser, *A Brief History of the Orange County Flood Control District*, American Society of Civil Engineers, Los Angeles Section, Orange County Branch, History and Heritage Committee: January 2000, pp. 11-12.

Even as the economic malaise of the Depression years subsided, the onset of World War II once again redirected national revenues for flood control measures previously approved under the Flood Control Act of 1936 that had authorized the Los Angeles Drainage Area projects, as well as Orange County's Santa Ana River project of nine flood control measures. Only two containment projects were funded during this period, the Brea and Fullerton dams, completed by the War Department in 1940 and 1941, respectively. With a nationwide population boom following World War II, residential development was vigorous in southern California, sprouting vast acres of housing that placed even greater demand on Orange County's existing water facilities.[11]

Shifting land use priorities in the 1950s forever changed the region. Where citrus had dominated the landscape, new neighborhoods claimed former orchard lands, creating major suburban enclaves to house the expanding population base. Adequate water supplies remained a challenge and even moderate storms proved highly damaging to residential property. While the earlier Brea and Fullerton dams of the 1940s caught run off, additional lateral conveyance was still needed to meet expanding residential and agricultural demand. In response, the OCFCD in 1955 sponsored an engineering study to explore additional flood control provisions in the county. The following year, the county's largest ever municipal bond was approved by voters to finance ten dams, two containment basins, numerous diversion channels, and other upgrades to the Santa Ana River channel. Ambitious in scope and funding - $42,620,000 – the projects were sold as an investment in a county clearly headed for robust development. The infusion of construction dollars and labor was used to acquire rights-of-way, build new canal sections, straighten and widen existing alignments, build or alter bridges crossing over the channel, and create containment basins.[12]

When completed in the early 1960s, a total of four contributing channels – Bolsa Chica, Westminster, East Garden Grove-Wintersburg, and Ocean View – comprised the Westminster Flood Control Channel. Like previous water management endeavors, the Channel and its associated reaches was designed to further maximize the fragile watershed and unite previous flood control efforts once and for all. After completion if all canals in the 1960s, the Channel was augmented by the San Antonio Dam (1960) as well as by the associated San Antonio and Chino Creek channels - all of which ultimately joined the Santa Ana River and nourished the Prado Dam reservoir.

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[11] *East Garden Grove-Wintersburg Channel Historic Resources Assessment Report*, p. 3.

[12] Sonya Ytuarte Nasser, *A Brief History of the Orange County Flood Control District*, American Society of Civil Engineers, Los Angeles Section, Orange County Branch, History and Heritage Committee: January 2000.

4. Potential Effects to Historic Resources

Consistent with other open canals built in southern California during the mid-twentieth century, the Westminster Flood Control Channel system is composed of both trapezoidal and rectangular box conduits, and includes culverts, and bridge crossings for vehicles and railroads. Channels are earthen or concrete and bridges are simple pre-stressed concrete slab types carried by round concrete columns, and have built-up concrete curbs and regularly set metal posts with horizontal guardrail barriers. The Channel itself measures approximately 48 feet wide at the base with height averaging 10.5 feet. Overall materials and characteristics are concrete channels, riprap-lined trapezoidal channels, concrete-lined trapezoidal channels, earthen levees, and steel sheet pile. Metal gates for manipulating flows and tidal effects are located where the project enters the Pacific Ocean.

Of the 29 crossings to be affected by the current project – bridges, overpasses – 28 were built just prior to, or during the years of original project completion, 1956-1963. Orange County records show that most all of these have been "modified," mostly due to widening and/or seismic reinforcement.[13] Actions proposed by the current project include both Minimum

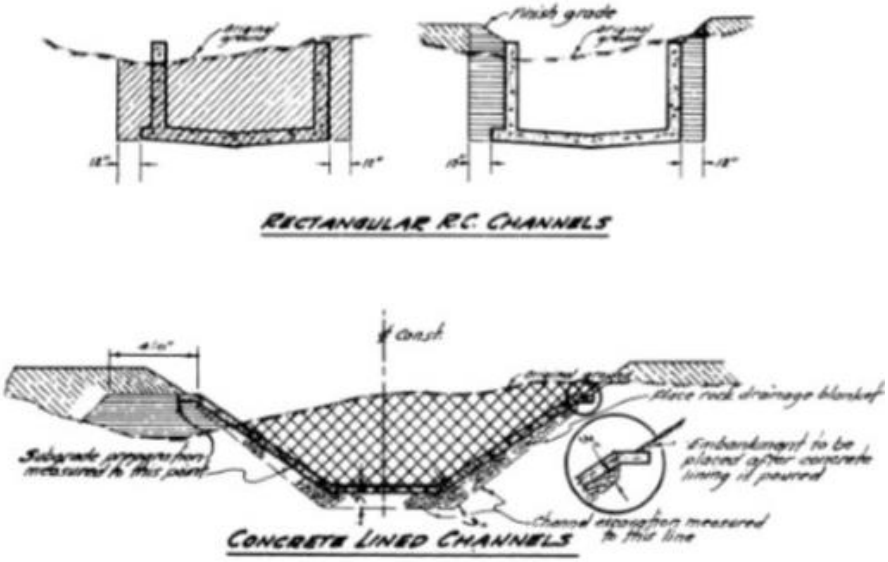

Figure 1. *Cross sections of rectangular reinforced concrete and trapezoidal concrete lined channels. (Source: Garden Grove-Wintersburg Channel drawings, U.S. Army Corps of Engineers, Los Angeles District)*

[13] Project spreadsheet of channel modifications prepared by the U.S. Army Corps of Engineers, Los Angeles District, 2018.

Modification, defined as, 1) Nonstructural – flood warning system, removal of flow impediments; 2) In-Channel Modifications – lining channels with concrete; and 3) Downstream Modifications – reconstructing a tide gate. Maximum Modifications will involve, 1) Nonstructural - flood warning system, removal of flow impediments; 2) In-Channel Modifications – altering channel geometry, new floodwalls, 3) Upstream Modifications – diversion bypass channels; and 4) Downstream Modifications – replacing or constructing some tide gates that no longer function effectively and allow seepage of salt water into fresh water areas.

One addition to the system will occur at the end of the Bolsa Chica Channel, where a 2,500 foot long, 3-foot tall concrete floodwall would be built along PCH at Outer Bolsa Bay to reduce the impact of flooding from C05/C06 on traffic. The visual effects of this wall are negligible in view of the non-eligibility of the overall resource. However, potential effects to archaeological resources or properties of a religious or cultural nature should be considered.

Notwithstanding existing alterations and those proposed for the current project, a 2000 National Register evaluation of bridges by Orange County and recorded by CalTrans concluded no structures in the Westminster system are eligible for listing in the National Register, though six identified as part of the Corps' project do not have a record of evaluation.[14] Four additional bridges not identified as part of the Corps' project were evaluated not eligible.

Because of their abundance within the system, the crossings originally played a critical role in the Channel's historic presentation. This analysis therefore concludes the lack of integrity of these formerly contributing features significantly compromises the overall potential eligibility of the resource.

Figure 2. Bridges in Project APE – USACE and CalTrans Inventory

USACE BRIDGE LOCATION	CAL TRANS LOCATION	YEAR	NR ELIGIBILITY
CO2 - Bolsa Chica Beach Channel			
No. 7	.2 MI E/O Route 1	1981	Not eligible
CO4 – Westminster Channel			
No. 1/Bolsa Ave	.2MI E/O Springdale Ave	1963/1972	Not eligible
No. 2/McFadden Ave	at Springdale Street	1963	Not eligible
No. 3/Marina Viking Way	W/O Springdale Street	1963	Not eligible

[14] CalTrans. *California State - Structure Maintenance and Investigations, Historical Significance. Local Agency Bridges for Orange County. March 2019.*

No. 4/HS Walkway w/2 piers	N/O Edinger Ave	1963	Not eligible
No. 5/Graham St	50’ N/O Edinger Ave	1963	Not eligible
No. 6/Bolsa Chica St	100’ N/O Edinger Ave	1960	Not eligible
CO5 – E Garden Grove/Wintersburg			
No. 8/US Warner Ave	.2 MI W/O Springfield	1960	Not eligible
No. 9/Springdale St	.1 MI N/O Warner Ave	1960	Not eligible
No. 10/Edwards St	.1 MI N/O Warner Ave	1960	Not eligible
No. 11/Golden West St	.1 MI N/O Warner Ave	1959	Not eligible
No. 12/Pedestrian Br*	---	---	---
No. 13/Pedestrian Br*	---	---	---
No. 14/CO5-CO6 Confluence	.2 MI N/O Warner Ave	1964	Not eligible
No. 15/Beach/Heil	ORA-039-5.13-HNTB	1960-61	Not eligible
No. 16/Magnolia/Edinger	at Edinger Ave	1961-67	Not eligible
No. 17/Pedestrian Br*	---	---	---
No. 18/Bushard St	.25 MI Edinger Ave	1960-61	Not eligible
No. 19/McFadden/Brookhurst	at McFadden Ave	1960	Not eligible
No. 20/Pedestrian Br	.10 MI N. McFadden Ave	1961	Not eligible
No. 21/Ward St	200’ N/O Tampion Ave	1961	Not eligible
No. 22/ Deming St*	---	1960	---
No. 23/Euclid St	.1 MI N/O McFadden Ave	1960	Not eligible
No. 24/Bolsa St	.2 MI East of Euclid Street	1960	Not eligible
No. 25/Fifth St	.2 MI W/O Newhope St	1950-60	Not eligible
No. 26/Hazard Ave	at Hazard Ave	1950	Not eligible
No. 27/Beach Blvd*	---	1960	---
CO 6 – Ocean View Channel			
No. 28/Newland*	---	1960	---
No. 29/Bushard	.1 MI N/O Warner Ave	1961-1983	Not eligible

Additional Crossings within the Project Area Evaluated by CalTrans:

CHANNEL/BRIDGE NAME	CAL TRANS LOCATION	YEAR	NR ELIGIBILITY
CO2 - Bolsa Chica Beach Channel			
?	100’ W Bolsa Chica Rd	1959-1972	Not eligible
CO4 – Westminster Channel			
?	.1 MI S route 1-405	1965	Not eligible
?	100’ N Bolsa Ave	1965-1972	Not eligible
CO5 – E Garden Grove/Wintersburg			
?	.4 MI S/) Warner Ave	1961	Not eligible

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APPENDIX: Aerial Maps of Channels and Associated Bridge Crossings

(Numbering corresponds to bridge numbers identified in Figure 2)

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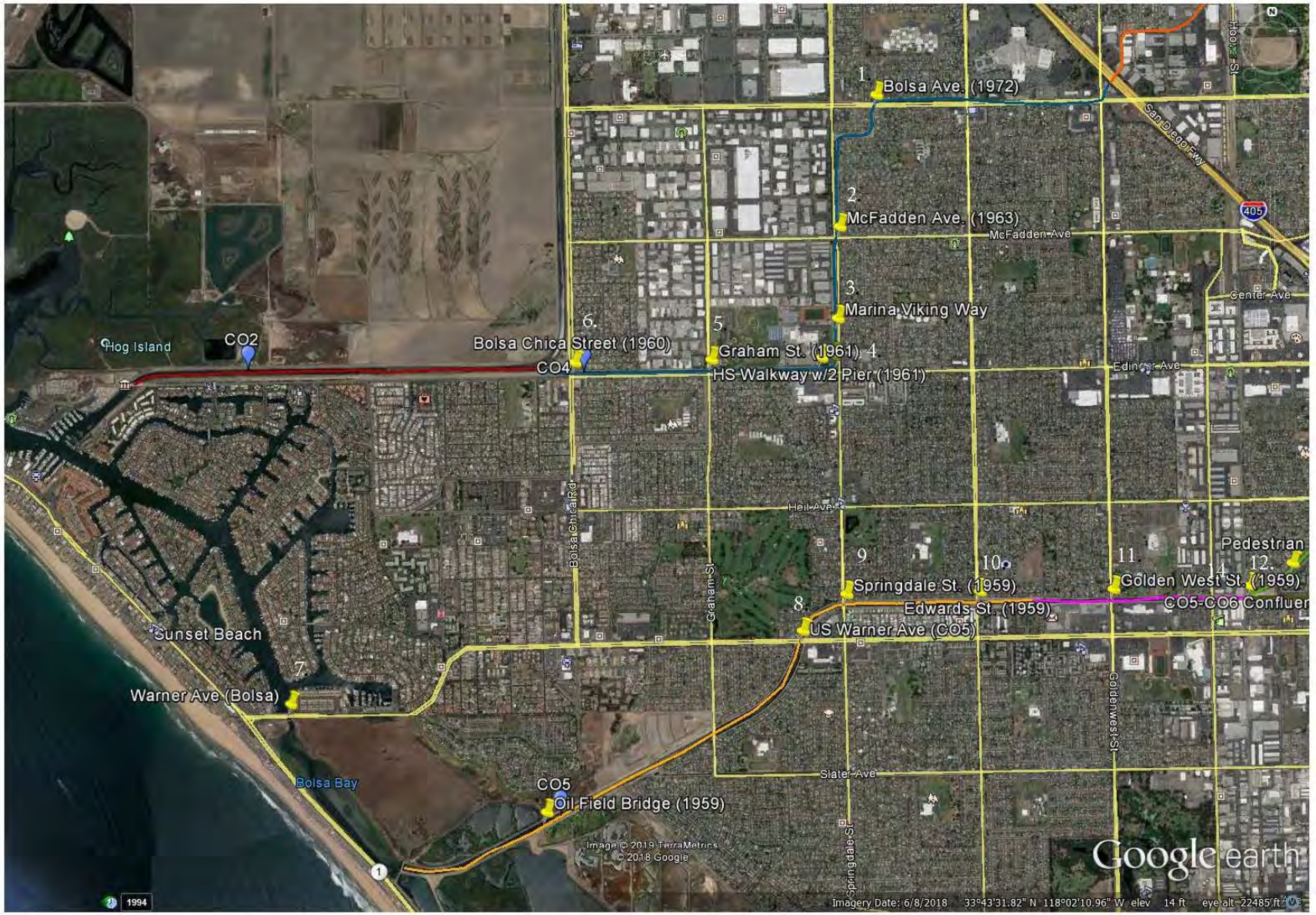

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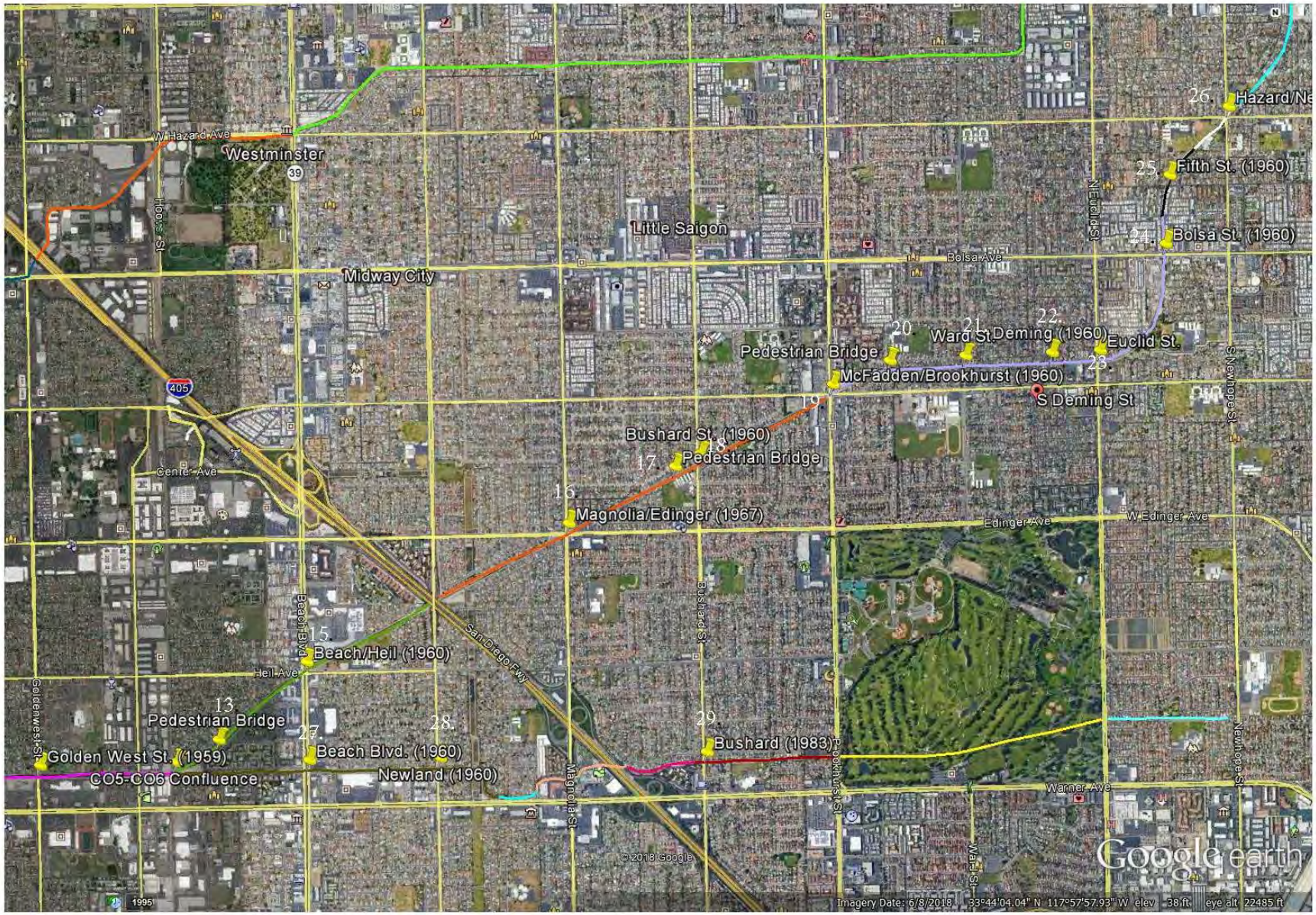

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3.0 404(b)(1) Analysis

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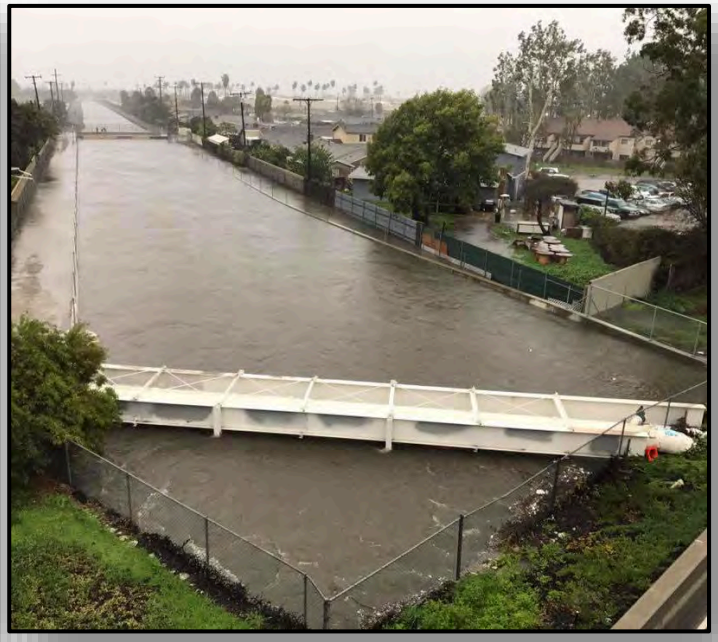
Westminster, East Garden Grove
Flood Risk Management Study
404(b)1 Analysis



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Chicago District
December 2019

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Table of Contents

I. Project Description 3
a. Location 3
b. General Description 4
c. Authority and Purpose 12
d. General Description of Dredged or Fill Material 12
(1) General Characteristics of Material 12
(2) Quantity of Material 13
(3) Source of Material 13
e. Description of the Proposed Discharge Site(s) 13
(1) Location 13
(2) Size 14
(3) Type of Site 14
(4) Type of Habitat 14
(5) Timing and Duration of Discharge 16
f. Description of Placement Method 16
II. Factual Determinations 16
a. Physical Substrate Determinations 16
(1) Substrate Elevation and Slope 16
(2) Sediment Type 16
(3) Dredged/Fill Material Movement 17
(4) Physical Effects on Benthos 17
(5) Other Effects 17
(6) Actions Taken to Minimize Impacts 18
b. Water Circulation, Fluctuation and Salinity Determinations 18
(1) Water 18
(2) Current Patterns and Circulation, Current Flow and Water Circulation 19
(3) Normal Water Level Fluctuations 20
(4) Salinity Gradients 20
(5) Actions That Will Be Taken to Minimize Impacts 20
c. Suspended Particulate/Turbidity Determinations 20
(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site 20
(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column 21
(3) Effects on Biota 22
(4) Actions taken to Minimize Impacts 23
d. Contaminant Determinations 23
e. Aquatic Ecosystem and Organism Determinations 23
(1) Effects on Plankton 23
(2) Effects on Benthos 23
(3) Effects on Nekton 24
(4) Effects on Aquatic Food Web 24
(5) Effects on Special Aquatic Sites 24
(6) Threatened and Endangered Species 25
(7) Other Wildlife 26
(8) Actions to Minimize Impacts 26
f. Proposed Disposal Site Determinations 26
(1) Mixing Zone Determination 26

(2) Determination of Compliance with Applicable Water Quality Standards 26
(3) Potential Effects on Human Use Characteristic 27
g. Determination of Cumulative Effects on the Aquatic Ecosystem 28
h. Determination of Secondary Effects on the Aquatic Ecosystem 28
III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge 28
a. Adaptation of the Section 404(b)(l) Guidelines to this Evaluation 28
b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem 28
c. Compliance with Applicable State Water Quality Standards 28
d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 Of the Clean Water Act 28
e. Compliance with Endangered Species Act of 1973 28
f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 29
g. Evaluation of Extent of Degradation of the Waters of the United States 29
(1) Significant Adverse Effects on Human Health and Welfare 29
(2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems 29
(3) Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity and Stability 30
(4) Significant Adverse Effects on Recreational, Aesthetic, and Economic Values 30
h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem 30
i. On the basis of the guidelines, the proposed disposal site for the discharge of the dredged material is specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize adverse impacts to the aquatic ecosystem. 30
IV. Bibliography 30

I. Project Description

a. Location

The project is located within the Westminster watershed in western Orange County, California, approximately 25 miles southeast of the City of Los Angeles. Cities in the watershed include Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach, and Huntington Beach. Included in the project area are four drainage channels (known as C02, C04, C05, and C06) as well as portions of the Pacific Coast Highway (PCH) and Interstate 405 (I-405). The channels outfall into the Pacific Ocean, and portions of the coastal area, including Outer Bolsa Bay and the Bolsa Chica Ecological Reserve, are also part of the project area. *Figures 1* and *2* show the watershed and features within the study area.

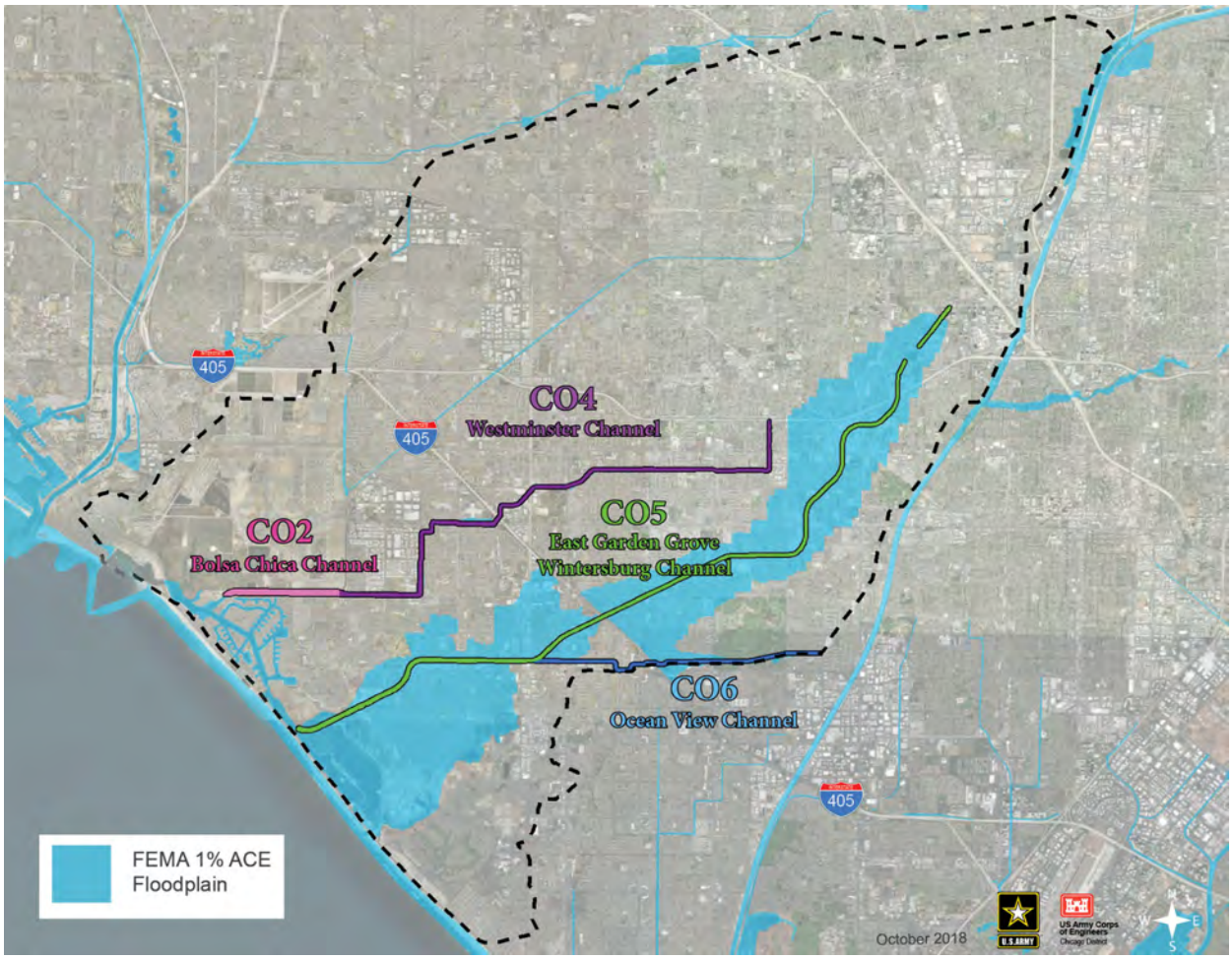

Figure 1: Westminster Watershed and the Study Channels Overlaid on the FEMA 1% ACE Floodplain (Source: FEMA National Flood Hazard Layer).

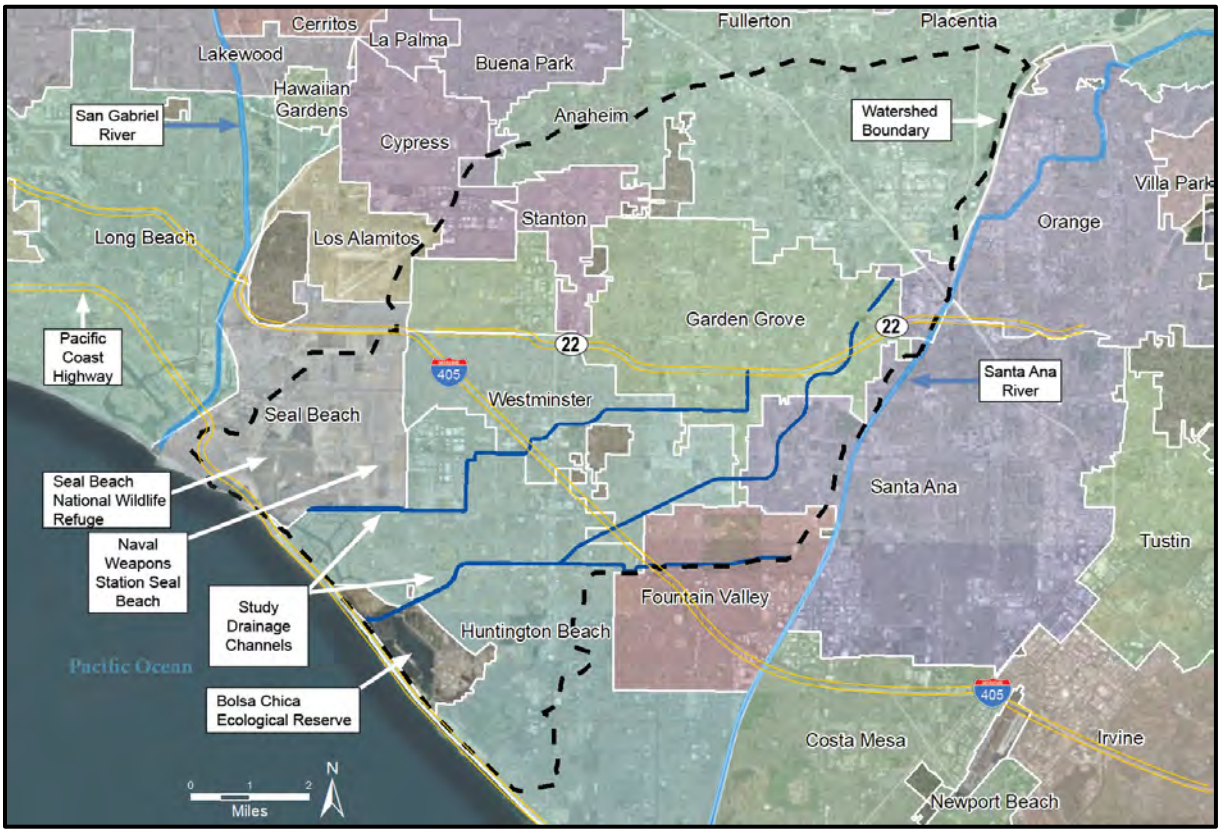

Figure 2: Study Area.

b. General Description

The Minimum Channel Modifications Alternative is the National Economic Development (NED) Plan. Under the NED Plan (*Tables 1* and *2*, and *Figure 3*), earthen or riprap lined channels would be paved with concrete to increase conveyance efficiency. Hydraulic and hydrologic (H&H) modeling determine that increasing the span of the Warner Avenue Bridge and removing the tide gates located at the downstream end of C05 Reach 1 were all necessary measures to implement in the NED Plan.

The leveed areas in the downstream reaches of C02 and C05 (i.e., reaches 23 and 01, respectively) would be improved to reduce the risk of levee failure. Modifications in Reach 1 would include installation of dual-steel sheet pile channel walls and preservation of existing soft bottom, tidally-influenced habitat. In Reach 23, a single line of sheet pile would be driven at the crest of the existing levee along the entire south side of the channel within the reach and tied back into C04 Bolsa Chica Street. This would reduce the risk of levee failure in this reach.

Table 1: NED Plan Modificaitons in C02/C04 on a Reach-by-Reach Basis Compared to Existing Conditions.

C02/C04			
Channel	**Reach**	**EXISTING CONDITIONS**	**NED PLAN**
C02	23	Earthen trapezoidal	Single steel sheet pile driven at levee crest on south side of channel only. No excavation of material in the channel. Top of sheet pile may extend ~3 feet above current levee crest elevation. Tie back into C04 at Bolsa Chica Street.
C04	20	Riprap lined trapezoidal from C02 to Bolsa Chica St.; Earthen & riprap trapezoidal from Bolsa Chica St. to Graham St.; Earthen trapezoidal from Graham St. to McFadden Ave.; Riprap trapezoidal from McFadden Ave. to Bolsa Ave.; Earthen & riprap trapezoidal from Bolsa Ave. to Edwards St. Concrete lined rectangular from Edwards St. to I-405	Concrete lined trapezoidal from C02 to Edwards St.; Concrete lined rectangular from Edwards St. to I-405 (existing);
C04	21	Concrete lined rectangular	No Action
C04	22	Concrete lined compound from Beach Blvd. to Magnolia St.; Concrete rectangular with soft bottom from Magnolia St. to Brookhurst; Riprap trapezoidal from Brookhurst St. to Westminster Ave.; Concrete lined trapezoidal from Westminster Ave. to SR-22	Concrete lined compound from Beach Blvd. to Magnolia St.; Concrete rectangular from Magnolia St. to Brookhurst; Concrete lined trapezoidal from Brookhurst St. to SR-22

Table 2: NED Plan Modifications in C05/C06 on a Reach-by-Reach Basis Compared to Existing Conditions.

C05/C06			
Channel	**Reach**	**EXISTING CONDITIONS**	**NED PLAN**
C05	1	Earthen levee from tide gates to Warner Ave. w/ some SSP on south bank near Graham St.; SSP rectangular from Graham St. to Warner Ave.; Earthen levees from Warner Ave. to 1,300 ft upstream of Edwards Ave.	Sheet pile/soft bottom/splash walls (various heights) from tide gates to existing rectangular channel west of Golden West St. 3 crossing replaced of different sizes
C05	2	Concrete lined rectangular	Concrete rectangular with 1' splash walls from Goldenwest to Gothard St.; Concrete rectangular from Gothard St. to C05/C06 confluence.
C05	3	Riprap lined trapezoidal from C05/C06 confluence to Woodruff St.; Concrete rectangular from Woodruff St. to I-405	Concrete lined trapezoidal from confluence with C06 to Beach Blvd.; Concrete lined rectangular from Beach Blvd. to I-405
C05	4	Concrete lined rectangular from I-405 to Quartz St.; Riprap lined trapezoidal from Quartz St. to Bushard St.	Concrete lined rectangular from I-405 to Magnolia St.; Concrete lined trapezoidal from Magnolia St. to Bushard St.
C05	5	Riprap lined trapezoidal from Bushard St. to Brookhurst St.; 1,300 ft of concrete lined trapezoidal upstream of Brookhurst St.; Riprap lined trapezoidal to 3rd St.	Concrete lined trapezoidal
C05	6	Concrete lined trapezoidal	No Action
C05	7	Covered concrete conduit	No Action
C05	8	Concrete lined trapezoidal	No Action
C05	9	Concrete lined trapezoidal	No Action
C05	10	Covered concrete conduit	No Action
C05	11	Covered concrete conduit	No Action
C05	12	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')	No Action
C06	13	Earthen trapezoidal from C05/C06 confluence to Bolsa Ave./RT-39; Riprap lined trapezoidal from Bolsa Ave./RT-39 to Ross Lane	Concrete lined trapezoidal
C06	14	Concrete lined rectangular	No Action
C06	15	Covered concrete conduit	No Action
C06	16	Concrete lined rectangular	No Action
C06	17	Earthen and riprap lined trapezoidal	Concrete lined trapezoidal

C05/C06			
Channel	**Reach**	**EXISTING CONDITIONS**	**NED PLAN**
C06	18	Mile Square Park-concrete low flow v-channel	No Action
C06	19	Riprap lined trapezoidal	Concrete lined trapezoidal

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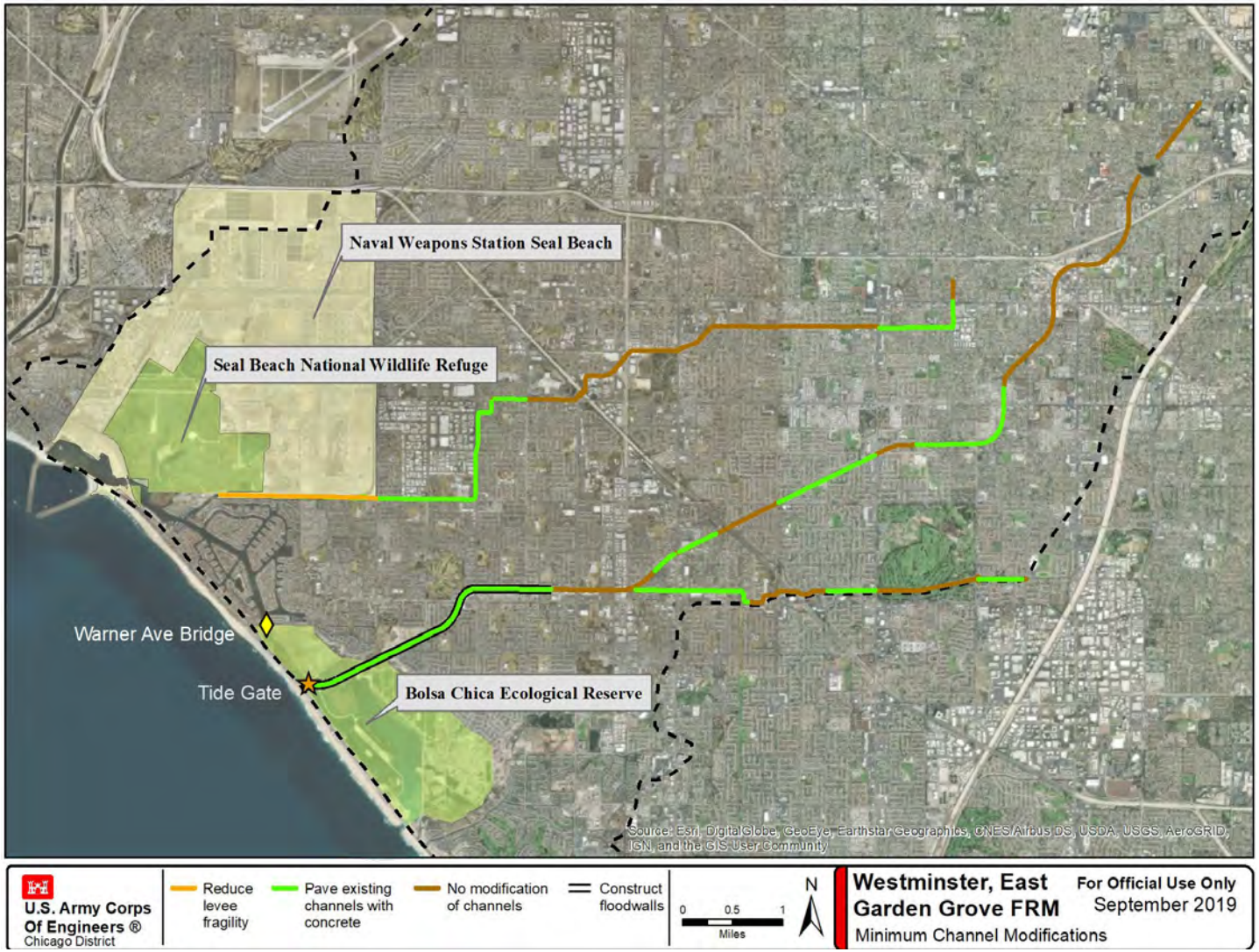

Figure 3: NED Plan

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The Maximum Channel Modifications Alternative is the Locally Preferred Plan (LPP). Under the LPP (*Tables 3* and *4*, *Figure 4*), trapezoidal channels would be reconfigured to have a rectangular cross sectional geometry. This would increase both conveyance and capacity. This alternative is designed to contain the 1% ACE storm event. For reaches that do not contain the 1% ACE event after conversion to a concrete rectangular channel, floodwalls are added. H&H modeling determined that increasing the span of Warner Avenue Bridge and removing the tide gates on C05 Reach 1 were all necessary measures to implement in the LPP.

Table 3: LPP Modifications in C02/C04 on a Reach-by-Reach Basis Compared to Existing Conditions.

C02/C04			
Channel	**Reach**	**EXISTING CONDITIONS**	**LPP**
C02	23	Earthen trapezoidal	Sheet pile with anchor system located at existing levee crest on south side of channel only. Excavation of material on the channel side of the sheet pile.
C04	20	Riprap lined trapezoidal from C02 to Bolsa Chica St.; Earthen & riprap trapezoidal from Bolsa Chica St. to Graham St.; Earthen trapezoidal from Graham St. to McFadden Ave.; Riprap trapezoidal from McFadden Ave. to Bolsa Ave.; Earthen & riprap trapezoidal from Bolsa Ave. to Edwards St. Concrete lined rectangular from Edwards St. to I-405	80' Concrete rectangular with middle 48' left earthen from C02 to McFadden Ave.; 68' Concrete rectangular with middle 40' left earthen from McFadden Ave.to Bolsa Ave.; 55' Concrete rectangular from Bolsa Ave. to Edwards St.; 3 crossings replaced of different dimensions
C04	21	Concrete lined rectangular	Diversion Channel at Westminster Mall (See *Appendix B – Civil Engineering* to the main report)
C04	22	Concrete lined compound from Beach Blvd. to Magnolia St.; Concrete rectangular with soft bottom from Magnolia St. to Brookhurst; Riprap trapezoidal from Brookhurst St. to Westminster Ave.; Concrete lined trapezoidal from Westminster Ave. to SR-22	Base of concrete lined channel increased to 35’ from Beach Blvd. to Magnolia St.; Soft bottom channel from Magnolia St. to Brookhurst St. concrete lined; Concrete lined trapezoidal from Brookhurst Street to Westminster Ave.; 18’ Concrete rectangular from Westminster Ave. to SR-22; 12 crossing replaced of different dimensions

Table 4: LPP Modifications in C05/C06 on a Reach-by-Reach Basis Compared to Existing Conditions.

C05/C06			
Channel	**Reach**	**EXISTING CONDITIONS**	**LPP**
C05	1	Earthen levee from tide gates to Warner Ave. w/ some SSP on south bank near Graham St.; SSP rectangular from Graham St. to Warner Ave.; Earthen levees from Warner Ave. to 1,300 ft upstream of Edwards Ave.	Sheet pile/soft bottom/splash walls (various heights) from tide gates to existing rectangular channel west of Golden West St.; 3 crossings replaced of different sizes
C05	2	Concrete lined rectangular	Concrete lined rectangular with 1' splash walls from Golden West St. to Gothard St.; Concrete lined rectangular from Gothard St. to C05/C06 confluence
C05	3	Riprap lined trapezoidal from C05/C06 confluence to Woodruff St.; Concrete rectangular from Woodruff St. to I-405	Concrete lined rectangular; Some sections of 1' splash wall between Beach Blvd. and Woodruff Rd.; 2 crossings replaced of different sizes
C05	4	Concrete lined rectangular from I-405 to Quartz St.; Riprap lined trapezoidal from Quartz St. to Bushard St.	Concrete lined rectangular with splash walls (various heights); 3 crossings replaced of different sizes
C05	5	Riprap lined trapezoidal from Bushard St. to Brookhurst St.; 1,300 ft of concrete lined trapezoidal upstream of Brookhurst St.; Riprap lined trapezoidal to 3rd St.	Concrete lined rectangular with splash walls (various heights); 6 crossings replaced of different dimensions
C05	6	Concrete lined trapezoidal	Concrete lined rectangular; 1 crossing replaced
C05	7	Covered concrete conduit	Replace crossing at New Hope & Hazard
C05	8	Concrete lined trapezoidal	Concrete lined rectangular; 3 crossings replaced of different sizes
C05	9	Concrete lined trapezoidal	Concrete lined rectangular; 5 crossings replaced of different sizes
C05	10	Covered concrete conduit	Replace crossing at Aspenwood; Haster Basin inlet culverts modified
C05	11	Covered concrete conduit	No Action
C05	12	Concrete lined trapezoidal (first 1400') and covered concrete conduit (next 1000')	No Action
C06	13	Earthen trapezoidal from C05/C06 confluence to Bolsa Ave./RT-39; Riprap lined trapezoidal from Bolsa Ave./RT-39 to Ross Lane	Concrete lined rectangular at confluence; Concrete lined trapezoidal from confluence to Ross St.; 2 crossings replaced of different sizes

C05/C06			
Channel	**Reach**	**EXISTING CONDITIONS**	**LPP**
C06	14	Concrete lined rectangular	Concrete lined rectangular from Ross St. to Asari Lane; Concrete lined rectangular with splash walls (1.5-2') from Asari Lane to Riverbend Dr.
C06	15	Covered concrete conduit	Covered concrete conduit; 1 crossing replaced
C06	16	Concrete lined rectangular	Concrete lined rectangular, widened to 30’
C06	17	Earthen and riprap lined trapezoidal	Concrete lined trapezoidal, ~1ft splash walls
C06	18	Mile Square Park-concrete low flow v-channel	No Action
C06	19	Riprap lined trapezoidal	Concrete lined trapezoidal

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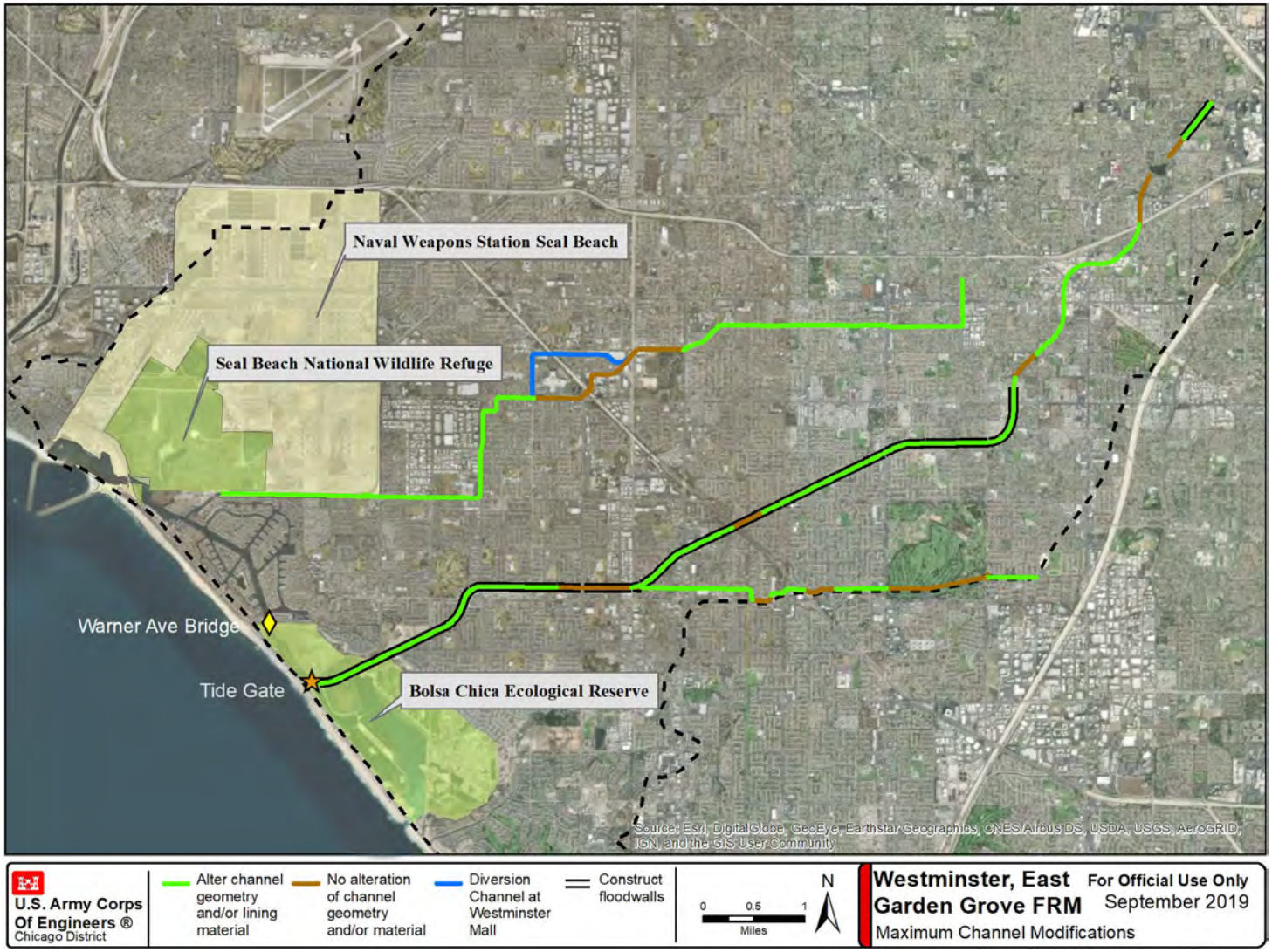
Naval Weapons Station Seal Beach
Seal Beach National Wildlife Refuge
Warner Ave Bridge
Tide Gate
Bolsa Chica Ecological Reserve
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
U.S. Army Corps Of Engineers ®
Chicago District
Alter channel geometry and/or lining material
No alteration of channel geometry and/or material
Diversion Channel at Westminster Mall
Construct floodwalls
0 0.5 1
Miles
N
Westminster, East Garden Grove FRM
For Official Use Only
September 2019
Maximum Channel Modifications

Figure 4: LPP

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c. Authority and Purpose

The Westminster Feasibility Study is being conducted in accordance with the study resolution adopted by the Committee on Public Works, House of Representatives Committee on Public Works on May 8, 1964 (Flood Control Act of 1938).

The purpose of the feasibility study is to evaluate flood risk within the Westminster watershed following the completion of channel modifications and major flood control projects for the Santa Ana River and the removal of the Westminster watershed from the Santa Ana River 100 year floodplain. Flood risk within the watershed can be attributed to drainage channels that collect surface runoff and convey it to the Pacific Ocean. Preliminary analysis shows that flows overtop the C02/C04 and C05/C06 channel systems during a 4% annual chance of exceedance (ACE) storm event, putting approximately 400,000 area residents as well as approximately 44,000 structures at risk of inundation. Overbank flooding also impacts traffic in the project area, causing closures on local roads as well as major routes, including I-405. In total, the study area experiences approximately $74,000,000 (FY2020 price levels, 2035 base year, 2.75% federal discount rate) in equivalent annual direct damages as a result of overbank flooding. The evaluation of flood risk includes identifying measures to reduce flood hazards associated with the Westminster channels, such as risks to life safety, damages to residential and commercial structures and public infrastructure. The evaluation also considers measures to reduce flood impacts downstream of the channels in the vicinity of Outer Bolsa Bay.

Specific activities for the NED Plan and LPP include:

- Widening and lining with concrete the existing channel footprint for portions of the four channels;
- Widening the channel area that flows under the bridge at Warner Avenue; and,
- Removing tide gates at the outfall of C05 Reach 1 and replacing with an access bridge.

The precise footprints of these activities is not defined, however, at least portions of the work will occur in waters of the United States, such that the provisions of Title 40, Chapter 1, Subchapter H apply.

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material

The channels are natural earth, with riprap and/or concrete lining in portions. Except during precipitation events, the channel flows are low (typically 2 cfs or less).

Bolsa Chica Ecological Reserve is a tidal basin restored in an area that had been previously used for a gun club and for oil extraction. The soft bottom materials have been chemically characterized in the past; contaminants included arsenic, barium, beryllium, chromium, cobalt, copper, lead, mercury, nickel, oil and grease, PCBs, vanadium and zinc. As part of the restoration of the reserve, contaminated sediment was dredged with the highest concentration materials being disposed of off-site. Clean sediment was used to blend with remaining contaminated sediment for the construction of habitat areas.

Warner Avenue Bridge crosses the channel connecting Huntington Harbour with Outer Bolsa Bay. Channel construction plans identify riprap areas along the channel including near the bridge. One

boring taken near Warner Ave. bridge but within the embankment (not in the channel) identifies the embankment as mainly clay and silt, with a layer of peat at an approximate elevation of 30 ft. The peat is underlain by silts and sands. The physical and chemical quality of the sediment within the channel is not known.

Channel C05 includes tide gates at the outfall to Outer Bolsa Bay. The conditions of the sediment near the gates is not known.

(2) Quantity of Material

The NED Plan includes the excavation of approximately 263,500 total cubic yards (CY) of material and the placement of approximately 481,100 total CY of material (*Table 5*). The LPP includes the excavation of approximately 1,814,500 total CY of material and the placement of approximately 481,100 total CY of material (*Table 6*).

Table 5: Quantities of Material for the NED Plan

Feature	Material Excavated (CY)	Material to be Placed (CY)
Channels	210,200	410,000
Tide Gates	4,500	7,300
Warner Avenue Bridge	48,800	63,800

Table 6: Quantities of Material for the LPP

Feature	Material Excavated (CY)	Material to be Placed (CY)
Channels	1,761,200	650,000
Tide Gates	4,500	7,300
Warner Avenue Bridge	48,800	63,800

(3) Source of Material

The source material for paving channels, constructing a new bridge where the tide gates on C05 Reach 1 were located will be new and clean construction materials including concrete, metals, rock, and plastic or rubber gaskets as needed. These clean and inert, new materials are not expected to be a major source of contamination for the water. Care would be taken during construction to ensure erosion control and to minimize turbidity in the harbor areas.

e. Description of the Proposed Discharge Site(s)

(1) Location

It is proposed that all materials excavated, including soils, sediment and waste concrete and rock, be disposed of upland in an appropriate licensed disposal facility.

(2) Size

The NED Plan includes channel modifications in approximately 10 of 23 total reaches while the LPP includes channel modifications in approximately 19 of 23 total reaches. Both alternatives include increasing the span of Warner Avenue Bridge and replacing the tide gates at the downstream end of Reach 1 C05 with an access bridge.

(3) Type of Site

The drainage channels are constructed channels for the purpose of urban drainage. The soft bottom areas of the channels support low quality plants in some reaches, however, the majority of the channels are hardscaped and/or scoured leaving bare surfaces.

Outer Bolsa Bay and Bolsa Chica Ecological Reserve are tidally influenced backwater areas separated from the Pacific Ocean by urban features (i.e., PCH). Work in these areas could include both upland and in-water work.

(4) Type of Habitat

The project area is surrounded by urban development. The drainage channels may perform as low quality habitat or wildlife corridors, particularly for birds. The channels that are currently paved or lined with riprap provide little habitat however the confluences of C02 and C04, which are hydrologically connected to Anaheim Bay, potentially facilitate wildlife movement. It is anticipated that smaller and human-tolerant species, such as raccoon, opossum, striped skunk, fox, and coyote, are likely present within the study area partly due to open space located downstream of the project area.

The downstream portions of the channels (C02 and C05) transition from freshwater marsh areas to brackish marsh, and then to coastal salt marsh in Huntington Harbor and Outer Bolsa Bay. The areas include several types of estuarine habitat: tidal marsh, salt marsh, mudflats, tidal creeks, tidal pools, and salt pannes. *Figure 5* is a map of the habitat types within Bolsa Chica Reserve, which is a higher quality habitat than much of the project area.

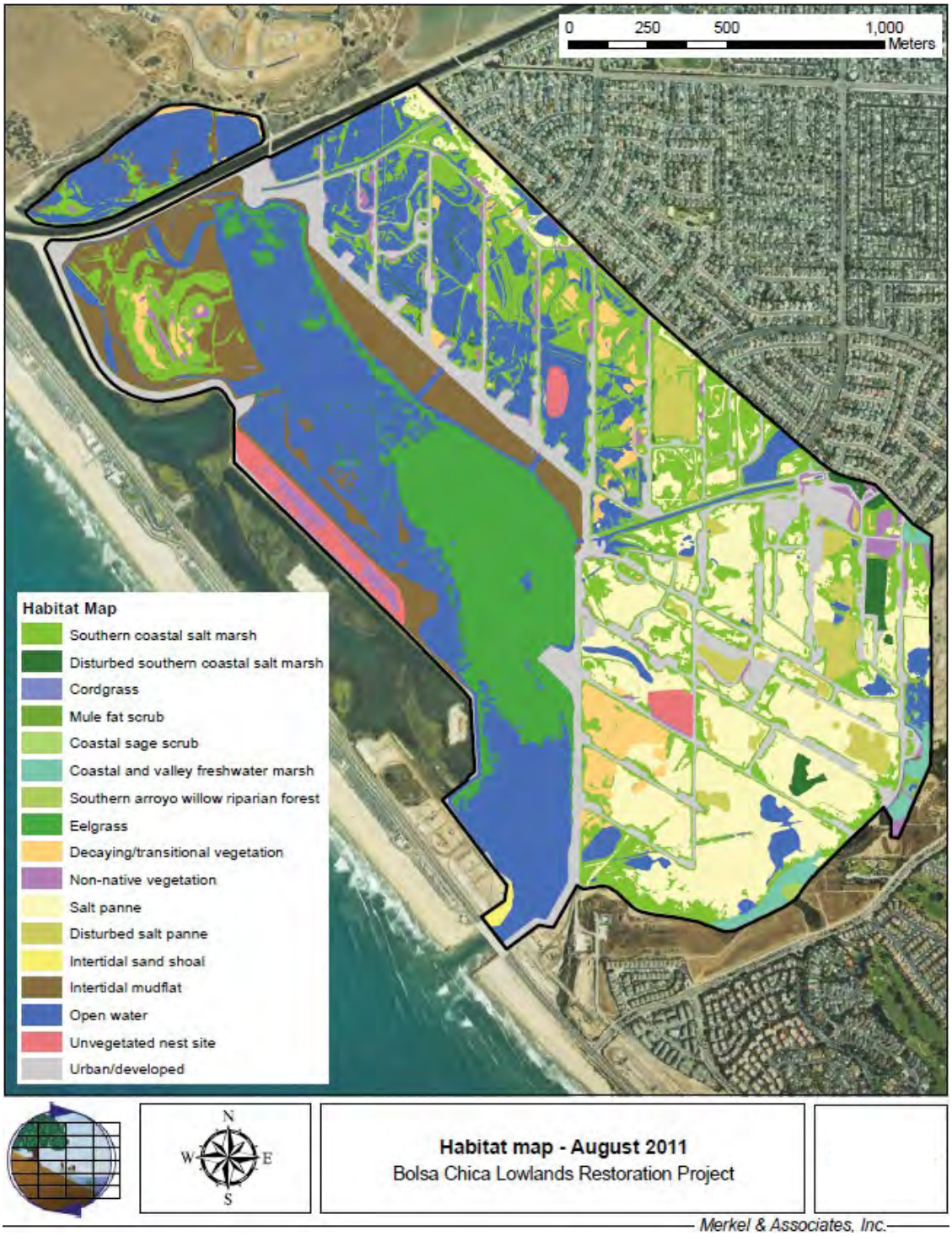

Figure 5: Habitats Present within the Bolsa Chica Lowlands Restoration Project Including Eelgrass (Merkel & Associates 2013).

(5) Timing and Duration of Discharge

The anticipated timeframe is several years in the future. Construction would occur in segments, with the overall work broken out into discrete portions. For example, increasing the span at Warner Avenue Bridge would be a separate project, while various portions of channel would be paved as separate projects. The timing of any work that could impact habitat or sensitive species could be adjusted to account for environmental windows (i.e., to avoid nesting periods, spawning times for fish). The duration of construction for both the NED Plan and LPP is not expected to last more than 15 years.

f. Description of Placement Method

Soil excavation would occur using land based earth excavation equipment such as backhoes. In-water excavation of soils or sediment would occur mechanically. Construction within C02 Reach 2 and C05 Reach 1 (driving of sheetpile) would be done in the dry; however, only half of the channel would be dry (i.e., water would be allowed to still flow through half of the channel). Construction within the other channel reaches would be done in the dry (placement of concrete) with water from upstream being pumped around the construction site and downstream. Construction of the Warner Avenue Bridge modification and replacement of the tide gates with an access bridge would be done in the dry; however, only the area where construction is occurring would be in the dry (i.e., water would be allowed to still flow through other side). Stone placement for erosion protection would be done mechanically, using earthmoving or mechanical equipment. Soil and sediment for disposal would be placed upland for staging and dewatering or would be placed directly into trucks for hauling to the disposal site. No sediment or untreated return water would be placed in the channels nor in the bay/harbor/estuary areas.

II. Factual Determinations

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope

The study area is located on the coastal plain of Orange County, which extends from the City of Irvine to the Orange/Los Angeles County border. The coastal plain is divided into two (2) sub-plains, the Downey Plain and the Tustin Plain. The Downey Plain comprises the alluvial fans of the Los Angeles, San Gabriel, and Santa Ana Rivers (Poland et al. 1956). The Downey Plain has a uniform grade with an average grade of 20 feet per mile (6.1 meters per kilometer). The Tustin Plain is nearly flat and gently slopes to the southwest.

(2) Sediment Type

The soils within the project area are summarized in the table below. Little information is available on the sediment within the harbor/bay/estuary portions of the project.

Table 7: Project soil types.

Soil Type	Soil Characteristics	Depth to Water Table
Beaches	Sandy, gravelly, or cobbly coastal shores.	0-72 inches
Bolsa Silt Loam	Mixed alluvium that generally occurs on large alluvial fans.	36-72 inches
Bolsa Silt Loam, Drained	Mixed alluvium derived from igneous, metamorphic and sedimentary rock. Typically occur on alluvial fans.	>80 inches
Bolsa Silty Clay Loam	Mixed alluvium generally occurring on alluvial fans.	36-72 inches
Bolsa Silty Clay Loam, Drained	Mixed alluvium derived from igneous, metamorphic and sedimentary rock. Typically found on alluvial fans.	>80 inches
Hueneme Fine Sandy Loam	Stratified alluvium derived from sedimentary rock found on alluvial fans.	42-60 inches
Hueneme Fine Sandy Loam, Drained	Stratified alluvium derived from sedimentary rock found on alluvial fans.	>80 inches
Metz Loamy Sand	Alluvium derived from mixed found typically on alluvial fans.	>80 inches
Metz Loamy Sand, Moderately Fine Substratum	Mixed alluvium derived from igneous, metamorphic and sedimentary rock found on alluvial fans and flood plains.	>80 inches
Myford Sand Loam, 9 to 30 percent slopes, eroded	Alluvium derived from sandstone typically found on floodplain terraces.	>80 inches
Omni Clay, Drained	Mixed alluvium found on depressions.	>80 inches
Omni Silt Loam, Drained	Mixed alluvium found on depressions.	>80 inches
Thapto-histic Fluvaquents	Organic material and/or mixed alluvium found on beach plains.	24-42 inches
Tidal Flats	Stratified clay to sand deposits found adjacent to bays and lagoons and is regularly inundated by tidal flow.	0 inches

(3) Dredged/Fill Material Movement

Sediment and soil to be removed will be excavated mechanically, stockpiled upland, dewatered (as needed) and hauled via truck to the disposal site. Concrete and other construction materials will be moved by truck to the project area and will be placed mechanically.

(4) Physical Effects on Benthos

A portion of the existing periphyton, epibenthic plankton, and benthic macroinvertebrate habitat and organisms around the Warner Avenue Bridge and at the tide gate location will be disturbed during construction activities. These areas are a small portion of the existing habitat and is not expected to cause a detrimental loss of benthic organisms and habitat.

(5) Other Effects

The project construction could cause water quality impacts if best management practices, including erosion control and stormwater pollution prevention practices, are not followed. Any environmental impacts caused by the short-term increases in suspended solids due to the construction activities are

anticipated to be temporary and minimal; the use of best management practices as a proactive approach is recommended.

(6) Actions Taken to Minimize Impacts

Construction will use best management practices to prevent material spills or uncontrolled discharges into the river, and to control erosion and stormwater run-off. Upland work areas will be subject to erosion control and will be permanently stabilized when work is completed. Dredging activities will also use best management practices to minimize solid suspension. Excess soil and sediment disposal will occur upland with return water treatment and/or controls to prevent the release of anthropogenic compounds to the channels.

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water

(a) Salinity

The drainage channels provide fresh water to the Bolsa Bay estuary areas. Bolsa Bay is brackish or saline, depending on the extent of the tidal influence on specific portions of the bay area. The source of salinity is the tidal influence. The extent of the drainage area is not changing with either the NED Plan or LPP, and the total stormwater runoff input to the bay/harbour is also not changing. The timing of flows may be affected by the channel modifications; with a smooth lined channel it is anticipated that the storm runoff period will be shorter and with a higher peak flow.

(b) Water Chemistry

Construction materials will be new, inert materials such as concrete, metals and other new materials. Short-term effects on the water quality are expected because of temporary increases in the concentration of suspended solids and turbidity following the construction and dredging operations. The temporary increase of suspended solids is expected to cause short-term decreases in water clarity and minor changes to the color of the water, particularly if erosion controls are not used. The long term water chemistry of the system should not be impacted by the implementation of this project.

(c) Clarity

As discussed above, the new construction materials are not expected to be a source of contamination, and dredged sediment will be placed upland with no direct return of untreated water. Short-term effects on clarity may occur because of temporary increases in the concentration of suspended solids and turbidity during in-water work activities. The temporary increase of suspended solids is expected to cause short-term decreases in water clarity.

(d) Color

The proposed work is not anticipated to cause any considerable long-term effects or changes to the water color, but a temporary increase of suspended solids during construction could cause short-term and minor changes to the color of the water.

(e) Odor

The proposed construction is not anticipated to cause any considerable long-term effects on, or changes to, the odor of the water. The upland placement of the dredged sediment could cause temporary upland odor impacts in the immediate environs of a sediment staging or dewatering operation, due to the anaerobic nature of most sediment. These odors would dissipate over a relatively short time as the sediment dries and is hauled to the disposal site.

(f) Taste

The proposed work would not be anticipated to cause any long-term effects on, or changes to, the taste of the water. Water in the drainage channels and from the bay/estuary is not used as a drinking water source.

(g) Dissolved Gas Levels

The proposed work is not anticipated to alter dissolved gas levels in the drainage channels nor in the bay/harbor/estuary.

(h) Nutrients

Temporary increases of turbidity during construction could produce minor, localized effects on nutrient levels in the water column. The project will not change the runoff area or sources of nutrients in stormwater runoff.

(i) Eutrophication

Eutrophication is typically caused by excessive nutrient levels. As discussed above, the proposed work activities could produce minor, localized effects on nutrient levels in the water column during construction, but these effects are expected to be short-term, minor, and aesthetic impacts. The proposed work is not expected to impact eutrophication in the system.

(j) Others as Appropriate

No other impacts were identified.

(2) Current Patterns and Circulation, Current Flow and Water Circulation

(a) Current Patterns and Flow

Flows in the drainage channels occur during precipitation events. These channels drain rapidly toward the ocean, and outlet into Huntington Harbour, Anaheim Bay, and Outer Bolsa Bay. The downstream ends of the channels, including the outfalls, are tidally influenced.

(b) Velocity

The velocity of water in the channels varies. Velocities in the channels during storm events may increase over current velocities. Water flow in the bay/harbor area is not expected to be changed.

(c) Stratification

The drainage channels are not thermally stratified; much of the channel length holds little water and the shallow depths do not allow for stratification. The harbors and bays are also not thermally stratified due to the tidal influences. The NED Plan and the LPP will have no impact on the stratification conditions within the project area.

(d) Hydrologic Regime

Neither the NED Plan nor the LPP are expected to have the effect of making the drainage channel flows more "peaky". That is, water will travel faster and the resulting hydrograph will be a sharper peak due to the improved channel conditions. Both alternatives are expected to have an impact on the time needed for drainage of upland areas, but not to impact the overall quantity of water that is received from any specific storm event.

(3) Normal Water Level Fluctuations

Neither the NED Plan nor the LPP are expected to impact the water level at the outlet (downstream) since those areas are controlled by tidal conditions.

(4) Salinity Gradients

Neither the NED Plan nor the LPP are expected to impact the salinity gradients already in the system (due to the upstream drainage of freshwater into a tidal zone). Both alternatives are not anticipated to change the overall volume of water that would drain into Outer Bolsa Bay or Huntington Harbour.

(5) Actions That Will Be Taken to Minimize Impacts

Neither the NED Plan nor the LPP are anticipated to result in any long-term effects on, or changes to, the water quality, current patterns or flow, water circulation, or the normal water level fluctuation of the Westminster watershed. Temporary construction impacts, such as turbidity increases, are possible. Proactive erosion control and stormwater pollution prevention practices will be used to limit any temporary impacts.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site

Both the NED Plan and the LPP are expected to produce minor and temporary increases of suspended solids and turbidity in the local vicinity any in-water work. Plumes of suspended particles may be visible and aesthetically displeasing until the particles gradually settle and the plumes dissipate. All soil and sediment disposal will be upland to minimize impacts to the bay areas.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column

(a) Light Penetration

Both the NED Plan and LPP are expected to cause minor, temporary, and localized increases of suspended solids during construction that in turn could cause a temporary decrease the clarity of the water and reduce the penetration of light through the water column. If the penetration of light is reduced for an extended period of time, it can lower the rate of photosynthesis and "primary productivity" of an aquatic area. Primary productivity generally refers to the fixation of solar energy by green plants (i.e., autotrophs) in a terrestrial ecosystem, or phytoplankton for an aquatic ecosystem. Persistently high turbidity can cause adverse impacts to sight-dependent species because the reduced clarity can hinder the feeding ability of these species, and thereby limit their growth and increase their susceptibility to disease.

In regards to elevated suspended solids concentrations, it explains the following in 40 CFR 230.21:

> "The extent and persistence of these adverse impacts caused by discharges depend upon the relative increase in suspended particulates above the amount occurring naturally, the duration of the higher levels, the current patterns, water level, and fluctuations present when such discharges occur, the volume, rate, and duration of the discharge, particulate deposition, and the seasonal timing of the discharge."

Since the minor, temporary, and localized increases of suspended solids due to the NED Plan or LPPs' activities are anticipated to be low relative to the levels of suspended solids that typically result from storm events and adverse weather conditions, the alternatives are not expected to cause any long-term adverse impacts on the chemical or physical properties of the water column.

(b) Dissolved Oxygen

Minor, temporary, and localized increases of suspended solids at proposed construction sites could result in slight reductions in the level of dissolved oxygen water in the column. This is because the biological and chemical content of the suspended material may react and in turn deplete some of the dissolved oxygen in the water column.

(c) Toxic Metals and Organics

Because of the urban nature of the watershed, it is presumed that any sediment and soil will be of generally poor chemical quality; no sediment or soil will be placed in-water for disposal. Rather all excess soil and sediment disposal will occur upland with no direct return of untreated water. The materials proposed for channel lining or other construction will be new, clean construction materials that are not expected to release toxic metals or organics.

(d) Pathogens

The drainage area for the channels includes an urban environment; the surrounding drainage area is not affected by the NED Plan or LPP. The sediment and water in the channels as well as in the

outfall areas may reflect the urban area and its potential pathogen sources such as uncontrolled waste disposal (dumping). Since all sediment will be disposed of upland with no direct return of untreated water, any pathogens entrained in the sediment will not be released to the environment. The construction materials that will be used for the approach channel and control technology construction will be new, clean materials that are not anticipated to be a source of pathogens.

(e) Aesthetics

The existing drainage channels reflect the urban drainage area, and uncontrolled dumping and garbage in the channels is not uncommon. The proposed lined channels will be more regular in shape and appearance, which may lend a small improvement in aesthetics, however overall no great change is anticipated. The drainage channels are not used for recreation activities that depend on aesthetics. The Bolsa Chica Ecological Reserve is the most aesthetically appealing portion of the project area. Neither the NED Plan nor the LPP are expected to impact the aesthetics of the water in the estuary and the reserve.

(f) Others as Appropriate

Neither the NED Plan nor the LPP are expected to cause any other adverse effects on the chemical and physical properties of the water column.

(3) Effects on Biota

(a) Primary Production, Photosynthesis

Neither the NED Plan nor the LPP are expected to cause any long-term adverse impacts to the harbor/bay/estuary environment.

(b) Suspension/Filter Feeders

Both the NED Plan and the LPP may cause some minor, temporary, and localized increases of suspended solids, which could benefit suspension/filter feeders, but, since the effects are anticipated to be low relative to the levels of suspended solids that typically result from storm events and adverse weather conditions, the project is not expected to cause any long-term effects on the suspension/filter feeders.

(c) Sight Feeders

Persistently high turbidity can cause adverse impacts to sight-dependent species because the reduced clarity can hinder the feeding ability of these species, and thereby limit their growth and increase their susceptibility to disease. Both the NED Plan and LPP will cause minor, temporary, and localized increases of suspended solids, but, as mentioned previously, the effects are anticipated to be low relative to the levels of suspended solids that typically result from storm events and adverse weather conditions. Although there may be minor, temporary, and localized impacts, the project is not expected to cause persistent, long-term adverse effects on the sight feeders.

(4) Actions taken to Minimize Impacts

In order to minimize any adverse impacts of the NED Plan or LPP, in water work will be scheduled to avoid major spawning, migration and nesting times that could be impacted by the construction.

d. Contaminant Determinations

A contaminant determination has not been prepared at this time; sediment data that meet the requirements for the State of California Tiered Assessment of sediments approach are not available. The sediment is presumed to be of uncertain quality due to urban impacts. Evidence suggests that sediment in Bolsa Chica Ecological Reserve may have low concentrations of anthropogenically source compounds, in spite of past remediation efforts. The urban nature of the watershed suggests that multiple sources may contribute chemical pollutants to the bay/harbor/estuary. For these reasons, it is proposed that all soils and sediments be disposed of upland. A contaminant determination will be performed when additional project details are available. All actions will comply with the newly proposed 2018 Amendments to the Water Quality Control Plan for Enclosed Bays and Estuaries of California, Sediment Quality Provisions. Any sediment characterization activities will be coordinated in advance with the Santa Ana Regional Water Control Board.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton

Plankton are pelagic, which means they live within the water column itself, as opposed to benthic organisms that live along the bottom. Plankton generally drift along with the water currents and/or float on or near the water surface, as opposed to nekton, which are active swimmers that can propel themselves through water currents. Plankton are typically divided into phytoplankton, which includes photosynthesizing species like algae that derive energy from sunlight, water, and carbon dioxide, and zooplankton, which consume food in order to derive energy. Although most planktonic species are small and often microscopic, there are large plankton organisms that are still considered to be plankton because they drift with the water current. There are not expected to be significant plankton resources in the drainage channels themselves, such that work associated with the NED Plan and LPP would not be expected to impact plankton. The work in the bay/harbor areas is localized. Although plankton are present in the estuary areas, the proposed work is not expected to have significant impacts on the plankton populations in the bay.

(2) Effects on Benthos

Benthos refers to the organisms (plants and animals) that inhabit the bottom of a sea, stream or lake. The drainage channels are not considered to represent significant benthic habitat. The proposed work in the Outer Bolsa Bay area is limited in area. The proposed work areas may impact the benthic community in the immediate environs of the project, however due to the small area (compared to the entire bay/estuary area), this impact is expected to be minor.

(3) Effects on Nekton

Nekton refers to the aquatic life (organisms) that can swim freely and are generally independent of the water currents. This includes fish eggs and larvae. Proposed channel work for both the NED Plan and LPP is not expected to impact nekton. The proposed work in Outer Bolsa Bay may have a minor impact on the areas immediately adjacent to the work. The proposed work areas are small compared to the entire bay, so that any impacts are anticipated to be small.

(4) Effects on Aquatic Food Web

The proposed work in the drainage channels under both the NED Plan and LPP is not expected to impact the local food web because the drainage channels are not considered to be significant habitat supporting the food web. Any impacts to Outer Bolsa Bay are expected to be localized to the construction area, and are not expected to impact the larger food web in the tidal areas.

(5) Effects on Special Aquatic Sites

(a) Sanctuaries and Refuges

The Bolsa Chica Ecological Reserve and the Seal Beach National Wildlife Refuge are within the study area for the NED Plan and LPP. Both the NED Plan and LPP are not expected to have any impact to the Seal Beach National Wildlife Refuge. Both the NED Plan and LPP include replacement of the tide gates on C05 Reach with an access bridge and increasing the span of Warner Avenue Bridge which are both located within the Bolsa Chica Ecological Reserve. Construction activities are expected to have an adverse impact to species utilizing the area, however, these impacts are expected to be temporary and would be reduced to less than significant with the implementation of mitigation measures which are discussed in the main report. Increasing the span of Warner Avenue Bridge is expected to have a long-term significant and unavoidable direct impact to approximately 0.15 acre of jurisdictional estuarine wetland. Modificaiton of the flood control channels would have no direct impacts to jurisdictional wetlands. Compensatory mitigation for the loss of the 0.15 acre of estuarine wetland would be necessary. The conceptual mitigation strategy is detailed in *Appendix M – Conceptual Mitigation Plan* to the main report.

(b) Wetlands

As discussed above, both the NED Plan and LPP would have a direct impact on approximately 0.15 acre of jurisdictional estuarine wetlands. This direct impact would be due to the modification of the Warner Avenue Bridge and the excavation of the upstream constriction point. As mentioned above, compensatory mitigation is required for this loss in jurisdictional wetland and the conceptual mitigation strategy is detailed in *Appendix M – Conceptual Mitigation Plan* to the main report.

(c) Mud Flats

Mud flat habitat does exist within the study area. Specifically, there is mud flat habitat within C03 Reach 23 and C05 Reach 1. Construction within these reaches for both the NED Plan and LPP includes widening these reaches, driving sheetpile along the walls, and leaving the channel bottom

soft. Therefore, no loss in mud flat habitat is expected with the implementation of the NED Plan or LPP. Increasing the width of C05 Reach 1 would result in an increase in the amount of soft-bottom habitat in the study area.

(d) Vegetated Shallows

Eelgrass is considered vegetated shallows. There is eelgrass present within the downstream portion of C02 Reach 23 and in Huntington Harbour. While eelgrass would not be directly impacted by implementation of the NED Plan or LPP, there would be a potential indirect impact. The upstream channel modifications could result in increased flow velocities downstream that would potentially indirectly impact the eelgrass that is present in the downstream portions of C02 Reach 23 by preventing its growth. Compensatory mitigation is proposed for this potential indirect impact to eelgrass. The conceptual mitigation strategy is presented in *Appendix M – Conceptual Mitigation Plan* to the main report.

(e) Coral Reefs

There are no coral reefs within the project area so this topic is not applicable.

(f) Riffle and Pool Complexes

There are no riffle and pool complexes present in the vicinity of the project, so this topic is not applicable.

(6) Threatened and Endangered Species

The U.S. Fish and Wildlife Service's (USFWS) Environmental Conservation Online System Information for Planning and Consultation (ECOS-IPaC) was queried regarding federally-listed species that may be present within the study area. An official species list was obtained November 2, 2017 (Consultation Code 08ECAR00-2018-SLI-0137), and this list was confirmed again via the ECOS-IPaC website on May 10, 2018. Thirteen federally-listed threatened, endangered, or candidate species are listed on the USFWS official species list as occurring within the study area. The California Department of Fish and Wildlife (CDFW) also noted that the green turtle (*Chelonia mydas*) and California seablite (*Suaeda californica*), both federally-listed species, are also found within the study area.

In addition to federally-listed species, there are approximately 42 state species listed as state threatened, endangered, candidate, special concern, fully protected, watch list, and rare plant that may be found within the study area. In addition, the CDFW in a letter dated January 12, 2018, listed the following state-listed species and state sensitive species and habitats as occurring within the Bolsa Chica Ecological Reserve: western snowy plover (*Charadrius nivosus nivosus*), light-footed Ridgway's rail (*Rallus obsoletus levipes*), California least tern (*Sternula antillarum browni*), Belding's savannah sparrow (*Passerculus sandwichensis beldingii*), peregrine falcon (*Falco peregrinus*), burrowing owl (*Athene cunicularia*), coastal California gnatcatcher (*Polioptila californica californica*), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), osprey (*Pandion haliaetus*), black skimmer (*Rynchops niger*), white-faced ibis (*Plegadis chihi*), California seablite (*Suaeda californica*), estuary seablite (*Suaeda esteroa*), coast woolly-heads (*Nemacaulis denudata var. denudata*), southern tarplant (*Centromadia parryi ssp.*

australis), and green turtle (*Chelonia mydas*). Per the letter, sensitive marine resources include eelgrass (*Zostera marina*) beds, beach habitat, intertidal and subtidal habitat, nesting/spawning habitat (including grunion, *Leuresthes tenuis*, habitat), mud flats, sand flats, dunes, coastal strand, and salt marsh.

Construction activities associated with channel modifications would impact foraging activities by special status species such as California least tern, western snowy plover, black skimmer, and peregrine falcon. Construction activities within C02 Reach 23 and C05 Reach 1 as well as the replacement of the tide gates with an access bridge could impact nesting activities by special status species, such as the Belding's savannah sparrow. Construction activities could also temporarily impact green turtle foraging behavior within Bolsa Chica Ecological Reserve as well as within the vicinity of C02 Reach 23. Construction activities would likely temporarily deter green turtles from utilizing habitat and foraging within the vicinity where construction activities are occurring. The implementation of mitigation measures is expected to minimize these impacts which would be temporary in duration (lasting only as long as construction is occurring). In addition, compensatory mitigation is recommended for the temporary impacts to California least tern foraging habitat. For details of the conceptual mitigation strategy refer to *Appendix M – Conceptual Mitigation Strategy* to the main report.

(7) Other Wildlife

Other local wildlife such as raccoons, opossums, fox and other small ubiquitous species that survive in urban areas maybe be disrupted during construction activities, but are not anticipated to be significantly impacted. These species are highly tolerant of human activities and are expected to relocate themselves during construction with no impact on the overall species occurrence.

(8) Actions to Minimize Impacts

Best management practices will be used for all construction. Construction will be conducted in the dry when possible. All excess soil and sediment will be disposed of upland at an appropriate disposal facility. Erosion and turbidity controls and best management practices for construction will be used for all projects.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination

A mixing zone is not applicable because sediment will be placed upland with no direct return of untreated water.

(2) Determination of Compliance with Applicable Water Quality Standards

The project is expected to comply with all applicable water quality standards and no violations are anticipated.

(3) Potential Effects on Human Use Characteristic

(a) Municipal and Private Water Supply

The drainage channels and bay/estuary are not used for drinking water. Both the NED Plan and LPP could reduce infiltration from the channels to the local shallow aquifers due to paving of the channel bottoms. Since the channels do not hold water continuously but only during precipitation events, the amount of impact to infiltration is expected to be minor.

(b) Recreational and Commercial Fisheries

No effects on commercial fisheries will occur in regards to the NED Plan or LPP, since commercial fishing does not occur within the vicinity.

(c) Water Related Recreation

The drainage channels are not used for recreation. The Bolsa Chica Ecological Reserve is a recreational feature. Impacts to the reserve will be limited since significant construction is not proposed for that area. Increasing the span of Warner Avenue Bridge may cause some temporary navigation restrictions that could impact recreational boaters. Navigation notices would be used to provide advance notice to boaters, to limit temporary impacts during construction.

(d) Aesthetics

There may be minor and temporary effects on the aesthetic quality of the air, water, and visual quality, and increases in noise levels due to the construction activities. All impacts are expected to be relatively minor and short term. The aesthetic effects will be temporary and will only impact those people in the immediate vicinity of construction work.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves

The Bolsa Chica Ecological Reserve is an approximately 1,300 acre coastal estuary located in the City of Huntington Beach, Orange County, California. The reserve is bordered on the north by Warner Avenue, on the west by the Pacific Coast Highway and Bolsa Chica State Beach, on the south by Seapointe Avenue, and on the east by residential neighborhoods. Construction activities at the Warner Avenue Bridge could cause a temporary impact to the reserve.

Huntington Harbour is located on the northwest corner of Huntington Beach bordering Seal Beach and Sunset Beach. The harbor encompasses five man-made islands bounded by a network of navigable channels and the land surrounding them. Huntington Harbour is not expected to be impacted by the NED Plan or LPP.

The Seal Beach National Wildlife Refuge was established in 1972 and is administered by the USFWS to protect and conserve essential habitats for threatened and endangered species. The 965 acre refuge is located within the Naval Weapons Station Seal Beach, in Orange County, California and encompasses remnant saltwater marsh in the Anaheim Bay estuary. Seal Beach Refuge is not expected to be impacted by the NED Plan or the LPP.

g. Determination of Cumulative Effects on the Aquatic Ecosystem

There are no identified significant cumulative effects on the aquatic ecosystem due to the NED Plan or LPP.

h. Determination of Secondary Effects on the Aquatic Ecosystem

There are no identified secondary effects on the aquatic ecosystem due to the NED Plan or LPP.

III. Findings of Compliance or Non-Compliance with the Restrictions on Discharge

a. Adaptation of the Section 404(b)(l) Guidelines to this Evaluation

There were no adaptations of the Section 404(b)(l) guidelines for this evaluation.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem

The feasibility study document discusses the practicable alternatives that were evaluated. It is expected that all of the alternatives considered, besides the "no action" alternative, would have similar impacts.

c. Compliance with Applicable State Water Quality Standards

The proposed construction will comply with the California Construction General Permit Order (currently 2009-0009-DWQ but subject to update). Work in or near the bay/estuaries will comply with the California Sediment Quality Objectives, Clean Water Act Section 401 and the Porter-Cologne Water Quality Control Act, and will be protective of the natural environment. Excess soils and dredged sediment will be placed upland for disposal with no direct return of untreated water. None of the proposed activities are anticipated to cause any considerable long-term effects on, or changes to, the water chemistry or quality. Short-term effects on the water quality are possible because of temporary increases in the concentration of suspended solids and turbidity due to construction and dredging operations. To minimize impacts, erosion control and stormwater pollution prevention practices will be implemented proactively. Overall the project is expected to comply with all applicable water quality standards and no violations are anticipated.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 Of the Clean Water Act

The project is in compliance with applicable Toxic Effluent Standards under Section 307 of the Clean Water Act; with the Endangered Species Act of 1973; with the National Historic Preservation Act of 1966; and with the Marine Protection, Research, and Sanctuaries Act of 1972.

e. Compliance with Endangered Species Act of 1973

Pursuant to the ESA, USFWS and the National Marine Fisheries Service (NMFS) has regulatory authority over Federally-listed species. Under the ESA, a permit to "take" a listed species is required for any

Federal action that may harm a listed species. ESA, Section 7 prohibits Federal agencies from authorizing, funding, or carrying out activities that are likely to jeopardize the continued existence of a listed species, or destroy or adversely modify its critical habitat. By consulting with USFWS and NMFS before initiating projects, agencies review actions to determine if they could adversely affect listed species or their habitat and design their programs and projects to conserve listed and proposed species. USFWS and NMFS coordination with other Federal agencies is important to species conservation. USFWS is the administering agency for non-marine species. NMFS is the administering agency for marine species, including anadromous fish species.

USACE has initiated coordination with the USFWS and NMFS with scoping letters which were sent November 30, 2017. A biological evaluation was also submitted to both the USFWS and NMFS on November 26, 2019. Coordination with these two agencies will continue as the project progresses and will ensure that the proposed project is in full compliance with Section 7 of the Act.

f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972

Essential Fish Habitat (EFH) for groundfish, coastal pelagic species, and finfish and market squid has been designated in Anaheim Bay, Huntington Harbour, and Inner and Outer Bolsa Bay. EFH for these species also extends upstream into C02 Reach 23, and C05 Reach 1 and Reach 2. A biological evaluation which included an EFH assessment was submitted to the NMFS on November 26, 2019. NMFS is currently reviewing the biological evaluation and will submit any conservation recommendations they may have regarding how to avoid and minimize any potential impacts to EFH within the vicinity of the project. Any conservation recommendations provided by the NMFS will be considered and responded to by USACE. Once USACE considers and responds to any conservation recommendations provided by NMFS, the proposed project will be in compliance with this Act.

g. Evaluation of Extent of Degradation of the Waters of the United States

(1) Significant Adverse Effects on Human Health and Welfare

The proposed fill (construction of the lined channels, increasing span of Warner Avenue Bridge, and replacement of the tide gates with an access bridge) activity is not expected to have any long-term adverse impacts on human health or welfare, including;
(a) Municipal and private water supplies,
(b) Recreational and commercial fisheries,
(c) Plankton,
(d) Fish,
(e) Shellfish,
(f) Wildlife communities (including community diversity, productivity, and stability), or
(g) Special aquatic sites

(2) Significant Adverse Effects on Life Stages of Aquatic Life and Other Wildlife Dependent on Aquatic Ecosystems

No significant adverse effects are anticipated.

(3) Significant Adverse Effects on Aquatic Ecosystem Diversity, Productivity and Stability

No long-term adverse effects are expected on aquatic ecosystem diversity, productivity or stability.

(4) Significant Adverse Effects on Recreational, Aesthetic, and Economic Values

As described earlier, the project may have minor and temporary effects on recreational, and aesthetic values. In regards to recreation, the work at the Warner Avenue Bridge may cause temporary navigation restrictions which could impact recreational boaters. The project will also cause minor and temporary effects on the aesthetic quality of the air, water, and visual quality in the area close to the project site. Increases in noise levels due to the construction will also occur, but is expected to be minor and temporary. The aesthetic effects will be temporary and will only impact those people in the immediate vicinity. No impacts to economic values of the area are expected.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem

The main step that will be taken to minimize potential adverse impacts is that dredged sediment will be disposed of upland with no untreated return water. This will prevent the release of anthropogenic compounds associated with the sediment. Good housekeeping and best management practices including erosion control and stormwater pollution prevention practices will be used for all construction activities to minimize localized impacts to water.

i. On the basis of the guidelines, the proposed disposal site for the discharge of the dredged material is specified as complying with the requirements of these guidelines, with the inclusion of appropriate and practical conditions to minimize adverse impacts to the aquatic ecosystem.

IV. Bibliography

Merkel & Associates, Inc., 2013, Bolsa Chica Lowlands Restoration Project Monitoring Program, Annual Report 2013, Monitoring Years 4-7, Prepared for California State Lands Commission.

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4.0 Preliminary Compendium Report for Water Quality and Sediment in the C05 (Garden Grove-Wintersburg Channel), Westminster, California

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PRELIMINARY COMPENDIUM REPORT FOR WATER QUALITY AND SEDIMENT IN THE CO5 (GARDEN GROVE-WINTERSBURG CHANNEL) WESTMINSTER, CALIFORNIA

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TABLE OF CONTENTS

Page

SECTION 1.0 – INTRODUCTION....1
1.1 BACKGROUND....1
1.1.1 Watershed....1
1.1.2 Flood Plains....3
1.1.3 Groundwater Resources....3
1.1.4 Topography....3
1.1.5 Climate....3

SECTION 2.0 – EXISTING DATA PLANS AND PROGRAMS....5
2.1 CLEAN WATER ACT....5
2.1.1 Beneficial Uses....5
2.1.2 303(d) List....6
2.1.3 California Toxics Rule....6
2.2 SANTA ANA REGION BASIN PLAN....10
2.3 CALIFORNIA OCEAN PLAN....12
2.4 SANTA ANA REGIONAL WATER QUALITY MONITORING PROGRAM ELEMENTS....13
2.4.1 Receiving Waters Monitoring Program....13
2.4.1.1 Mass Emissions Monitoring....13
2.5 NATIONAL STATUS AND TRENDS PROGRAM....13
2.6 ASSEMBLY BILL 411....15

SECTION 3.0 – ANALYSIS OF EXISTING DATA....16
3.1 MASS EMISSIONS PROGRAM....16
3.2 TOXICITY....19
3.3 BACTERIA....20

SECTION 4.0 – DISCUSSION....22

SECTION 5.0 – LITERATURE CITED....23

APPENDIX A – DRY WEATHER AND WET WEATHER CONCENTRATIONS OF TRACE METALS BETWEEN 2006 AND 2014

APPENDIX B – ACTUAL CONCENTRATIONS FOR TOXICITY TESTS FROM DRY AND STORM WEATHER SAMPLES

LIST OF TABLES

Page

Table 2-2 Santa Ana Region 303(d) List of Water Quality Limited Segments 8

Table 2-3 California Toxics Rule 9

Table 2-4 Select Water Quality Objectives from the Santa Ana River Basin Plan 10

Table 2-5 California Ocean Plan Water Quality Objectives 12

Table 2-6 Sediment Effects Guideline Values for Protection of Marine Aquatic Life 13

Table 3-1 Exceedances of CTR Criteria at CO5 2004-2008 17

Table 3-2 Exceedances of CTR Criteria at CO5 2008-2014 17

Table 3-3 Toxicity in Dry Weather at CO5 2005-2014 19

Table 3-5 Exceedances of Bacteria Criteria at CO5 2005-2014 21

LIST OF FIGURES

Page

Figure 1 Project Vicinity Map 2

Figure 2 Annual Rainfall in Santa Ana Region 4

Figure 3 Exceedances of Bacteria Criteria at CO5- by Sampling Season 21

SECTION 1.0 – INTRODUCTION

1.1 BACKGROUND

This Water Quality and Sediment Compendium Report summarizes the existing data available for water quality and sediment within the East Garden Grove-Wintersburg Channel of the Westminster Flood Risk Management Project (proposed project). The purpose of the report is to provide a comparison of current water quality conditions specifically in the East Garden Grove-Wintersburg (C05) to conditions in the channel from two decades ago (i.e., 1990s).

The proposed project will examine opportunities to improve the function of the constructed flood control channels or storm drains of the C05, Oceanview (C06), Westminster (C04), and Bolsa Chica (C02) Channel Systems. These channels are part of the Westminster watershed. The Westminster watershed is designated with the letter "C" by Orange County. As such, these channels are numbered C05, C06, C04, and C02, as identified above. The proposed project would allow the modification of the C05, C06, C04, and C02 channels to provide 100-year flood conveyance of stormwater.

CO5 and its tributaries, including C06, collect and convey runoff over approximately 28 square miles to Outer Bolsa Bay (Figure 1). CO5 begins upstream of Haster Basin in the City of Garden Grove and is approximately 11 miles long. C06 extends for about 4 miles and originates east of Mile Square Park in the City of Fountain Valley and flows westerly to the City of Huntington Beach where it discharges into the C05 channel northeast of the intersection of Gothard Street and Warner Avenue. Current data for CO5 are from a sampling station at Gothard Street. CO5 terminates with one-way flap gates at the south end of Outer Bolsa Bay. From Outer Bolsa Bay, runoff is conveyed under the Warner Avenue Bridge through Huntington Harbour, Anaheim Bay and ultimately the Pacific Ocean. Tidal waters flow between Outer and Inner Bolsa Bay through tide gates that partly restrict tidal exchange (CSLC et al. 2001). The tidal range in Inner Bolsa Bay is muted to about 22 percent of that of Outer Bolsa Bay.

1.1.1 Watershed

The proposed Project is located within the Anaheim Bay-Huntington Harbour Watershed (Hydrologic Unit Code [HUC] 180702010001), which encompasses approximately 80 square miles of Orange County. The Anaheim Bay-Huntington Harbour Watershed lies on flat coastal plains bounded by the Santa Ana River, Talbert Mesa, the Pacific Ocean and the Westminster Channel system. The watershed includes portions of the cities of Anaheim, Cypress, Fountain Valley, Garden Grove, Huntington Beach, Los Alamitos, Santa Ana, Seal Beach, Stanton, and Westminster in the County of Orange. The watershed covers an area that is predominantly urbanized. Typical flow in the Anaheim Bay-Huntington Harbour Watershed is almost completely dry weather runoff. There is no dominant river for the watershed that drains a substantial portion of the watershed. Channels that drain the watershed include Stanton Storm Channel; CO2; Anaheim Harbor City Channel; CO4; CO5; and CO6.

Figure 1 Project Vicinity Map

(to be provided by Corps)

1.1.2 Flood Plains

The Project area is within the 100-year flood plain. The Project area is designated as Zone A, which represents areas subject to inundation by the 1-percent-annual-chance flood event (FEMA 2015).

1.1.3 Groundwater Resources

Groundwater in the project area occurs within the Coastal Plain of Orange County groundwater basin, which underlies a coastal alluvial plain with total storage capacity of about 38,000,000 acre-feet. Orange County Water District manages this groundwater basin. Recharge is predominantly from percolation of Santa Ana River flow, infiltration of precipitation, and injection into wells.

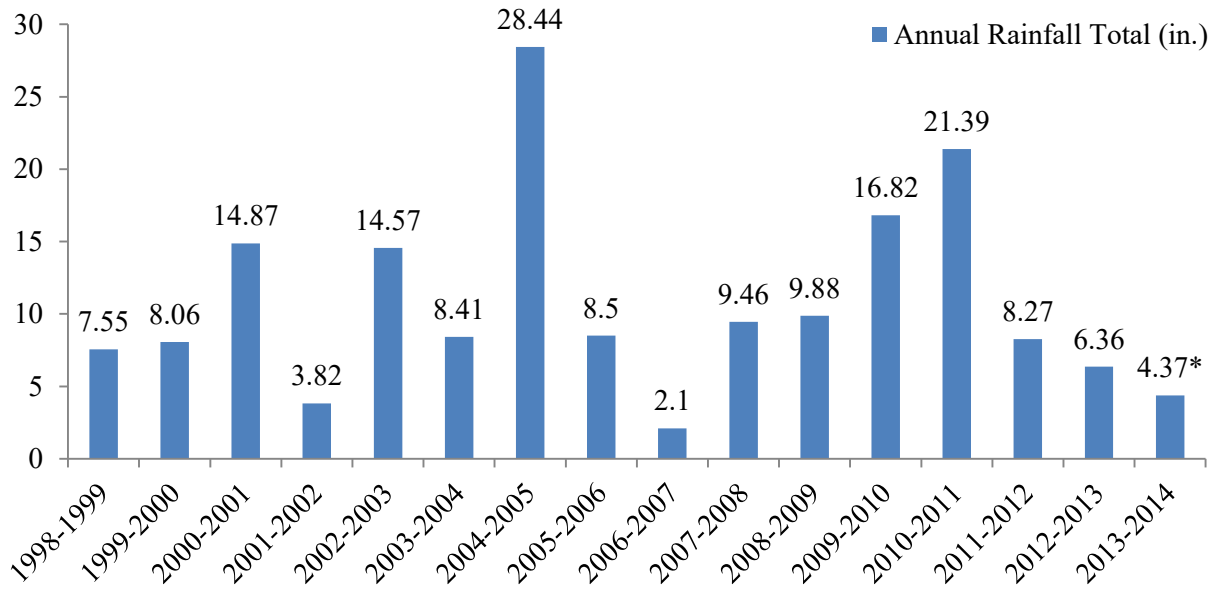
1.1.4 Topography

The headwaters for the channels within the watershed begin in the northern and eastern reaches of the watershed, which has a very low slope, having once been primarily swamplands or low coastal floodplains for the San Gabriel and Santa Ana rivers. All the channel reaches within the watershed are improved (lined) for flood control.

1.1.5 Climate

The climate in Orange County is classified as Mediterranean, which is characterized by pronounced seasonal changes in rainfall (i.e., dry summer and rainy winters) with relatively modest transitions in temperature. The average annual rainfall varies between 10 and 15 inches. Most rainfall occurs generally between December and March during a few large storm events (Orange County Watersheds and Coastal Resources Division, 2003). A graph of the total annual rainfall in the Santa Ana Region is provided in Figure 2.

Figure 2 Annual Rainfall in Santa Ana Region



*A lack of rain overall limited the storm monitoring efforts in the Santa Ana Region for 2013-14.

SECTION 2.0 – EXISTING DATA PLANS AND PROGRAMS

2.1 CLEAN WATER ACT

Section 303 of the CWA requires that the state identify and prioritize waters that do not meet, or are not expected to meet water quality standards by technology-based controls alone. Lists of these waters are included in the Section 303(d) lists submitted to the USEPA.

Section 401 of the CWA specifies than any applicant for a federal license or permit to conduct any activity that may result in any discharge into navigable water shall provide the licensing or permitting agency with a certification. The certification shall indicate that the project complies with all water quality standards, including beneficial uses, water quality objectives, and the state antidegradation policy.

Section 402 of the CWA permits discharge of a pollutant based on certain discharge conditions as part of the National Pollutant Discharge Elimination System (NPDES). The NPDES program establishes enforceable effluent limitations on discharges, require monitoring, designate reporting requirements, and require BMPs.

Section 404 of the CWA regulates the discharge of dredge or fill materials into waters of the US. The program is jointly administered by the USACE and US Environmental Protection Agency (USEPA) The USACE enforces the Section 404 provisions and reviews applications for individual and nationwide permits. The USACE also verified jurisdictional delineations identifying waters of the US.

Total Maximum Daily Load (TMDL) is a regulatory term in the (CWA, describing a value of the maximum amount of a pollutant that a body of water can receive while still meeting water quality standards.[1] Alternatively, TMDL is an allocation of that water pollutant deemed acceptable to the subject receiving waters.

2.1.1 Beneficial Uses

Waterbodies in the East Garden Grove-Wintersburg Channel watershed fall under the jurisdiction of the California Regional Water Quality Control Board (RWQCB), Santa Ana Region. The RWQCB sets water quality objectives and beneficial uses for surface and ground water in the Water Quality Control Plan Santa Ana River Basin (RWQCB 1995). The RWQCB lists the receiving waters of CO5 as Sunset Bay-Huntington Harbour, Inner and Outer Bolsa Bay, and Bolsa Chica Ecological Reserve.

Table 2-1 shows designated beneficial uses for these C05 receiving waters. No beneficial uses have been set for CO5 itself. Designated beneficial uses common to all three receiving waterbodies include contact and non-contact water recreation (REC-1, REC-2), wildlife habitat (WILD), rare, threatened, or endangered species (RARE), spawning, reproduction and development (SPWN), and marine habitat (MAR). Sunset Bay-Huntington Harbour beneficial uses also include commercial and sports fishing (COMM) and navigation (NAV). Beneficial uses of Bolsa Bay and Bolsa Chica Ecological Reserve include preservation of Biological Habitats of Special Significance (BIOL). Additional designated beneficial uses are shellfish

harvesting (SHELL) in Bolsa Bay and estuarine habitat (EST) in Bolsa Chica Ecological Reserve.

2.1.2 303(d) List

Table 2-2 shows the pollutants for which CO5 and Huntington Harbour have been placed on the Santa Ana Region 303(d) List of Water Quality Limited Segments. CO5 is on the 303(d) list for unionized ammonia from an unknown source as a Category 5A, which is "a water segment where standards are not met and a TMDL is required, but not yet completed, for at least one of the pollutants being listed for this segment." CO5 is not listed on the 303(d) list for pH or water temperature.

Huntington Harbour is on the 303(d) list for chlordane, copper, lead, nickel PCBs, and sediment toxicity all from unknown and multiple sources. CO5 is not the only contributor to Huntington Harbour. Huntington Harbour also is on the 303(d) list for pathogens from urban runoff/storm sewers. The pathogen impairment is focused at the 11th Street, Anderson Street Marina, Clubhouse Marina and Sunset Aquatic Park locations. These locations exceed the enterococcus bacteria standard.

2.1.3 California Toxics Rule

USEPA promulgated CWA 303(c) water quality criteria for priority toxic pollutants in California's inland surface waters and enclosed bays and estuaries in the California Toxics Rule (CTR). The CTR supplements, and does not change or supersede, the criteria that USEPA promulgated for California in the National Recommended Water Quality Criteria, but fills gap in California's water quality standards necessary to protect human health and aquatic life beneficial uses. The Criterion Maximum Concentration is the highest concentration of a pollutant to which aquatic life can be exposed for a short period of time (1-hour average) without deleterious effects. The Criterion Continuous Concentration is the highest concentration of a pollutant to which aquatic life can be exposed for an extended period of time (4 days) without deleterious effects. These values are listed in Table 3.4-4.

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Table 2-1 Beneficial Uses of East Garden Grove Wintersburg Channel and Receiving Waters

BAYS, ESTUARIES, AND TIDAL PRISMS	BENEFICIAL USE																			Hydrologic Unit	
	MUN	AGR	IND	PROC	GWR	NAV	POW	REC1	REC2	COMM	WARM	LWRM	COLD	BIOL	WILD	RARE	SPWN	MAR	SHEL	EST	Primary	Secondary
Sunset Bay – Huntington Harbour	+					X		X	X	X					X	X	X	X			801.1	
Bolsa Bay	+							X	X	X				X	X	X	X	X	X		801.1	
Bolsa Chica Ecological Reserve	+							X	X					X	X	X	X	X		X	801.1	

Table 2-2 Santa Ana Region 303(d) List of Water Quality Limited Segments

REGION	WATER BODY NAME	WATER	WATERSHED CALWATER/ USGS HUC	POLLUTANT POTENTIAL SOURCES	ESTIMATED AREA ASSESSED	FIRST YEAR LISTED	TMDL REQUIREMENT STATUS	DATE
8	East Garden Grove Wintersburg Channel	River & Stream	80111000/18070201	Ammonia (unionized)/source unknown	2.9 Miles	2010	5A	2021
8	Huntington Harbour	Bay & Harbor	80111000/18070201	chlordane/source unknown	221 Acres	2006	5A	2019
				copper/source unknown	221 Acres	2002	5A	2019
				Lead/source unknown	221 Acres	2006	5A	2019
				Nickel/source unknown	221 Acres	2002	5A	2019
				PCBs (Polychlorinated biphenyls)(tissues)/source unknown	221 Acres	2002	5A	2019

Final 2010 Integrated Report (CWA Section 303(d) List / 305(b) Report), USEPA Final Approval: October 11, 2011

Table 2-3 California Toxics Rule

Constituent	Freshwater		Saltwater	
	Criterion Maximum Concentration (µg/L)	Criterion Continuous Concentration (µg/L)	Criterion Maximum Concentration (µg/L)	Criterion Continuous Concentration (µg/L)
Arsenic	340	150	69	36
Cadmium	4.3	2.2	43	9.3
Chromium (VI)	16	11	1100	50
Copper	13	9	4.8	3.1
Lead	65	2.5	210	8.1
Nickel	470	52	74	8.2
Selenium		5	290	71
Silver	3.4		1.9	
Zinc	120	120	90	81
Cyanide	22	5.2	1	1
Pentachlorophenol	19	15	13	7.9
Aldrin	3		1.3	
gamma-BHC	0.95		0.16	
Chlordane	2.4	0.0043	0.09	0.004
4,4'-DDT	1.1	0.001	0.13	0.001
Dieldrin	0.24	0.056	0.71	0.0019
alpha-Endosulfan	0.22	0.056	0.034	0.0087
beta-Endosulfan	0.22	0.056	0.034	0.0087
Endrin	0.086	0.036	0.037	0.0023
Heptachlor	0.52	0.0038	0.053	0.0036
Heptachlor Epoxide	0.52	0.0038	0.053	0.0036
Polychlorinated biphenyls (PCBs)		0.014		0.03
Toxaphene	0.73	0.0002	0.21	0.0002

Note: Values for metals have been converted to total recoverable.
µg/L - micrograms per liter.
Source: California Toxics Rule 2000

2.2 SANTA ANA REGION BASIN PLAN

The Water Quality Control Plan for the Santa Ana River Basin (1995, updated 2014) contains water quality objectives to reasonably protect and to maintain or enhance the beneficial uses of water. The objectives and criteria contained in the Basin Plan are presented in Table 2-4. The standards represent maximum levels that allow beneficial uses of the water basin to continue unimpaired.

Enclosed bays include indentations along the coast that enclose an area of oceanic water within distinct headlands or harbor works. Estuaries includes waters located at the mouths of streams, including coastal lagoons, that serve as areas of mixing for fresh and ocean waters. Regional objectives for enclosed bays and estuaries include algae, bacteria/coliform, residual chlorine, color, floatables, oil and grease, dissolved oxygen, pH, radioactivity, solid/suspended/settleable solids, sulfides, surfactants (surface-active agents), taste and odor, temperature, toxic substances, and turbidity. Inland surface waters include streams, rivers, lakes, and wetlands in the Region. Regional objectives for inland surface waters include algae, unionized ammonia, site-specific unionized ammonia objective for the Santa Ana River System, bacteria/coliform, boron, chemical oxygen demand, chloride, residual chlorine, color, total dissolved solids (total filterable residue), floatables, fluoride, hardness (as $CaCO_3$), total inorganic nitrogen, metals, methylene blue-activated substances (MBAS), nitrate, oil and grease, dissolved oxygen, pH, radioactivity, sodium, solid/suspended/settleable solids, sulfate, sulfides, surfactants (surface-active agents), taste and odor, temperature, toxic substances, and turbidity.

Table 2-4 Select Water Quality Objectives from the Santa Ana River Basin Plan

Objective	Bays and Estuaries
	Criteria
Algae	Waste discharges shall not contribute to excessive algal growth in receiving waters.
Residual Chlorine	Shall not exceed 0.1 mg/L.
Coliform Bacteria	REC-1 - Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30-day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period. SHEL – Fecal coliform: median concentration not more than 14 MPN (most probable number)/100 mL and not more than 10 of samples exceed 43 mpn/mL.
Dissolved Oxygen	Shall not be depressed to levels that adversely affect beneficial uses as a result of controllable water quality factors.

Objective	Bays and Estuaries Criteria
pH	Shall not be raised above 8.6 or depressed below 7.0 as a result of controllable water quality factors; ambient pH levels shall not be changed more than 0.2 units.
Temperature* (new discharges)	Bays - Elevated temperature waste discharges shall comply with limitations necessary to assure protection of beneficial uses. The maximum temperature of waste discharges shall not exceed the natural temperature of the receiving waters by more than 20°F. Thermal waste discharges having a maximum temperature greater than 4°F above the natural temperature of the receiving water are prohibited. Estuaries - Elevated temperature waste discharges shall comply with the following: a.) The maximum temperature shall not exceed the natural receiving water temperature by more than 20°F. b.) Elevated temperature waste discharges either individually or combined with other discharges shall not create a zone, defined by water temperatures of more than 1°F above natural receiving water temperature, which exceeds 25 percent of the cross- sectional area of a main river channel at any point. c.) No discharge shall cause a surface water temperature rise greater than 4°F above the natural temperature of the receiving waters at any time or place. d.) Additional limitations shall be imposed when necessary to assure protection of beneficial uses. Thermal waste discharges having a maximum temperature greater than 4°F above the natural temperature of the receiving water are prohibited.
Toxic Substances	Concentrations in the water column, sediments or biota shall not adversely affect beneficial uses.
Turbidity	Increases in turbidity which result from controllable water quality factors shall comply with the following: Natural turbidity 0-50 NTU = Maximum increase of 20% Natural turbidity 50-100 NTU = Maximum increase of 10 NTU Natural turbidity greater than 100 NTU = Maximum increase of 10%
	Inland Surface Waters
Un-ionized ammonia	Calculated numerical UIA-N objectives as well as corresponding total ammonia nitrogen concentration for various pH and temperature conditions shown in tables in the Basin Plan.
Coliform Bacteria	MUN – Total coliform less than 100 organisms/100 mL. REC-1 - Fecal coliform: log mean less than 200 organisms/100 mL based on five or more samples/30-day period, and not more than 10% of the samples exceed 400 organisms/100 mL for any 30-day period. REC-2 – Fecal coliform: average less than 2,000 organisms/100 mL and not more than 10% of samples exceed 4,000 organisms/100 mL for any 30-day period.
Nitrate	Nitrate-nitrogen concentrations shall not exceed 45 mg/L (as NO3) or 10 mg/L (as N) in inland surface waters designated MUN as a result of controllable water quality factors.
pH	Shall not be raised above 8.5 or depressed below 6.5 as a result of controllable water quality factors.
*As identified in the "Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan, updated 1998)." Source: Santa Ana River Basin Water Quality Control Plan (1995, updated 2014).	

2.3 CALIFORNIA OCEAN PLAN

The State Water Resources Control Board (SWRCB 2012) has established objectives for the protection of marine aquatic life in the California Ocean Plan. For purposes of identifying the difference in objectives for the receiving waters compared to the subject channel (i.e., CO5), those objectives are listed in Table 2-5.

Table 2-5 California Ocean Plan Water Quality Objectives

Constituent	Limiting Concentrations			
	Units of Measurement	6-Month Median	Daily Maximum	Instantaneous Maximum
Arsenic	µg/L	8	32	80
Cadmium	µg/L	1	4	10
Chromium (Hexavalent)	µg/L	2	8	20
Copper	µg/L	3	12	30
Lead	µg/L	2	8	20
Mercury	µg/L	0.04	0.16	0.4
Nickel	µg/L	5	20	50
Selenium	µg/L	15	60	150
Silver	µg/L	0.7	2.8	7
Zinc	µg/L	20	80	200
Cyanide	µg/L	1	4	10
Total Chlorine Residual	µg/L	2	8	60
Ammonia (expressed as nitrogen)	µg/L	600	2400	6000
Acute Toxicity	TUa	N/A	0.3	N/A
Chronic Toxicity	TUc	N/A	1	N/A
Phenolic Compounds (non-chlorinated)	µg/L	30	120	300
Chlorinated Phenolics	µg/L	1	4	10
Endosulfan	ng/L	0.009	0.018	0.027
Endrin	ng/L	0.002	0.004	0.006
HCH	ng/L	0.004	0.008	0.012
Radioactivity	Not to exceed limits specified in Title 17, Division 1, Chapter 5, Subchapter 4, Group 3, Article 3, Section 30253 of the California Code of Regulations.			

2.4 SANTA ANA REGIONAL WATER QUALITY MONITORING PROGRAM ELEMENTS

2.4.1 Receiving Waters Monitoring Program

This report includes a summary of data collected as part of the Orange County Stormwater Program Unified Program Effectiveness Assessment (PEA) Unified Annual Progress Report for the Santa Ana Region. The Orange County Stormwater Program (OCSWP) is a cooperative municipal regulatory compliance initiative focused on the management of urban and stormwater runoff for the protection and enhancement of Orange County's creeks, rivers, streams, and coastal waters (County of Orange and OCFCD 2013). The primary objective of the Program is to satisfy the requirements of area-wide municipal National Pollutant Discharge Elimination System (NPDES) permits (NPDES CAS618030), specifically, RWQCB Order R8-2009-0030 (Santa Ana Regional Board). The NPDES permits were first adopted in 1990 and subsequently renewed in 1996 (Second Term), 2002 (Third Term), and 2009 (Fourth Term).

2.4.1.1 Mass Emissions Monitoring

Mass Emissions monitoring provides the estimate of total annual masses of constituents transported by flood control drainage channels to receiving waters during both dry-weather and stormwater runoff conditions. Mass emissions monitoring also provides water chemistry data to assess water quality with respect to acute and chronic toxicity criteria from the CTR. Toxicity testing is conducted with freshwater organisms for dry weather runoff samples and with a combination of freshwater and marine organisms for stormwater runoff samples.

2.5 NATIONAL STATUS AND TRENDS PROGRAM

No comparable criteria exist for the protection of aquatic life from contaminated sediments. As a part of the National Status and Trends Program, the National Oceanographic and Atmospheric Administration (NOAA) published and updated effects-based sediment quality values for evaluating the potential for constituents in sediment to cause adverse biological effects (Long and Morgan 1990, Long et al. 1995). Those values are referred to as Effects Range-Low (ER-L) and Effects Range-Median (ER-M). The ER-L concentrations are equivalent to the lower tenth percentile of available data screened by NOAA and indicate the low end of the range of concentrations at which adverse biological effects are observed or predicted in sensitive species and/or sensitive life stages. These values are to be used as guidelines only and not as thresholds and not associated with any regulatory requirements. The ER-M values are concentrations based on the NOAA screened data at which effects are observed or predicted in Table 2-6.

Table 2-6 Sediment Effects Guideline Values for Protection of Marine Aquatic Life

Parameter	Effects Range-Low (ER-L)	Effects Range-Median (ER-M)
Metals (mg/Kg)		
Antimony	2.0	2.5

Parameter	Effects Range-Low (ER-L)	Effects Range-Median (ER-M)
Arsenic	8.2	70
Cadmium	1.2	9.6
Chromium	81	370
Copper	34	270
Lead	46.7	218
Mercury	0.15	0.71
Nickel	20.9	51.6
Silver	1	3.7
Zinc	150	410
Organics (µg/Kg)		
Acenaphthene	16	500
Acenaphthylene	44	640
Anthracene	85.3	1100
Fluorene	19	540
2-Methyl naphthalene	70	670
Naphthalene	160	2100
Phenanthrene	240	1500
Low-molecular weight PAH	552	3160
Benz(a)anthracene	261	1600
Benzo(a)pyrene	430	1600
Chrysene	384	2800
Dibenzo(a,h)anthracene	63.4	260
Fluoranthene	600	5100
Pyrene	665	2600
High molecular weight PAH	1700	9600
Total PAH	4022	44792
p,p'-DDE	2.2	27
Total DDT	1.58	46.1
Total PCBs	22.7	180

ER-L = Effects Range Low - Concentration at lower tenth percentile at which adverse biological effects were observed or predicted.
ER-M = Effects Range Median - Concentration at which adverse biological effects were observed or predicted in 50% of test organisms.
mg/Kg - milligrams per kilogram.
µg/Kg - micrograms per kilogram.
Source: Long et al. 1995.

2.6 ASSEMBLY BILL 411

Assembly Bill (AB) 411 requires the State Department of Health Services to adopt regulations requiring the testing of all beaches for total coliform, fecal coliform, enterococci, streptococci bacteria, and chemical pollutants including, but not limited to, PCBs, PAHs, and mercury on a weekly basis from April 1 to October 31, inclusive, of each year if certain conditions are met. AB 411 also includes protective minimum standards for the location of monitoring sites and monitoring frequency, to require posting in clearly visible points along affected beaches whenever state standards are violated. AB 411 would require the local health officer to notify the Director of Parks and Recreation within 24 hours of any beach posting, closure, or restriction, and would require the Director of Parks and Recreation to establish a telephone hotline and update it daily to inform the public of beach postings, closures, and restrictions.

The minimum protective bacteriological standards for waters adjacent to public beaches and public water-contact sports areas shall be as follows:

(1) Based on a single sample, the density of bacteria in water from each sampling station at a public beach or public water contact sports area shall not exceed:

(A) 1,000 total coliform bacteria per 100 milliliters, if the ratio of fecal/total coliform bacteria exceeds 0.1; or

(B) 10,000 total coliform bacteria per 100 milliliters; or

(C) 400 fecal coliform bacteria per 100 milliliters; or

(D) 104 enterococcus bacteria per 100 milliliters.

(2) Based on the mean of the logarithms of the results of at least five weekly samples during any 30-day sampling period, the density of bacteria in water from any sampling station at a public beach or public water contact sports area, shall not exceed:

(A) 1,000 total coliform bacteria per 100 milliliters; or

(B) 200 fecal coliform bacteria per 100 milliliters; or

(C) 35 enterococcus bacteria per 100 milliliters.

SECTION 3.0 – ANALYSIS OF EXISTING DATA

3.1 MASS EMISSIONS PROGRAM

Patterns of CTR exceedances for CO5 during dry weather and wet weather (e.g., stormwater) conditions have been summarized as part of the annual mass emissions monitoring program conducted by the County. The sampling location for CO5 is at Gothard Street (i.e., EGWCO5). A measured concentration greater than that guidance value is considered an exceedance. Acute samples represent instantaneous maximum concentration and chronic samples represent a 4-day average concentration.

Countywide, constituents detected most frequently in exceedance of their respective tolerance interval are primarily nutrients (nitrate as N, ammonia as N, and orthophosphate as PO_4), bacteria (Enterococcus), and metals/trace elements toxicity, primarily selenium and copper.

Trace Metals

Sites are provided a score based on the exceedance percentages compared to the total number of samples within the region for water quality. Site scores are identified as “very good” with 0% - 15% exceedances, “good” with 16% - 40% exceedances, “fair” with 41% - 75% exceedances, and “poor” with 76% - 100% exceedances. Dry weather and wet weather concentrations of trace metals between 2006 and 2014 are provided in Appendix A.

Between 1991 and 1997, concentrations of cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), nickel (Ni), silver (Ag), and zinc (Zn) have been measured in waters of CO5. In CO5, zinc was detected in all samples. Copper, lead, and nickel were detected in over half the samples. Cadmium, chromium, and silver were only occasionally detected. Occasionally, copper, nickel and zinc exceeded the California Ocean Plan and National and/or California Toxics Rule limitations during the 1990s. Detected chromium, lead, and silver sometimes exceeded either the California Ocean Plan or the National and/or California Toxics Rule limitations. Copper concentrations were elevated above the National and/or California Toxics Rule limitation at all sites tested within CO5 during the 1990s.

Between 2004 and 2008, none of the samples showed an exceedance for zinc under acute conditions or copper under chronic conditions. There was one exceedance in the 2007-2008 season out of 83 acute samples within the region. Between 2004 and 2008, the site score was very good. Table 3-1 presents the number of samples and exceedances for three constituents.

Table 3-1 Exceedances of CTR Criteria at CO5 2004-2008

Season	Samples				Exceedances of CTR Freshwater Criteria Maximum Concentration at CO5		
	Regional		CO5		Acute		Chronic
	Acute	Chronic	Acute	Chronic	Cu	Zn	Cu
2004-2005	103	24	4	2			
2005-2006	107	25	9	2			N/A
2006-2007	82	20	8	2	0	0	0
2007-2008	83	21	9	2	1		

Between 2009 and 2014, none of the samples showed an exceedance for cadmium (Cd), nickel (Ni), lead (Pb), zinc (Zn), or selenium (Se). During the 2009-2010 season, both of the dry weather samples from CO5 showed an exceedance of copper (Cu). CO5 showed an exceedance for copper in stormwater samples in each season except for 2011-2012 and 2012-2013. Between 2009 and 2014, the site score was very good. Table 3-2 presents the number of samples and exceedances for six constituents.

Table 3-2 Exceedances of CTR Criteria at CO5 2008-2014

Season	Samples				Exceedances of CTR Freshwater Criteria Maximum Concentration at CO5											
	Regional		CO5		Cd		Cu		Ni		Pb		Zn		Se*	
	dry	st	dry	st	dry	st	dry	st	dry	st	dry	st	dry	st	dry	st
2008-2009	82	93	2	4	N/A	N/A		1			N/A	N/A			N/A	N/A
2009-2010	71	92	2	10	N/A	N/A	2	9							N/A	N/A
2010-2011	79	101	2	8	0	0	0	5	0	0	N/A	N/A	0	0	0	0
2011-2012	73	52	2	6	0	0	0	0	0	0	0	0	0	0	0	0
2012-2013	83	29	2	2	0	0	0	0	0	0	0	0	0	0	0	0
2013-2014 (Acute)	100	22	2	2	0	0	0	1	0	0	0	0	0	0	0	0
2013-2014 (Chronic)	100	22	2	2	0	0	0	1	0	0	0	0	0	0	0	0

General Minerals and Nutrients

Nutrient enrichment was detected at CO5 in 1991-1997, where ammonia and ammonium ranged from 0.1 to 2.2 mg/L, and phosphate generally ranged from 0.1 to 3.5, although one observation was 63 mg/L (CSLC et al. 2001). Nitrate typically ranged from 0.2 to 19 mg/L. Phosphate and nitrate were elevated in CO5 during winter and spring between 1991 and 1997, probably as a result of stormwater runoff. Waters in CO5 were brackish, with moderate total dissolved solids concentrations. Between 1991 and 1997, the channel waters had relatively low nutrient, sulfate, and total organic carbon concentrations. Dry weather and wet weather concentrations of nutrients between 2006 and 2014 are provided in Appendix A.

Organic Compounds

In 1996, Tetra Tech, Inc. tested for concentrations of total extractable petroleum hydrocarbons (TEPHs), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), organochlorine (OC) pesticides, organophosphorus (OP) pesticides, and chlorinated (OC) herbicides in surface waters of the waters of the Lowlands, Bolsa Bay, and CO5. Several organic contaminants were detected in waters of CO5 in 1996, except for PCBs and OC pesticides, which were not detected. No California Ocean Plan or National Toxics Rule limitations are available for comparison with the measured organic contaminants. No TEPHs were detected in CO5. PAHs were detected in runoff areas of CO5, which had detectable concentrations of pesticides and herbicides.

Samples from 2005-2006 detected PCBs, organochlorine, organophosphate and pyrethroid pesticides. Samples from 2007-2010 detected acid extractable compounds, base/neutral extractable compounds, polynuclear aromatic hydrocarbons, organochlorine, organophosphate and pyrethroid pesticides. By 2008, there is a decline in dimethoate. Concentrations of OP pesticides can vary by orders of magnitude at a site during the course of a storm. The two samples from C05 collected on consecutive days in January 2009 both showed significant amounts of pyrethroid pesticides with the greater concentrations occurring near the onset of the storm. By 2010, concentrations of the organophosphate pesticides, Diazinon and Chlorpyrifos (aka Dursban) in samples collected at Mass Emissions sites show a steady decline. However, detectable amounts of Malathion, another OP pesticide are still found. Malathion is the OP pesticide that most commonly detected at the site.

2010-2011 season detected both organophosphorus and pyrethroid pesticides, with the pyrethroid pesticides more prevalent in stormwater samples. 2011-2012 samples detected organochlorine pesticides, polynuclear aromatic hydrocarbons, and pyrethroid pesticides, of which there were three exceedances of pyrethroid pesticides (i.e., cyfluthrin, permethrin). CO5 was not sampled for organic compounds in 2012-2014. Stormwater samples from the Mass Emissions sites regionally from 2013-2014 show that detection patterns continue to suggest a shift towards the use of synthetic, pyrethroid pesticides and away from organophosphate pesticides in urbanized areas. The synthetic pyrethroid pesticide group was detected nearly five times more often than the organophosphorus pesticides during storm events in the Santa Ana Region.

3.2 TOXICITY

Statistics for the analysis of toxicity include Acute Toxicity Units (TUa) and Chronic Toxicity Units (TUc). The lowest TUc possible, which indicates no toxicity, is 1. Zero is the lowest TUa value possible. As toxicity increases, the toxic units increase. Lethal concentration (LC) concentration that causes mortality (e.g., 50%) of the organisms. The lower the LC percentage, the more toxic the sample. Inhibition concentrations (IC) are the concentrations that cause an inhibition (e.g., 25 percent or 50 percent) of an organism's function such as growth, or cell density. The lower the IC percentage, the more toxic the sample. Chronic effects are estimated using the "No Observable Effects Concentration" (NOEC), for both survival and reproduction. The lower the value of the NOEC, the more toxic the sample.

Samples were considered to be toxic if the organism response test results (i.e., survival, reproduction, or growth) were less than 80% effect. Toxicity was found occur in less test samples of dry weather samples in comparison to stormwater samples collected from CO5, which mirrors the results of toxicity within inland receiving waters regionally. Table 3-3 shows a summary of the toxic units for dry weather samples between 2005 and 2014. Actual concentrations for toxicity tests from dry weather samples are provided in Appendix B. Table 3-4 shows a summary of the toxic units for dry weather samples between 2005 and 2014. Actual concentrations for toxicity tests from wet weather samples are provided in Appendix B.

Table 3-3 Toxicity in Dry Weather at CO5 2005-2014

Date	# Samples	Matrix	Weather	Ceriodaphnia Reproduction	7d Ceriodaphnia Reproduction	7d Ceriodaphnia Survival	48 hr Ceriodaphnia Survival	Acute Ceriodaphnia Survival	96 hr Hyallela Survival	Acute Hyallela Survival	96 hr Selenastrum Growth	Chronic Selenastrum Growth
				TUc	TUc	TUc	TUa	TUa	TUc	TUa	TUc	TUc
8/23/2005			D							0		1
11/14/2005			D							0.59		8
6/25/2007	24		D	1		1		1		0		2
9/18/2006	24		D	1		1		1		0.44		1
10/1/2007			D	1			0					
10/8/2008	24		D	1			0				1	
6/23/2009	24		D	1			0				1	
9/20/2010	24	FW	D		1	1	0				1	
6/7/2011		FW	D		1	1	0				1	
8/30/2011	24	FW	D		1	1			1		1	
6/11/2012	24	FW	D		1	1			1		1	
9/17/2012	24		D	1		1		0	1		1	
5/28/2013	24		D	1		**1**		0	1		1	
9/23/2013	24		D	1		1		0	1		1	
6/2/2014	24		D	1		**1**		0	1		1	

Table 3-4 Toxicity in Wet Weather at CO5 2005-2014

Date	# Samples	Matrix	Weather	Ceriodaphnia Reproduction	7d Ceriodaphnia Reproduction	7d Ceriodaphnia Survival	Acute Ceriodaphnia Survival	Mysidopsis Growth	7d Mysidopsis Growth	Acute Mysidopsis Survival	7d Mysidopsis Survival	Sea Urchin Fertilization	Chronic Sea Urchin Development
				TUc	TUc	TUc	TUa	TUc	TUc	TUc	TUc	TUc	TUc
10/18/2005			ST		1				1		1	2	
3/29/2006			ST										
10/14/2006	6		ST	1			0	>2		1.23	>2	1	1
2/11/2007	12		ST	1			0	1		0	1	8	2
12/7/2007			ST	2				1		2		1	1
2/22/2008			ST	1				1		2		2	1
11/4/2008	1		ST					1		2		>16	4
1/23/2009	6		ST					2		2		1	1
11/20/2010	12	FW	ST		1	1			1		1	1	
3/20/2011	12	FW	ST		1	1			1		1	2	
10/4/2011	6	FW	ST		>1	1			1		1	>2	
3/17/2012	11	FW	ST		1	1			1		1	1	
2/20/2013	12		ST	1		1	0				2	1	
10/9/2013	10		ST	1		1	0				1	1	

3.3 BACTERIA

Intestinal bacteria are sampled as indicators of fecal contamination in water and of overall microbial water quality. If found in significant concentrations in water, coliform bacteria are considered to indicate the potential presence of human and/or animal fecal waste. Total coliform is measured in terms of the number of coliform organisms per unit volume. Total coliform numbers can include nonfecal bacteria. Therefore, measurement of fecal coliforms is considered a better predictor of fecal contamination.

The County of Orange Health Care Agency has monitored coliform bacteria in water samples in CO5. Results from 1991 to 1997 indicate that these runoff areas represent potential bacteriological contaminant sources for the nearby wetland. Total coliform densities in CO5 were variable, ranging from 140 to 80,000 MPN per 100 mL during dry weather. During wet weather, total coliform densities were substantially elevated (2,400 to 160,000 MPN per 100 mL) in CO5.

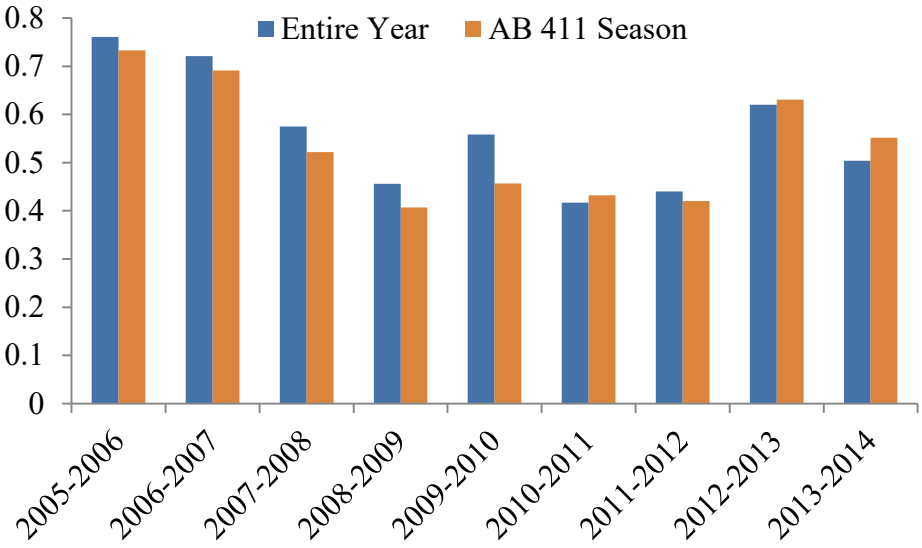
The total number of AB 411 exceedances is divided by the total number of sample tests, resulting in a proportion for each drain between 0 and 1.0. Categories for AB411 exceedances are: 0 - <0.14, 0.14 - <0.40, 0.40 - < 0.75, and 0.75 – 1.0. Table 3-5 and Figure 3 show the exceedances of bacteria criteria between 2005 and 2014.

Table 3-5 Exceedances of Bacteria Criteria at CO5 2005-2014

Year	Entire Year		AB 411 Season	
	n	Avg Hits	n	Avg Hits
2005-2006	*	0.761	*	0.733
2006-2007	*	0.721	*	0.691
2007-2008	*	0.575	*	0.522
2008-2009	38	0.456	27	0.407
2009-2010	46	0.558	27	0.457
2010-2011	44	0.417	27	0.432
2011-2012	39	0.44	19	0.42
2012-2013	50	0.62	28	0.631
2013-2014	47	0.504	29	0.552

* data not available, n = number of samples, avg hits = total number of exceedances for total coliform, fecal coliform, and enterococcus combined divided by the total number of sample tests

Figure 3 Exceedances of Bacteria Criteria at CO5- by Sampling Season



SECTION 4.0 – DISCUSSION

Recent data (i.e., 2005-2014) on CTR exceedances in CO5 generally are very good in both dry and wet weather. Patterns of toxicity in CO5 generally are very good in both dry and wet weather. Exceedance ratings of AB 411 during the AB 411 season (i.e., April to October) are better than exceedance ratings over than the entire year. Based on the review of recent water quality data for CO5, although there are occasional exceedances of CTR criteria, toxicity, and bacteria, the frequency and concentrations of these exceedances are less than that identified from two decades ago.

SECTION 5.0 – LITERATURE CITED

California Regional Water Quality Control Board

2014 Water Quality Control Plan, Santa Ana River Basin (8). Update to include approved amendments from 2008 and 2011. July 2014.

California State Lands Commission, United States Fish and Wildlife Service, and the United States Army Corps of Engineers

2001 Final EIR/EIS for the Bolsa Chica Lowlands Restoration Project, Volume 1. Submitted by Chambers Group, Inc. Prepared for California State Lands Commission, United States Fish and Wildlife Service, and the United States Army Corps of Engineers. April 2001.

County of Orange and Orange County Flood Control District (OCFCD)

2005 Section C-11, Santa Ana Region Appendices: Water Quality Monitoring Summary and Analyses. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2004-2005 Reporting Period*. November 15, 2005.

2006 Section C-11 Tables, Santa Ana Region Water Quality Monitoring Summary and Analyses Tables. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2005-2006 Reporting Period*. November 15, 2006.

2007 Section C-11 Tables, Santa Ana Region Water Quality Monitoring Summary and Analyses Tables. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2006-2007 Reporting Period*. November 15, 2007.

2008 Section C-11 Tables (Santa Ana Region), Santa Ana Region Water Quality Monitoring Summary and Analyses Tables. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2007-2008 Reporting Period*. November 14, 2008.

2009 Section C-11 Tables (Santa Ana Region), Santa Ana Region Water Quality Monitoring Summary and Analyses Tables. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2008-2009 Reporting Period*. November 13, 2009.

2010 Section C-11 Tables (Santa Ana Region), Santa Ana Region Water Quality Monitoring Summary and Analyses Tables. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2009-2010 Reporting Period*. November 15, 2010.

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Program Effectiveness Assessment (Santa Ana Region), 2010-2011 Reporting Period. November 15, 2011.

2012 Section C-11 Attachment 2 (Santa Ana Region): Data. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2011-2012 Reporting Period*. November 15, 2012.

2013 Section C-11 Attachment 2 (Santa Ana Region): Data. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2012-2013 Reporting Period*. November 15, 2013.

2014 Section C-11 (Santa Ana Region): Santa Ana Region Water Quality Monitoring Summary and Analyses. In *Unified Annual Progress Report Program Effectiveness Assessment (Santa Ana Region), 2013-2014 Reporting Period*. November 14, 2014.

United States Environmental Protection Agency (USEPA)

2000 Water Quality Standards; Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California; Final Rule. 40 CFR Part 131. Federal Register. Rules and Regulations. Vol. 65, No. 97, Thursday, May 18, 2000.

APPENDIX A – DRY WEATHER AND WET WEATHER CONCENTRATIONS OF TRACE METALS BETWEEN 2006 AND 2014

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Dry Weather and Wet Weather Concentrations of Trace Metals Between 2006 and 2014
Load

			Nutrients							Trace Metals									
Period	Volume Sampled ac-ft	Type	Nitrate as NO3	NH3 as N	TKN	Total Phos. as PO4	Ortho Phos. as P	TSS	VSS	Cd	Cr lbs	Cu	Pb	Ni	Ag	Zn	As	Se	Hardness as CaCO3
Oct 14-16, 2006	12	Total	140.6	45	147	26.34	1.19	867	222	0.02	0.06	0.78	0.1	0.42	0.01	2.977	0.11	0.05	9614
		Diss								0.01	0.03	0.501	0.02	0.39	0.01	1.752	0.1	0.04	
Feb 11-15, 2007	50	Total	678.7	39.4	200	115	19.02	2880	934	0.04	0.3	2.939	0.53	0.61	0.03	12.3	0.33	0.09	19728
		Diss								0.03	0.1	1.428	0.07	0.47	0.03	4.488	0.26	0.05	
Dec 7-11, 2007	62	Total	822	37.9	128.7	122	22.9	2633	772	0.042	0.29	2.2	0.44	0.61	0.04	9.36	0.34	0.06	21731
		Diss								0.042	0.21	1.3	0.04	0.54	0.04	5.72	0.3	0.05	
Feb 22-26, 2008	219	Total	1713	69.3	524	370.1	20.5	12182	2577	0.149	0.88	7.1	1.53	1.66	0.15	22.39	0.91	0.27	54146
		Diss								0.149	0.38	4.5	0.15	1.31	0.15	10.47	0.8	0.37	
Jan 23-27, 2009	4	Total	0.03	0.002	0.01	0.006	0	0.2	0.08	0.004	0.03	0.5	0.04	0.07	0.003	0.73	0.03	0.007	0.76
		Diss								0.001	0.01	0.18	0.006	0.06	0.001	0.35	0.02	0.007	
Nov 20-23, 2010	44	Total	366	33	316	160	11	13780	3322	0.04	0.7	5.28	1.14	0.74	0.03	14.22	0.36	0.17	10639
		Dissolved								0.03	0.13	1.97	0.03	0.33	0.03	2.44	0.18	0.3	
Mar 20-24, 2011	559	Total	4550	128	2883	2177	61	381775	83662	0.84	14.3	78.23	33.02	15.14	0.38	347.02	5.55	0.82	162962
		Dissolved								0.38	0.94	16.81	0.38	3.3	0.38	19.6	1.71	0.5	
Oct 4-6, 2011	139	Total	0.6	0.07	0.63	0.26	0.02	36	8.1	0.1	2	16	3.5	2.9	0.1	41	1.1	0.29	22
		Dissolved								0.1	0.37	4.2	0.28	1.6	0.1	5.6	0.62	0.11	
Mar 17-19, 2012	71	Total	0.28	0.02	0.17	0.09	0.01	7.8	1.8	0.04	0.4	5.5	1.1	0.76	0.01	16	0.36	0.08	12
		Dissolved								0.01	0.19	2.9	0.08	0.46	0.01	4	0.26	0.09	
Feb 19-21, 2013	8.37	Total	762.4	7.18	112.8	30.5	1.03	2519	952	0.027	0.158	2.06	0.312	0.31	0.026	6.26	0.179	0.099	22468
		Dissolved								0.026	0.066	1.49	0.026	0.24	0.026	2.24	0.153	0.09	
Oct 9-11, 2013	10.01	Total	143.16	15.96	200.86	24.36	1.05	1391.75	543.24	0.005	0.099	1.12	0.125	0.513	0.003	3.677	0.148	0.044	5209
		Dissolved								0.003	0.061	0.776	0.047	0.481	0.003	2.754	0.133	0.036	

Dry Weather and Wet Weather Concentrations of Trace Metals Between 2006 and 2014
Mean

			Nutrients							Trace Metals									
Period	Volume Sampled ac-ft	Type	Nitrate as NO3	NH3 as N	TKN	Total Phos. as PO4 mg/L	Ortho Phos. as P	TSS	VSS	Cd	Cr	Cu	Pb	Ni ug/L	Ag	Zn	As	Se	Hardness as CaCO3 mg/L
Oct 14-16, 2006	12	Total	4.31	1.38	4.5	0.81	0.04	27	6.8	0.46	1.93	23.9	3.19	12.7	0.25	91.27	3.43	1.38	295
		Diss								0.25	0.92	15.4	0.46	11.8	0.25	53.71	2.91	1.26	
Feb 11-15, 2007	50	Total	4.99	0.29	1.47	0.85	0.14	21	6.9	0.27	2.18	21.6	3.89	4.5	0.25	90.48	2.43	0.69	145
		Diss								0.25	0.74	10.5	0.48	3.5	0.25	33.02	1.9	0.37	
Dec 7-11, 2007	62	Total	4.9	0.22	0.76	0.72	0.14	15.6	4.6	0.25	1.72	13.07	2.61	3.59	0.25	55.6	2.01	0.33	129
		Diss								0.25	1.26	7.99	0.25	3.18	0.25	33.9	1.78	0.29	
Feb 22-26, 2008	219	Total	2.9	0.12	0.88	0.62	0.03	20.5	4.3	0.25	1.48	11.97	2.56	2.78	0.25	37.6	1.53	0.46	91
		Diss								0.25	0.65	7.52	0.25	2.2	0.25	17.6	1.34	0.62	
Jan 23-27, 2009	4	Total	5.4	0.39	2.2	1.1	0.08	37	15	0.37	2.5	46	4	6.1	0.28	67	2.5	0.64	140
		Diss								0.09	1.3	17	0.55	5.8	0.09	32	2.2	0.64	
Nov 20-23, 2010	44	Total	3.1	0.27	2.64	1.34	0.09	115	28	0.29	5.8	44.1	9.51	6.2	0.25	119	3	1.4	89
		Dissolved								0.25	1.1	16.5	0.25	2.8	0.25	20	1.5	0.3	
Mar 20-24, 2011	559	Total	3	0.08	1.9	1.43	0.04	251	55	0.55	9.4	51.5	21.73	10	0.25	228	3.7	0.5	107
		Dissolved								0.25	0.6	11.1	0.25	2.2	0.25	13	1.1	0.3	
Oct4-6, 2011	139	Total	3.2	0.4	3.33	1.4	0.11	193.01	42.65	0.25	5.25	42.65	9.27	7.58	0.25	109.55	2.93	0.77	116.48
		Dissolved								0.25	0.97	11.17	0.73	4.3	0.25	14.85	1.64	0.28	
Mar 17-19, 2012	71	Total	2.93	0.25	1.79	0.96	0.1	80.76	18.33	0.2	2.09	28.26	5.7	3.92	0.07	83.52	1.84	0.44	112.24
		Dissolved								0.05	0.96	15.04	0.44	2.38	0.07	20.97	1.34	0.44	
Feb 19-21, 2013	8.37	Total	5.3	0.2	1.57	0.32	0.01	35	9	0.26	1.6	20.4	2.99	3.3	0.26	43	1.9	0.7	160
		Dissolved								0.26	0.5	13.8	0.26	2.5	0.26	18	1.5	0.7	
Oct 9-11, 2013	10.01	Total	5.3	0.59	7.38	0.9	0.04	51	20	0.18	3.6	41.2	4.59	18.9	0.11	135	5.4	1.6	191
		Dissolved								0.11	2.2	28.5	1.73	17.7	0.11	101	4.9	1.3	

APPENDIX B – ACTUAL CONCENTRATIONS FOR TOXICITY TESTS FROM DRY AND STORM WEATHER SAMPLES

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Actual Concentrations for Toxicity Tests from Dry Weather Samples, Part I

				Ceriodaphnia Reproduction						7d Ceriodaphnia Reproduction						7d Ceriodaphnia Survival					
				Conc.						Conc.						Dillution					
				Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc
Date	# Samples	Matrix	Weather	%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc	
8/23/2005			D																		
11/14/2005			D																		
6/25/2007	24		D	13.3	17.6	100		>100	1							80	100			>100	1
9/18/2006	24		D	19.2	19.2	100		**>100**	1							100	100			**>100**	1
10/1/2007			D						1												
10/8/2008	24		D						1												
6/23/2009	24		D						1												
9/20/10	24	FW	D							26.6	29	100	>100	>100	1	100	100	100	>100	>100	1
6/7/2011		FW	D							20.6	24.6	100	>100	>100	1	100	100	100	>100	>100	1
8/30/2011	24	FW	D							21.9	17.7	100	**>100**	**>100**	1	100	100	100	**>100**	**>100**	1
6/11/2012	24	FW	D							22.2	27.1	100	**>100**	**>100**	1	100	100	100		90	1
9/17/2012	24		D	18.9	29	100	**>100**	**>100**	1							100	100	100	>100	>100	1
5/28/2013	24		D	25.7	24.7	100	**>100**	**>100**	1							100	100	**100**	**>100**	**>100**	**1**
9/23/2013	24		D	19.2	26.9	100	**>100**	**>100**	1							100	100	100	**>100**	**>100**	1
6/2/2014	24		D	24.5	25.5	100	**>100**	**>100**	1							100	100	**100**	**>100**	**>100**	**1**

Actual Concentrations for Toxicity Tests from Dry Weather Samples, Part II

				48 hr Ceriodaphnia Survival						Acute Ceriodaphnia Survival						96 hr Hyallela Survival						
				Dilution						Dilution						Dilution						
	# Samples	Matrix	Weather	Control	100%	NOEC	IC25	IC50	TUa	Control	100%	NOEC	IC25	IC50	Tua	Control	100%	NOEC	IC25	IC50	TUc	TUa
Date				%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc		
8/23/2005			D																			
11/14/2005			D																			
6/25/2007	24		D							100	100			>100	1							
9/18/2006	24		D							100	100			**>100**	1							
10/1/2007			D						0													
10/8/2008	24		D						0													
6/23/2009	24		D						0													
9/20/10	24	FW	D	100	100	100	>100	>100	0							100	100	100	>100	>100		0
6/7/2011		FW	D	100	100	100	>100	>100	0							100	100	100	>100	>100		0
8/30/2011	24	FW	D	100	100	100	**>100**	**>100**								100	95	100	**>100**	**>100**	1	
6/11/2012	24	FW	D	100	100	100	200	90								100	100	100	**>100**	**>100**	1	
9/17/2012	24		D							100	100	100	>100	>100	0	100	100	100	**>100**	**>100**	1	
5/28/2013	24		D							100	100	100	**>100**	**>100**	0	100	100	100	**>100**	**>100**	1	
9/23/2013	24		D							100	100	100	**>100**	**>100**	0	100	90	100	**>100**	**>100**	1	
6/2/2014	24		D							100	100	100	**>100**	**>100**	0	90	100	100	**>100**	**>100**	1	

Actual Concentrations for Toxicity Tests from Dry Weather Samples, Part III

				Acute Hyallela Survival						96 hr Selenastrum Growth						Chronic Selenastrum Growth					
				Dillution						Dillution						Dillution					
				Control	100%	NOEC	IC25	IC50	TUa	Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc
Date	# Samples	Matrix	Weather	%	%	% conc	% conc	% conc		Cell Dt	Cell Dt	% conc	% conc	% conc		Cell Dt	Cell Dt	% conc	% conc	% conc	
8/23/2005			D		100				0									200		>100	1
11/14/2005			D		90				0.59									12.5		**>100**	8
6/25/2007	24		D	100	100			>100	0							1101400	154750	50		78	2
9/18/2006	24		D	90	85			**>100**	0.44							1070500	2E+06	100		>100	1
10/1/2007			D																		
10/8/2008	24		D												1						
6/23/2009	24		D												1						
9/20/10	24	FW	D							2418000	2E+06	100	>100	>100	1						
6/7/2011		FW	D							1354500	2E+06	100	>100	>100	1						
8/30/2011	24	FW	D							1314750	2E+06	1770000	**>100**	**>100**	1						
6/11/2012	24	FW	D							1292750	2E+06	1616500	**>100**	**>100**	1						
9/17/2012	24		D							122550	2E+06	100	>100	>100	1						
5/28/2013	24		D							1076250	1E+06	100	**>100**	**>100**	1						
9/23/2013	24		D							158800	2E+06	100	**>100**	**>100**	1						
6/2/2014	24		D							1332750	2E+06	100	**>100**	**>100**	1						

Actual Concentrations for Toxicity Tests from Storm Weather Samples, Part I

				Ceriodaphnia Reproduction						7d Ceriodaphnia Reproduction						7d Ceriodaphnia Survival					
				Conc.						Conc.						Conc.					
	# Samples	Matrix	Weather	Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc
Date				%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc	
10/18/2005			ST								100	100		>100	1						
3/29/2006			ST																		
10/14/2006	6		ST	20.3	14.8	100		>100	1												
2/11/2007	12		ST	15	25.6	100		>100	1												
12/7/2007			ST						2												
2/22/2008			ST						1												
11/4/2008	1		ST																		
1/23/2009	6		ST																		
11/20/2010	12	FW	ST							25	25	100	>100	>100	1	90	100	100	>100	>100	1
3/20/2011	12	FW	ST							19.9	26.8	100	>100	>100	1	90	89	100	>100	>100	1
10/4/2011	6	FW	ST							18.8	12.7	<100	77.05	>100	>1	100	80	100	>100	>100	1
3/17/2012	11	FW	ST							17.3	17.2	100	>100	>100	1	100	90	90	>100	100	1
2/20/2013	12		ST	17	20	100	>100	>100	1							90	100	100	>100	>100	1
10/9/2013	10		ST	16.8	21.8	100	>100	>100	1							90	80	100	>100	>100	1

Actual Concentrations for Toxicity Tests from Storm Weather Samples, Part II

				Acute Ceriodaphnia Survival						Mysidopsis Growth						7d Mysidopsis Growth					
				Conc.						Conc.						Conc.					
Date	# Samples	Matrix	Weather	Control %	100% %	NOEC % conc	IC25 % conc	IC50 % conc	TUa	Control mg/ind	100% mg/ind	NOEC % conc	IC25 % conc	IC50 % conc	TUc	Control mg/ind	100% mg/ind	NOEC % conc	IC25 % conc	IC50 % conc	TUc
10/18/2005			ST														100	100		>100	1
3/29/2006			ST																		
10/14/2006	6		ST	100	100			>100	0	0.29	0.05	<50		30	>2						
2/11/2007	12		ST	100	100			>100	0	0.16	0.27	100		>100	1						
12/7/2007			ST												1						
2/22/2008			ST												1						
11/4/2008	1		ST												1						
1/23/2009	6		ST												2						
11/20/2010	12	FW	ST													0.181	0.22	100	>100	>100	1
3/20/2011	12	FW	ST													0.296	0.27	25	>100	>100	1
10/4/2011	6	FW	ST													0.269	0.364	100	>100	>100	1
3/17/2012	11	FW	ST													0.231	0.173	100	0.146	0.211	1
2/20/2013	12		ST	90	100	100	>100	>100	0												
10/9/2013	10		ST	100	90	100	>100	>100	0												

Actual Concentrations for Toxicity Tests from Storm Weather Samples, Part III

				Acute Mysidopsis Survival						7d Mysidopsis Survival					
				Conc.						Conc.					
	# Samples	Matrix	Weather	Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc
Date				%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc	
10/18/2005			ST								92.5	100		>100	1
3/29/2006			ST												
10/14/2006	6		ST	100	43			81	1.23	95	35	<50		75	>2
2/11/2007	12		ST	100	100			>100	0	100	98	100		>100	1
12/7/2007			ST						2						
2/22/2008			ST						2						
11/4/2008	1		ST						2						
1/23/2009	6		ST						2						
11/20/2010	12	FW	ST							85	82.5	100	>100	>100	1
3/20/2011	12	FW	ST							85	85	100	>100	>100	1
10/4/2011	6	FW	ST							80	77.5	100	>100	>100	1
3/17/2012	11	FW	ST							90	75	100	77.5	90	1
2/20/2013	12		ST							82.5	0	50	20.422	32.986	2
10/9/2013	10		ST							97.5	95	100	>100	>100	1

Actual Concentrations for Toxicity Tests from Storm Weather Samples, Part IV

	# Samples	Matrix	Weather	Sea Urchin Fertilization						Chronic Sea Urchin Development					
				Conc.						Conc.					
				Control	100%	NOEC	IC25	IC50	TUc	Control	100%	NOEC	IC25	IC50	TUc
Date				%	%	% conc	% conc	% conc		%	%	% conc	% conc	% conc	
10/18/2005			ST		0	50		74.23	2						
3/29/2006			ST												
10/14/2006	6		ST	100	99	100		>100	1	100	99	100		>100	1
2/11/2007	12		ST	100	83	12.5		>100	8	100	93	50		>100	2
12/7/2007			ST						1						1
2/22/2008			ST						2						1
11/4/2008	1		ST						>16						4
1/23/2009	6		ST						1						1
11/20/2010	12	FW	ST	0.972	0.975	100	>100	>100	1						
3/20/2011	12	FW	ST	0.88	0.7	38 50	>62	>62	2						
10/4/2011	6	FW	ST	1	0.91	<50	>100	>100	>2						
3/17/2012	11	FW	ST	1	1	100	>100	>100	1						
2/20/2013	12		ST	100	100	100	>100	>100	1						
10/9/2013	10		ST	95.2	97	100	>100	>100	1						

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5.0 Westminster, East Garden Grove, CA Flood Risk Management Study Decision on Implementation of the Full Tidal Basin Spillover

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Westminster, East Garden Grove, CA Flood Risk Management Study
Decision on Implementation of the Full Tidal Basin Spillover Alternative

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Decision

In a letter to the Corps dated 03 December 2018, the California State Lands Commission requested consideration of an alternative to the current plan for conveying flood flows from the East Garden Grove-Wintersburg (EGGW) Flood Control Channel (C05) to the ocean. The alternative would outlet the flows through the Full Tidal Basin (FTB) of the Bolsa Chica Ecological Reserve (BCER) instead of through an expanded Warner Avenue Bridge to Huntington Harbour to Anaheim Bay. The study team met with representatives of the California State Lands Commission, California Department of Fish and Wildlife, Santa Ana Regional Water Quality Control Board, U.S. Fish and Wildlife Service, and the National Marine Fisheries Service on multiple occasions to discuss the alternative.

The request to consider this alternative was motivated by the potential for a mutually beneficial alternative whereby the Orange County Flood Control District, in operating and maintaining the flood risk management project, would contribute to the maintenance dredging of shoaling at the ocean outlet of BCER. Tidal flow into and out of the BCER is essential to the habitat established by the mitigation project. Outlet dredging activities for the mitigation project cost more than originally estimated and have been impacted by budget shortfalls.

The Corps' subsequent analysis concludes that the alternative is not preferred over the current selected plan of directing the flows into Huntington Harbour. This decision was reached after analyzing the Environmental, Hydrology & Hydraulics (H&H), Cost, and Federal Policy aspects of the alternative. The FTB alternative has more potential impacts environmentally, is not significantly cheaper, and has HTRW policy issues that require rejection of the alternative in the presence of a worthy alternative. The analysis also concludes that conveying flood flows from C05 to the FTB would not require regular dredging of the ocean outlet for the purpose of flood risk management.

Background

A Draft Integrated Feasibility Report (IFR) and Draft Integrated Environmental Impact Statement/Environmental Impact Report (EIS/EIR) is being prepared for the Westminster, East Garden Grove Orange County, California, Flood Risk Management Study. The Draft IFR includes an analysis of a reasonable range of alternatives to reduce the risks to life safety, damages to residential and commercial structures, damages to public infrastructure, and time lost due to traffic delays caused by flooded transportation routes. The Draft IFR also includes an assessment of the environmental impacts of the flood risk management alternatives. Note that when the Corps originally scoped the study in 2006, it specifically excluded consideration of alternatives that might affect the Full Tidal Basin in the BCER. The Bolsa Chica Lowlands Restoration Project was established as a mitigation project for the Ports of Los Angeles and Long Beach through an agreement with the Corps, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. EPA, California Department of Fish and Game, California Coastal Conservancy, California State Lands Commission, Long Beach Harbor, and Los Angeles Harbor. The decision to avoid the FTB was driven by concerns over the potential to adversely affect the reserve, as well as likely requiring the renegotiation and amendment of the existing mitigation agreement.

Study Area

The study area is the highly urbanized Westminster watershed in western Orange County, California. The watershed is approximately 87 square miles in area and lies on a flat coastal plain. The watershed was formerly part of the floodplain of the Santa Ana River, which historically meandered throughout the existing watershed as far north as Anaheim Bay. Channelization and large scale flood control modifications have constrained the Santa Ana River to the main stem channel on the eastern border of the Westminster watershed.

Cities in the watershed include Anaheim, Stanton, Cypress, Garden Grove, Westminster, Fountain Valley, Los Alamitos, Seal Beach, and Huntington Beach (**Figure 1**).

Naval Weapons Station Seal Beach, Seal Beach National Wildlife Refuge, and the Bolsa Chica Ecological Reserve are significant landmarks on the downstream end of the study area.

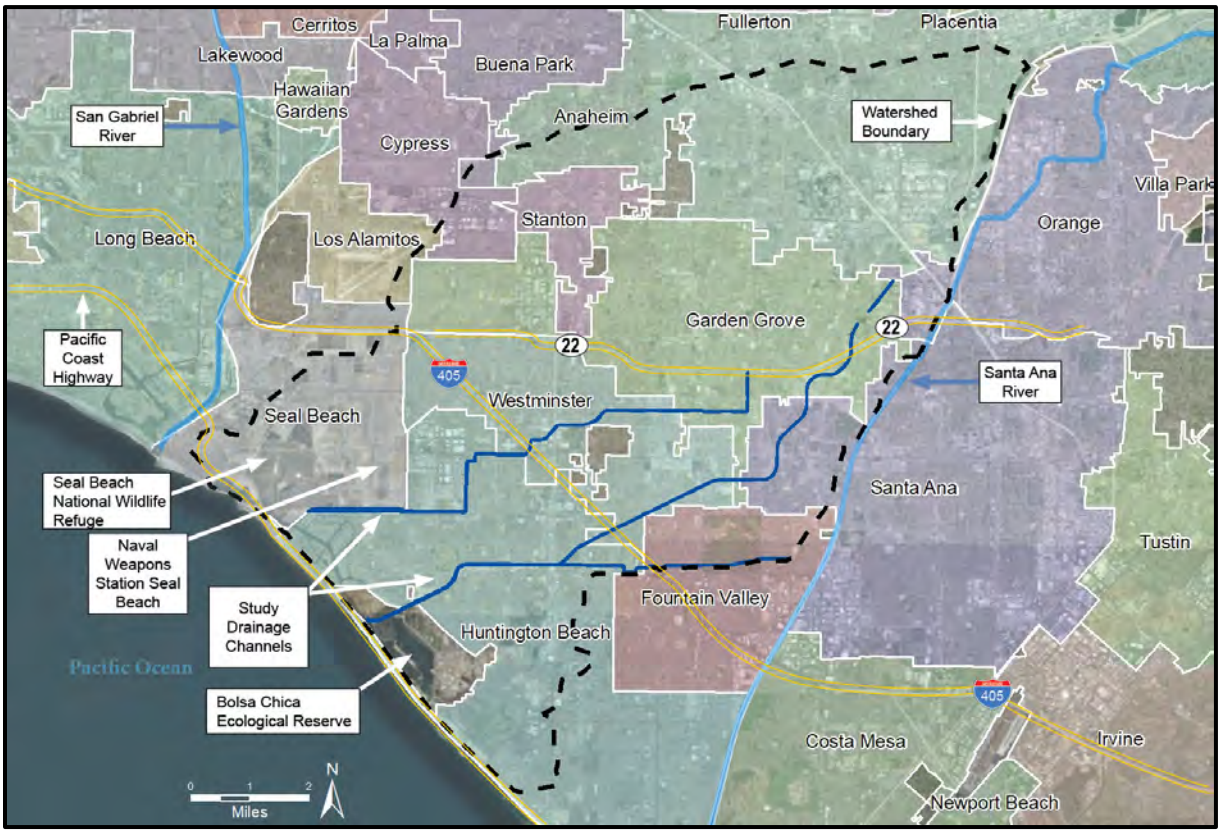

Figure 1 – Study area.

The project area includes portions of four non-federal flood control channels within the Westminster watershed and the receiving waters of one of the flood control channel systems in the Bolsa Chica Ecological Reserve (**Figure 2**).

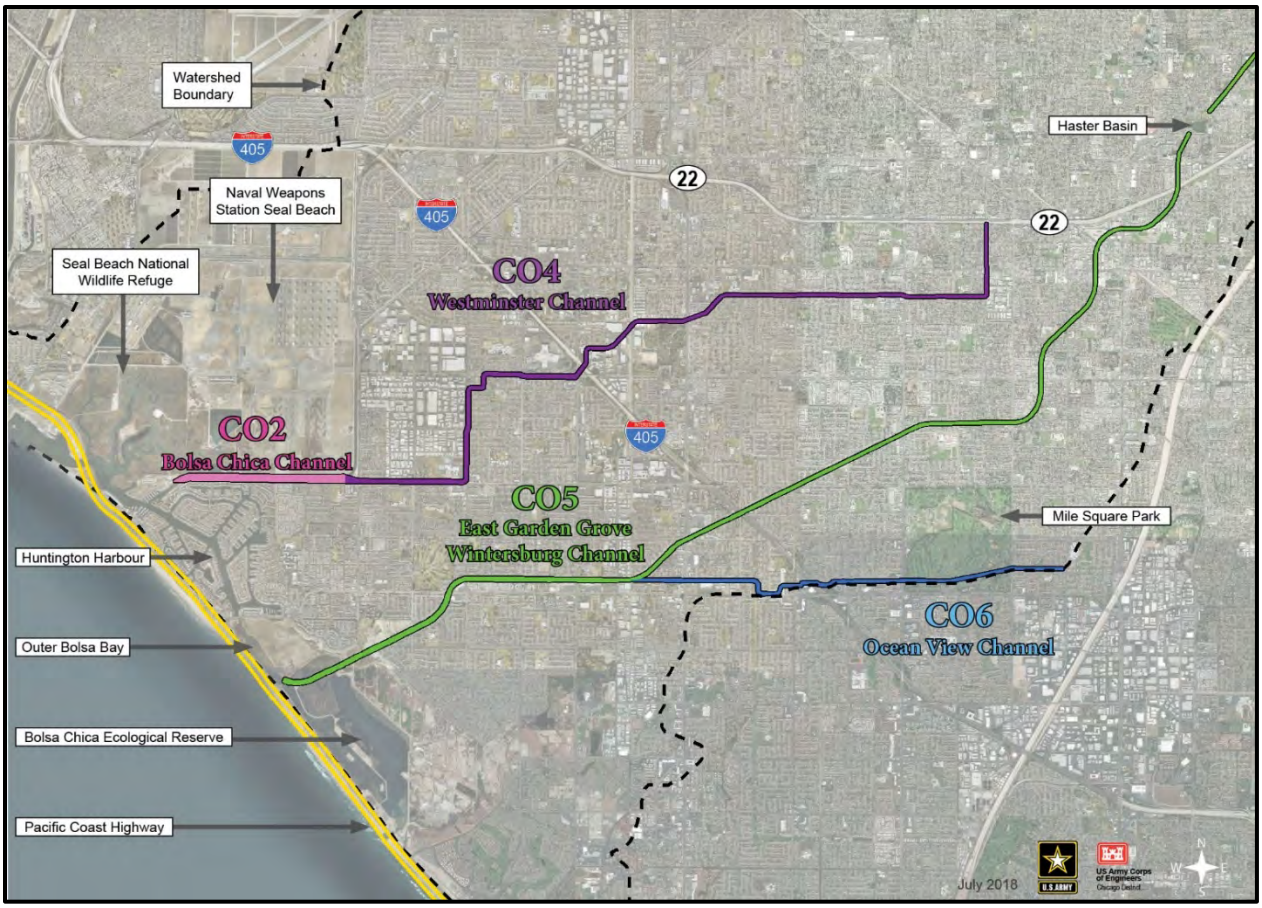

Figure 2 – Drainage channels within the study area.

Full Tidal Basin (FTB) Outlet Alternative Description

The proposed FTB Outlet alternative specifically focuses on the downstream end of C05. C05 begins west of the intersection of Interstate 5, Highway 57, and Highway 22 in the City of Santa Ana and flows southwest through Haster Basin, under Interstate 405, and through the Bolsa Chica Ecological Reserve (BCER). C05 also includes waters from its tributary channels, including the Ocean View Channel (C06), all of which discharge into Outer Bolsa Bay, Huntington Harbour, and eventually the Pacific Ocean at Anaheim Bay.

Under the feasibility study tentatively selected plan and locally preferred plan, floodwaters from the C05 would flow north into Huntington Harbour and eventually out to the Pacific Ocean through Anaheim Bay. The plan requires increasing the span of Warner Avenue Bridge and excavation of the channel upstream of the bridge to accommodate increased flows caused by channel improvements upstream. The proposed alternative would spill water from C05 into the FTB of the BCER. The FTB outlets to the ocean under a bridge on Pacific Coast Highway (PCH). An approximately 1700-foot weir with adjacent erosion protection would be installed along the C05 south levee to allow waters to overflow into the FTB. The weir would be designed to prevent waters from smaller storm events, as well as the initial flush from larger storm events, from entering the FTB. Only storm events greater than approximately the 10-25-year event would be able to overflow into the basin.

Analysis

The discussion of the FTB alternative below considers the Environmental, H&H, Cost and Federal Policy aspects of the decision. The FTB alternative was not part of the original scope of study or NEPA/CEQA documentation, and it has not been evaluated to the extent of the current alternative. However, enough information is available to confirm the preference of the current plan.

Environmental Analysis

The environmental analysis contained in the Bolsa Chica Lowlands Restoration Report (2001) was utilized to understand potential significant adverse impacts to area resources from spilling from C05 into the FTB. Alternative 6 of the report is very similar to the proposed FTB alternative for the Westminster study. The report included the analysis of 8 alternatives, including the No Action Plan and the Proposed Project. Under Alternative 6, an approximately 1200-foot side weir would have been constructed into the south levee of C05 to allow a portion of the peak flows during 10-year and greater storms to discharge into the full tidal basin (**Figure 3**). During peak flows of a 100-year storm, 4,650 cfs would be conveyed to Outer Bolsa Bay via the flood control channel and 4,640 cfs would flow into the wetlands. Flows from C05 would begin spilling into the full tidal basin at about the 10-year storm interval. Alternative 6 had two potentially significant adverse impacts that could not be mitigated to insignificant:

- Elevated *Enterococcus* levels during 10-year or greater storms which may cause temporary closure of nearshore zone water, resulting in a significant, adverse impact.
- Significant water quality impact from exceedance of water quality standards in the wetlands and coastal waters during 10-year or greater storm flows.

Predicted values for three metals, as well as total coliform bacteria, were used to determine the significance of water quality impacts from chemical and bacteriological factors. Modeling results indicated that for 10-, 25-, and 100-year storm flows, metal concentrations in the full tidal basin would have violated both the instantaneous and 4-day criteria for zinc and copper and the 4-day criterion for lead. Metals levels in coastal areas would have violated the instantaneous criterion for copper during the 25- and 100-year storms. Because these violations would have occurred throughout the wetlands and into the coastal areas, this impact would have been significant. In regards to coliforms, modeling results indicated that for all storm flows, the full tidal basin would have had violations only near the diversion structure. No violations would have been expected to occur in coastal waters. Short-term violations close to the diversion structure but not throughout the wetlands or in coastal waters would have resulted in adverse but insignificant impacts. It was noted that it would have been possible that for 10-year storms or greater, beach postings and/or closures may have resulted due to *Enterococcus* levels in ocean waters being above the new criteria, which would have been a significant adverse impact. Conversely, water quality in Outer Bolsa Bay was expected to improve since part of the floodwaters from C05 would have been diverted to the full tidal basin during large storms.

In addition to the aforementioned significant adverse impacts, other potential impacts were expected to be adverse but insignificant in terms of sediment, flora and fauna.

Ultimately, the current mitigation project, referred to as the “Proposed Project” in the Bolsa Chica Lowlands Restoration Report, was selected over all the alternatives including Alternative 6. The reasoning was that of all the restoration alternatives, the Proposed Project was expected to provide the highest quality environment for aquatic fish and invertebrates because C05 would not discharge into the full tidal basin. Therefore, the disturbance to the aquatic community from the freshwater influx and pollutants during storm flows would not occur. In addition, since the Proposed Project would have no

discharges from C05, metals and bacteria would not be carried into the wetlands and ocean. All of the other tidal inlet alternatives, including Alternative 6, were expected to have significant, unmitigable, adverse impacts to water quality in the wetlands and coastal waters from pollutants in storm flows. Bacteria in ocean waters would have likely exceeded thresholds during some storm events and swimming and surfing would have been restricted. Loss of swimming and surfing use of ocean waters during periods when bacteria exceed threshold levels would have been an unmitigable, significant, adverse impact to recreation.

The implementation of the "Proposed Project" included a multi-party legal agreement. All of the parties agreed to implement a project "in substantial conformance with the Concept Plan" and this would serve as mitigation for the work done by the Ports of Long Beach and Los Angeles. The agreement has been expanded/modified three times. The Agreement says: "The parties agree that the Project shall provide, in perpetuity, fish and wildlife habitats in the Bolsa Chica Lowlands consistent with the Concept Plan." To achieve that purpose, the parties agreed "to carry out the Project in substantial conformance with the Concept Plan" and defined "substantial conformance" to mean "not differing in any way that results in a reduction in the habitat values and aquatic functions anticipated from the Project and not in conflict with the requirements of State and Federal law." Any change to the general plan would require the approval of all signatories to the agreement. The concept plan calls for an ecosystem that is "predominantly salt water influenced, but incorporating biologically beneficial freshwater influence." Because an EIS supported the Federal decision to implement this plan, a rather substantial supplemental EIS/EIR would be required to alter it, especially considering the need to reach a contrary conclusion regarding spilling floodwaters from C05 into the basin.

The FTB overflow alternative would need to include modification for the loss of habitat due to the construction of the overflow weir and associated scour protection features. Due to the high ecological value of the existing BCER, it is likely that significant mitigation would be required.

Environmental Analysis Conclusion: the FTB alternative being virtually identical to Alternative 6 of the Bolsa Chica Lowlands Restoration Report can be assumed to cause two known potentially significant adverse impacts that could not be mitigated to insignificant, as discussed above. It was noted that it is possible that water quality has improved somewhat because of environmental regulations that restrict certain metals in vehicle brake pads that went into effect in 2017.

Additionally, high quality habitat has developed in the FTB since the Bolsa Chica Lowlands Restoration Project was implemented, including mudflats, other wetlands, and nesting areas for threatened & endangered bird species. Adverse impacts to these sensitive and high quality species would be possible if spilling was to occur from C05 to the FTB. This potential to impact existing high quality habitat would need to be analyzed and compared to any adverse impacts under the tentatively selected plan. By comparison, all significant adverse environmental impacts of the tentatively selected plan are able to mitigated, and thus there is anticipated to be no net adverse impact. Therefore, the current plan is preferred.

Adopting the FTB alternative would require a time consuming and costly modification to the mitigation project agreement with required EIS/EIR. The current plan EIS/EIR is nearing completion. In addition, including the FTB alternative into the study at this time would significantly delay the completion of the study, require additional funding, and approval of a study schedule extension by Corps HQ.

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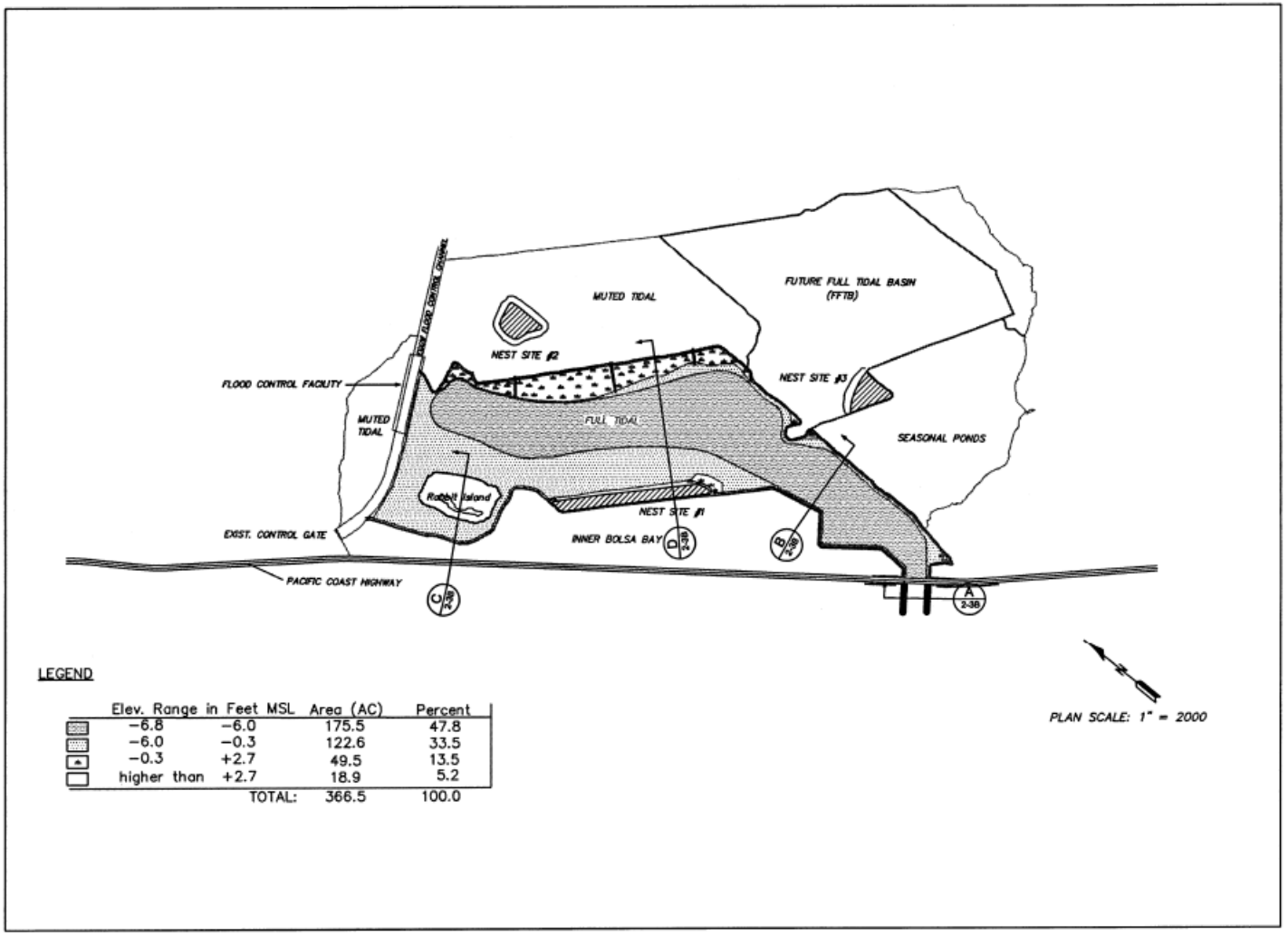

Figure *3* – Alternative 6 Concept Plan Source: Bolsa Chica Lowlands Restoration Report

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Hydrology & Hydraulic Analysis

Hydraulic models were used to evaluate the proposed FTB alternative. The C05 channel would contain flows up to the 10-25 year frequency. For larger storm events, a 1700' long hydraulic structure would be required to safely pass flows into the FTB. Localized armoring for scour protection would also need to be installed in the FTB.

During discussions with the State Lands Commission and other stakeholders it became clear that a "win-win" situation was desired in which flood flows spilling into the FTB would help to clear sand deposition at the ocean outlet or if the flood control project could contribute to the annual dredging costs of the outlet. However, based on the modeling, overflow from C05 into the FTB is unaffected by the dredge condition of the full tidal basin for the 100-year event. Discharge is controlled by the weir capacity of the overflow. A shoaled in pre-dredge condition is not severe enough to cause backwater across the overflow structure. Due to the large hydraulic capacity of the inlet/outlet channel and attenuation for both the pre and post dredge condition, stage increases in the FTB from the overflow are small (tenths of a foot). The model shows that the water surface elevation in FTB under the pre-dredge condition is only a couple of inches greater than the post dredge condition.

The model suggests that the greatest benefit of dredging appears to be establishing the full tidal range in the FTB. Prior to dredging, model results show muting during both high and low tide. This confirms the importance of dredging operations in support of the BCER mitigation project.

H&H Analysis Conclusion: the H&H model analysis only considered the pre and post dredge condition and did not look at long term impacts of not dredging the ocean outlet in the FTB. It is assumed that the current dredging being carried out by the State Lands Commission is integral to the success of the existing restoration project and that it will continue to occur in the future without project condition. Therefore, annual dredging to support the operation of the flood risk management project is not necessary and would not be included in a FTB alternative for flood risk management.

Cost Analysis

The FTB alternative includes construction of a 1700' weir structure, and localized armoring for scour protection. The estimated cost of the 1700' overflow weir has been derived from the costs for a similar structure for alternative 6 discussed in the Bolsa Chica Lowlands Restoration Report (2001). Alternative 6 featured a 1200' weir with riprap erosion protection. The cost of a 1700' weir with riprap, pro-rated from costs estimated for alternative 6 and escalated to today's dollars is $26,187,000. This includes construction, design, construction management and contingency costs.

For comparison, the cost of the tentatively selected plan including the extension of Warner Avenue Bridge, widening of the channel upstream from the bridge, and armor protection for higher flows in Huntington Harbour is $36,541,000.

While an impacts analysis of the weir structure and associated scour protection has not been completed, mitigation would be required. Mitigation for high quality habitat would likely be out of kind, and require significantly higher acre ratio than an equal replacement. Mitigation costs could be significant.

Cost Analysis Conclusion: construction the FTB alternative hydraulic structures appears to be approximately $10 million cheaper than the current plan. However, mitigation costs have not been fully analyzed nor included in the cost analysis. In any case, the cost difference is not large enough to compel selection of the FTB alternative when considering other environmental and HTRW risks/impacts.

Federal Policy on HTRW

Corps policy prohibits the selection of an alternative with HTRW risk when other practicable alternatives are available. The Corps uses the term HTRW for hazardous, toxic, and radioactive wastes. This generally means all materials regulated under a federal environmental statute. More critically, civil works appropriations cannot be used to perform remediation of contaminated sites. The strong policy of the United States is that polluters should bear the costs of pollution:

> [I]t is [Civil Works] policy to not use federal appropriations to remedy contamination that is the responsibility of others and for which there is little or no nexus between the contamination and USACE. The policy to not conduct response actions on sites with other viable PRPs [potentially responsible parties] is based on the following: fiscal law restraints, which limit use of appropriated funds to clean up contamination not caused by USACE; lack of adequate resources to pursue cost-recovery or contribution action; concern that the burden of proof is not unnecessarily shifted to the United States with respect to any action; necessity to preclude diversion of program dollars from other CW activities; desire to avoid incurrence of long-term cost demands; and consistency with the National policy that the "polluter pays" for contamination for which it is liable and that general taxpayer funds should not be used to relieve PRPs of their liability under CERCLA.

Corps guidance requires that HTRW assessments during feasibility studies should determine the type and extent of HTRW contamination, if any, and how HTRW considerations affect project alternatives. Because the alternative to spill floodwaters into the Bolsa Chica Ecological Reserve wasn't part of the original plan formulation, the Corps did not perform a full-scale Phase I environmental site assessment per ASTM E1527-13. Nevertheless, an experienced environmental engineer did assess the potential risks associated with this alternative. That analysis informs the answers to the questions asked by Corps senior leadership prior to approval of projects:

1. *Is avoidance of HTRW practicable?*

As discussed in the draft feasibility report, Corps planners have identified an alternative for managing the flows from C05 that is technically feasible, cost effective, and environmentally acceptable. The alternative to send flows through Huntington Bay and under Warner Avenue is feasible to construct and has benefits that exceed its costs, and thus is considered cost-effective. It is also environmentally acceptable. All significant adverse environmental impacts of the tentatively selected plan are mitigable, and thus there is anticipated to be no net adverse impact.

2. *What is the risk of required response action for proposed alternative under current conditions?*

The construction of the BCER was the result of an agreement between a number of federal and state resource agencies to mitigate the environmental consequences of the expansion of the LA-Long Beach ports. Prior to the construction of the reserve, the area was an active oil field for 50 years. It is still

adjacent to an operating oil field. The service roads that transect the site were originally built to facilitate oil operations.

A review of the environmental impact statement from the Bolsa Chica Lowlands Restoration Project makes clear that the ecological reserve was constructed on a contaminated site, with contaminated soils either hauled off site or used in construction of certain levees, nesting areas, and overlooks that surround the area. It is unclear whether contaminated material was used to construct nest sites or other areas of the ecological reserve. The available data shows that the materials confined on site exceed California's residential exposure standards. The precise locations and extent of contaminated material is unknown and would need to be assessed; whether the containment is intact would also need to be assessed.

Additionally, the full tidal basin and the active oil field are situated below sea level; if the inlet were closed or there was extreme muting of the tidal inlet, rising groundwater levels and oil contamination is possible. Maintenance of the inlet is crucial and emergency dredging, triggered by El Niño storms, has been needed in the recent past (2016-2017).

In sum, though the site is currently functioning as an ecological reserve, the site includes a number of recognized environmental conditions that could potentially require remediation, including risks from deteriorating levees or nest sites, groundwater contamination, and oil contamination from the adjacent oil field.

3. *What is the risk of response action from the proposed FTB alternative?*

If the Corps were to implement the suggested alternative, it would require extensive environmental analysis, sampling, and modeling. The location and extent of contamination throughout the site is unknown, which makes it challenging to determine what mitigating measures would be necessary.

At a minimum, by constructing a portion of the flood risk management on the site, the Corps would likely take on operator liability for both existing and any new releases on the site. The indemnification provisions of the Project Partnership Agreement would help to insulate the Corps from response costs, but could not prevent the Corps from being named a potentially responsible party in a suit by a regulator or third party.

Although preliminary modeling has suggested that the increased flows from the overflow weirs are unlikely to create flows sufficiently large to directly impact the stability of the levees (from scouring, for example), by virtue of its use of the site to direct floodwaters, the Corps would be responsible for ensuring that those levees were sufficient to prevent the incursion of oil from the adjacent oil field or a release from any degradation of the levees. It is also unknown at this point whether groundwater releases are a concern and whether the site could be isolated from either receiving or releasing contaminated groundwater.

4. *Are there adequate legal protections for this alternative?*

As with all cost-shared flood risk management projects, before implementation the Non-Federal Sponsor (in this case Orange County), would be required to sign a project partnership agreement whereby it agrees that if CERLCA-regulated materials are discovered on the project site, the sponsor "shall be responsible, as between the Government and the Non-Federal Sponsor, for the costs of cleanup and response" and that "[s]uch costs shall not be considered part of total project costs."

Although this indemnification agreement would potentially insulate the Corps from the costs of any response, it would not prevent a regulator or third party naming the Corps as a potentially responsible party, and it would require affirmative litigation to seek contribution from Orange County or other PRPs.

HTRW Analysis Conclusion: apart from the engineering and cost concerns with this suggested alternative, the direction of flood flows into the Bolsa Chica Ecological Reserve raises significant risks related to HTRW. With extensive modeling, sampling, and analysis, it may be possible to reduce those risks. Nevertheless, Corps policy requires avoidance of HTRW risks when it is practicable to do so. The tentatively selected plan is a practicable alternative that raises none of the significant HTRW risks potentially implicated by the FTB alternative. Based on this rationale, the FTB alternative is not policy compliant and in light of a valid alternative, is unlikely to be approved by Corps leadership in the agency approval phase of the study.

6.0 Jurisdictional Determination

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
CARLSBAD FIELD OFFICE
5900 LA PLACE CT., SUITE 100
CARLSBAD, CALIFORNIA 92008

April 22, 2019

SUBJECT: Approved Jurisdictional Determination

Shawna Herleth-King
U.S. Army Corps of Engineers, Chicago District
231 S. LaSalle Street, Suite 1500
Chicago, Illinois 60604-1437

Dear Ms. Herleth-King:

I am responding to your request (File No. SPL-2019-00262-ERS) dated January 16, 2019, for an approved Department of the Army jurisdictional determination (JD) for the U.S. Army Corps of Engineers' federal Westminster Flood Risk Management Study (Study) located within the cities of Seal Beach, Huntington Beach, Santa Ana, Garden Grove, and unincorporated Orange County, California and centered at approximately 33.581771, -117.636084.

For the Study, we completed a JD that provides the extent of the Corps' geographic jurisdiction within the Study area (i.e., it is within a water of the United States). Depending on the activities proposed under a Federal project, it is anticipated that some activities could be regulated activity under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Because we have no specific activity-related information, this evaluation pertains only to geographic jurisdiction.

Based on available information, I have determined that there are waters of the United States within the Study area, in the locations depicted in Appendix A. The basis for our determination can be found in the enclosed JD form(s).

This letter includes an approved jurisdictional determination for the Corps' Westminster Flood Risk Management Study. As with non-Federal Corps projects, if you wish to submit new information regarding this jurisdictional determination, please do so within 60 days. We will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination.

This determination has been conducted to identify the extent of the Corps' Section 404 Clean Water Act and Section 10 Rivers and Harbors Act jurisdiction within the Study area, as identified in your request, and is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date.

Thank you for inviting us to participate on the Project Delivery Team for the Study. Should you have any questions, Eric Sweeney may be reached at (760) 602-4837 or via e-mail at Eric.R.Sweeney@usace.army.mil. Please help me to evaluate and improve the regulatory

experience for others by completing the customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Corice J. Farrar
Chief, Orange and Riverside Counties Section
South Coast Branch
Regulatory Division

Enclosures

Regulatory Program

INTERIM APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers
This form should be completed by following the instructions provided
in the Interim Approved Jurisdictional Determination Form User Manual.

SECTION I: BACKGROUND INFORMATION

A. COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (AJD): April 22, 2019

B. ORM NUMBER IN APPROPRIATE FORMAT (e.g., HQ-2015-00001-SMJ): SPL-2019-00262-ERS

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State:CA County/parish/borough: Orange City: Seal Beach, Huntington Beach, Santa Ana, Garden Grove, and unincorporated Orange County, California
Center coordinates of site (lat/long in degree decimal format): Lat. 33.730041, Long. -118.000158.
Map(s)/diagram(s) of review area (including map identifying single point of entry (SPOE) watershed and/or potential jurisdictional areas where applicable) is/are: ☒attached ☒ in report/map titled "Review Areas for Westminster AJD" (Appendix A, Figure 1). As shown in this map, the Corps evaluated for the presence of jurisdictional aquatic resources within six total reviews areas: 1) Warner Avenue Bridge (WAB) Review Area, 2) PCH Floodwall Review Area, 3) C02 Channel Review Area, 4) C04 Channel Review Area, 5) C05 Channel Review Area, and 6) C06 Channel Review Area.
☐ Other sites (e.g., offsite mitigation sites, disposal sites, etc.) are associated with this action and are recorded on a different jurisdictional determination (JD) form. List JD form ID numbers (e.g., HQ-2015-00001-SMJ-1): .

D. REVIEW PERFORMED FOR SITE EVALUATION:
☐ Office (Desk) Determination Only. Date: .
☒ Office (Desk) and Field Determination. Office/Desk Dates: Field Date(s): February 21, 2019, March 27, 2019, and April 16, 2019.

SECTION II: DATA SOURCES

Check all that were used to aid in the determination and attach data/maps to this AJD form and/or references/citations in the administrative record, as appropriate.
☐ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant. Title/Date: .
☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☐ Data sheets/delineation report are sufficient for purposes of AJD form. Title/Date: .
  ☐ Data sheets/delineation report are not sufficient for purposes of AJD form. Summarize rationale and include information on revised data sheets/delineation report that this AJD form has relied upon: .
  Revised Title/Date: .
☒ Data sheets prepared by the Corps. Title/Date: Wetland data sheets prepared by the Corps to map wetlands within the Warner Avenue Bridge and PCH Floodwall Review Areas are included as Appendix D.
☐ Corps navigable waters study. Title/Date: .
☐ CorpsMap ORM map layers. Title/Date: .
☐ USGS Hydrologic Atlas. Title/Date: .
☐ USGS, NHD, or WBD data/maps. Title/Date: .
☐ USGS 8, 10 and/or 12 digit HUC maps. HUC number: .
☐ USGS maps. Scale & quad name and date: .
☐ USDA NRCS Soil Survey. Citation: .
☒ USFWS National Wetlands Inventory maps. Citation: GIS data accessed from https://www.fws.gov/wetlands/data/data-download.html.
☐ State/Local wetland inventory maps. Citation: .

☐ FEMA/FIRM maps. Citation: .
☒ Photographs: ☒ Aerial. Citation: Eagle Aerial Imagery (2018), accessed at https://data-ocpw.opendata.arcgis.com. or ☒ Other. Citation: Photos taken of study areas during field visits on March 27, 2019 and April 16, 2019 (see Appendix B).
☒ LiDAR data/maps. Citation: See below.
☐ Previous JDs. File no. and date of JD letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☒ Other information (please specify):

Data used to map High Tide Line (HTL) and Mean High Water (MHW) contour lines within the Warner Avenue Bridge and PCH Flood Wall Review Areas:
• USGS West Coast El-Nino Lidar Project (2016) LiDAR data were used to identify MHW and HTL contour lines within the Warner Avenue Bridge and PCH Flood Wall Review Areas. Contour lines were estimated for a few short incomplete segments within the Warner Avenue Bridge Review Area through extrapolation the surrounding contours and visual inspection of aerial imagery. This dataset was accessed using the National Oceanic and Atmospheric Administriction (NOAA) Data Access Viewer at https://coast.noaa.gov/dataviewer/#/.
• Contour lines were drawn based on NADV datum values of 4.5 feet for MHW and 6.82 for HTL. These values were derived based on NOAA tidal data obtained for the Newport Bay Entrance (NOAA tide station #9410580) at https://tidesandcurrents.noaa.gov/datums.html?id=9410580 and https://tidesandcurrents.noaa.gov/noaatideannual.html?id=9410580.

Data used to map the Ordinary High Water Mark (OHWM) within Westminster Channels C02, C04, C05, and C06:
• Hydrologic data modeling the spatial extent of the 10-year flood event was used to identify the OHWM within the Westminster Channels, as the 10-year event was determined to most accurately characterize flows that form "ordinary high" water conditions throughout the flood control channels. A 10-year flood inundation map shapefile showing this spatial extent was provided by the Corps Chicago District to support Regulatory's analysis.
• In limited portions of the 10-year inundation map where the 10-year event extended outside the channel boundaries, visual inspection of high resolution aerial imagery was used to identify channel boundaries as the top of the observed channel bank.
• For C02 Channel, National Wetland Inventory (NWI) data were used to identify the location within C02 at which the 10-year flood event indicator ceases to apply and is replaced by MHW and HTL indicators more appropriately suited for assessing jurisdiction within estuarine Bolsa Bay. This break was determined to be located approximately 800 feet downstream of the C02-C04 confluence where NWI distinguishes between "Estuarine and Marine Deepwater" to the west and "Riverine" to the the east.

Mapping the Section 10/Non-Section 10 boundaries (i.e., upstream tidal extent) within C02 and C05 was completed using 2009-2011 California Coastal Conservancy LiDAR data. This dataset was accessed using the National Oceanic and Atmospheric Administriction (NOAA) Data Access Viewer at https://coast.noaa.gov/dataviewer/#/.

The Corps mapped wetlands and mudflats within the Warner Avenue Bridge and PCH Flood Wall Review Areas using a Trimble Yuma sub-meter GPS unit during a field visit conducted on March 27, 2019. In addition, field validation of the inundation maps for the Westminster Channel Review Area was conducted using GPS on February 21, 2019. Note that in the PCH Floodwall Review Area, GPS measurements for the mudflats could not be obtained because these mudflats were not accessable by foot. For these mudflats, the lateral extent was instead estimated visually in the field and later verified using high resolution aerial imagery.

SECTION III: SUMMARY OF FINDINGS

Complete ORM "Aquatic Resource Upload Sheet" or Export and Print the Aquatic Resource Water Droplet Screen from ORM for All Waters and Features, Regardless of Jurisdictional Status – Required

A. RIVERS AND HARBORS ACT (RHA) SECTION 10 DETERMINATION OF JURISDICTION:

☐ "*navigable waters of the U.S.*" within RHA jurisdiction (as defined by 33 CFR part 329) in the review area.

- **Complete Table 1 - Required**

NOTE: If the navigable water is not subject to the ebb and flow of the tide or included on the District's list of Section 10 navigable waters list, DO NOT USE THIS FORM TO MAKE THE DETERMINATION. The District must continue to follow the procedure outlined in 33 CFR part 329.14 to make a Section 10 RHA navigability determination.

B. CLEAN WATER ACT (CWA) SECTION 404 DETERMINATION OF JURISDICTION: "*waters of the U.S.*" within CWA jurisdiction (as defined by 33 CFR part 328.3) in the review area. **Check all that apply.**

☒ (a)(1): All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide. (Traditional Navigable Waters (TNWs))

- **Complete Table 1 - Required**

☐ This AJD includes a case-specific (a)(1) TNW (Section 404 navigable-in-fact) determination on a water that has not previously been designated as such. Documentation required for this case-specific (a)(1) TNW determination is attached.

☐ (a)(2): All interstate waters, including interstate wetlands.

- **Complete Table 2 - Required**

☐ (a)(3): The territorial seas.

- **Complete Table 3 - Required**

☐ (a)(4): All impoundments of waters otherwise identified as waters of the U.S. under 33 CFR part 328.3.

- **Complete Table 4 - Required**

☒ (a)(5): All tributaries, as defined in 33 CFR part 328.3, of waters identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 5 - Required**

☒ (a)(6): All waters adjacent to a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3, including wetlands, ponds, lakes, oxbows, impoundments, and similar waters.

- **Complete Table 6 - Required**

☒ Bordering/Contiguous.

Neighboring:

☒ (c)(2)(i): All waters located within 100 feet of the ordinary high water mark (OHWM) of a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3.

☐ (c)(2)(ii): All waters located within the 100-year floodplain of a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3 and not more than 1,500 feet of the OHWM of such water.

☐ (c)(2)(iii): All waters located within 1,500 feet of the high tide line of a water identified in paragraphs (a)(1) or (a)(3) of 33 CFR part 328.3, and all waters within 1,500 feet of the OHWM of the Great Lakes.

☐ (a)(7): All waters identified in 33 CFR 328.3(a)(7)(i)-(v) where they are determined, on a case-specific basis, to have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 7 for the significant nexus determination. Attach a map delineating the SPOE watershed boundary with (a)(7) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

☐ (a)(8): All waters located within the 100-year floodplain of a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3 not covered by (c)(2)(ii) above and all waters located within 4,000 feet of the high tide line or OHWM of a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3 where they are determined on a case-specific basis to have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 8 for the significant nexus determination. Attach a map delineating the SPOE watershed boundary with (a)(8) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

C. NON-WATERS OF THE U.S. FINDINGS:

Check all that apply.

☐ The review area is comprised entirely of dry land.

☐ Potential-(a)(7) Waters: Waters that DO NOT have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 9 and attach a map delineating the SPOE watershed boundary with potential (a)(7) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

☐ Potential-(a)(8) Waters: Waters that DO NOT have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 9 and attach a map delineating the SPOE watershed boundary with potential (a)(8) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

☒ Excluded Waters (Non-Waters of U.S.), even where they otherwise meet the terms of paragraphs (a)(4)-(a)(8):

- **Complete Table 10 - Required**

☐ (b)(1): Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA.
☐ (b)(2): Prior converted cropland.
☐ (b)(3)(i): Ditches with ephemeral flow that are not a relocated tributary or excavated in a tributary.
☐ (b)(3)(ii): Ditches with intermittent flow that are not a relocated tributary, excavated in a tributary, or drain wetlands.
☐ (b)(3)(iii): Ditches that do not flow, either directly or through another water, into a water identified in paragraphs (a)(1)-(a)(3).
☐ (b)(4)(i): Artificially irrigated areas that would revert to dry land should application of water to that area cease.
☐ (b)(4)(ii): Artificial, constructed lakes and ponds created in dry land such as farm and stock watering ponds, irrigation ponds, settling basins, fields flooded for rice growing, log cleaning ponds, or cooling ponds.
☐ (b)(4)(iii): Artificial reflecting pools or swimming pools created in dry land.[1]
☐ (b)(4)(iv): Small ornamental waters created in dry land.[1]
☐ (b)(4)(v): Water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water.
☐ (b)(4)(vi): Erosional features, including gullies, rills, and other ephemeral features that do not meet the definition of tributary, non-wetland swales, and lawfully constructed grassed waterways.[1]
☐ (b)(4)(vii): Puddles.[1]
☒ (b)(5): Groundwater, including groundwater drained through subsurface drainage systems.[1]
☐ (b)(6): Stormwater control features constructed to convey, treat, or store stormwater that are created in dry land.[1]
☐ (b)(7): Wastewater recycling structures created in dry land; detention and retention basins built for wastewater recycling; groundwater recharge basins; percolation ponds built for wastewater recycling; and water distributary structures built for wastewater recycling.

☐ Other non-jurisdictional waters/features within review area that do not meet the definitions in 33 CFR 328.3 of (a)(1)-(a)(8) waters and are not excluded waters identified in (b)(1)-(b)(7).

- **Complete Table 11 - Required.**

D. ADDITIONAL COMMENTS TO SUPPORT AJD: A total of eight different aquatic resource types, summarized in Table 1 below, were identified throughout the six review areas studied as part of this AJD. In order to distinguish between the variety of environmental settings, Clean Water Rule (CWR) classifications, Special Aquatic Site categories, and jurisdictional designations represented across these resources, a four-term nomenclature was used to provide a full description of each resource. Each term used in this nomenclature is summarized below:

• Cowardin classification (first term): Each resource was characterized as "estuarine" or "riverine" based on the extent to which it was most appropriate considered as part of Bolsa Bay (estuarine) versus the flood control channel system (riverine). Corps jurisdictional limits for estuarine resources were based on tidal elevations (MHW for the Section 404/10 limit and HTL for Section 404-only limit) while Corps jurisdictional limits for riverine resources was based on OHWM, represented in this study by the spatial extent of the 10-year flood event.

• CWR designation (second term): Each resource was identified as "navigable" if classified as an (a)(1) TNW, "Tributary" if classified as an (a)(5) water, "bordering" if classified as an (a)(6) wetland/mudflat coinciding with the MHW line, or "neighboring" if classified as an (a)(6) wetland/mudflat located within 100 feet landward of the MHW line.

• Special Aquatic Site Status category (third term): Each resource was identified as "non-wetland" (not a special aquatic site), "wetland," or "mudflat" WOUS.

[1] In many cases these excluded features will not be specifically identified on the AJD form, unless specifically requested. Corps Districts may, in case-by-case instances, choose to identify some or all of these features within the review area.

• Jurisdictional designation (fourth term): Each resource's status as jurisdictional under both Section 404 and Section 10 ("404/10") or jurisdictional under only Section 404 ("404-only") was indicated by this term. Note that mudflats did not receive a jurisdictional designation because the spatial analysis produced small fragments on mudflat possessing the "404-only" classification (i.e., above MHW), which is not consistent with the understanding that mudflats are generally located in the lower-intertidal zone. Nevertheless, despite omission of this term for mudflats, all mudflats identified in this AJD should be considered Section 404-jurisdictional.

Throughout C02, C04, C05, and C06 Channels, the 10-year event OHWM was always located substantially higher than the channel bottom. Any wetlands that may have potentially formed along the channel bottom would not be adjacent to the OHWM and were therefore instead classified as part of the channel and as non-wetland WOUS. Within the estuarine portion of C02 in which jurisdiction was identified by MHW and HTL, potential vegetated wetland areas that appeared contiguous with the MHW line were evaluated and determined to be non-jurisdicitonal (Appendix D) and were therefore classified as non-wetland WOUS. Furthermore, GPS data obtained for the estuarine portion of C02 during the Corps' site visit on April 16, 2019 showed mudflats within this area to be located well below the MHW line and therefore would not be considered adjacent aquatic resources. For this reason, these mudflat areas were also classified as non-wetland WOUS.

Reinforced Concrete Boxes (RCBs) are prevalent throughout the Westminster Channel system where channels pass below surface infrastructure, namely roadways. In most locations, the subsurface waterway formed by an RCB was considered jurisdictional because the RCB conveys flows over a very short distance (e.g., under a road or road intersection). In several locations, however, the subsurface path was determined to be of sufficient length so as to represent an non-jurisdictional underground ("groundwater") break in the channel's path per 33 CFR §328.3(b)(5). The specific locations of these excluded underground ("groundwater") features are identified in Table 11 below.

Per Corps Chicago District's instructions, Haster Basin as well as stormwater conveyance features within Miles Square Golf Course were excluded from the C05 and C06 Channel Review Areas, respectively, because no flood control work is planned within these facilities.

As of the date of issuance of this AJD, Corps Civil Works is currently completing channel improvments within the segment of C06 Channel located between the C05-C06 confluence and Beach Boulevard. This work will repair the eroded, largely earthen, embankement and construct a new 2,110-foot-long trapezoidal concrete channel for the purpose of better protecting adjacent property owners from potential property loss due to erosion of the embankment. The Corps notes that the delineation documented herein is based on the pre-construction conditions of this segment of C06, despite the fact that some alteration to channel geometry, and therefore OHWM, is expected to occur as a result of the ongoing improvements work.

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Jurisdictional Waters of the U.S.

Jurisidcitional waters of the U.S. (WOUS) identified within each review area are shown in Appendix A. The total acreage of each identified jurisdicitonal resource type is summarized in the table below:

Table 1. Acres of each WOUS type within each Review Area

	Acres of WOUS within each Review Area					
WOUS type	**WAB**	**PCH Floodwall**	**C02**	**C04**	**C05**	**C06**
Estuarine Bordering Mudflat WOUS	0.01	0.57	-	-	-	-
Estuarine Bordering Wetland WOUS (404-only)	0.01	0.23	-	-	-	-
Estuarine Bordering Wetland WOUS (404/10)	0.02	0.13	-	-	-	-
Estuarine Navigable Non-Wetland WOUS (404-only)	0.19	0.13	4.83	-	-	-
Estuarine Navigable Non-Wetland WOUS (404/10)	1.73	4.20	21.03	-	-	-
Estuarine Neighboring Wetland WOUS (404-only)	0.11	-	-	-	-	-
Riverine Navigable Non-Wetland WOUS (404/10)	-	-	3.31	10.09	46.29	-
Riverine Tributary Non-Wetland WOUS (404-only)	-	-	-	28.55	38.80	11.40

The following shapefiles, which are included with and incorporated by reference in this AJD, provide complete geographic information describing the geographic boundaries of all jurisdictional aquatic resources identified within each review area:

- WAB Review Area: WarnerAvenueBridge_WOUS.shp
- PCH Floodwall Review Area: PCHFloodwall_WOUS.shp
- C02, C04, C05, and C06 Channel Review Areas: WestminsterChannels_WOUS.shp

Table 2. (a)(1) Traditional Navigable Waters

(a)(1) Waters Name	**(a)(1) Criteria**	**Rationale to Support (a)(1) Designation** **Include High Tide Line or Ordinary High Water Mark indicators, when applicable.**
WAB Estuarine Navigable Non-Wetland WOUS (404-only and 404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	These navigable WOUS are subject to the ebb and flow of the tide and are used, or are susceptable for use, to transport interstate or foreign commerce. The HTL was identified as 6.82 feet NADV, and MHW line identified as 4.5 feet, using USGS West Coast El-Nino Lidar Project (2016) LiDAR data (see Section II above). Aquatic resources within these review areas are located within Bolsa Bay, which has historically been considered by Los Angeles District to be Traditional Navigable Waters (Appendix C).
PCH Floodwall Estuarine Navigable Non-Wetland WOUS (404-only and 404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	
C02 Estuarine Navigable Non-Wetland WOUS (404-only and 404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide. This waterway includes an approximately 1.5-mile stretch of C02 starting at C02's outlet to Bolsa Bay at Edinger Bridge and ending approximately 800 feet downstream of the C02-C04 confluence.
C02 Riverine Navigable Non-Wetland WOUS (404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide, though upstream freshwater nuisance and stormwater flows are anticipated to contribute predominantly to hydrologic inputs. This waterway includes an approximately 800-foot stretch of C02

(a)(1) Waters Name	(a)(1) Criteria	Rationale to Support (a)(1) Designation Include High Tide Line or Ordinary High Water Mark indicators, when applicable.
		located between the C02-C04 confluence and a point approximately 800 feet downstream of the confluence.*
C04 Riverine Navigable Non-Wetland WOUS (404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide, though upstream freshwater nuisance and stormwater flows are anticipated to contribute predominantly to hydrologic inputs. This waterway includes an approximately 1.1-mile stretch of C04 starting at C04's confluence with C02 and ending upstream at C04's Section 10/non-Section 10 boundary.*
C05 Riverine Navigable Non-Wetland WOUS (404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide, though upstream freshwater nuisance and stormwater flows are anticipated to contribute predominantly to hydrologic inputs. This waterway includes an approximately 3.5-mile stretch of C05 starting at C05's outlet to Bolsa Bay and ending at C05's Section 10/non-Section 10 boundary.*

* The spatial extent of the 10-year flood event was selected for use as the OHWM for "riverine" (a)(1) waters above considering the dominant role of stormwater flows in producing "ordinary high" water levels within these flood control channels.

Table 3. (a)(2) Interstate Waters

(a)(2) Waters Name	Rationale to Support (a)(2) Designation
N/A	N/A

Table 4. (a)(3) Territorial Seas

(a)(3) Waters Name	Rationale to Support (a)(3) Designation
N/A	N/A

Table 5. (a)(4) Impoundments

(a)(4) Waters Name	Rationale to Support (a)(4) Designation
N/A	N/A
N/A	N/A

Table 6. (a)(5)Tributaries

(a)(5) Waters Name	Flow Regime	(a)(1)-(a)(3) Water Name to which this (a)(5) Tributary Flows	Tributary Breaks	Rationale for (a)(5) Designation and Additional Discussion. Identify flowpath to (a)(1)-(a)(3) water or attach map identifying the flowpath; explain any breaks or flow through excluded/non-jurisdictional features, etc.
C04 Riverine Tributary Non-Wetland WOUS (404-only)	Perennial	C04 Riverine Navigable Non-Wetland WOUS (404/10)	No	This (a)(5) waterway flows to C04 Riverine Navigable Non-Wetland WOUS (404/10), an (a)(1) WOUS.
C05 Riverine Tributary Non-Wetland WOUS (404-only)	Perennial	C05 Riverine Navigable Non-Wetland WOUS (404/10)	No	This (a)(5) waterway flows to C05 Riverine Navigable Non-Wetland WOUS (404/10), an (a)(1) WOUS.
C06 Riverine Tributary Non-Wetland WOUS (404-only)	Perennial	C05 Riverine Navigable Non-Wetland WOUS (404/10)	No	This (a)(5) waterway flows to C05 Riverine Tributary Non-Wetland WOUS (404-only), which in turn flows to C05 Riverine Navigable Non-Wetland WOUS (404/10), an (a)(1) WOUS.

Table 7. (a)(6) Adjacent Waters

(a)(6) Waters Name	(a)(1)-(a)(5) Water Name to which this Water is Adjacent	Rationale for (a)(6) Designation and Additional Discussion. Identify the type of water and how the limits of jurisdiction were established (e.g., wetland, 87 Manual/Regional Supplement); explain how the 100-year floodplain and/or the distance threshold was determined; whether this water extends beyond a threshold; explain if the water is part of a mosaic, etc.
WAB Mudflat WOUS	WAB Estuarine Navigable Non-Wetland WOUS (404/10)	These (a)(6) waters, which are located in the southwest corner of the review area, are considered adjacent (bordering) jurisdictional waters because they coincide with the MHW line.
WAB Estuarine Bordering Wetland WOUS (404-only)		
WAB Estuarine Bordering Wetland WOUS (404/10)		
WAB Estuarine Neighboring Wetland WOUS (404-only)	WAB Estuarine Navigable Non-Wetland WOUS (404/10)	These (a)(6) waters are considered adjacent jurisdictional waters because they are located within 100 feet of the MHW line. One neighboring wetland was identified in the northern portion of the review area. This muted tidal wetland is separated from Bolsa Bay by an approximately 10-foot-long culvert that conveys flows to the wetland only during the highest tides (i.e., when tide levels are above MHW).
PCH Floodwall Mudflat WOUS	PCH Floodwall Estuarine Navigable Non-Wetland WOUS (404/10)	These (a)(6) waters are considered adjacent (bordering and contiguous) jurisdictional waters because they directly abut jurisdictional wetlands that are in turn adjacent to the MHW line. These waters also coincide with the MHW line in some areas.
PCH Floodwall Estuarine Bordering Wetland WOUS (404-only)	PCH Floodwall Estuarine Navigable	These (a)(6) waters are considered adjacent (bordering and contiguous) jurisdictional waters because they coincide with the MHW line.

PCH Floodwall Estuarine Bordering Wetland WOUS (404/10)	Non-Wetland WOUS (404/10)	

Table 8. (a)(7) Waters

SPOE Name	(a)(7) Waters Name	(a)(1)-(a)(3) Water Name to which this Water has a Significant Nexus	Significant Nexus Determination Identify SPOE watershed; discuss whether any similarly situated waters were present and aggregated for SND; discuss data, provide analysis, and summarize how the waters have more than speculative or insubstantial effect on the physical, chemical, or biological integrity of the (a)(1)-(a)(3) water, etc.
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Table 9. (a)(8) Waters

SPOE Name	(a)(8) Waters Name	(a)(1)-(a)(3) Water Name to which this Water has a Significant Nexus	Significant Nexus Determination Identify SPOE watershed; explain how 100-yr floodplain and/or the distance threshold was determined; discuss whether waters were determined to be similarly situated to subject water and aggregated for SND; discuss data, provide analysis, and then summarize how the waters have more than speculative or insubstantial effect the on the physical, chemical, or biological integrity of the (a)(1)-(a)(3) water, etc.
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Non-Jurisdictional Waters

Table 10. Non-Waters/No Significant Nexus

SPOE Name	Non-(a)(7)/(a)(8) Waters Name	(a)(1)-(a)(3) Water Name to which this Water DOES NOT have a Significant Nexus	Basis for Determination that the Functions DO NOT Contribute Significantly to the Chemical, Physical, or Biological Integrity of the (a)(1)-(a)(3) Water. Identify SPOE watershed; explain how 100-yr floodplain and/or the distance threshold was determined; discuss whether waters were determined to be similarly situated to the subject water; discuss data, provide analysis, and summarize how the waters did not have more than a speculative or insubstantial effect on the physical, chemical, or biological integrity of the (a)(1)-(a)(3) water.
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Table 11. Non-Waters/Excluded Waters and Features

Paragraph (b) Excluded Feature/Water Name	Rationale for Paragraph (b) Excluded Feature/Water and Additional Discussion.
Westminster Mall Underground Conveyance	This approximately 3,100-foot underground conveyance, which passes under Westminster Mall, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents two breaks in C04 Channel, one spanning from approximately 33.745979, -118.005944 to approximately 33.744789, -118.007247 and another spanning from approximately 33.744713, -118.007577 to approximately 33.744650, -118.015853.
Hazard Avenue and Beach Boulevard Underground Conveyance	This approximately 325-foot underground conveyance, which passes under the intersection of Hazard Avenue and Beach Boulevard, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break in C04 Channel spanning from approximately 33.752306, -117.989363 to approximately 33.751990, -117.990388.
Warner Avenue and Magnolia Street Underground Conveyance	This approximately 1,800-foot break, which passes under I-405 as well as a commercial area near the intersection of Warner Avenue and Magnolia Street, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break in C06 Channel spanning from approximately 33.717636, -117.968448 to approximately 33.716250, -117.974231.
Rosita Park Underground Conveyance	This approximately 1,080-foot underground conveyance, which passes under Rosita Park near the intersection of Hazard Avenue and Newhope Street, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break C05 Channel spanning from approximately 33.752614, -117.928698 to approximately 33.750509, -117.931268.
Orange County Transportation Facility Underground Conveyance	This approximatly 300-foot underground conveyance, which passes under the Orange County Transportation Facility at 11790 Cardinal Circle, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break C05 Channel spanning from approximately 33.763921, -117.923657 to approximately 33.763227, -117.924225.

Table 12. Non-Waters/Other

Other Non-Waters of U.S. Feature/Water Name	Rationale for Non-Waters of U.S. Feature/Water and Additional Discussion.
N/A	N/A

Appendix A

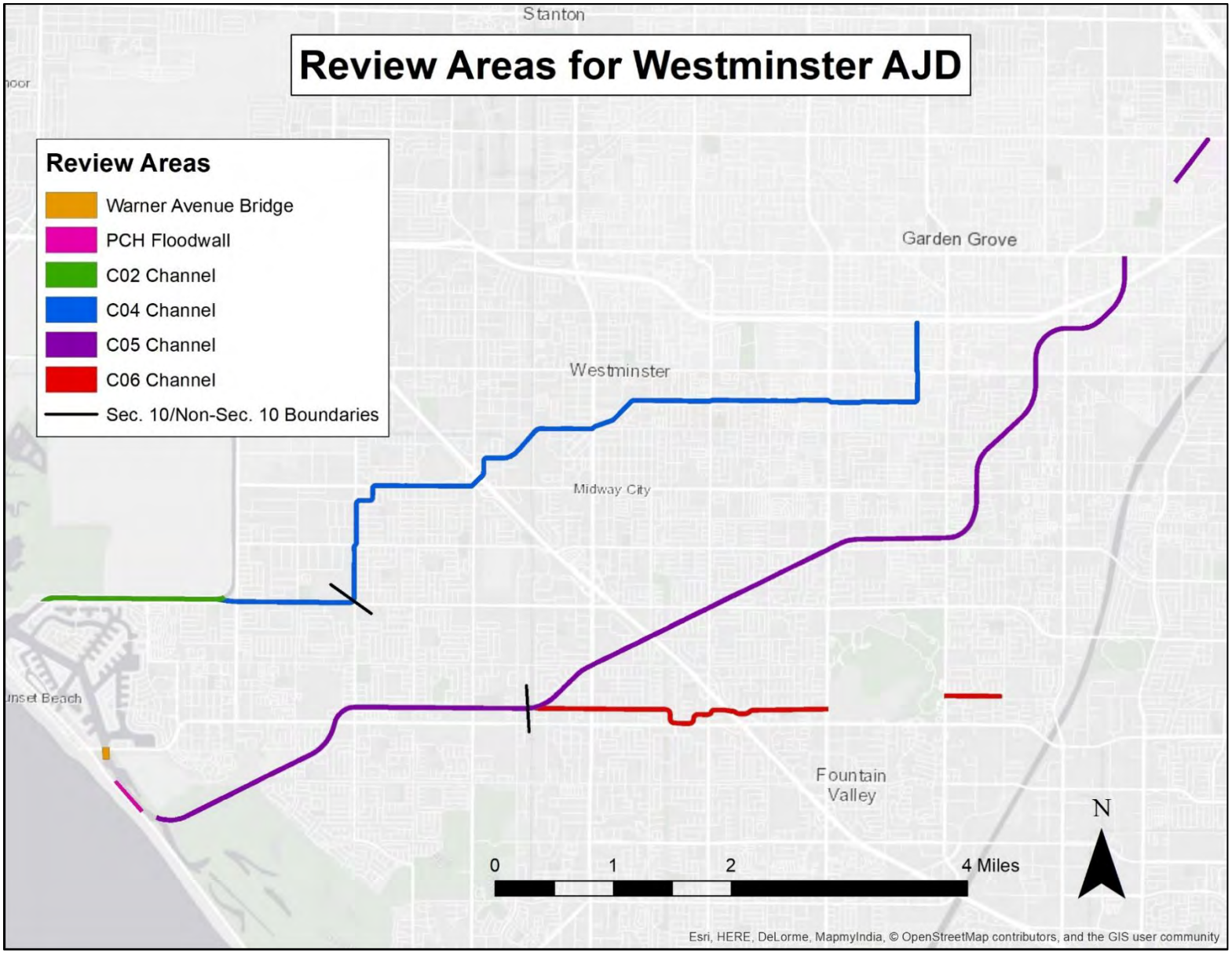

Figure 1 Review Areas evaluated for the Westminster Flood Risk Management Study AJD.

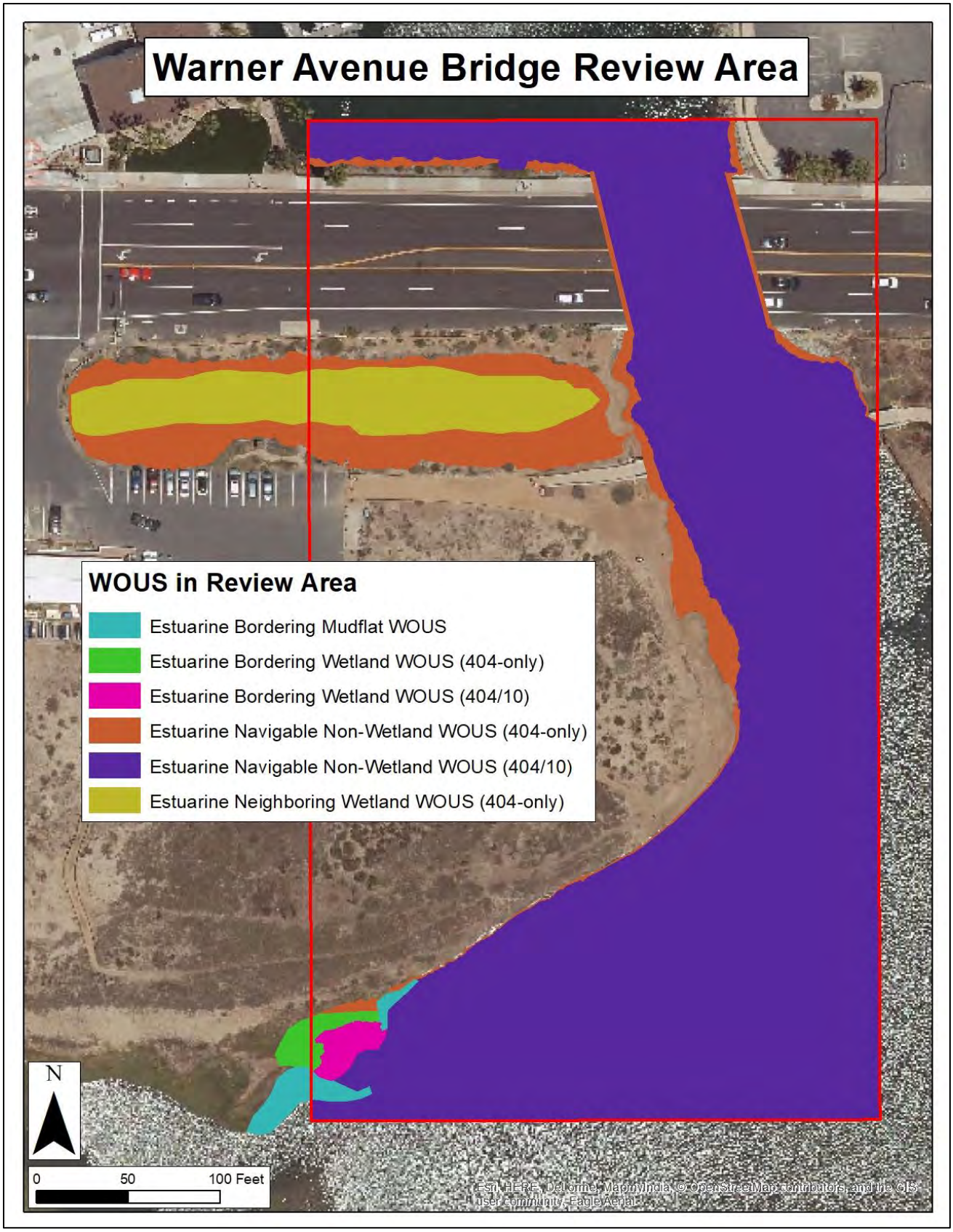

Figure 2 Jurisdictional waters of the U.S. within the Warner Avenue Bridge Review Area.

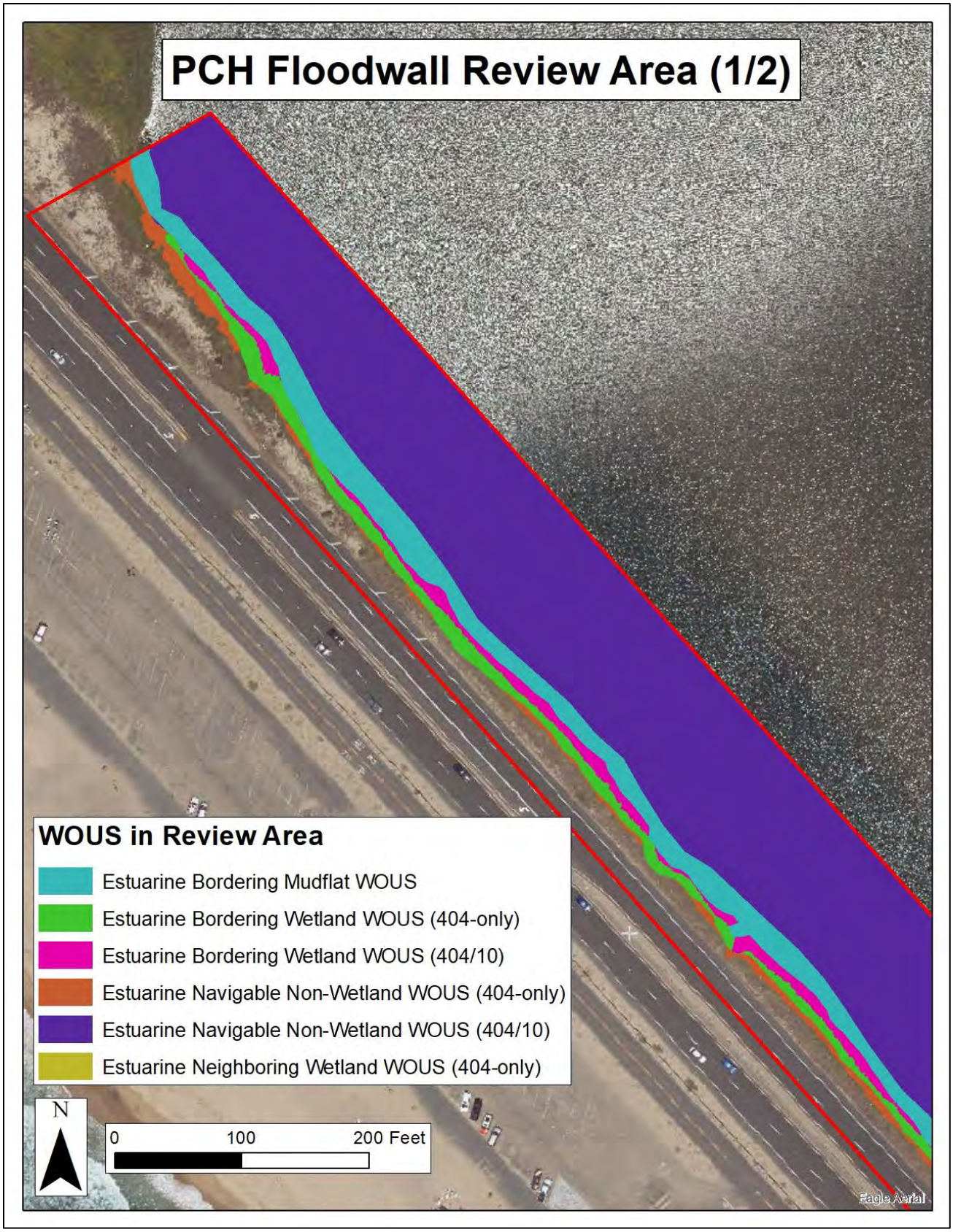

Figure 3 Jurisdictional waters of the U.S. within the PCH Floodwall Review Area (1 of 2).

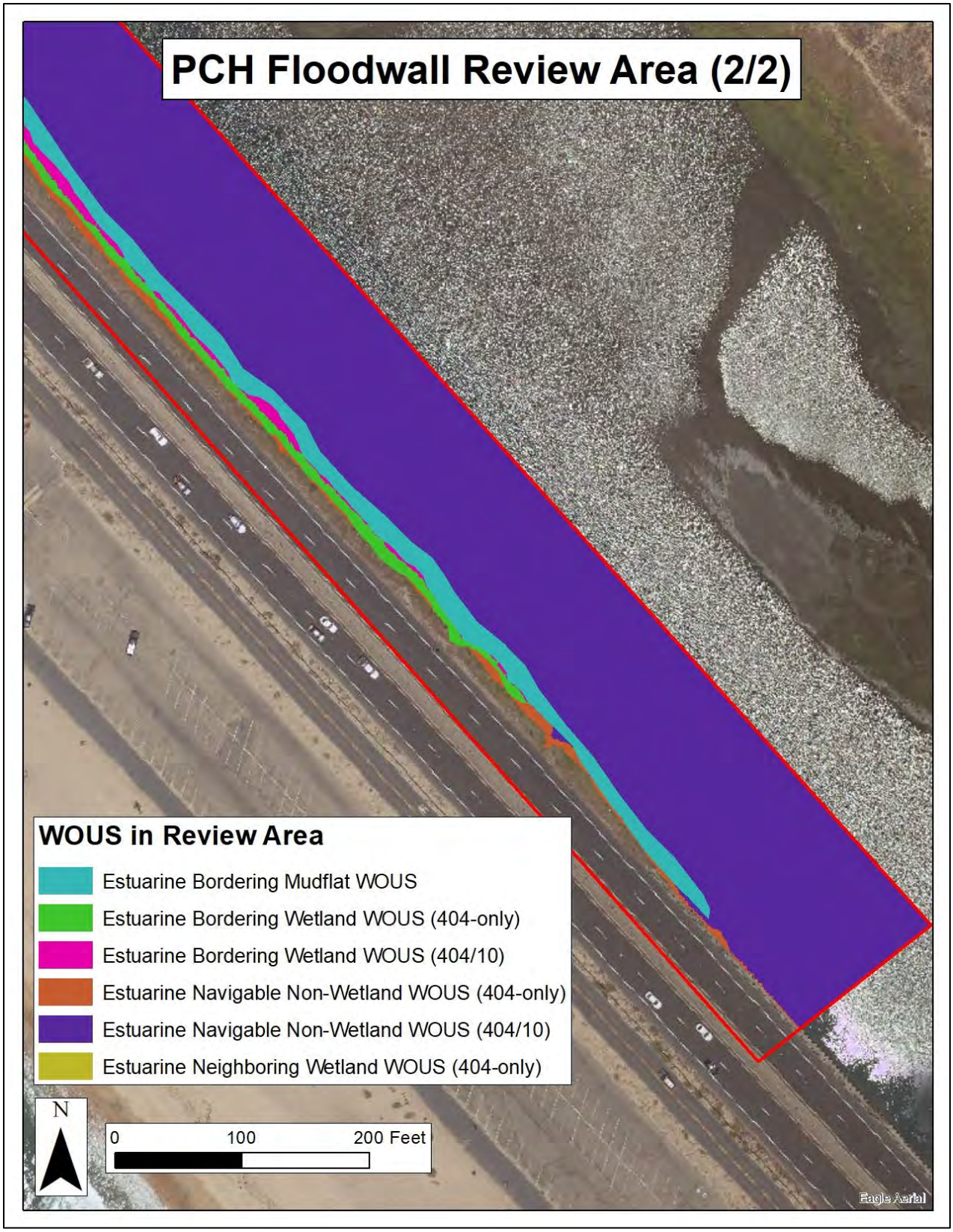

Figure 4 Jurisdictional waters of the U.S. within the PCH Floodwall Review Area (2 of 2).

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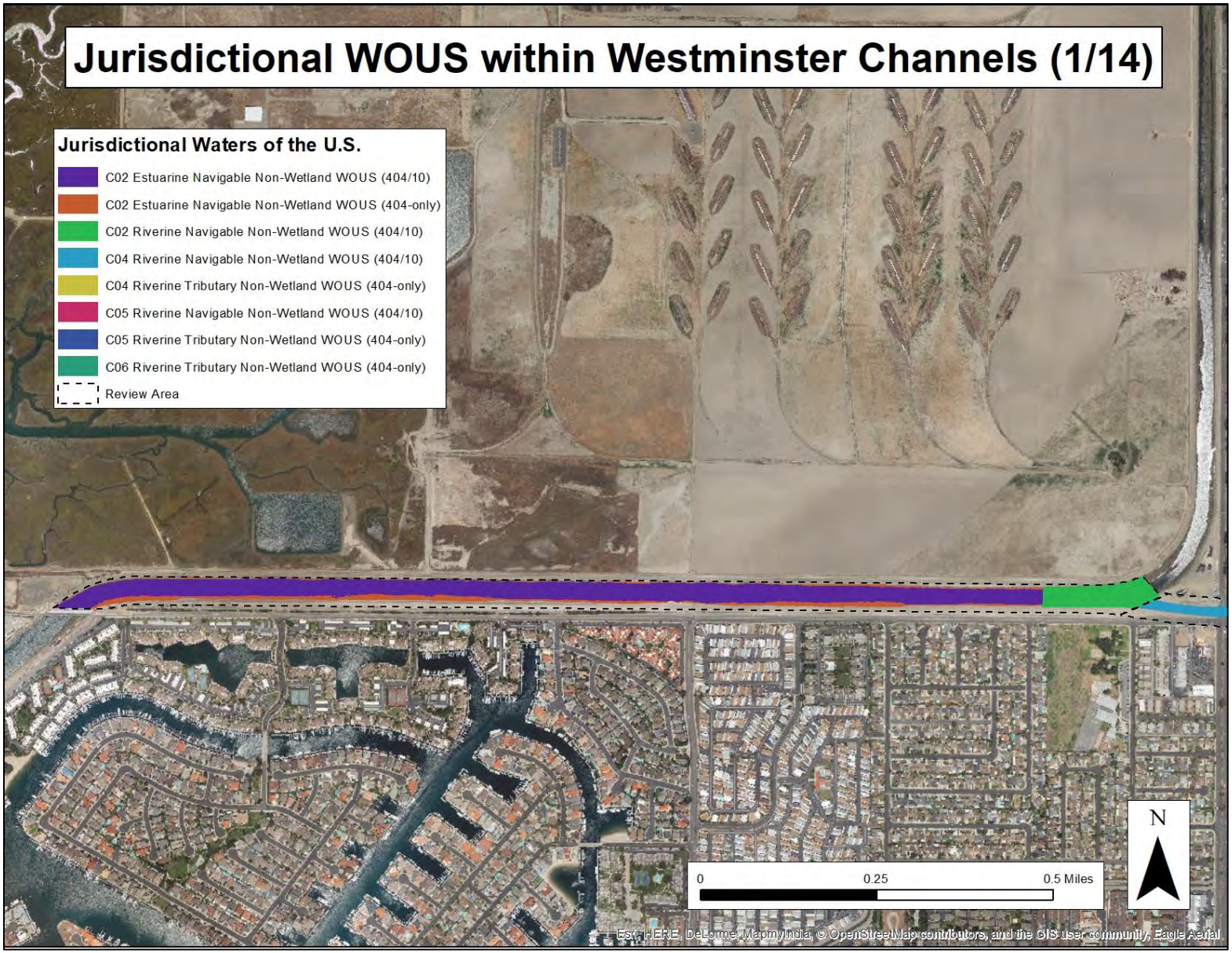

Figure 5 Jurisdictional waters of the U.S. identified within the Westminster Channels (1 of 14).

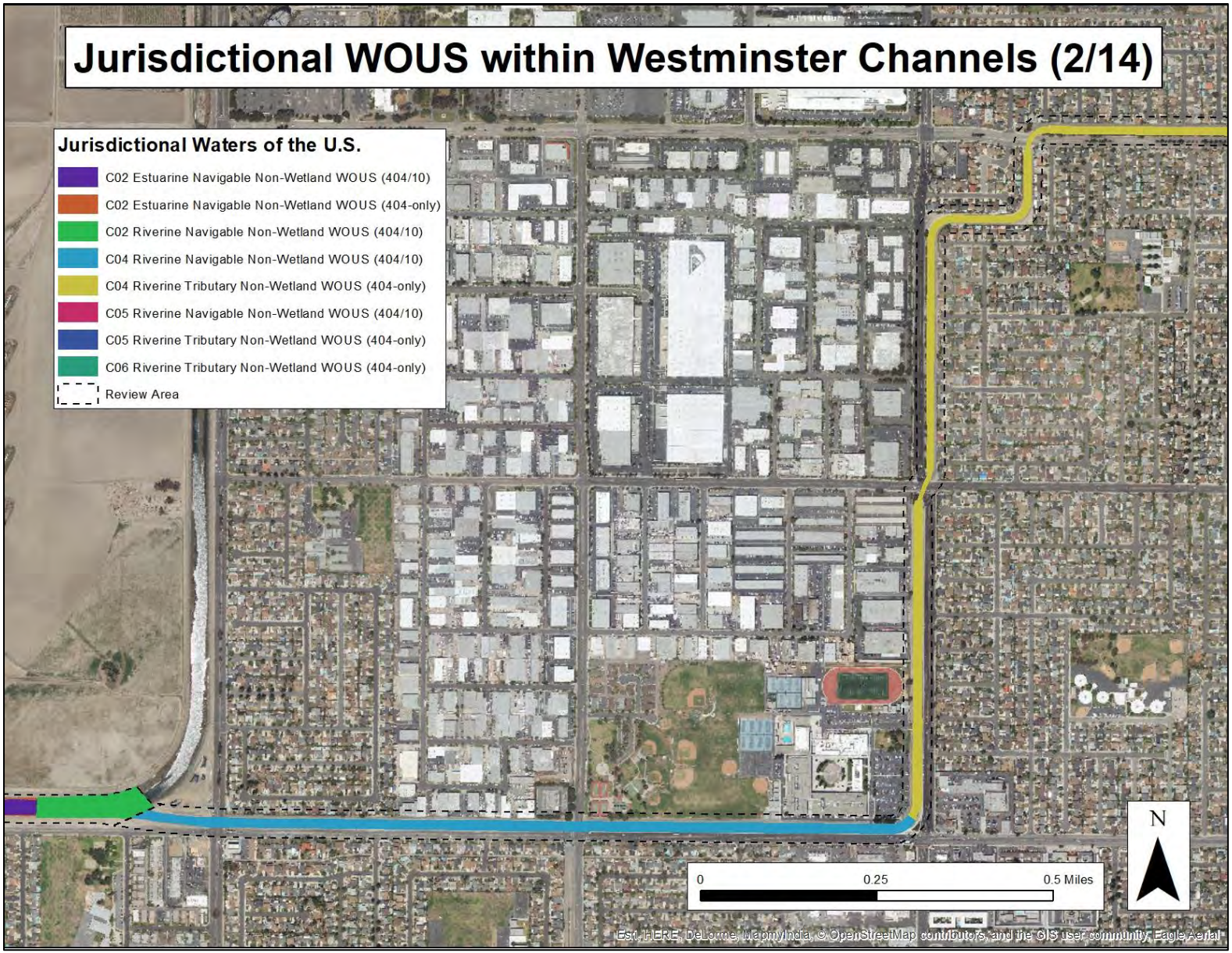

Figure 6 Jurisdictional waters of the U.S. identified within the Westminster Channels (2 of 14).

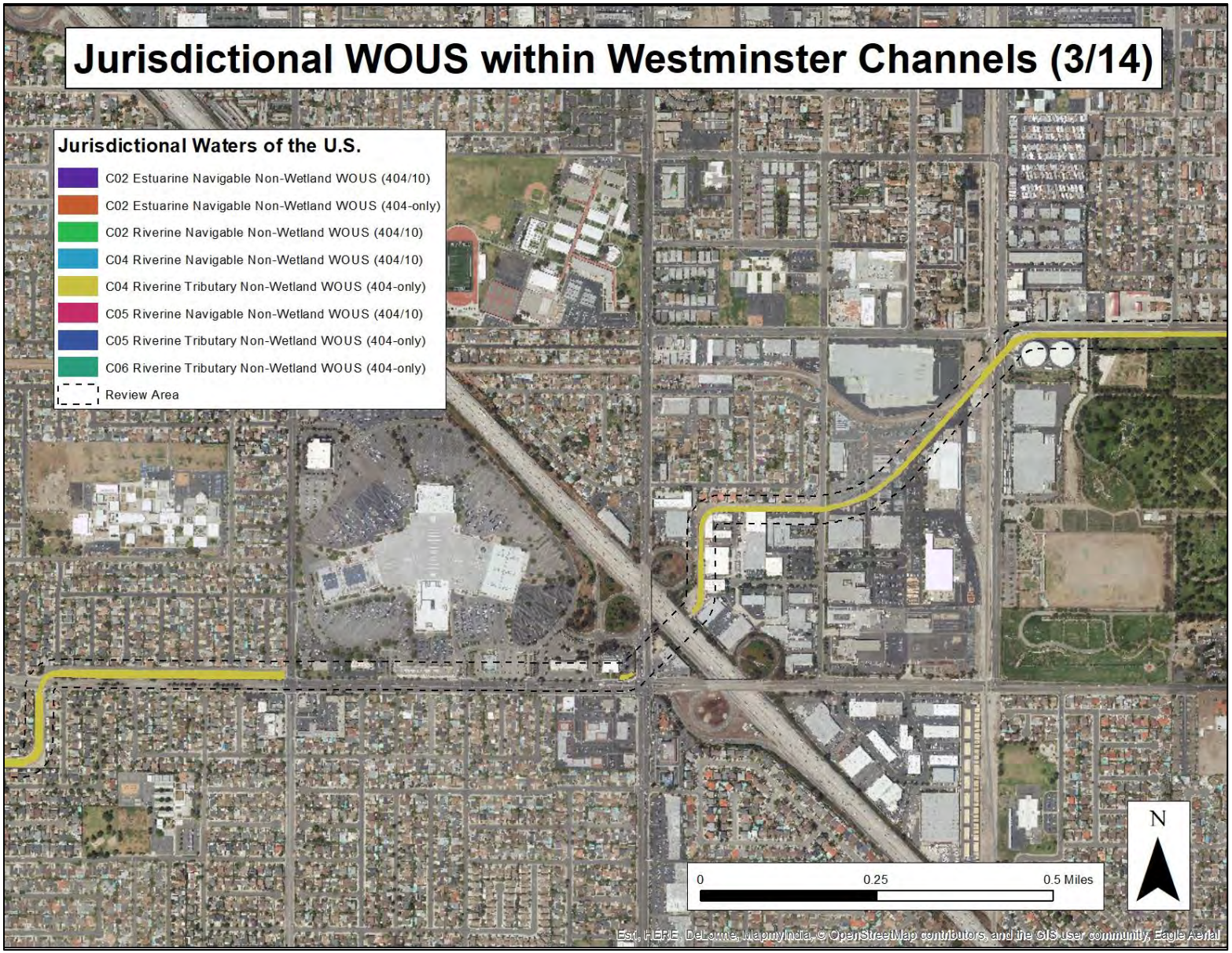

Figure 7 Jurisdictional waters of the U.S. identified within the Westminster Channels (3 of 14).

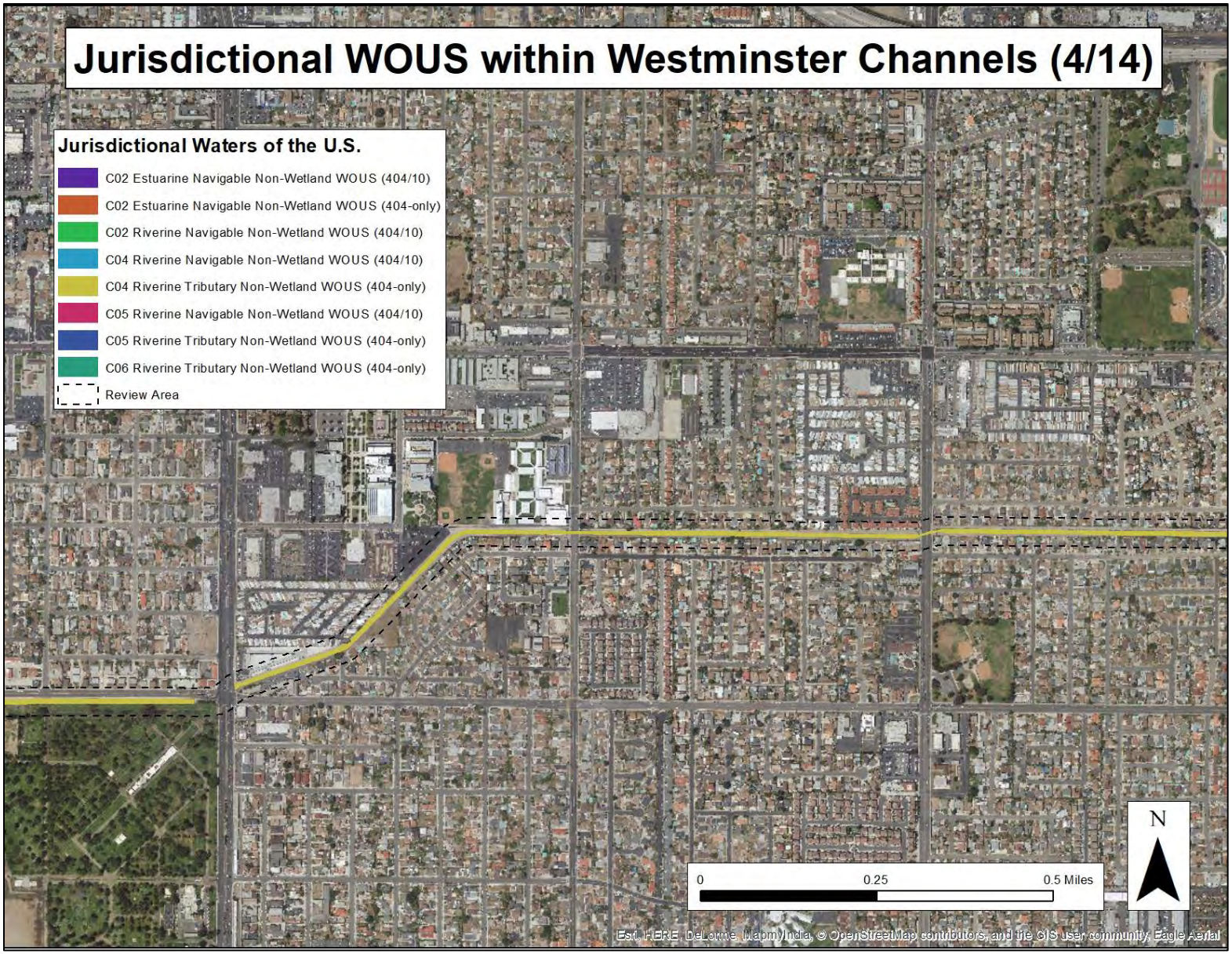

Figure 8 Jurisdictional waters of the U.S. identified within the Westminster Channels (4 of 14).

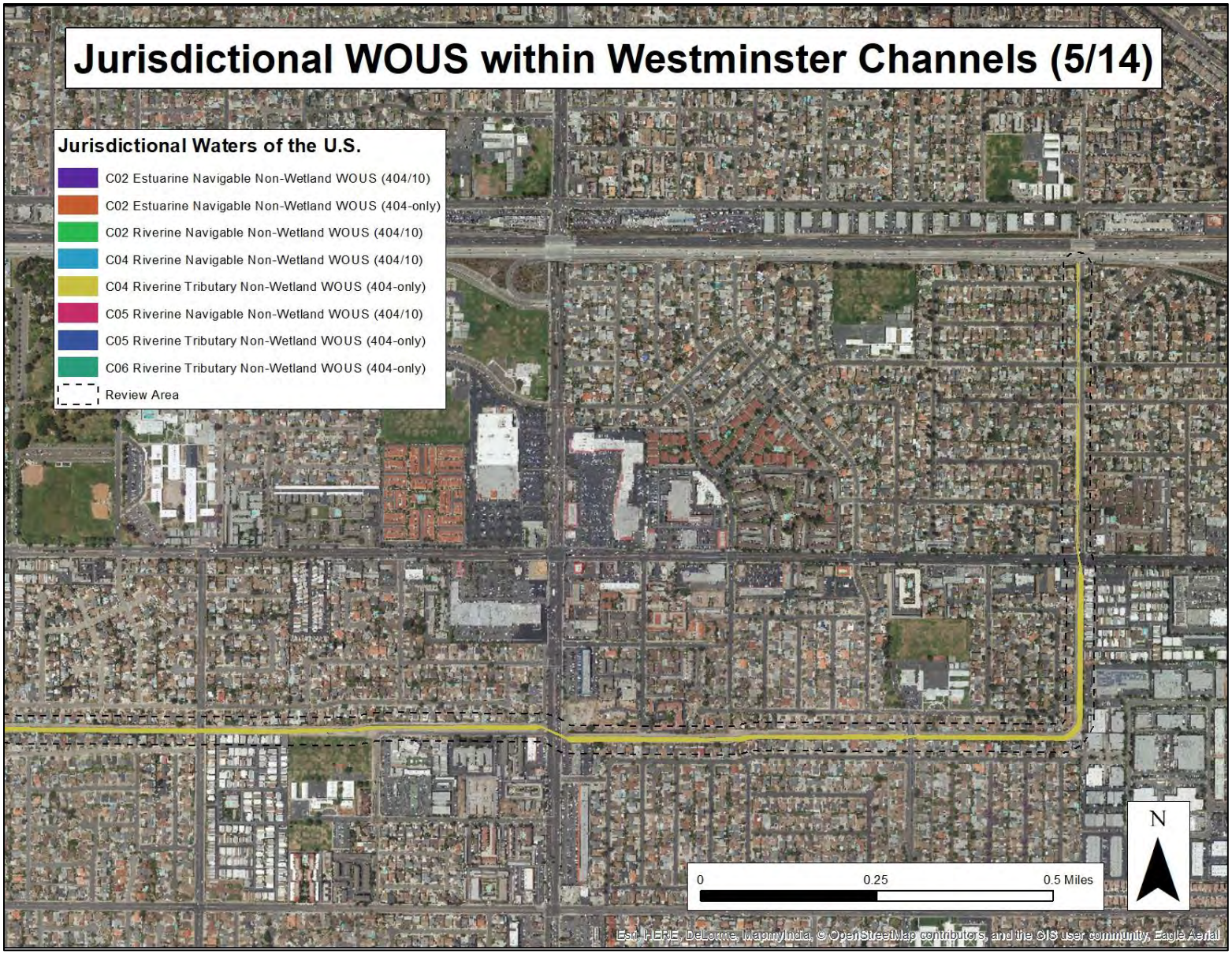

Figure 9 Jurisdictional waters of the U.S. identified within the Westminster Channels (5 of 14).

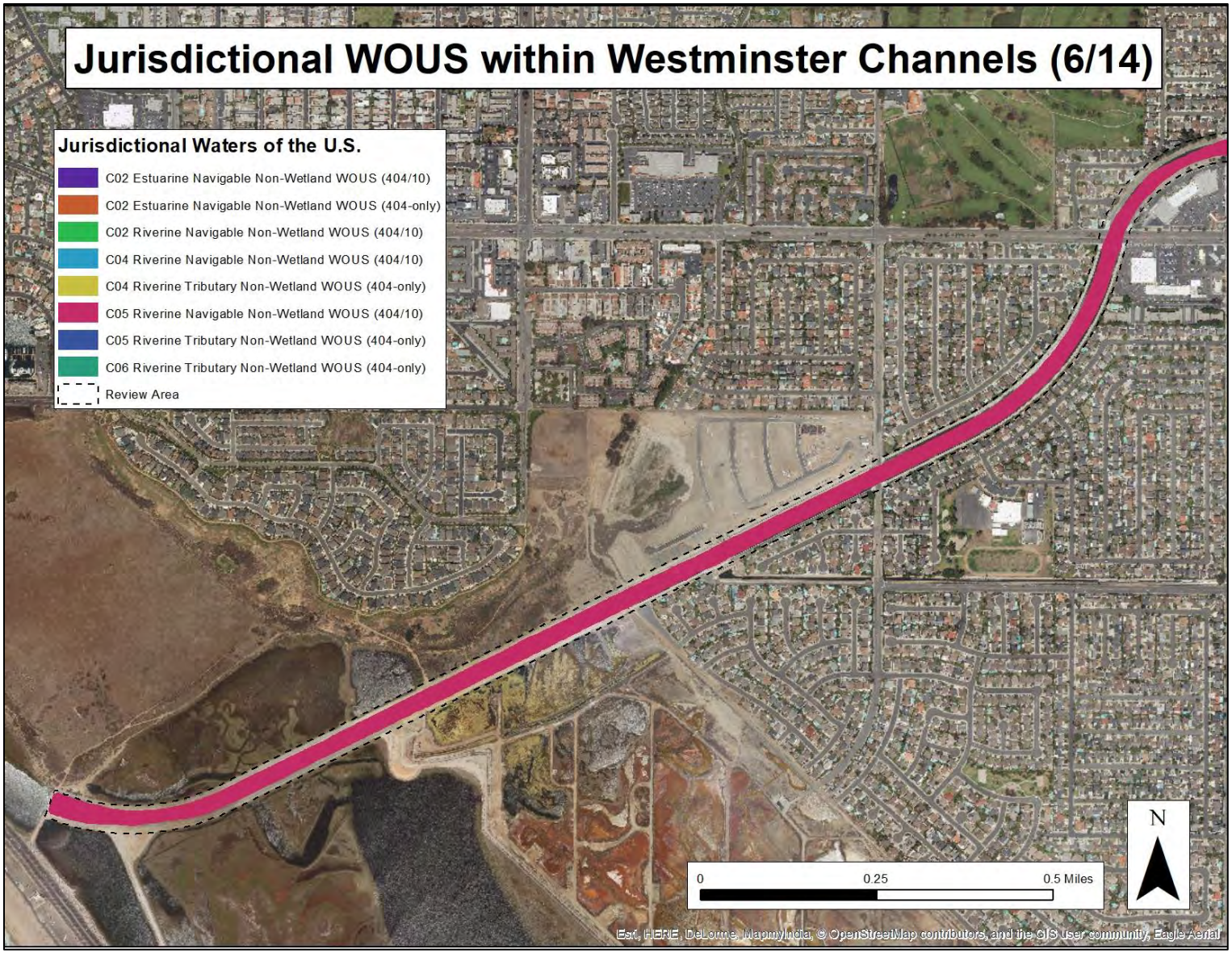

Figure 10 Jurisdictional waters of the U.S. identified within the Westminster Channels (6 of 14).

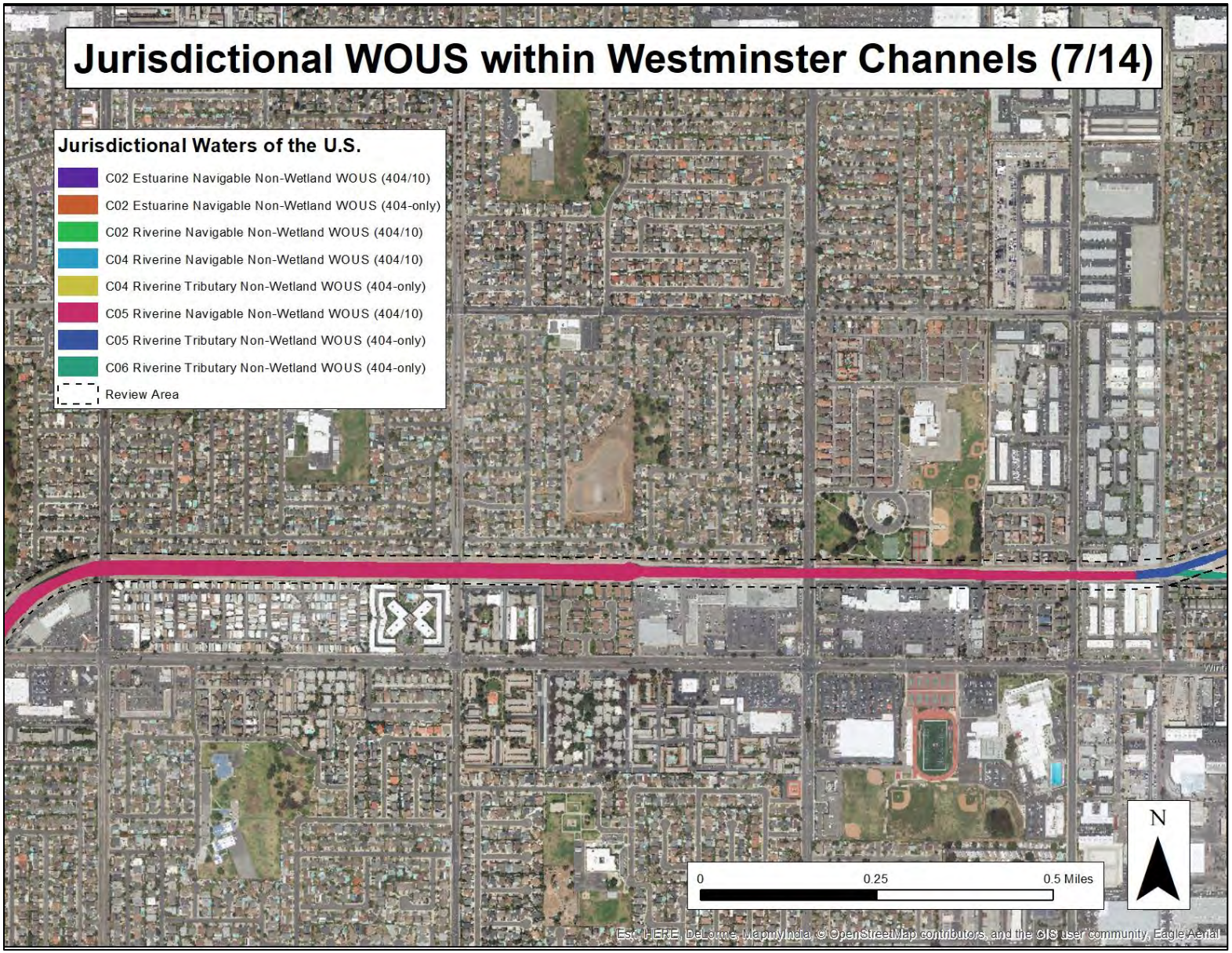

Figure 11 Jurisdictional waters of the U.S. identified within the Westminster Channels (7 of 14).

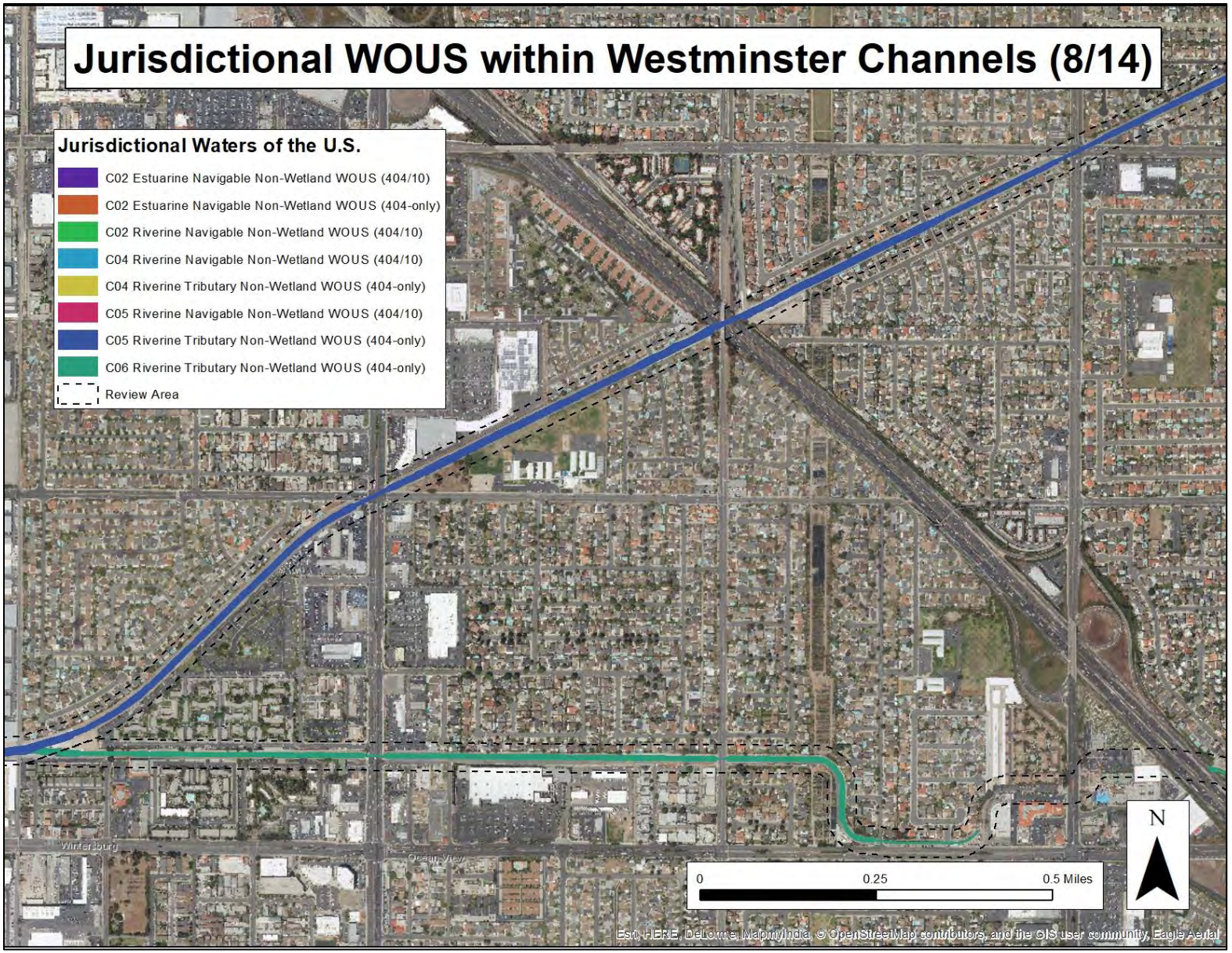

Figure 12 Jurisdictional waters of the U.S. identified within the Westminster Channels (8 of 14).

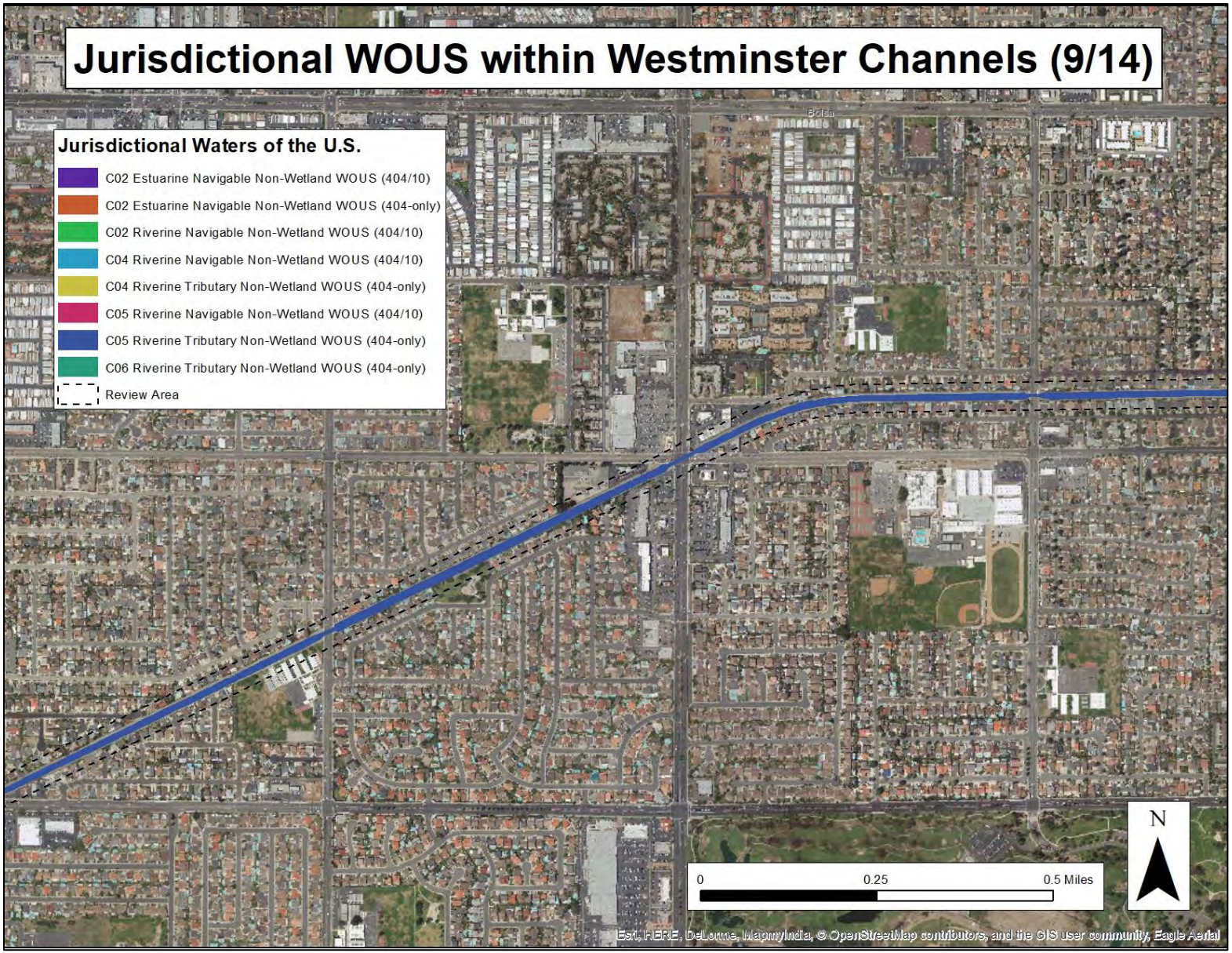

Figure 13 Jurisdictional waters of the U.S. identified within the Westminster Channels (9 of 14).

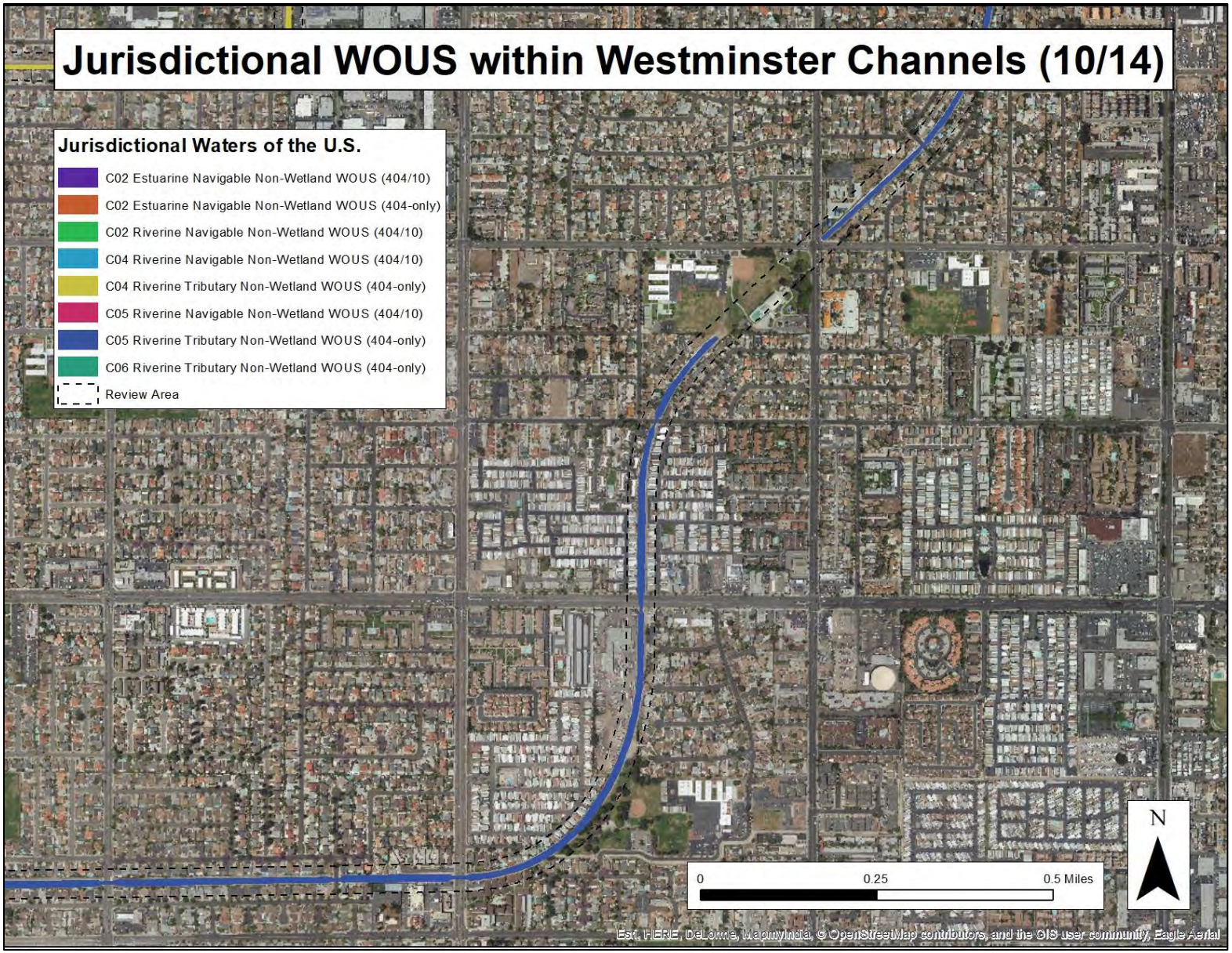

Figure 14 Jurisdictional waters of the U.S. identified within the Westminster Channels (10 of 14).

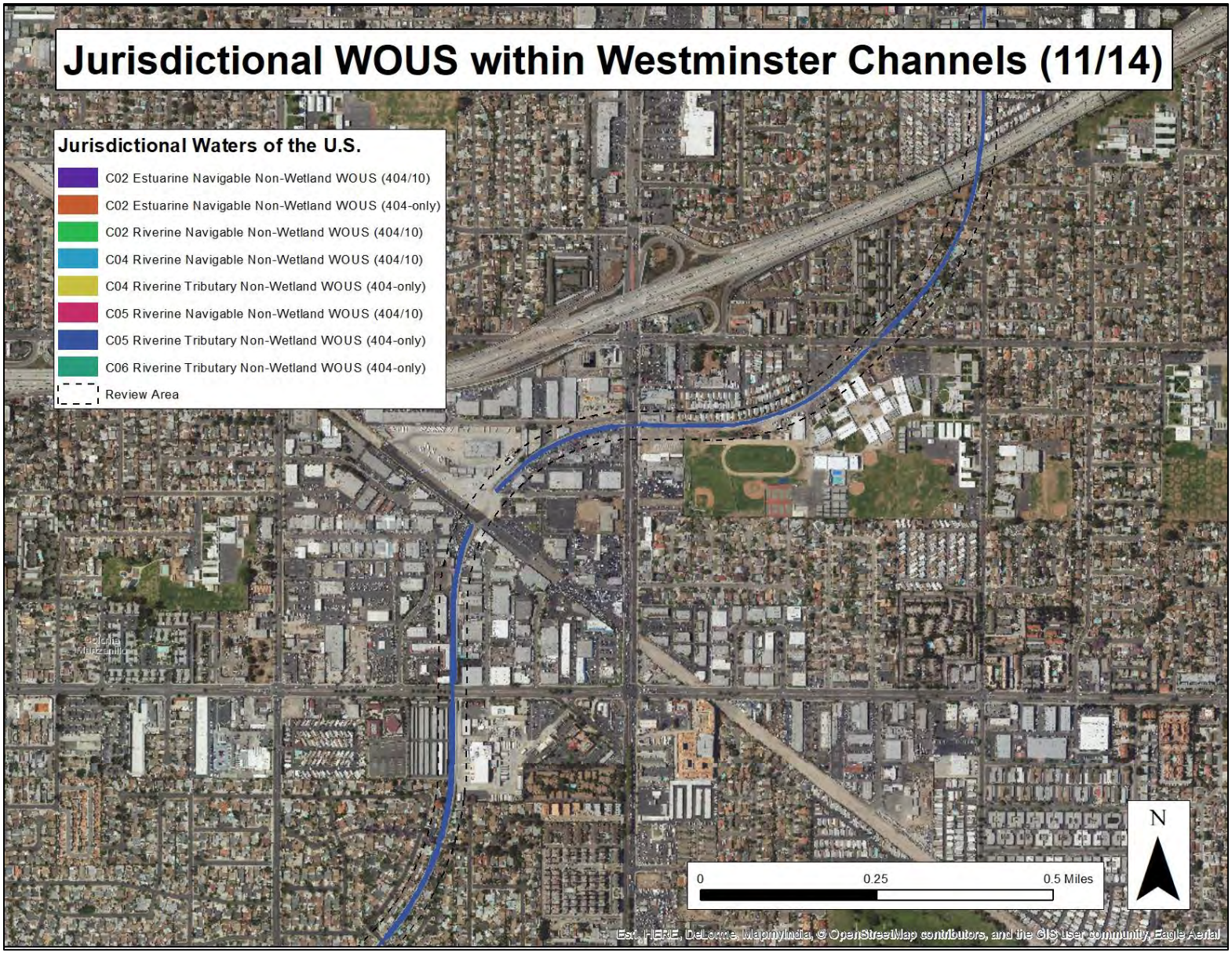

Figure 15 Jurisdictional waters of the U.S. identified within the Westminster Channels (11 of 14).

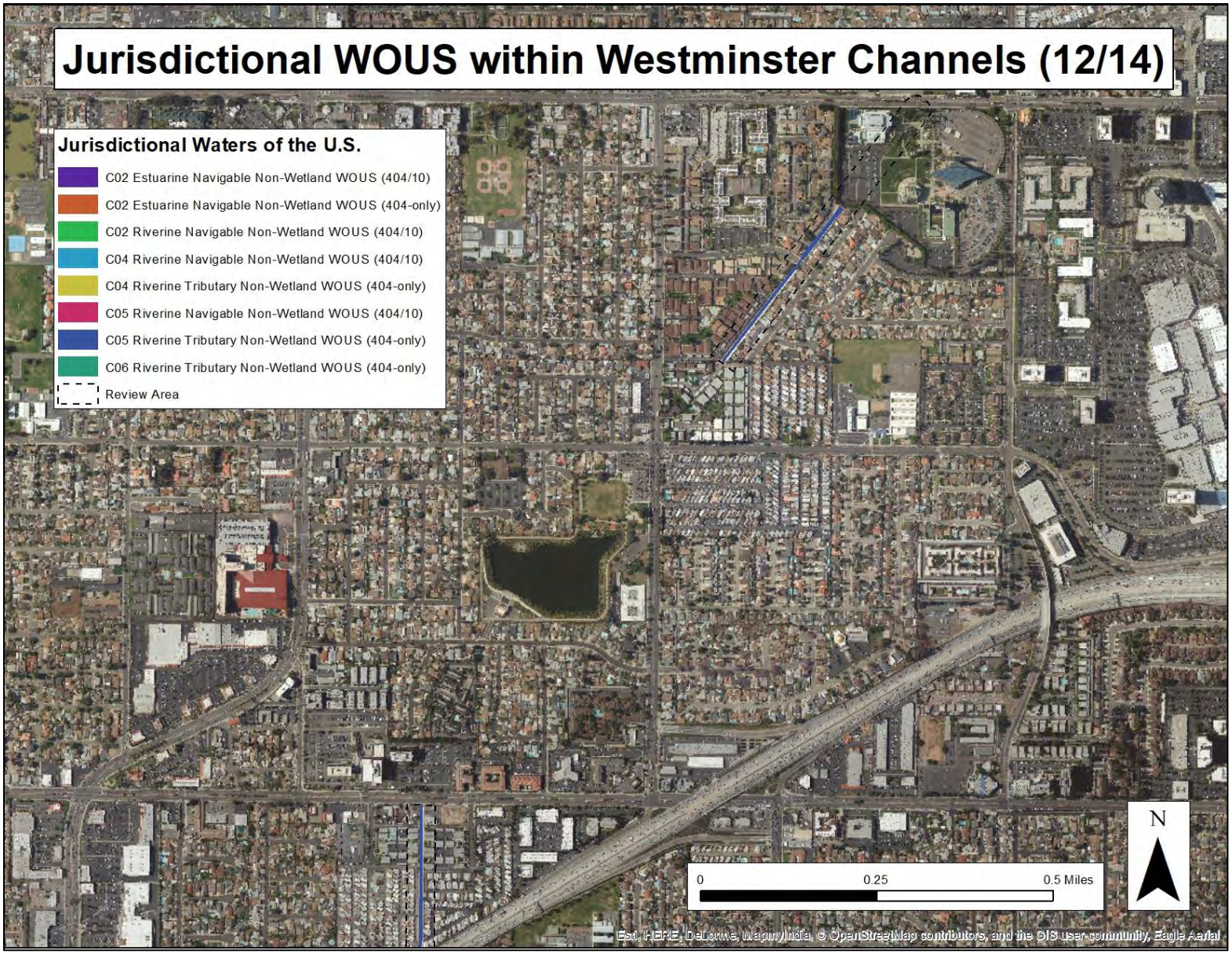

Figure 16 Jurisdictional waters of the U.S. identified within the Westminster Channels (12 of 14).

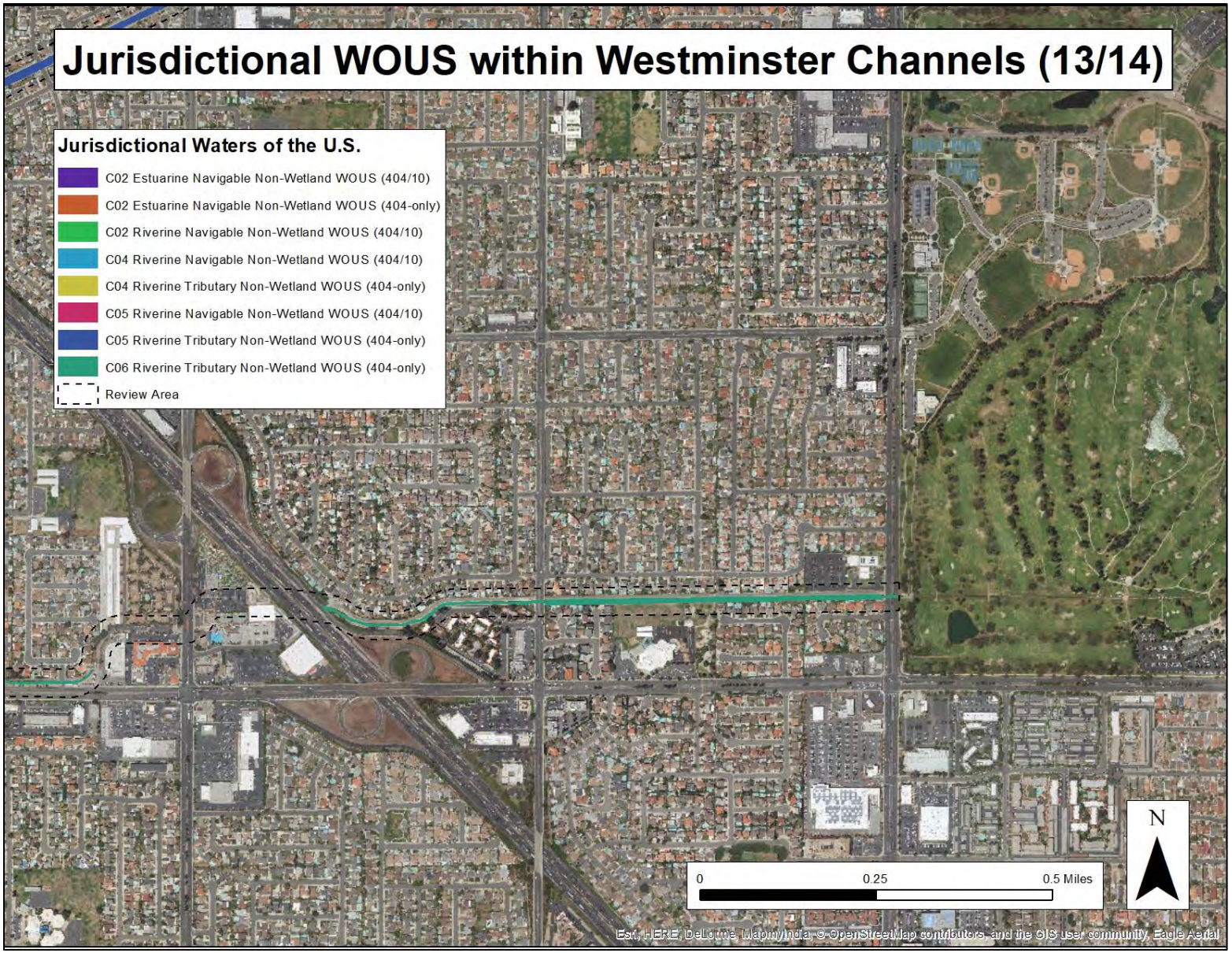

Figure 17 Jurisdictional waters of the U.S. identified within the Westminster Channels (13 of 14).

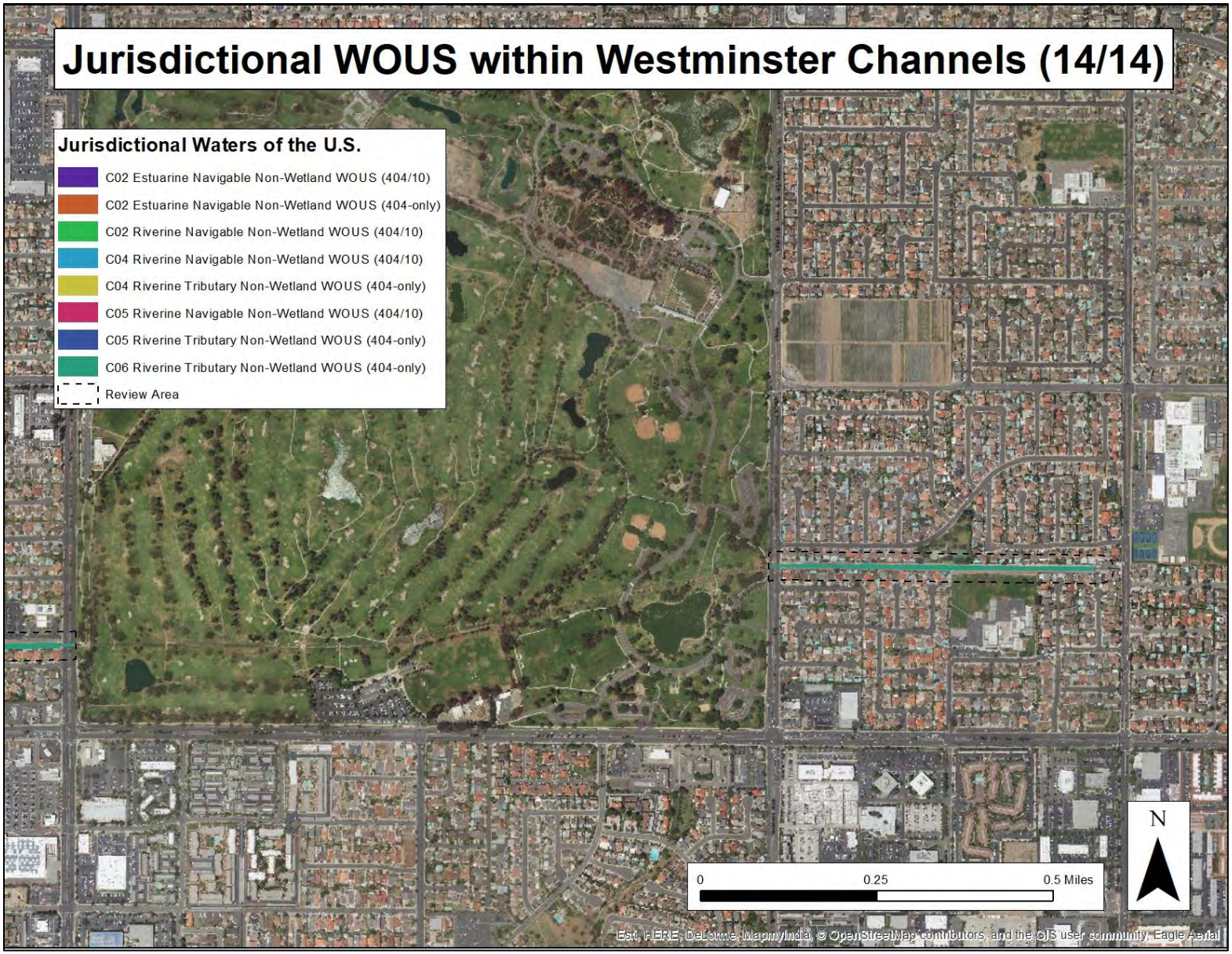

Figure 18 Jurisdictional waters of the U.S. identified within the Westminster Channels (14 of 14).

Appendix B

Figure 1 Muted tidal wetland identified within the Warner Avenue Bridge Review Area during a site visit completed on March 27, 2019. The wetland receives only the highest tidal flows through a culvert that inlets water from the adjacent Bolsa Bay. The view shown here is oriented toward the east, with Warner Avenue Bridge and Bolsa Bay located behind the wetland.

Figure 2 View of the muted tidal wetland within the Warner Avenue Bridge Review Area, oriented to the west.

Figure 3 View, oriented north, of tidal wetland and mudflat areas within the PCH Floodwall Review Area as observed during the March 27, 2019 site visit.

Figure 4 View, oriented south, of tidal wetland and mudflat areas within the PCH Floodwall Review area.

Figure 5 View of Bolsa Chica Channel (C02), oriented west, as observed during an April 16, 2019 site visit.

Figure 6 View of Bolsa Chica Channel (C02), oriented to the east.

Figure 7 Cattail (*Typha domingensis*) sprouts present along the C02 channel fringe, a potential indicator of disturbance and brackish conditions within C02 Channel.

Appendix C

PUBLIC NOTICE
RELATIVE TO NAVIGABLE WATERS WITHIN
THE LOS ANGELES DISTRICT

Date Received

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2711
LOS ANGELES, CALIFORNIA 90053

	Act'n	Info
		✓
		✓
	✓	✓

29 November 1972

Send copies to CCCD 12 (Coun) + Compt (WBR). KEEP THIS. SAT 12/1/72

TO WHOM IT MAY CONCERN:

This Public Notice is issued to inform all interested parties of the definition of navigable waters of the United States subject to the regulatory authorities of the Corps of Engineers, Los Angeles District, as established by the River and Harbor Act of 1899. As a general proposition, limits of jurisdiction over tidal waters of the Pacific Ocean from the Mexican-California border to Cape San Martin shall extend to the line on shore reached by the mean of the higher high waters. For the specific areas set forth below, waters of the Pacific Ocean currently regarded as navigable waters of the United States to the limits indicated are as follows:

San Simeon Bay - San Luis Obispo County 2.5 ft. m.s.l.
Lower Morro Bay - San Luis Obispo County 2.4 ft. m.s.l.
San Luis Obispo Creek - San Luis Obispo County 2.5 ft. m.s.l.
Pismo & Arroyo Grande Creeks - San Luis Obispo County 2.5 ft. m.s.l.
Santa Maria River - Santa Barbara County 2.5 ft. m.s.l.
Santa Ynez River - Santa Barbara County 2.5 ft. m.s.l.
Devareaux Ranch Lagoon - Santa Barbara County 2.5 ft. m.s.l.
Goleta Slough - Santa Barbara County 2.5 ft. m.s.l.
Carpinteria (El Estero) Marsh - Santa Barbara County 2.5 ft. m.s.l.
Ventura River - Ventura County 2.6 ft. m.s.l.
Mugu Lagoon - Ventura County 2.5 ft. m.s.l.
Calleguas Creek - Ventura County 2.5 ft. m.s.l.
Ballona Creek - Los Angeles County 2.6 ft. m.s.l.
Los Angeles River - Los Angeles County 2.5 ft. m.s.l.
San Gabriel River - Orange County 2.5 ft. m.s.l.
Anaheim Bay - Orange County 2.5 ft. m.s.l.
Bolsa Bay - Orange County 2.5 ft. m.s.l.
Upper Newport Bay - Orange County 2.5 ft. m.s.l.
San Juan Creek - Orange County 2.6 ft. m.s.l.
San Mateo Creek - San Diego County 2.6 ft. m.s.l.
Santa Margarita River - San Diego County 2.5 ft. m.s.l.
San Luis Rey River - San Diego County 2.5 ft. m.s.l.
Buena Vista Lagoon - San Diego County 2.5 ft. m.s.l.
Agua Hedionda Lagoon - San Diego County 2.5 ft. m.s.l.
Batiquitos Lagoon - San Diego County 2.5 ft. m.s.l.
San Elijo Lagoon - San Diego County 2.5 ft. m.s.l.

San Dieguito River - San Diego County 2.5 ft. m.s.l.
Los Penasquitos Lagoon - San Diego County 2.5 ft. m.s.l.
Upper Mission Bay - San Diego County 2.6 ft. m.s.l.
San Diego River - San Diego County 2.7 ft. m.s.l.
Lower San Diego Bay - San Diego County 3.0 ft. m.s.l.
Tijuana Estuary - San Diego County 2.5 ft. m.s.l.

Federal Laws prohibit work or construction in such waters unless recommended by the Chief of Engineers and authorized by the Secretary of the Army prior to commencement of the work. The authorization is ordinarily granted in the form of a permit. Applications for such permits in the navigable waters of the Pacific Ocean described herein should be forwarded to the District Engineer, Attn: SPLCO-O at the above address. This notice will be added to the listing of navigable waters within the Los Angeles District issued on 30 June 1965.

H. McK. ROPER, JR.
COL, CE
District Engineer

Appendix D

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 1

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Slight depression Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): C Lat: 33.711447 Long: -118.060868 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Emergent wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

Wetland is a muted tidal wetland, since it only receives water during the highest tides.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	95	Yes	OBL
2. Salicornia pacifica	50	Yes	OBL
3. Limonium californicum	5		
4. Frankenia salina	1		
5.			
6.			
7.			
8.			
	151 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/1	95	10YR 4/6	5	C	PL	Clay/Loa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 2

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Slight depression Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): C Lat: 33.711416 Long: -118.060865 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Emergent wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	70	Yes	OBL
2. Salicornia pacifica	40	Yes	OBL
3. Limonium californicum	10		
4. Frankenia salina	5		
5.			
6.			
7.			
8.			
	125 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100					Sand	
6-15	10YR 4/1	95	10YR 4/6	5	C	PL	Clay/Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 3

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Slight depression Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): C Lat: 33.711391 Long: -118.060883 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Emergent wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	95 = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	45	Yes	OBL
2. Salicornia pacifica	30	Yes	OBL
3. Limonium californicum	10		FACW
4. Frankenia salina	10		FACW
5.			
6.			
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Sand	
5-12	10YR 3/3	100					Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 4

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.710498 Long: -118.060857 Datum: NAD 1983

Soil Map Unit Name: Marina loamy sand NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	80	Yes	OBL
2. Salicornia pacifica	90	Yes	OBL
3. Batis maritima	10		OBL
4. Suaeda esteroa	1		FACW
5.			
6.			
7.			
8.			
	181 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 5

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.710509 Long: -118.060905 Datum: NAD 1983

Soil Map Unit Name: Marina loamy sand NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	50	Yes	OBL
2. Salicornia pacifica	30	Yes	OBL
3. Batis maritima	5		OBL
4. Frankenia salina	10		FACW
5.			
6.			
7.			
8.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	95	10YR 3/6	5	C	PL	Clay/Loa+	
8-15	10YR 3/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 6

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.710551 Long: -118.060902 Datum: NAD 1983

Soil Map Unit Name: Marina loamy sand NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	20	Yes	OBL
2. Salicornia pacifica	10		OBL
3. Frankenia Salina	40	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 3/2	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 7

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 20

Subregion (LRR): C Lat: 33.707427 Long: -118.058737 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	40	Yes	OBL
2. Salicornia pacifica	30		OBL
3. Batis maritima	25		OBL
4. Frankenia salina	25		FACW
5. Distichlis littoralis	50	Yes	OBL
6.			
7.			
8.			
	170 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/1	85	10YR 3/6	15	C	PL	Clay/Loa	Adundant oxidized living roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 8

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 20

Subregion (LRR): C Lat: 33.707418 Long: -118.058746 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	50	Yes	OBL
2. Salicornia pacifica	50	Yes	OBL
3. Batis maritima	20		OBL
4. Frankenia salina	30		FACW
5. Distichlis littoralis	60	Yes	OBL
6.			
7.			
8.			
	210 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1	100					Clay/Loa+	
4-12	10YR 3/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 9

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 20

Subregion (LRR): C Lat: 33.710498 Long: -118.060857 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Jaumea carnosa	40	Yes	OBL
2. Salicornia pacifica	40	Yes	OBL
3. Batis maritima	20		OBL
4. Frankenia salina	35		FACW
5. Distichlis littoralis	60	Yes	OBL
6.			
7.			
8.			
	195 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: C02 Channel Review Area City/County: Huntington Beach Sampling Date: 4/16/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 10

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): C Lat: 33.730109 Long: -118.051273 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. Frankenia salina	35	Yes	FACW
2. Batis maritima	40	Yes	OBL
3. Salicornia pacifica	5		OBL
4.			
5.			
6.			
7.			
8.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/2	100					Clay/Loa+	
9-14	10YR 2/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: C02 Channel Review Area City/County: Huntington Beach Sampling Date: 4/16/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 11

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): C Lat: 33.730136 Long: -118.051382 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. Frankenia salina	4		
2. Salicornia pacifica	1		
3. Batis maritima	1		
4. Typha domingensis	50	Yes	OBL
5.			
6.			
7.			
8.			
	56 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	95	10YR 3/6	5	C	M	Clay/loam	
2-9	10YR 3/1	100					Clay/loam	
9-12	10YR 4/1	100					Clay/loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No _____ Depth (inches): 0 - 12

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: C02 Channel Review Area City/County: Huntington Beach Sampling Date: 4/16/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 12

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.730152 Long: -118.051435 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. Frankenia salina	5		
2. Batis maritima	1		
3. Salicornia pacifica	1		
4. Typha domingensis	30	Yes	OBL
5.			
6.			
7.			
8.			
	37 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	95	10YR 3/6	5	C	M	Clay/loam	
3-12	10YR 4/1	100					Clay/loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

7.0 Biological Evaluation

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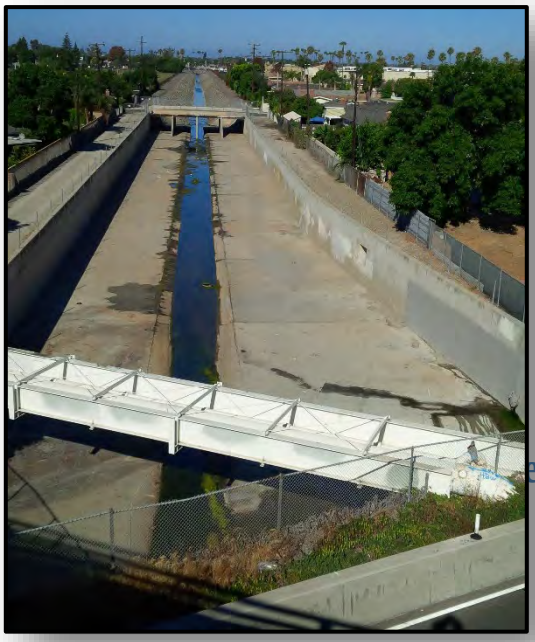
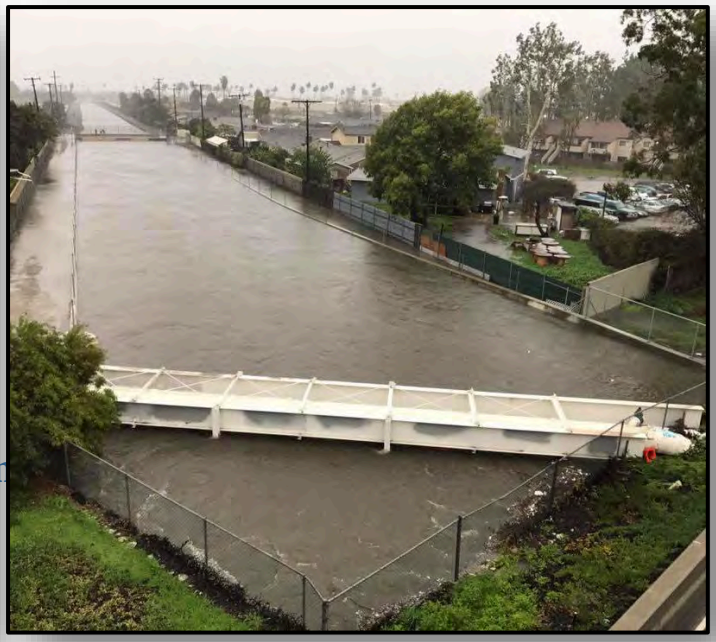
BIOLOGICAL EVALUATION
For
WESTMINSTER, EAST GARDEN GROVE, CA
FLOOD RISK MANAGEMENT STUDY





US Army Corps of Engineers®
Chicago District

Biological Evaluation
November 2019

Prepared for:
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And

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Prepared by:
U.S. Army Corps of Engineers
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25 November 2019

Biological Evaluation
November 2019

Summary of Findings, Conclusions, and Determinations

The U.S. Army Corps of Engineers, in cooperation with the Orange County Public Works, is currently conducting a flood risk management study within the Westminster Watershed. The study is being conducted in accordance with the study resolution adopted by the Committee on Public, House of Representatives Committee on Public Works on May 8, 1964 (Flood Control Act of 1938).

The purpose of the proposed project is to evaluate the flood risk within the Westminster watershed that is primarily attributable to underperforming flood control channels that collect surface runoff and convey it downstream towards eventual discharge into the Pacific Ocean. The study area is the highly urbanized Westminster watershed in western Orange County, California. Project features are located in the Cities of Fountain Valley, Garden Grove, Huntington Beach, Santa Ana, and Westminster. Preliminary analysis shows that flooding overtops the existing drainage channel infrastructure in the study area between 20% and 10% annual chance of exceedance (ACE) storm events (i.e., 5 and 10 year recurrence intervals, respectively), putting approximately 400,000 area residents and 44,000 structures at risk of inundation during a 0.2% ACE event. Overbank flooding also impacts traffic in the project area, causing delays and/or closures on local roads as well as major routes, including Interstate 405. In total, the study area experiences approximately $72,000,000 (Fiscal Year 2020 price levels, 2035 base year, 2.75% federal discount rate) in average annual equivalent direct damages as a result of overbank flooding.

Two alternatives were formulated and evaluated for implementation. The Minimum Channel Modifications Plan would convert earthen/riprap trapezoidal channels within the C02/C04 and C05/C06 system to concrete lined trapezoidal channels. This would increase the conveyance efficiency of the channels. In addition, the tide gates at the downstream end of C05 Reach 1 would be removed and the Warner Avenue Bridge would be lengthened. The Maximum Channel Modifications Plan would convert earthen/riprap/concrete lined trapezoidal/rectangular channels within the C02/C04 and C05/C06 system to open rectangular concrete lined channels. This would increase the conveyance efficiency and capacity of the channels. In addition, the tide gates at the downstream end of C05 Reach 1 would be removed and the Warner Avenue Bridge would be lengthened.

Design-Bid-Build is the assumed project delivery method for the proposed alternatives. The preconstruction engineering and design (PED) period is referred to as the preliminary engineering and design period, design period, and advertise and award period. PED for the Warner Avenue Bridge, tide gates, and the downstream reaches of C02 (Reach 23) and C05 (Reach 1) would occur concurrently between approximately January 2020 to May 2022. Once construction on these features begins, PED for upstream reach sections is assumed to take approximately 64 weeks lag from the immediate downstream reach section construction finish date. For some smaller reaches, PED is assumed to take approximately 31 weeks lag from the immediate downstream reach section construction finish date. Construction of the Minimum Channel Modifications Alternative would begin in May 2022 and would be completed by July 2031, while construction of the Maximum Channel Modifications Alternative would begin in May 2022 and would be completed by July 2031. While both alternatives are analyzed, the Maximum Channel Modifications Alternative is the Recommended Plan proposed to be implemented.

Some construction activities associated with the proposed project would create increased noise levels from construction equipment and have the potential to harass or injure listed-species and their prey. In addition, modification of the channels could cause indirect impacts to eelgrass (*Zostera marina*) where some listed species forage. Mitigation and environmental commitments have been incorporated into the Proposed Project to minimize and offset effects to the aquatic environment and protected species and habitats. These include weekly surveys of the downstream construction areas for bird species, using a Giken soft pile driver in downstream areas where sensitive species are present, and in-kind and out-of-kind mitigation for indirect impacts to eelgrass.

Biological Evaluation
November 2019

After a review and analysis of listed-species and critical habitat in the Action Area and the proposed compensatory mitigation and mitigation measures, the USACE has determined the Recommended Project would have '*no effect*" on salt marsh bird's-beak or Ventura marsh milk-vetch. The USACE has also determined that the Recommended Project would have a '*may affect, not likely to adversely affect'* on California least tern, coastal California gnatcatcher, light-footed Ridgway's rail, western snowy plover, and green turtle. In regards to EFH, the USACE has determined that the proposed project will indirectly affect approximately 1.7 acres of eelgrass with required compensatory mitigation acreage varying depending on in-kind or out-of-kind mitigation.

Table of Contents

1.0 Introduction 3
1.1 Project History 4
2.0 Description of the Proposed Project and Action Area 7
2.1 Increasing the Span of Warner Avenue Bridge 7
2.2 Removing the Tide Gates at the Downstream End of C05 Reach 1 and Replacing with an Access Bridge 8
2.3 Installing a Single Steel Sheet Pile Wall Along the South Levee Crest of C02 Reach 23 9
2.4 Installing Dual Sheet Pile Walls Along the North and South Levee Crests of C05 Reach 1 11
2.5 Converting Earthen/Riprap/Concrete Lined Trapezoidal Channels to Open Rectangular Concrete Lined Channels in C04 (Reaches 20 and 22), C05 (Reaches 2, 3, 4, 5, 6, 8, 9, and 12) and C06 (Reaches 13, 14, 16, 17, 19) 13
2.6 Constructing a Diversion Channel Connecting C04 Reach 21 to Reach 20 14
2.7 Compensatory Mitigation Activities 16
2.8 Summary of the Proposed Project 16
3.0 Listed Species & Critical Habitat in the Proposed Projects Biological Study Area 21
3.1 Studies Required 22
4.0 Environmental Baseline Conditions 24
4.1 Biological Resources 28
5.0 Effects of the Action on Federally Managed Species 42
5.2 Proposed Species, Candidate Species and/or Proposed Critical Habitat Within the Action Area 69
5.3 Essential Fish Habitat 69
5.4 Summary of Avoidance and Minimization Efforts 75
6.0 Conclusions and Determination 79
6.1 ESA Conclusions 79
6.2 ESA Determination 79
6.3 EFH Conclusions 79
7.0 Literature Cited 80
8.0 Appendix A – Existing Conditions vs. Proposed Project Figures 85
9.0 Appendix B – USFWS IPac List 87
10.0 Appendix C – Reconnaissance Level Survey Report for the Feasibility Study in Support of the Westminster East Garden Grove Flood Risk Management Study 89
11.0 Appendix D – Jurisdictional Determination 91
12.0 Appendix E – Jurisdictional Determination Results vs. Project Project Modifications Figures 93
13.0 Appendix F – Species Lists 95
13.1 Biological Resources 97
13.2 Bibliography 110
14.0 Appendix G – Threatened and Endangered Species Figures 111

Figures:

Figure 1: Study Area 4
Figure 2: Drainage Channels within the Study Area 5
Figure 3: Proposed alignment of diversion channel at Westminster Mall 15
Figure 4: Maximum Channel Modifications Plan 20
Figure 5: Overview of the Proposed Project's Action Area Showing the Biological Study Area Which Includes Potential Extent of Direct and Indirect Effects of the Proposed Project and Compensatory Mitigation Features on Special Status Species. 23
Figure 6: Riprap lined trapezoidal and earthen trapezoidal channels found within the Westminster watershed. 26
Figure 7: Example trapezoidal riprap and earthen channel cross-sections found within the Westminster watershed. 26
Figure 8: Existing channel geometry 27
Figure 9: Existing channel bottom conditions. 27
Figure 10: Locations of eelgrass within Anaheim Bay/Huntington Harbour area during eelgrass surveys in April and July 2013 (Source: 32
Figure 11: Locations of eelgrass within Sunset Aquatic Park Marina and C02 during September 2013 surveys. 33
Figure 12: Locations of eelgrass downstream of Warner Avenue Bridge during September 2013 surveys. 34
Figure 13: Habitats present within the Bolsa Chica Lowlands Restoration Project, including eelgrass 35
Figure 14: Habitat types in the SBNWR 39
Figure 15: Bolsa Chica Lowlands Project Habitat Map (Source: Merkel & Associates Inc.) 53
Figure 16: City of Huntington Beach Habitat Map Showing Habitat for the Bolsa Chica Mesa (Source: City of Huntington Beach General Plan 2017). 54
Figure 17: Coastal Sage Scrub Habitat Within the Bolsa Chica Mesa (Red Outline). 55
Figure 18: Location of Designated Critical Habitat Within the BCER for the Western Snowy Plover (76 FR 16155) 61
Figure 20: Location of Designated EFH within the Study Area. 70

Tables:

Table 1: Summary of the Proposed Project Modifications 17
Table 3: Federally Listed Species and Critical Habitat Potentially Occurring or Known to Occur in the Project Area. 21
Table 3: Channel reaches with potential Essential Fish Habitat. 69
Table 4. Mitigation Measures. 76
Table 5: Species may be affected, but not likely to adversely effect. 79
Table 6: Species not likely to be affected. 79
Table 9: List of plant species found within the Bolsa Chica Ecological Reserve (Courtesy of the CDFW) 97
Table 10: Frequently observed bird species at Bolsa Chica Ecological Reserve (Courtesy of the CDFW). 98
Table 11: Less Frequently Observed Bird Species at Bolsa Chica Ecological Reserve (Courtesy of the CDFW) 101
Table 12: List of fish species documented at Bolsa Chica Ecological Reserve by the CDFW. 103
Table 13: List of aquatic invertebrates documented at Bolsa Chica Ecological Reserve by the CDFW. 104
Table 14: List of terrestrial invertebrates documented at the Bolsa Chica Ecological Reserve by the CDFW. 105
Table 15: List of reptiles documented at the Bolsa Chica Ecological Reserve by the California Department of Fish and Wildlife. 105

Table 16: List of mammals documented at the Bolsa Chica Ecological Reserve by the CDFW. 105
Table 17: Birds Observed at Seal Beach National Wildlife Refuge. 106
Table 18: Benthic Invertebrates Observed within Vicinity of Seal Beach NWR during 2013 surveys.... 109
Table 19: Fish Species Observed within Vicinity of Seal Beach NWR during 2013 surveys. 109

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List of Acronyms:

Acronym	Definition		Acronym	Definition
ACE	Annual Chance of Exceedance		MSA	Magnuson-Stevens Fishery Conservation and Management Act
ADM	Agency Decision Milestone		NAAQS	National Ambient Air Quality Standards
ASA(CW)	Assistant Secretary of the Army (Civil Works)		NCCP	Natural Communities Conservation Plan
BCER	Bolsa Chica Ecological Reserve		NED	National Economic Development
BCR	Benefit to Cost Ratio		NEPA	National Environmental Policy Act
BMP	Best Management Practice		NFS	Non-federal Sponsor
CAA	Clean Air Act		NHI	Northwest Habitat Institute
Cal-OSHA	California Division of Occupational Safety and Health Administration		NOAA	National Oceanic and Atmospheric Administration
CCC	California Coastal Conservancy		NOI	Notice of Intent
CDC	California Department of Conservation		NOP	Notice of Preparation
CDFW	California Department of Fish and Wildlife		NPDES	National Pollutant Discharge Elimination System
CEQ	Council on Environmental Quality		NRHP	National Register of Historic Places
CEQA	California Environmental Quality Act		NWR	National Wildlife Refuge
CESA	California Endangered Species Act		NWSSB	Naval Weapons Station Seal Beach
CFR	Code of Federal Regulations		OCTA	Orange County Transportation Authority
CNDDB	California Natural Diversity Database		OCPW	Orange County Public Works
CTR	California Toxics Rule		OCWD	Orange County Water District
DAMP	Drainage Area Management Plan		OMB	Office of Management and Budget
DoD	Department of Defense		O&M	Operations and Maintenance
DTA	DynusT Dynamics Simulation and Assignment		OMRR&R	Operation, Maintenance, Repair, Replacement, and Rehabilitation
EAD	Expected Annual Damages		OSHA	Occupational Safety and Health Administration
ECOS-IPaC	Environmental Conservation Online System Information for Planning and Consultation		PCH	Pacific Coast Highway
EDR	Environmental Data Resources		PDT	Project Delivery Team
EFH	Essential Fish Habitat		PED	Preconstruction Engineering and Design
EFHA	Essential Fish Habitat Areas Protected from Fishing		PHMS	Pacific Highly Migratory Species
EGGW	East Garden Grove Wintersburg		PMP	Project Management Plan
EIR	Environmental Impact Report		REC	Recognized Environmental Conditions
EIS	Environmental Impact Statement		RWQCB	Regional Water Quality Control Board
EOP	Environmental Operating Principles		SAR	Santa Ana River
ESA	Federal Endangered Species Act		SBNWR	Seal Beach National Wildlife Refuge

FCSA	Feasibility Cost Sharing Agreement		SCAB	South Coast Air Basin
FDR	Federal Discount Rate		SCAG	Southern California Association of Governments
FEMA	Federal Emergency Management Agency		SCAQMD	South Coast Air Quality Management District
FUDS	Formerly Used Defense Sites		SFHA	Special Flood Hazard Area
GHG	Greenhouse Gases		SHPO	State Historic Preservation Office
GI	General Investigation		SIP	State Implementation Plan
GWP	Global Warming Potential		SPL	Los Angeles District
HAPC	Habitat Areas of Particular Concern		SR	State Route
HCP	Habitat Conservation Plan		SWP	State Water Project
HQUSACE	Headquarters U.S. Army Corps of Engineers		SWPPP	Storm Water Pollution Prevention Plan
HTRW	Hazardous, Toxic, and Radioactive Waste		TSP	Tentatively Selected Plan
I-	Interstate-		USACE	U.S. Army Corps of Engineers
IBA	Important Bird Area		USDA FS	U.S. Department of Agriculture Forest Service
IDC	Interest During Construction		USEPA	U.S. Environmental Protection Agency
IEPR	Independent External Peer Review		USFWS	U.S. Fish and Wildlife Service
IFR	Integrated Feasibility Report		UST	Underground Storage Tanks
LACM	Los Angeles County Museum of Natural History		UXO	Unexploded Ordnance
LERRDs	Lands, easements, rights-of-way, relocation, and disposal areas		VT	Vertical Team
LPP	Locally Preferred Plan		WY	Water Year
LUST	Leaking Underground Storage Tanks			

1.0 Introduction

The purpose of this Biological Evaluation (BE) is to address the effect of the Westminster East Garden Grove, California, Flood Risk Management Study on Endangered Species Act listed species, listed as endangered or threatened under the federal Endangered Species Act (ESA), or their designated critical habitat. The BA is prepared in accordance with legal requirements found in Section 7(a)(2) of the Endangered Species Act. The document presents technical information upon which later decisions regarding the Proposed Project's impacts are developed.

The U.S. Army Corps of Engineers (USACE) is the federal sponsor for this study, the Westminster East Garden Grove Flood Risk Management Study, while the Orange County Public Works (OCPW) is the non-federal sponsor. The study is being conducted in accordance with the study resolution adopted by the Committee on Public Works, House of Representatives Committee on Public Works on May 8, 1964 (Flood Control Act of 1938), which reads:

> *"Resolved by the Committee on Public Works of the House of Representatives, United States, that the Board of Engineers for Rivers and Harbors is hereby requested to review the reports on (a) San Gabriel River and Tributaries, published as House Document No. 838, 76th Congress, 3d Session; (b) Santa Ana River and Tributaries, published as House Document No. 135, 81st Congress, 1st Session; and (c) the project authorized by the Flood Control Act of 1936 for the protection of the metropolitan area in Orange County, with a view to determining the advisability of modification of the authorized projects in the interest of flood control and related purposes."*

The project involves flood risk management in the highly urbanized Westminster watershed in western Orange County, California (*Figure 1*).

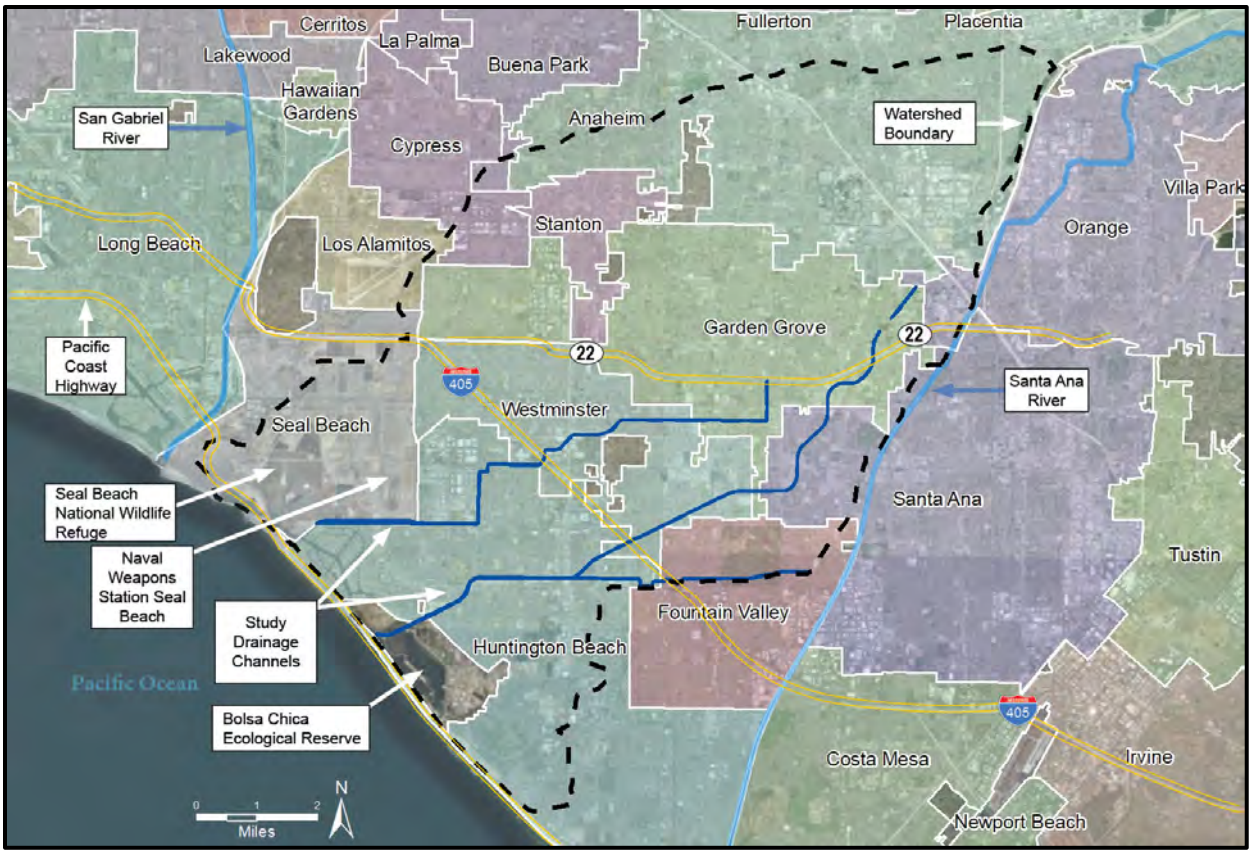

Figure 1: Study Area

1.1 Project History

1.1.1 Purpose and Need

1.1.1.1 Project Purpose

The purpose of the Recommended Plan is to minimize flood risk within the Westminster watershed that is primarily attributable to undersized drainage channels that collect surface runoff and convey it downstream towards eventual discharge into the Pacific Ocean. The Westminster watershed includes four drainage channels (*Figure 2*). The drainage channels were originally built in the 1950s and the 1960s to convey residual flood waters after the channelization of the Santa Ana River. The channel systems were mostly designed to contain the 25-year flood event, although some segments were constructed to 65% of the 25-year capacity. The combination of increased runoff and underperforming conveyance channels results in increased flood risk for the residents of the Westminster watershed.

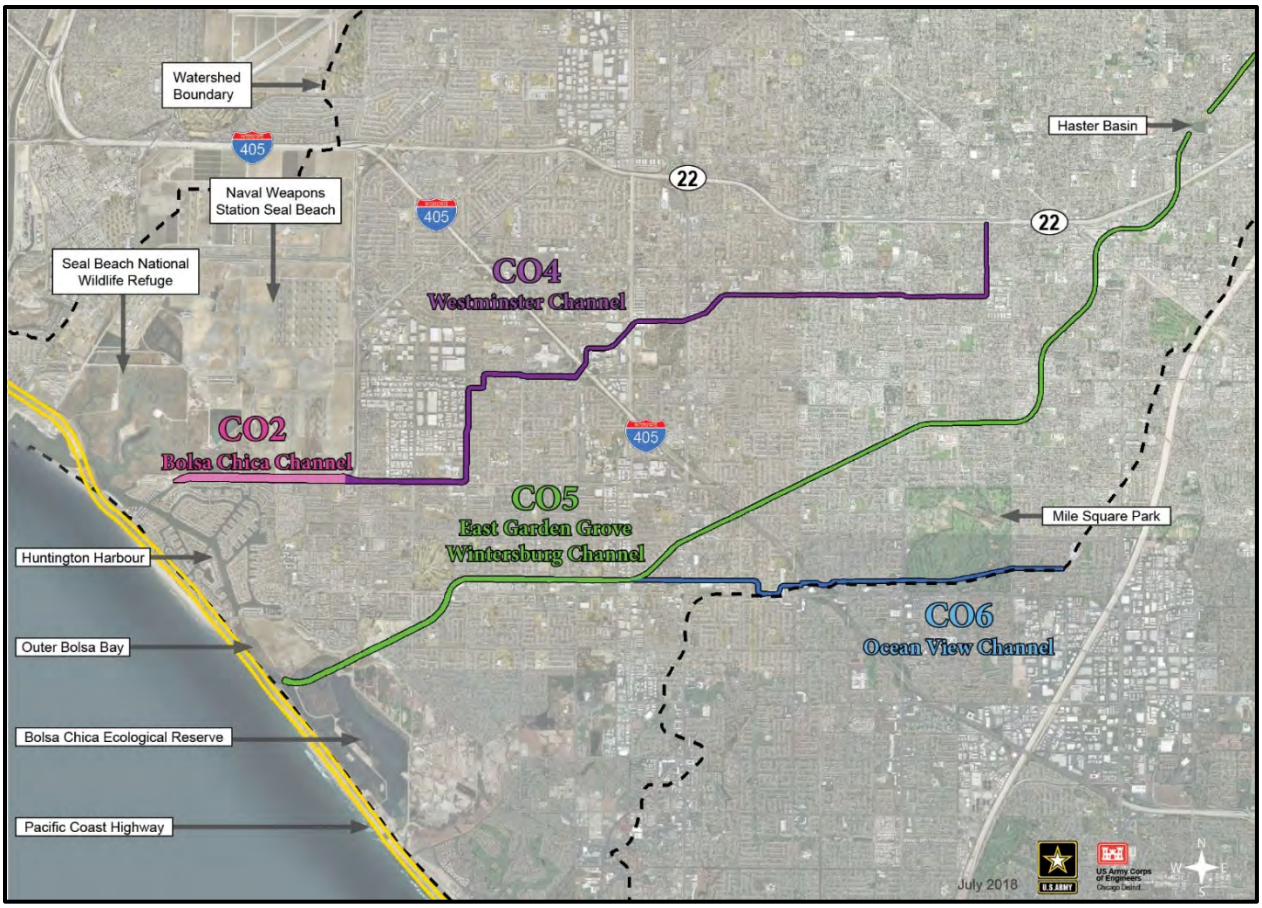

Figure 2: Drainage Channels within the Study Area

1.1.1.2 Project Need

The project is needed due to urbanization of the Westminster watershed since the 1950s, which has increased the potential for flood related damages, and life safety impacts associated with overtopping of the existing flood control systems during short duration, high intensity rainfall events. Urbanization has also increased the total amount of impermeable area, resulting in higher volumes of stormwater being directed to the channels due to limited infiltration opportunities.

The study area has a population at risk of approximately 400,000 during the 0.2% annual chance of exceedance (ACE) event. Flat terrain in the Westminster watershed and a high population density increase the impact of flooding on traffic and evacuation. The additional burden that flooding puts on already crowded roads can result in a loss of functionality for Garden Grove Hospital as delays caused by flooding negatively impact ambulance routes and other emergency services. Flooding can also negatively impact schools in the project area by obstructing pedestrian and bus routes, damaging facilities, and reducing access to emergency services. Interstate 405 and other major transportation routes in the project area can become impassable due to flooding, further increasing delays during high traffic periods and reducing access for people and services. Therefore, significant street flooding during storm events, combined with background congestion, poses serious life-safety risk in the Westminster watershed.

Preliminary analysis shows that flood flows overtop the drainage channels in the project area between the 20% and 10% ACE storm events (i.e., 5 and 10 year recurrence intervals, respectively), putting

approximately 400,000 residents and 44,000 structures at risk. Overbank flooding also impacts traffic in the project area, causing delays and/or closures on local roads as well as major routes, including Interstate 405. In total, the study area experiences approximately $72,000,000 (Fiscal Year 2020 price levels, 2035 base year, 2.75% federal discount rate) in average annual equivalent direct damages as a result of overbank flooding.

2.0 Description of the Recommended Plan and Action Area

The Recommended Plan includes the following components:

- Increasing the span of Warner Avenue Bridge;
- Removing the tide gates at the downstream end of C05 Reach 1 and replacing with an access bridge;
- Installing a single steel sheet pile wall along the south levee crest of C02 Reach 23;
- Installing double steel sheet pile walls along the north and south levee crests of C05 Reach 1;
- Converting earthen/riprap/concrete lined trapezoidal channels to open rectangular concrete lined channels in C04 (Reaches 20 and 22), C05 (Reaches 2, 3, 4, 5, 6, 8, 9, and 12) and C06 (Reaches 13, 14, 16, 17, 19);
- Constructing a diversion channel connecting C04 Reach 21 to Reach 20; and,
- Compensatory mitigation activities.

Appendix A includes figures showing the existing channel condition (i.e., earthen, riprap, or concrete) and the proposed modification that would occur if the Recommended Plan is implemented.

2.1 Increasing the Span of Warner Avenue Bridge

This component of the proposed project involves increasing the span of the existing Warner Avenue Bridge located between Huntington Harbour and Outer Bolsa Bay.

The existing bridge is founded on four pile bents made up of a cast-in-place concrete pile cap over 11 pre-cast concrete piles. The north side of the bridge has a 6-foot wide reinforced concrete sidewalk and a small shoulder bike lane. The south side of the bridge also has a small shoulder bike lane and a reinforced concrete bridge rail. The current design for the bridge leaves as much of the existing bridge as possible while widening the channel and increasing the bridge span. The new sections of the bridge will match the existing bridge construction using precast piles topped with cast-in-place pile caps. The new sections of the bridge will match the existing bridge construction using precast piles topped with cast-in-place pile caps.

Three piles bents will be added to the existing bridge, increasing the length of the existing bridge from approximately 91 feet long to 182 feet long, essentially doubling the span of the Warner Avenue Bridge. The bridge profile will not be modified. The bridge will provide four 12-foot-wide vehicular lanes (two lanes in each direction consistent with the existing bridge), a 10-foot-wide median (consistent with the existing bridge), two 8-foot-wide bike lanes (two lanes in each direction consistent with the existing bridge), and two 5-foot-wide sidewalks (one on each side of the bridge, currently there is only one sidewalk on the north side of the existing bridge). The bridge will include railing on both sides of the bridge that are approximately 4-feet high.

Project component construction will consist of placing fifteen inch deep precast/pre-stressed concrete ‘voided slabs’ on top of pile caps that span the 30 foot spacing of the pile bents. The voided slabs will be topped with a 3 inch wearing surface of asphalt. Construction of the bridge will require the removal of approximately 48,821 cubic yards of construction debris (e.g., concrete, soil, etc.). Prior to excavating the soil constriction located upstream of the existing bridge, installation of a temporary coffer dam will be required to block flows within the channel from where soil is being excavated. In all, a single temporary coffer dam will be required: a coffer dam that extends from downstream of Warner Avenue Bridge upstream above the constriction point on the west side of Outer Bolsa Bay. The coffer dam would be placed in such a way as to allow flows from Outer Bolsa Bay to continue through the area into

Huntington Harbour. For example, during excavation of the upland soils from the constriction point, the temporary coffer dam would only be placed along the west edge of the area. Flow from Outer Bolsa Bay would be able to continue through to Huntington Harbour along the east side of the channel. The temporary coffer dam would be constructed of masonry blocks and sandbags wrapped in plastic or concrete k-rail and sandbags wrapped in plastic. The height of the coffer dam would not exceed approximately 5 feet. A silt curtain would also be in place to minimize turbidity during construction activities. The coffer dam would be opened or removed in the event of a forecasted storm to exceed 0.3 inch.

In addition to excavation of the upstream constriction point, the temporary coffer dam will be in place during installation of rock slope protection (riprap). Approximately 800 linear feet of armoring along the Huntington Harbour wall area is assumed. The armoring includes the placement of approximately 20,000 tons of A-2 stone via marine plant and associated marine equipment.

Overall, the following construction equipment is expected to be used during construction of this proposed project component:

- Work barge,
- crane,
- medium to large-size backhoes,
- loaders for excavated material,
- off-road forklift,
- flatbed trucks to unload equipment and materials,
- an asphalt paving machine, and
- haul trucks.

This component of the proposed project would be installed in two phases in order to avoid special status bird breeding and nesting seasons within the adjacent Bolsa Chica Ecological Reserve as well as avoid complete closure of the bridge to traffic. The currently envisioned construction sequence includes the commencement of construction activities on the south side of the bridge, including the removal of the upstream constriction point. The north side of the bridge would remain open for a single lane of traffic in either direction. Once the construction of the south side of the bridge is complete, construction activities would move to the north side of the bridge. During this time the south side of the bridge would remain open for a single lane of traffic in either direction. Total construction time of this component is anticipated to be approximately 20 months with contingency. Vehicular access would be via Warner Avenue while work barge access would be via Huntington Harbour. Construction staging would be located along the east side of the channel, downstream of the bridge where there is a vacant parking lot.

Long-term maintenance and operation activities associated with this component of the proposed project would be similar to those associated with the existing bridge. Typical maintenance activities that occur on bridges include repairing bent or damaged steel beams, cracked or spalled concrete, damaged expansion joints, bent or damaged railings, painting, erosion protection, and inspections.

2.2 Removing the Tide Gates at the Downstream End of C05 Reach 1 and Replacing with an Access Bridge

This component of the proposed project involves removal of the tide gates structure at the downstream end of C05 Reach 1 and construction of an access bridge where the tide gate structure was located.

The new bridge will have three pile bents, similar to the Oil Field Bridge located upstream on C05 Reach 1 that has four pile bents. The new bridge piles would be cast in place concrete piles or driven precast/pre-stressed concrete piles. In addition to the bridge piles, two cantilever concrete abutments will be constructed to provide support for the new bridge as well as to create the side walls of the channel. These abutments will extend to and tie into the typical dual row sheet pile channel wall section proposed for C05 Reach 1 and which is described in Section 2.4 below. The new bridge will provide a 24 feet 8 inch clear span between rails and be capable of carrying vehicular traffic, similar to the existing tide gate structure. The bridge deck will consist of 18 inch deep precast/pre-stressed concrete "voided slabs". The slab units will span 36 feet and 6 inches between the abutments and pile bents.

Project component construction could occur two different ways. The contractor may be able to demolish and remove the existing tide gate structure working back towards the nearside bank, removing a section of the existing structure at a time. Alternately, the contractor may choose to install a temporary cofferdam and dewater a portion of the structure at a time to accomplish the demolition and construction of the new bridge abutments. If used, the coffer dam would be placed in such a way as to allow flow from C05 to continue through the channel and into Outer Bolsa Bay. The temporary coffer dam would be constructed of masonry blocks and sandbags wrapped in plastic or concrete k-rail and sandbags wrapped in plastic. The height of the coffer dam would not exceed approximately 5 feet. A silt curtain would also be in place to minimize turbidity during construction activities. The coffer dam would be opened or removed in the event of a forecasted storm to exceed 0.3 inch. The proposed project will require the removal of approximately 11 cubic yards of excess earthwork material and approximately 4,500 cubic yards of demolished concrete structure and miscellaneous fill material. These materials would be hauled off site after removal and excavation.

Construction equipment required for the proposed project component includes the following:

- crane,
- excavator,
- small front end loader,
- off-road forklift,
- loaders for excavated material,
- flatbed trucks to unload equipment and materials, and
- haul trucks.

This component of the proposed project would be installed in such a way as to avoid special status bird breeding and nesting season within the adjacent Bolsa Chica Ecological Reserve. Total construction time of this component is anticipated to be approximately 23 weeks. Construction staging would be about midway between the Oil Field Bridge and Graham Street on the south side of the channel.

Long-term maintenance and operation activities associated with this component of the proposed project would be similar to those associated with other bridges, such as the Warner Avenue Bridge. Typical maintenance activities that occur on bridges include repairing bent or damaged steel beams, cracked or spalled concrete, damaged expansion joints, bent or damaged railings, painting, erosion protection, and inspections.

2.3 Installing a Single Steel Sheet Pile Wall along the South Levee Crest of C02 Reach 23

This component of the proposed project involves re-construction of C02 Reach 23 from the outlet into Huntington Harbour upstream to the confluence of channel C02 with channel C04. The length of the proposed construction is approximately 8,900 linear feet.

Project component construction will consist of inserting a single sheet pile wall with a secondary anchor wall system on the south side of the channel only. The single sheet pile wall would be inserted at the hinge point of the existing maintenance road and the levee backslope on the south side of the channel. The row of single sheet pile would located outside of waters of the U.S. (WOUS) and waters of the State of California. The new maintenance road on the south side of the channel will be where the current backslope is located and the existing maintenance road will be excavated to the current elevation of the channel bed for a much wider channel than currently exists. Additionally, the earthen levee on the north side of the channel which has experienced significant erosion, will be graded and geocells will be placed to stabilize the improved slope. Native plantings will then be added to the geocells for further bank stabilization.

The Giken silent pile machine will be utilized for the insertion of the 36-foot-deep piles and 22-foot-deep anchor wall. The Giken machine pushes the pile into the ground without an impact hammer or vibration. The operation, with the exception of the crane engine (to hold the sheet) and the generator to power the Giken machine, is almost silent.

The steel sheet piles would be 36 feet long. The existing flood control channel is approximately 15 feet deep. The steel sheet piles will be embedded 30 feet below the grade of the existing channel invert and 18 feet above the grade of the existing channel invert. Most of the 18 feet of above grade sheet pile would be below the existing top of slope; 2 to 3 feet of sheet pile would extend above the existing top of slope. The steel sheet piles would be steel grade A690. No cathodic protection would be required. There is one bridge crossing within the reach of channel (i.e., Edinger Bridge), but it would not be reconstructed as part of the project.

Upon completion of the installation of the single row of sheet pile, the south earthen trapezoid side slope inside the channel and the existing maintenance road will be excavated to expose the vertical sheet pile to the channel flows, thus providing for the 100-year stormwater conveyance capacity within this channel reach. The final earthen invert grade elevation will be the same invert elevation that exists today. The soil will be removed from the channel with either an excavator or a front loader and placed in dump trucks for transport off the site. Access to the channel invert to remove the soil would occur from existing maintenance roads along the channel.

Prior to excavating the soil within the channel and grading of the northern earthen levee, installation of a temporary coffer dam will be required to block flows within the channel from where soil is being excavated and graded. In all, two temporary coffer dams will be required: a coffer dam from the confluence of C02 with Huntington Harbour upstream to the confluence of C02 and C04 along the south side of the channel, and a coffer dam from the confluence of C02 with Huntington Harbour upstream to the confluence of C02 and C04 along the north side of the channel. The coffer dams would be placed in such a way as to allow flow within the channel to continue through the area. For example, during excavation of the soil from the channel along the south levee, the temporary coffer dam from the confluence of C02 with Huntington Harbour upstream to the confluence of C02 and C04 along the south side of the channel would be in place. Flow within the channel would be able to continue along the north side of the channel. The temporary coffer dams would be constructed of masonry blocks and sandbags wrapped in plastic or concrete k-rail and sandbags wrapped in plastic. The height of the coffer dams would not exceed approximately 5 feet. The coffer dams would be opened or removed in the event of a forecasted storm to exceed 0.3 inch.

Overall, the following construction equipment is expected to be used during construction of this proposed project component:

- Giken silent pile driver,
- crane,
- excavator,
- small front end loader,
- off-road forklift,
- water truck, street sweeper,
- flatbed trucks to unload equipment and materials, and
- haul trucks.

This component of the proposed project would be installed in several phases in order to avoid special status bird breeding and nesting seasons within the adjacent Seal Beach National Wildlife Refuge. Total construction time of this component is anticipated to be approximately 40 weeks. Vehicular access would be via existing access points to the existing maintenance roads on both sides of the channel. Construction staging would be located adjacent to Edinger Bridge on the south side of the channel and at the confluence of C02 and C04.

Long-term maintenance and operation activities associated with this component of the proposed project would be similar to those associated with the existing channel. The design is such that maintenance is expected to be very minimal to non-existent. The project area is not prone to sediment deposition or scour. Inspection of the channel by OCPW Operations and Maintenance personnel will occur every month as well as after every significant rainfall event.

2.4 Installing Dual Sheet Pile Walls Along the North and South Levee Crests of C05 Reach 1

The proposed modification and design is the same used in C05 Reach 1 from approximately 2,025 feet downstream of Graham Street upstream to Warner Avenue (completed in 2014) and from Warner Avenue upstream to 1,250 feet downstream of Goldenwest Street. This component of the proposed project involves re-construction of C05 Reach 1 from the tide gates located at the downstream end of C05 Reach 1 upstream to approximately 2,200 feet downstream of Graham Street. The length of the proposed construction is approximately 4,600 linear feet along both embankments.

Project component construction will consist of inserting two parallel sheet pile walls on both sides of the channel. One row of sheet piles would be inserted at the hinge point of the existing maintenance road and the levee backslope on both sides of the channel and the second row would be driven 15 feet farther from the channel and parallel to the first row. The second row of sheet piles would be most of the distance down the levee backslope. All four rows of sheet piles (two rows on each side of the channel) would be located outside of waters of the U.S. (WOUS) and waters of the State of California. The new maintenance roads on both sides of the channel will be where the current backslopes are located and the existing maintenance roads will be excavated to the current elevation of the channel bed for a much wider channel than currently exists.

The Giken silent pile machine will be utilized for the insertion of the 60-foot-deep piles. The Giken machine pushes the pile into the ground without an impact hammer or vibration. The operation, with the exception of the crane engine (to hold the sheet) and the generator to power the Giken machine, is almost silent.

The steel sheet piles would be 60 feet long. The existing flood control channel is approximately 13 feet deep. The steel sheet piles will be embedded 30 feet below the grade of the existing channel invert and 15

feet above the grade of the existing channel invert. Most of the 15 feet of above grade sheet pile would be below the existing top of slope; 2 to 3 feet of sheet pile would extend above the existing top of slope. Soil cement columns (3-ft diameter) will be installed between the steel sheet piles and 40 feet below the existing channel invert grade and 10 feet above the invert grade.

The steel sheet piles would be marine grade and corrosion resistant. No cathodic protection would be required. There is one bridge crossing within the reach of channel to be reconstructed, Oil Field Bridge.

Upon completion of the installation of the four rows of sheet piles, and during the installation of the soil-cement columns between the sheet piles, the earthen trapezoid side slopes inside the channel and the existing maintenance roads will be excavated to expose the vertical sheet piles to the channel flows, thus providing for the 100-year stormwater conveyance capacity within this channel reach. The final earthen invert grade elevation will be the same invert elevation that exists today. The soil will be removed from the channel with either an excavator or a front loader and placed in dump trucks for transport off the site. Access to the channel invert to remove the soil would occur from existing maintenance roads along the channel.

After the four rows of sheet piles have been installed, cement will be mixed with the soil between the two parallel sheet pile walls to create soil-cement columns. The purpose of the soil-cement columns is to provide structural stability to the parallel sheet pile wall system and prevent piping of the poor quality, liquefiable, in-situ soils through joints in the sheet pile walls or under the sheet piles. Asphalt paved maintenance roads will be constructed on top of the soil-cement columns after they have cured. The dual rows of sheet piles will act as construction best management practices (BMPs) during the installation of the soil-mix columns.

Prior to excavating the soil within the channel, installation of a temporary coffer dam will be required to block flows within the channel from where soil is being excavated. In all, four temporary coffer dams will be required: a coffer dam from the tide gates upstream to the oil field bridge along the south side of the channel, a coffer dam from the tide gates upstream to the oil field bridge along the north side of the channel, a coffer dam from the oil field bridge upstream to approximately 2,600 feet downstream of Graham Street along the south side of the channel, and a coffer dam from the oil field bridge upstream to approximately 2,600 feet downstream of Graham Street along the north side of the channel. Only one coffer dam would be in place at a time, so as to allow flow within the channel to continue through the area. For example, during excavation of the soil from the channel along the south levee, the temporary coffer dam from the tide gates upstream to the oil field bridge along the south side of the channel would be in place. Flow within the channel would be able to continue along the north side of the channel. The temporary coffer dams would be constructed of masonry blocks and sandbags wrapped in plastic or concrete k-rail and sandbags wrapped in plastic. The height of the coffer dams would not exceed approximately 5 feet. The coffer dams would be opened or removed in the event of a forecasted storm to exceed 0.3 inch.

Overall, the following construction equipment is expected to be used during construction of this proposed project component:

- Giken silent pile driver,
- crane,
- medium to large-size backhoes,
- front-end loader,
- flatbed trucks to unload equipment and materials,
- off-road forklift,

- concrete trucks and pumps, and
- haul trucks.

This component of the proposed project would be installed in several phases in order to avoid special status bird breeding and nesting seasons within the adjacent Bolsa Chica Ecological Reserve. Total construction time of this component is anticipated to be approximately 20 months. Vehicular access would be via existing access points to the existing maintenance roads on both sides of the channel. Construction staging would be about midway between the Oil Field Bridge and Graham Street on the south side of the channel.

Long-term maintenance and operation activities associated with this component of the proposed project would be similar to those associated with the existing channel. The design is such that maintenance is expected to be very minimal to non-existent. The project area is not prone to sediment deposition or scour. Inspection of the channel by OCPW Operations and Maintenance personnel will occur every month as well after every significant rainfall event.

Both the USFWS and NMFS have expressed their desire for the USACE to evaluate further whether or not the dual sheetpile is necessary for flood control purposes in Reach 1 of C05, specifically in the portion of Reach 1 that is adjacent to the Bolsa Chica Ecological Reserve. Although this feature is included in the Recommended Plan at this time, the USACE is committed to further evaluating if the proposed dual sheet pile on the north levee of C05 Reach 1 adjacent to the muted tidal pocket of the Bolsa Chica Ecological Reserve is necessary. This evaluation would occur during the next phase of the project, the preconstruction engineering and design (PED) phase. During the PED phase of the project, the USACE is required by policy to perform value engineering (VE) studies on high dollar project components. Value engineering is an organized effort directed at analyzing proposed building features, systems, equipment, and material for the purpose of achieving essential functions at the lowest life cycle cost consistent with required performance, quality, reliability, and safety. Removal or modification of pertinent sections of the C05 levee will be considered under the VE study very early in the implementation phase of the project because downstream components would be the first to be constructed. Preliminary estimates show that there could be a significant cost savings to the project by eliminating the work related to this portion of the C05 channel, if feasible.

2.5 Converting Earthen/Riprap/Concrete Lined Trapezoidal Channels to Open Rectangular Concrete Lined Channels in C04 (Reaches 20 and 22), C05 (Reaches 2, 3, 4, 5, 6, 8, 9, and 12) and C06 (Reaches 13, 14, 16, 17, 19)

This component of the proposed project involves modifying earthen/riprap/concrete lined trapezoidal channels within the C04, C05, and C06 systems to open rectangular concrete channels. The proposed modifications would consist of replacing approximately 67 acres of existing trapezoidal riprap channel and 61 acres of existing trapezoidal concrete channel with an open rectangular concrete channel. There are 143 acres of earthen bottom channels of which there will be no net loss of. The 143 acres of earthen bottom channels will remain earthen bottom and are discussed in Section 2.3 and 2.4. The new open rectangular channels would be varying widths and depths depending on freeboard requirements and adjacent curb elevations. In addition, approximately 35 single barrel reinforced concrete box (RCB)/ double barrel RCBs and 3 pedestrian span bridges will be replaced in order to accommodate the change in channel geometry from trapezoidal to rectangular.

Project component construction will consist of demolition of the existing channels (e.g., removal of riprap/concrete), excavation of trapezoid side slopes (to create rectangular channel), excavation of soil

from channel bottom (to maintain existing channel invert), and lining with concrete. The modified channels would be constructed of cast-in-place concrete. Similarly, the majority of crossings would be replaced with cast-in-place RCBs of different dimensions. Prior to construction activities, installation of an upstream and downstream temporary coffer dam would be required to block flows within the channel where construction would be occurring. The downstream cofferdam would prevent tidal inundation from downstream and the upstream coffer dam would prevent inundation from urban runoff flows from upstream. The temporary coffer dams would be constructed of masonry blocks and sandbags wrapped in plastic or concrete k-rail and sandbags wrapped in plastic. The height of the coffer dams would not exceed 5 feet. The coffer dams would be opened or removed in the event of a forecasted storm to exceed 0.3 inch. The urban runoff from upstream of the construction sites will be placed in a temporary 12-inch to 18-inch diameter PVC pipe and pumped around the construction site or through the channel with a gravity fed diversion conduit.

Overall, the following construction equipment is expected to be used during construction of this proposed project component:

- medium to large-sized backhoes,
- excavator,
- loaders for excavated material,
- flatbed trucks to unload equipment and steel reinforcement,
- concrete trucks and pumps,
- bulldozer,
- compaction equipment,
- water truck,
- street sweeper, and
- haul trucks.

This component of the proposed project would be installed in multiple phases since the assumed delivery method is design-bid-build. This means that while a reach is being constructed, the upstream reach would be designed. Construction on the upstream reach would not begin until construction of the lower reach is completed. This would continue until the entire proposed project has been constructed. The design and bid phase for each reach is expected to take approximately 15 months. Total construction time of this component is anticipated to be approximately 14 to 19 years.

Long-term maintenance and operation activities with this component of the proposed project would be similar to those associated with the existing channels. Typical maintenance activities include vegetation control, rodent control, levee and channel repair, and sediment removal from within the channels if needed. Inspection of the channels by OCPW Operations and Maintenance personnel will occur every month as well as after every significant rainfall event.

2.6 Constructing a Diversion Channel Connecting C04 Reach 21 to Reach 20

This component of the proposed project involves constructing a diversion channel to address flooding caused by a restriction where flows in C04 are directed into a long reach of covered conduit that runs under I-405 and the Westminster Mall (*Figure 2*). The diversion will span two reaches in C04 (Reaches 20 and 21) and be a combination of open channel and reinforced concrete box (RCB). It would split off of Reach 21 at the intersection of Hoover and Hazard streets, run west along an abandoned Navy railroad line to the north of Westminster Mall, and then turn south underneath Edwards Street until it reconnects with Reach 20 (where Reach 20 goes underground) near the intersection of Edwards Street and Bolsa Avenue (*Figure 3*).

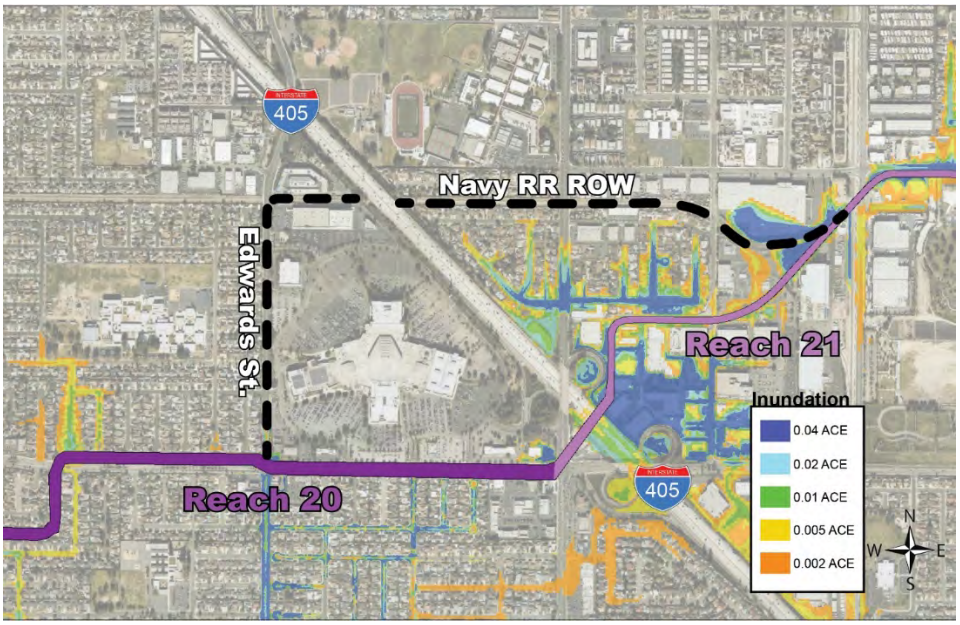

Figure 3: Proposed alignment of diversion channel at Westminster Mall (Black Dashed Line) would reduce flooding on C04 Reach 21 where it crosses I-405.

Project component construction will consist of excavation of soil from the proposed new channel and lining with concrete. The channel would be constructed of cast-in-place concrete. Once the channel is excavated, installation of an upstream and downstream temporary coffer dam would be needed to prevent flows from entering the unfinished diversion channel. The temporary coffer dams would be constructed of masonry blocks and sandbags wrapped in plastic or concrete k-rail and sandbags wrapped in plastic. The height of the coffer dams would not exceed 5 feet. Flows within the C04 channel system would be able to continue through the channels as the temporary cofferdams on the diversion channel would not interfere with flow.

Overall, the following construction equipment is expected to be used during construction of this proposed project component: medium to large-sized backhoes,

- excavator,
- loaders for excavated material,
- flatbed trucks to unload equipment and steel reinforcement,
- concrete trucks and pumps,
- bulldozer,
- compaction equipment,
- water truck,
- street sweeper, and
- haul trucks.

This component of the proposed project would be constructed in a single phase. Total construction time of this component is anticipated to be approximately 2.5 years. Construction staging would be located within the diversion channel rights-of-way.

Long-term maintenance and operation activities with this component of the proposed project would be similar to those associated with the existing channels. Typical maintenance activities include vegetation

control, rodent control, levee and channel repair, and sediment removal from within the channels if needed. Inspection of the channels by OCPW Operations and Maintenance personnel will occur every month as well as after every significant rainfall event.

2.7 Compensatory Mitigation Activities

Compensatory mitigation activities include eelgrass transplants in Outer Bolsa Bay (OBB), enhancement of the muted tidal pocket within the Bolsa Chica Ecological Reserve, and adding sand to the north and south tern islands within the Bolsa Chica Ecological Reserve to increase their resiliency to future sea level rise.

Approximately 0.5 acre of eelgrass would be planted to mitigate for indirect impacts to eelgrass due to implementation of the Proposed Project (out-of-kind mitigation is also proposed at the Palos Verdes Rocky Reef Restoration Project, but a description of those activities are not included here). Plant material will be salvaged from donor beds. The proposed eelgrass mitigation will utilize anchored bare-root transplant units. The anchors used will be biodegradable and pliable anchors. Staging and work areas will be situated on the levee along the north side of C05 Reach 1. Work areas will be set up within the channel right-of-way to avoid conflicts with hikers and bikers using the BCER trail system. Planting will be conducted using divers working on a defined planting grid with temporary boundary lines to control planting areas. The plant materials will be planted by excavating a hole in the sediments with a small trowel or by hand.

The muted tidal pocket would be enhanced by enlarging the culvert at the downstream end and inserting a hydraulic stop-log structure at the upstream end. Staging and work areas would be situated along the maintenance road on the north side of C05 Reach 1 within the channel right-of-way. An excavator would be used to remove soil along approximately 20 linear feet of the north levee, extending from approximately the Oil Field Bridge downstream. Soil that is removed from the levee would be disposed of at an appropriate landfill. Once the breech is complete, large stone will be placed to protect the opening from erosion and scour. For the culvert replacement at the downstream end, staging and work areas would be situated along the maintenance road on the north side of C05 Reach 1 within the channel right-of-way. An excavator would be used to remove the existing culvert. Soil that is removed from the area would be disposed of at an appropriate landfill.

For the tern islands, staging and work areas would be situated along the maintenance road to the east of the islands. A crane would be used to place approximately two feet of sand on top of the north and south tern islands. Sand would be clean, inert material purchased from a commercial supplier.

The compensatory mitigation component of the Recommended Plan would likely be constructed in a single phase. Total construction time of this component is anticipated to be approximately five months.

2.8 Summary of the Proposed Project

Table 1 and *Figure 4* provide a summary of the Proposed Project modifications which were described in more detail in Section 2.1 through 2.6.

Table 1: Summary of the Recommended Plan Modifications

Downstream Measures				
Feature		**Location**	**Existing Condition**	**Modification**
Warner Avenue Bridge		Outer Bolsa Bay/Huntington Harbour	Approximately 100-foot span	Increasing span to 180-ft and removal of approximately 0.85 acre upland habitat south of bridge adjacent to Bolsa Chica Conservancy
Tide Gates		C05 Reach 1	Tide gates	Permanent removal of tide gates and replacement with a new bridge
C02/C04 Channels				
Channel	**Reach**	**Location**	**Existing Condition**	**Modification**
C02	23	Edinger Bridge upstream to confluence of C02/C04	Earthen trapezoidal	Single sheet pile wall driven into existing south levee (approx. 8,900 linear feet) along with anchor column tieback system; excavation of south levee toe. North levee slope protection to include regrading and vegetated cellular confinement system.
C04	20	C02/C04 confluence upstream to Bolsa Chica Street	Riprap lined trapezoidal	80-foot concrete rectangular with middle 48 feet of channel left earthen
		Bolsa Chica Street upstream to Graham Street	Earthen and riprap lined trapezoidal	80-foot concrete rectangular with middle 48 feet of channel left earthen
		Graham Street upstream to McFadden Avenue	Earthen trapezoidal	80-foot concrete rectangular with middle 48 feet of channel left earthen
		McFadden Avenue upstream to Bolsa Avenue	Riprap lined trapezoidal	68-foot concrete rectangular with middle 40 feet of channel left earthen
		Bolsa Avenue upstream to Edwards Street	Earthen and riprap lined trapezoidal	55-foot concrete rectangular
		Edwards Street upstream to I-405	Concrete lined rectangular	No Change to Existing Condition
C04	21	I-405 upstream to Beach Boulevard	Concrete lined rectangular	Navy Railroad Reroute
C04	22	Beach Boulevard upstream to Magnolia Street	Concrete lined compound	Base of concrete lined channel increased to 35 feet
		Magnolia Street upstream to Brookhurst Street	Concrete lined rectangular	Concrete lined rectangular
		Brookhurst Street upstream to Westminster Avenue	Riprap lined trapezoidal	Concrete lined trapezoidal
		Westminster Avenue upstream to SR-22	Concrete lined trapezoidal	18-foot concrete rectangular

C05/C06 Channels				
Channel	**Reach**	**Location**	**Existing Condition**	**Modification**
C05	1	Tide gates upstream to Graham Street	Earthen levee with some steel sheetpile on south bank from Graham Street downstream 1900 feet	Sheetpile/soft bottom/splash walls (various heights)
		Graham Street upstream to Warner Avenue	Steel sheetpile walls on north and south banks	Sheetpile/soft bottom/splash walls (various heights)
		Warner Avenue upstream to approximately 1,300 feet east of Edwards Street	Earthen levee	Sheetpile/soft bottom/splash walls (various heights)
	2	1,300 feet east of Edwards Street upstream to C05/C05 confluence	Concrete lined rectangular	Concrete lined rectangular with 1-foot splash walls
	3	C05/C06 confluence upstream to Woodruff Street	Riprap lined trapezoidal	Concrete lined rectangular; some sections of 1-foot splash wall between Beach Boulevard and Woodruff Street
		Woodruff Street upstream to I-405	Concrete lined rectangular	No Change to Existing Condition
	4	I-405 upstream to Quartz Street	Concrete lined rectangular	No Change to Existing Condition
		Quartz Street upstream to Bushard Street	Riprap lined trapezoidal	Concrete lined rectangular with splash walls of various heights
	5	Bushard Street upstream to Brookhurst Street	Riprap lined trapezoidal	Concrete lined rectangular with splash walls of various heights
		Brookhurst Street upstream 1,300 feet	Concrete lined trapezoidal	Concrete lined rectangular with splash walls of various heights
		1,300 feet northeast of Brookhurst Street upstream to 3rd Street	Riprap lined trapezoidal	Concrete lined rectangular with splash walls of various heights
	6	3rd Street upstream to southeast portion of Rosita Park	Concrete lined trapezoidal	Concrete lined rectangular
	7	Southeast portion of Rosita Park upstream to Hazard Avenue	Covered concrete conduit	No Change to Existing Condition
	8	Hazard avenue upstream to south portion of Orange County Transportation hub	Concrete lined trapezoidal	Concrete lined rectangular
	9	South portion of Orange County Transportation hub upstream to Garden Grove Boulevard	Concrete lined trapezoidal	Concrete lined rectangular
	10	Garden Grove Boulevard upstream to Haster Basin	Covered concrete conduit	No Change to Existing Condition

	11	Haster Basin upstream approximately 1,200 feet	Covered concrete conduit	No Change to Existing Condition
	12	Approximately 1,200 feet northeast of Haster Basin upstream to Chapman Avenue	Concrete lined trapezoidal (first 1,400 feet) and covered concrete conduit (next 1,000 feet)	Concrete lined rectangular with splash walls of various heights; Haster Basin inlet culverts modified
C06	13	Confluence of C05/C06 upstream to Bolsa Avenue/Route 39	Earthen trapezoidal	Concrete lined rectangular
		Bolsa Avenue/Route 39 upstream to Ross Lane	Riprap lined trapezoidal	Concrete lined rectangular
	14	Ross Lane upstream approximately 750 feet	Concrete lined rectangular	Concrete lined rectangular with 1.5 to 2 foot splash walls from Asari Lane upstream to Riverbend Road
	15	Approximately 750 feet northeast of Ross Lane upstream to I-405	Covered concrete conduit	No Change to Existing Condition
	16	I-405 upstream to Bushard Street	Concrete lined rectangular	Concrete lined rectangular widened to 30 feet
	17	Bushard Street upstream to Brookhurst Street	Earthen and riprap lined trapezoidal	Concrete lined rectangular with 1 foot splash walls
	18	Mile Square Park	Concrete low flow v-channel	No Change to Existing Condition
	19	Euclid Street upstream to Newhope Street	Riprap lined trapezoidal	Concrete lined rectangular

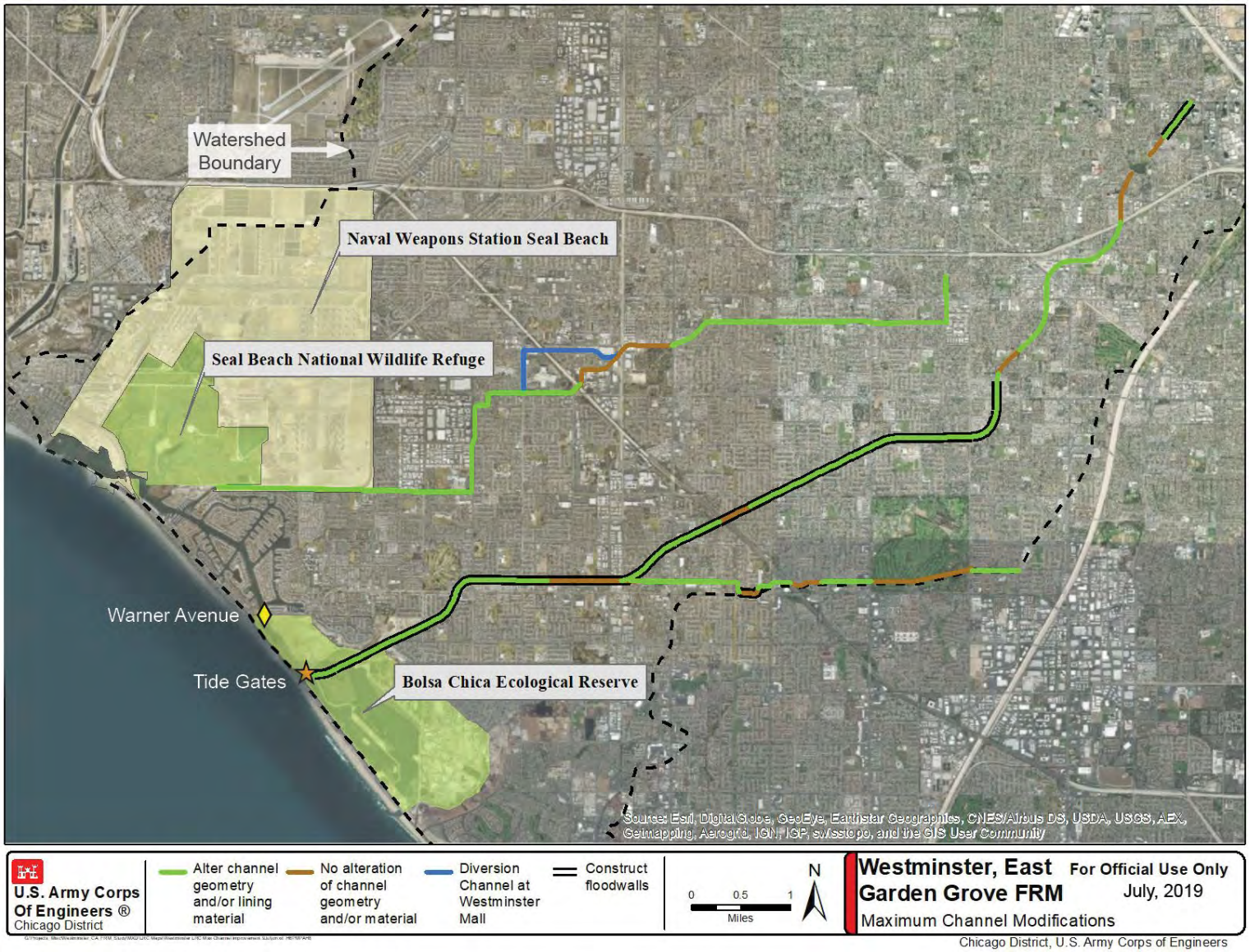

Figure 4: Recommended Plan Modifications

3.0 Listed Species & Critical Habitat in the Proposed Projects Biological Study Area

Thirteen federally listed species were identified as having the potential to occur within the biological study area (BSA) (*Table 3*). Of these species, salt marsh bird's-beak, Ventura marsh milk-vetch, California least tern, light-footed Ridgway's rail, western snowy plover, and green turtle have potential or limited potential to occur within the Proposed Project's action area and/or adjacent to the Proposed Project's action area. The remaining species are not expected to occur in or adjacent to the Proposed Project's action area because they are associated with particular habitat types that are absent from the action area, because they were not observed during a 2019 reconnaissance level survey, or because they are not known to occur in the immediate vicinity of the Proposed Project.

Table 2: Federally Listed Species and Critical Habitat Potentially Occurring or Known to Occur in the Project Area.

Species	Status[a]	General Habitat Description	Rationale (Potential For Species To Occur); Results of Literature Review/Recon Surveys
Salt Marsh Bird's-beak (*Cordylanthus maritimus* sp. *maritimus*)	FE	Occurs in sandy soils in upper coastal salt marsh.	Not expected to occur; limited suitable habitat.
San Diego Button-celery (*Eryngium aristulatum var. parishii*)	FE	Vernal pool obligate	Not expected to occur; no suitable habitat.
Ventura Marsh Milk-vetch (*Astragalus pycnostachyus var. lanosissimus*)	FE	Occurs in open, disturbed areas with sandy to gravelly substrate.	Not expected to occur; limited suitable habitat.
California seablite (*Suaeda californica*)	FE		Not expected to occur; limited suitable habitat.
California Least Tern (*Sterna antillarum browni*)	FE	Nests on sandy beaches.	Limited potential to occur for foraging; limited suitable foraging habitat. Not expected to occur for nesting; no suitable nesting habitat.
Coastal California Gnatcatcher (*Polioptila californica californica*)	FT	Obligate resident of coastal sage scrub vegetation types.	Limited potential to occur; limited marginally suitable habitat.
Least Bell's Vireo (*Vireo bellii pusillus*)	FE	Occurs along riparian habitat.	Not expected to occur; no suitable habitat.
Light-footed Ridgway's Rail (*Rallus obsoletus levipes*)	FE	Occurs in coastal salt marshes of pickleweed and Pacific cordgrass.	Limited potential to occur for foraging; limited suitable foraging habitat. Not expected to occur for nesting; no suitable nesting habitat.
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	FE	Usually breeds in patchy to dense riparian habitats along streams or other wetlands, near or adjacent to surface water.	Not expected to occur; no suitable habitat.
Western Snowy Plover (*Charadrius alexandrines nivosus*)	FT	Coastal beaches, sand spits, dune-backed beaches, sparsely vegetated dunes, beaches at creek and river mouths, and salt pans at lagoons and estuaries.	Limited potential to occur for foraging; limited suitable foraging habitat. Not expected to occur for nesting; no suitable nesting habitat.

Species	Status[a]	General Habitat Description	Rationale (Potential For Species To Occur); Results of Literature Review/Recon Surveys
Western Snowy Plover Critical Habitat	N/A	N/A	N/A
San Diego Fairy Shrimp (*Branchinecta sandiegonensis*)	FE	Vernal pool obligate	Not expected to occur; no suitable habitat
Green Turtle (*Chelonia mydas*)	FE	Generally found in fairly shallow waters (except when migrating) inside reefs, bays, and inlets. Completely herbivorous, needs adequate supply of sea grasses and algae.	Limited potential to occur; limited suitable habitat.
Pacific Pocket Mouse (*Perognathus longimembris pacificus*)	FE	Coastal dunes, coastal strands, and coastal sage scrub with alluvial sands.	Not expected to occur; no suitable habitat.

[a] FE – Federally Endangered, FT – Federally Threatened, and N/A – Not Applicable.

3.1 Studies Required

The biological study area for the Proposed Project includes the extent of potential direct and indirect impacts to special status species. The extent of potential direct impacts was assessed to be those occurring within the Proposed Project's action area, defined as where construction activities and staging of construction equipment would be occurring. The extent of potential indirect impacts was assessed to be those occurring within 500 feet of the Proposed Project's action area. Five hundred feet was chosen for the extent of indirect impacts since it is the range to which noise from construction activities could disrupt special status species, primarily bird species. *Figure 5* shows the extent of potential direct and indirect impacts within the Proposed Project's action area.

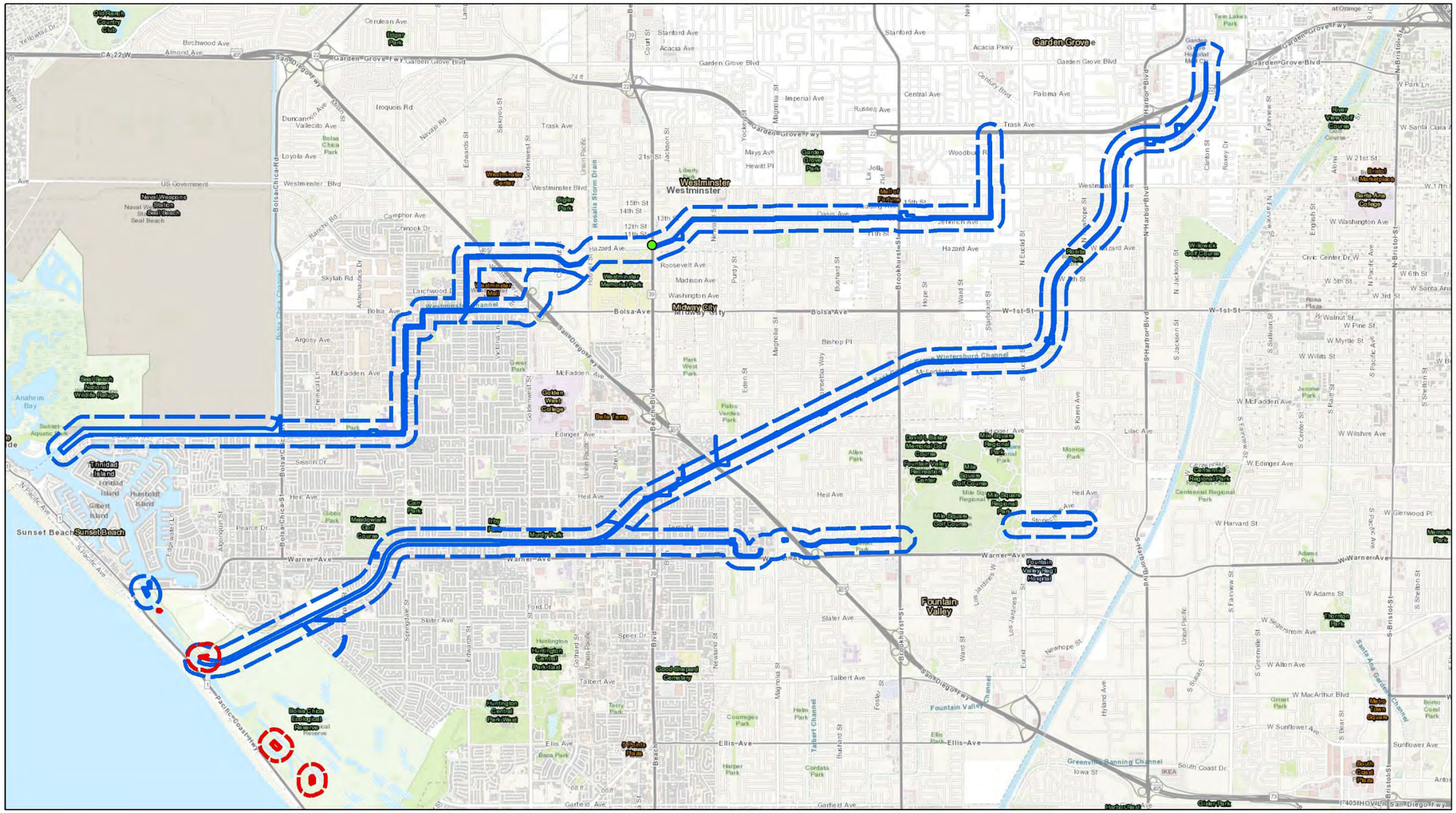

Figure 5: Overview of the Proposed Project's Action Area Showing the Biological Study Area Which Includes Potential Extent of Direct and Indirect Effects of the Proposed Project and Compensatory Mitigation Features on Special Status Species.

3.1.1 Literature Review

A literature review was conducted prior to the initiation of the reconnaissance level survey in order to identify special status species known to occur in the Proposed Project region that may have potential to occur in the BSA. This review included the California Native Plant Society's Electronic Inventory of Rare and Endangered Vascular Plans of California (CNPS 2019; U.S. Geological Survey [USGS] Seal Beach and Huntington Beach 7.5-minute topographical quadrangles), and the CDFW's California Natural Diversity Database (CDFW 2019; same quadrangles).

In addition, a list of Proposed, Threatened, or Endangered species; designated critical habitat; and Candidate species potentially occurring within the BSA was generated from the United States Fish and Wildlife Service's (USFWS) Information for Planning and Conservation (IPaC) website for the Proposed Project's action area. This list meets the requirements of Section 7(c) of the Endangered Species Act of 1973, as amended, and is provided in Appendix B.

3.1.2 General Flora and Fauna Surveys

Detailed focused flora and fauna surveys have not been conducted since the Proposed Project is still in the feasibility level phase. A reconnaissance level survey of flora was conducted in May 2018 and again in July 2019. Vegetation mapping of the Bolsa Chica Ecological Reserve and the Seal Beach National Wildlife Refuge were obtained from published documents available online. In addition, eelgrass mapping within Huntington Harbor was obtained from published documents available online. Focused plant surveys and vegetation mapping would be conducted during the next phase of the project, the preconstruction engineering and design (PED) phase, if the proposed project is approved.

Similarly to flora, focused fauna surveys have not been conducted. A reconnaissance level survey of fauna was conducted in July 2019. In addition, species lists from the Bolsa Chica Ecological Reserve and the Seal Beach National Wildlife Refuge were obtained from CDFW and published documents available online, respectively. Focused fauna surveys would be conducted during the next phase of the project, the PED phase, if the proposed project is approved.

3.1.3 Jurisdictional Delineation

A jurisdictional delineation was conducted for the BSA to provide baseline data concerning the type and extent of resources under the jurisdiction of USACE. The delineation was conducted to identify the extent of the Corp's Section 404 Clean Water Act and Section 10 Rivers and Harbors Act jurisdiction within the BSA. The delineation was conducted based on site evaluation including office and field determination. Results of the delineation are included in Appendix D. Appendix E includes figures showing the delineation results along with the Proposed Project's modifications.

4.0 Environmental Baseline Conditions

The Proposed Project's BSA includes constructed flood control channels or storm drains of the East Garden Grove-Wintersburg Channel (C05), Oceanview Channel (C06), Westminster Channel (C04), and the Bolsa Chica Channel (C02). These channel systems collect runoff from the urbanized areas in the cities of Santa Ana, Garden Grove, Westminster, Fountain Valley, Seal Beach, and Huntington Beach.

The Bolsa Chica Channel (C02) is divided into seven reaches beginning with Reach 23 and ending at Reach 29, but only Reach 23 is included in the study area. Reach 23 is approximately 1.5 miles long. The drainage area for the Bolsa Chica Channel consists of approximately 8.8 square miles and includes portions of the cities of Anaheim, Cypress, Garden Grove, Los Alamitos, Stanton, and unincorporated Orange County territory. The area surrounding the channel is fully developed for residential, commercial,

industrial, educational, and recreational uses. The channel runs adjacent to the Naval Weapons Station Seal Beach (NWSSB). It also runs through and adjacent to the Los Alamitos Armed Forces Training Base. Apart from the two military installations, this portion of the watershed is almost entirely urbanized.

The Westminster Channel (C04) is approximately eight miles long. The channel collects storm runoff from an approximately 10.9 square mile drainage area and is located in the cities of Santa Ana, Huntington Beach, Westminster, and Garden Grove. The channel begins at its confluence with C02 in Huntington Beach and extends northeast into Westminster and Garden Grove. The channel is divided into three reaches beginning with Reach 20 and ending at Reach 22.

The East Garden Grove-Wintersburg Channel (C05) is approximately 11.5 miles in length from Reach 1 through Reach 12. The C05 channel begins upstream of Haster Basin (i.e., Haster Basin Recreational Park) located in the City of Garden Grove and flows southwest through the cities of Santa Ana, Garden Grove, Westminster, and Huntington Beach before discharging into Bolsa Chica, Outer Bolsa Bay then into Huntington Harbour and ultimately into the Pacific Ocean. The channel collects storm runoff from an approximately 22.2 square mile drainage area (not including drainage area associated with the Oceanview Channel [C06]). The principle tributary is the OV channel (C06) that runs through the lower portion of the Westminster watershed and drains into Bolsa Bay. Bolsa Bay is home to the BCER and Bolsa Chica State Beach.

The Oceanview Channel (C06) is approximately 4.1 miles long from Reach 13 through Reach 19 (from Newhope Street to the confluence with the East Garden Grove Wintersburg [EGGW] channel) and is a tributary to the EGGW channel. The C06 channel begins east of Mile Square Park in the City of Fountain Valley and flows west through the park into the City of Huntington Beach, where it discharges into C05 at a point northeast of the intersection of Gothard Street and Warner Avenue. The channel provides flood risk management to approximately 5.1 square miles of residential or industrial areas in the cities of Fountain Valley and Huntington Beach, California.

Bolsa Chica Bay Marsh Area (at the downstream end of C05) is a biologically sensitive area that is environmentally protected. The area includes a multitude of existing and migrating species within a fresh water body.

The Non-functioning Tide Gate and Tidal Influence on the C05 Channel is currently a series of tide gates in Reach 1 of the C05 channel that serves to regulate and manage the coastal tidal influence, however, existing conditions indicate that the gates are not functioning as designed. Therefore, the lower reaches of the C05 channel convey urban runoff from upstream, yet are tidally influenced from the Pacific Ocean inlet at Bolsa Chica Bay. The tide gate is operated by OCPW.

Anaheim Bay-Seal Beach National Wildlife Refuge is part of the extensive San Diego NWR Complex and is located within the NWSSB. It encompasses 965 acres of remnant saltwater marsh in the Anaheim Bay estuary and serves as a significant stopover and wintering area along the Pacific Flyway for shorebirds. The refuge provides essential habitat for two federally listed endangered species — the light-footed Ridgway's rail (*Rallus obsoletus levipes*) and the California least tern (*Sternula antillarum browni*) — as well as the federally threatened western snowy plover (*Charadrius nivosus nivosus*), the state endangered Belding's savannah sparrow (*Passerculus sandwhichensis beldingi*) and a variety of migratory shorebirds, waterfowl, and seabirds. The green turtle (*Chelonia mydas*) has also been observed in one of the Refuge's four tidal basins (7th Street Pond), as well as the channel that extends from Anaheim Bay into the tidal basin. The green turtle is a federally-listed threatened species. USFWS operates the Nature Center on the Refuge in cooperation with the Navy.

Huntington Harbour is the discharge point for C02 and includes a public marina and facilities that are highly used by the public. Huntington Harbour also receives flows from the terminus of C05.

Figure 6: Riprap lined trapezoidal and earthen trapezoidal channels found within the Westminster watershed.

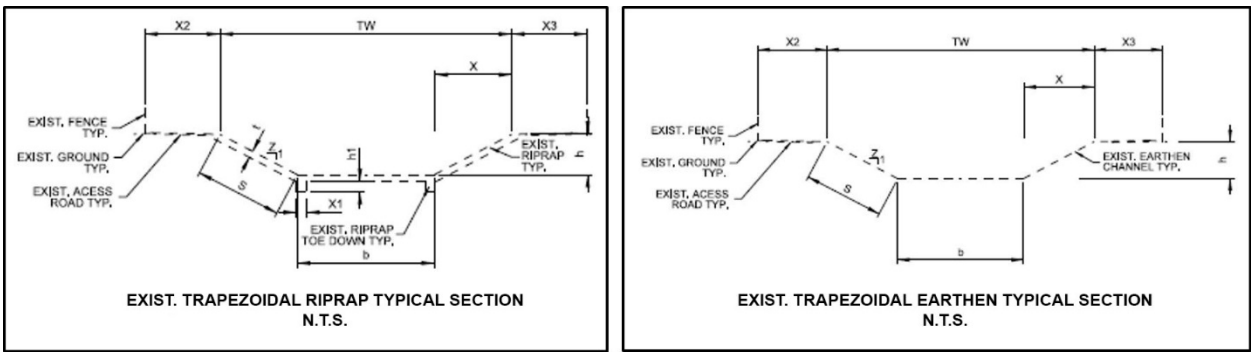

Figure 7: Example trapezoidal riprap and earthen channel cross-sections found within the Westminster watershed.

Figure 8: Existing channel geometry

Figure 9: Existing channel bottom conditions.

4.1 Biological Resources

This biological section provides a preliminary assessment of the biological resources existing within the project boundary of the Westminster watershed, Orange County, California. The section identifies the plant and animal resources including potential sensitive flora and fauna in the vicinity of the project channels and existing assessment of the channels for habitat value, which includes vegetation types as well as animal assemblages.

Channels within the Proposed Project area have been modified as discussed above and illustrated in *Figure 6*, *Figure 7*, *Figure 8*, and *Figure 9*. Elevations in the watershed range from 10 to 107 feet. Nearly all of the watershed tributaries to the channels are fully developed for residential, commercial, industrial, educational, and recreational uses. Modifications to the channels are being considered to increase the system's capacity to handle flood events. Therefore, the biological baseline description will describe the project limits in terms of what is presently there, concentrating on the channels that have some remaining biological resources.

Historically, thousands of acres of highly productive estuaries (e.g., saltwater and freshwater marshes) extended from Anaheim Bay to the Huntington Beach bluffs, including the area known as Bolsa Chica. In 1899, Bolsa Chica was diked to create the Bolsa Chica Gun Club, and later diked further and drained for oil extraction that began in the 1940s. Since then, much of the adjacent wetland and aquatic areas have been drained or filled for development. In the early 1970s, the remaining wetlands at Bolsa Chica were proposed for large-scale residential and commercial developments; however, these developments did not come to realization. In 1997, under a State-federal interagency agreement, most of the remaining lowland portions of Bolsa Chica were purchased by the State of California using mitigation funds from the Ports of Los Angeles and Long Beach for the purpose of wetland restoration.

Nearly 600 acres of marine and wetland habitat at Bolsa Chica have been restored or rehabilitated south of the C05 channel. Major components include: 1) removal and clean-up of oil extraction facilities from part of the wetlands area; 2) restoration of full tidal influence through a new inlet, bridge construction and excavation of a tidal basin; 3) creation and enhancement of aquatic habitats and intertidal wetlands; 4) creation of nesting and feeding areas for threatened and endangered birds; and 5) preservation of non-tidal wetlands.

The vegetation resources are typical of constructed flood control channels (channels) in the geographic urban environment. The vegetation in the channels is dominated by annual, weedy, and ruderal species. Correspondingly, native as well as non-native and invasive vegetation types are found here. The vegetation in channel is providing some value as habitat, although it is minimal. Ongoing vegetation management activities are taking place throughout the channels, which has some impacts on extant biological communities. In some areas (C04 Reach 22) it appears that habitat is being altered via vegetation management activities, and in other places (C06 Reach 18) vegetation management is maintaining the existing habitat conditions. The County of Orange does have a vegetation maintenance program which includes pesticide applications to manage, reduce, and control the growth of vegetation within the channels.

4.1.1.1 C02

Reach 23

Coastal salt waters are conveyed from the Pacific Ocean through Anaheim Bay and the northern edge of Huntington Harbour into C02 near Edinger Avenue. The vegetation type of Reach 23 is low-lying grasses

in mudflats that appear to be influenced by tidal action. A major part of Reach 23 is tidal mudflat at low tide, and tidal ponds and creek during high tide (twice daily).

4.1.1.2 C04

Reach 22

This channel reach is largely unvegetated, although small pockets of vegetation exist in isolated areas. However, there is no vegetation type that would be considered dominant for any part of this reach. A freshwater marsh was previously documented from between Brookhurst Street and Magnolia Avenue. This marsh was removed as part of regular channel maintenance activities by the County of Orange.

Reach 21

There is no vegetation along the channel except for the urban landscape plantings that are part of Westminster Memorial Park. Some portions of the low flow channel are supporting green algal mats and some weedy non-native grasses, but these areas are relatively isolated.

Reach 20

Reach 20 incorporates a gradient of apparent salt marsh vegetation at the downstream portion of the channel to brackish, freshwater marsh at the mid-point of the channel. Continuing downstream paralleling Springdale Street, the channel continues as trapezoidal riprap armor stone wall on both sides, earthen bed, and with tidal inundation. Sporadic vegetation is present throughout the reach, but a significant amount of emergent vegetation is present from McFadden Avenue until approximately Graham Street. Commonly observed species were smartweeds (*Polygonum spp.*), sprangletop (*Leptochloa fusca*), and bulrushes (*Scirpus spp.*).

These plants are well developed and inhabiting the edges as well as the center of the channel**.** Earthen trapezoidal sides are, at times, vegetated with ruderal plant species, which the County of Orange manages through a vegetation maintenance program. At the lower portion of Reach 20, vegetation consists of pockets of low stature, and sometimes prostrate plant assemblages not more than a few feet in width distributed throughout the channel. Algal mats tend to form at the lower edges of the mudflat habitat. The lower end of channel C04 Reach 20, confluences with the lower portion of channel C02 Reach 24 in the northwest quadrant of the intersection of Bolsa Chica Road and Edinger Avenue.

4.1.1.3 C05

Reach 1

A variety of vegetation types are present within C05 Reach 1. The channel starts with a concrete bottom at its uppermost extent and 1,350 feet downstream (west) of Goldenwest Avenue, the channel becomes an earthen trapezoidal levee with an earthen bottom. In this earthen section there is a meandering channel with large banks of wetland vegetation growing in sediment deposited along the sides of the channel. Downstream of Springdale Street, the channel deepens and the amount of side channel sediment and vegetation declines significantly. With the exception of a single mid-channel patch of cattails, the vegetation from this point to the entrance of Bolsa Chica Bay is scattered, sparse, and comprised of ruderal species. There is likely infiltration of saltwater due to a non-functional tide gate structure at the entrance to Bolsa Chica Bay, and this tidal influence appears to be influencing the vegetation composition in the lower reaches of C05 Reach 1.

Reach 2, 3, 4, and 5

Reach 2 continues upstream with concrete rectangular walls and bottom which then transitions to concrete rectangular walls. The lower portion of the reach is seen with water, and some floating algal mats, but the

bottom is concrete. Vegetation is sparse with intermittent cattails and ruderal plants, such as fan palms. Further downstream there are significant parcels of bulrush (*Scirpus spp.*) and cattail (*Typha domingensis*) along the waters edge. These species dominate large segments of the riparian corridor along the edges of the channel, or occasionally as islands in the middle of the channel. Breeding migratory birds were observed utilizing this in channel habitat. Some of the levee slopes are covered with crabgrass; however, the majority are barren.

Where vegetation occurs, it is primarily non-native grasses and other adventive vegetation. Distribution of vegetation in the channel is sporadic and typically confined to the toe of the slope where it meets the water. Water within these reaches is believed to be primarily run-off from the surrounding area. However, it could also be the upper tidal inundation level or a combination of both. Reaches 2 and 3 are inundated by tidal waters from Outer Bolsa Bay.

Reach 6, 7, 8, and 9

Reach 6 through Reach 9 is a concrete trapezoidal channel with concrete bottom that has a few isolated pockets of vegetation. Most of these pockets appear to have grown in accumulated sediment, and could be washed away under heavy flow conditions.

Reach 10

This reach is a concrete covered conduit that conveys water out of the south side of Haster Basin to Garden Grove Boulevard.

Haster Basin

Haster Basin is upstream of Reach 10 and is used as a flood damage reduction detention basin and secondarily as a recreation park (formerly known as Twin Lakes Park) for the local residents. The basin is vegetated with turf grass and various ornamental trees.

Reach 11 and 12

Reach 11 is concrete covered conduit. The headwaters of C05 Reach 12 is the south parking lot of the Crystal Cathedral. The channel is a concrete covered conduit that leads into a concrete trapezoidal channel of which both types of channels have a concrete bottom. No vegetation is found along these reaches of C05.

4.1.1.4 C06

Reach 13 – confluence with C05

Both structure types have earthen bottoms until the C06 confluences with C05 Reach 3. Vegetation is present in both types of channel structures indicative of a diminished quality freshwater marsh and a mixture of ruderal plant species.

Reach 14, 15, 16, and 17

No vegetation other than small patches of ruderal grasses and other weeds can be found in these reaches.

Reach 18

Reach 18 encompasses all of Mile Square Park from Euclid Street at the upstream and Brookhurst Street at the downstream end. The channel appears to be regularly maintained and the vegetation is almost entirely mowed grass.

Reach 19

The headwaters of C06 daylight approximately 205 feet west of Newhope Street in the city of Fountain Valley (2,400 feet east of Mile Square Park). There is sparse vegetation in this channel comprised of ruderal weed plant species.

4.1.1.5 Eelgrass Beds

Eelgrass provides important biological, physical, and economic benefits, and is also important to species managed under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Vegetated shallows that support eelgrass are also considered special aquatic sites under the 404(b)(1) guidelines of the Clean Water Act (40 C.F.R. § 230.43). Pursuant to the MSA, eelgrass is designated as Essential Fish Habitat (EFH) area of particular concern for various federally-managed fish species within the Pacific Coast Groundfish Fishery Management Plan (Pacific Fishery Management Council 2016). A Habitat Area of Particular concern (HAPC) is a subset of EFH that is rare, particularly susceptible to human-induced degradation, especially ecologically important, and/or located in an environmentally stressed area.

Within the study area, eelgrass is found within the Anaheim Bay/Huntington Harbour area and the Full Tidal Basin of the Bolsa Chica Ecological Reserve. In 2013, there were two separate surveys of eelgrass that were conducted in the Anaheim Bay/Huntington Harbour area. Merkel & Associates conducted a survey in early 2013, and mapped 7.8 acres of eelgrass throughout Huntington Harbour (*Figure 10*). CRM conducted a survey in late 2013, and mapped 0.126 acre of eelgrass specifically within the Sunset Aquatic Park Marina and outlet of C02 within Huntington Harbour (*Figure 11* and *Figure 12*). In regards to eelgrass within the channels of the Westminster watershed, Chambers Group Inc. conducted a reconnaissance level survey on July 6-7, 2019. The channels were surveyed to determine the extent of seawater tidal intrusion in an effort to establish how far up the channels salinity conditions could support marine vegetation such as eelgrass. No eelgrass was observed in any of the channel reaches that were surveyed. Salinity measurements indicate that conditions in the channels are not ideal for eelgrass to thrive (refer to *Appendix C* for the Reconnaissance Survey Report).

Eelgrass is also found adjacent to the study area within the Bolsa Chica Basin. As part of the monitoring for the Bolsa Chica Lowlands Restoration project, the presence/absence of eelgrass has been surveyed. The monitoring regimen generally conforms to the Bolsa Chica Lowland Restoration Project Biological Monitoring and Follow-up Plan prepared by the USFWS in 2001 (USFWS 2001). The Monitoring Plan calls for most biological monitoring (including eelgrass) to be conducted during the 2nd, 5th, and 10th years after completion of construction (i.e., 2006). Additional biological monitoring may be conducted as warranted by conditions observed at the site or the need for additional data. According to the Merkel & Associates 2013 monitoring report, in 2007 0.9 acre of eelgrass was transplanted in the full tidal basin of the Bolsa Chica Basin. By 2008 the eelgrass area in the full tidal basin had expanded to 2.0 acres (0.8 hectare), by 2009 it was 35.5 acres and by 2011 it was 105.4 acres (*Figure 13*). A more recent survey of eelgrass within Bolsa Chica Basin was not readily available; however, according to the BCER Manager there are currently approximately 140 acres of eelgrass within Bolsa Chica Basin (personal communication Kelly O'Reilly, 2018).

Figure 10: Locations of eelgrass within Anaheim Bay/Huntington Harbour area during eelgrass surveys in April and July 2013 (Source: Merkel & Associates Inc. 2014).

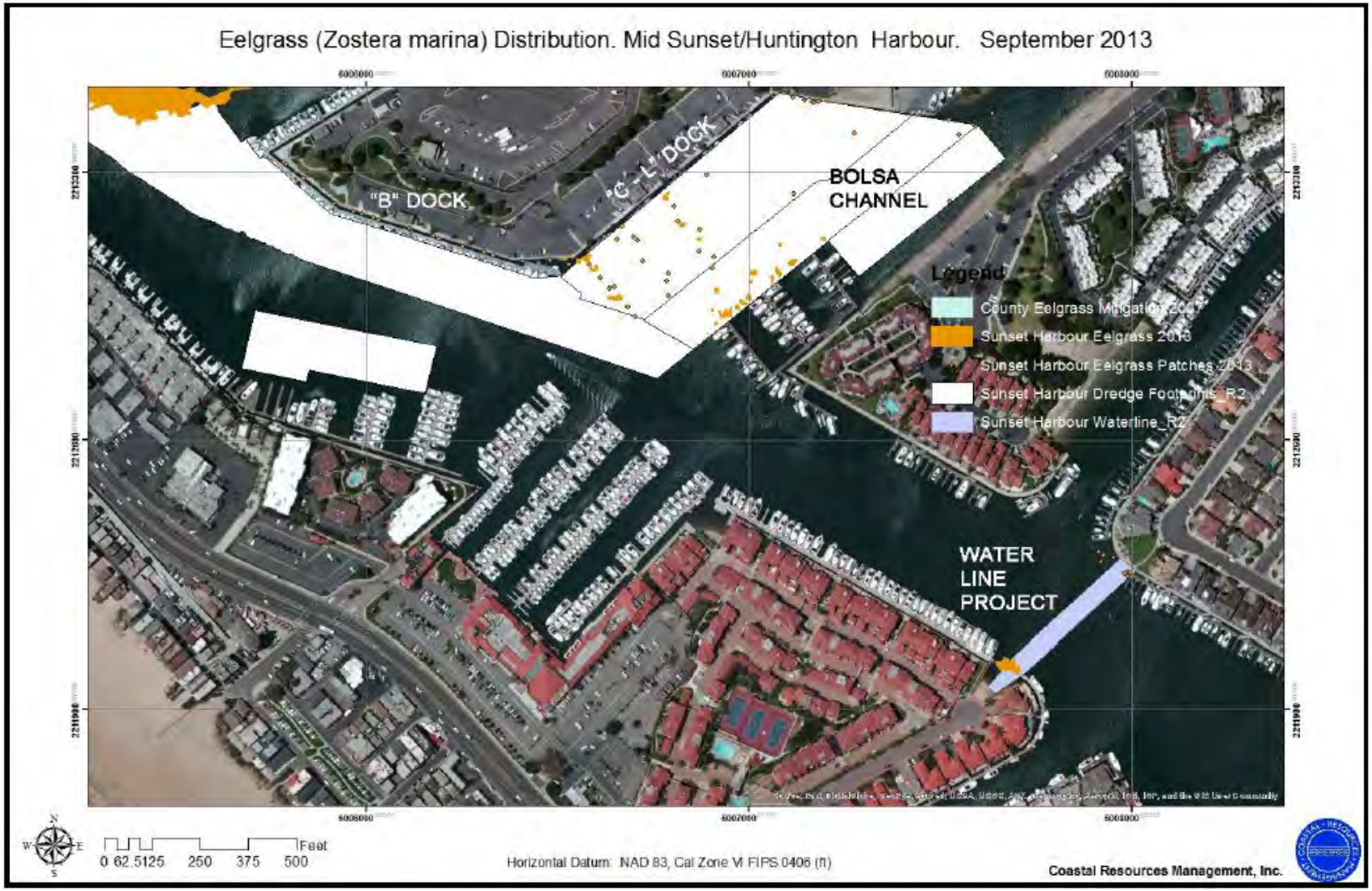

Figure 11: Locations of eelgrass within Sunset Aquatic Park Marina and C02 during September 2013 surveys.

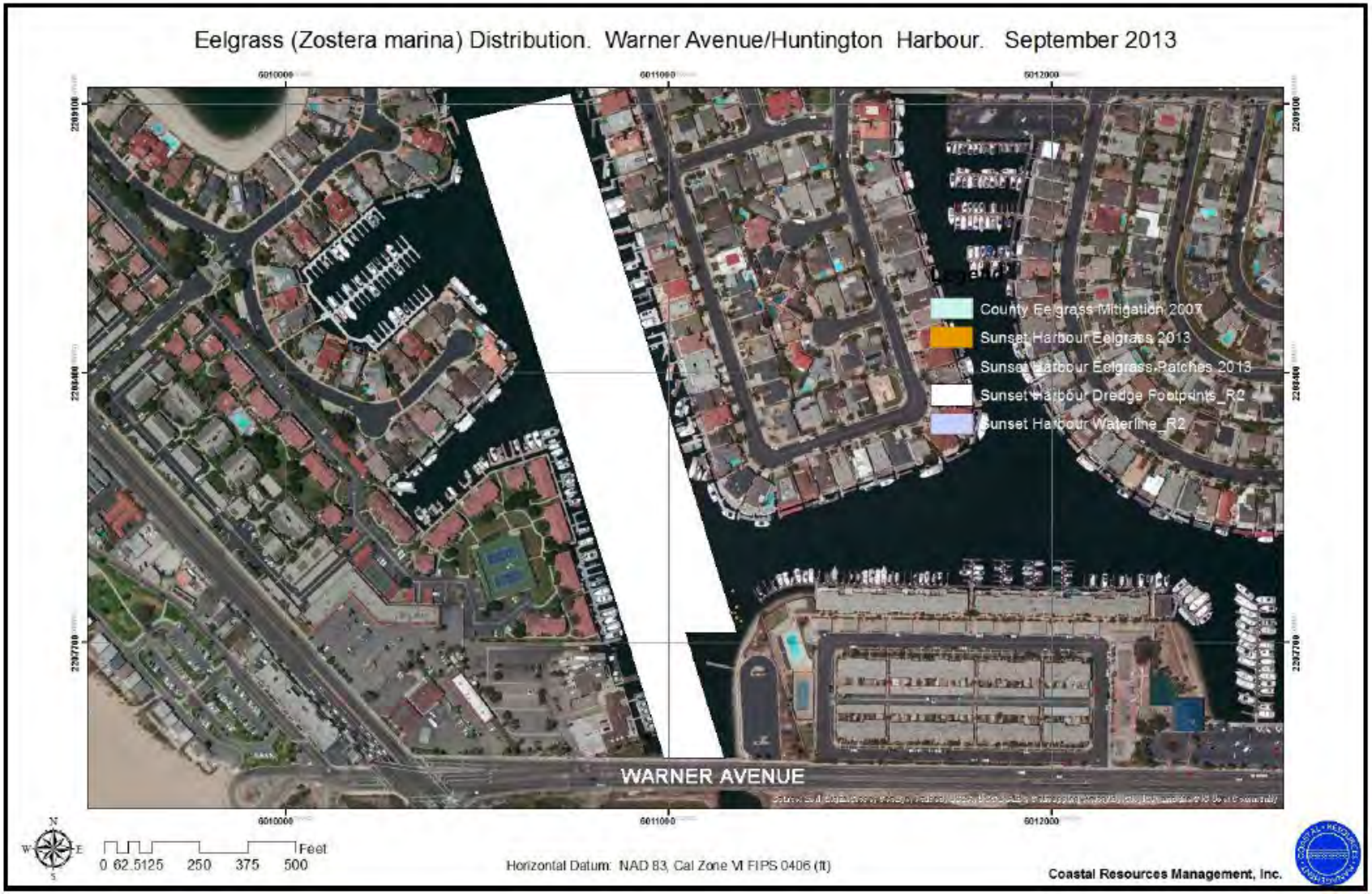

Figure 12: Locations of eelgrass downstream of Warner Avenue Bridge during September 2013 surveys.

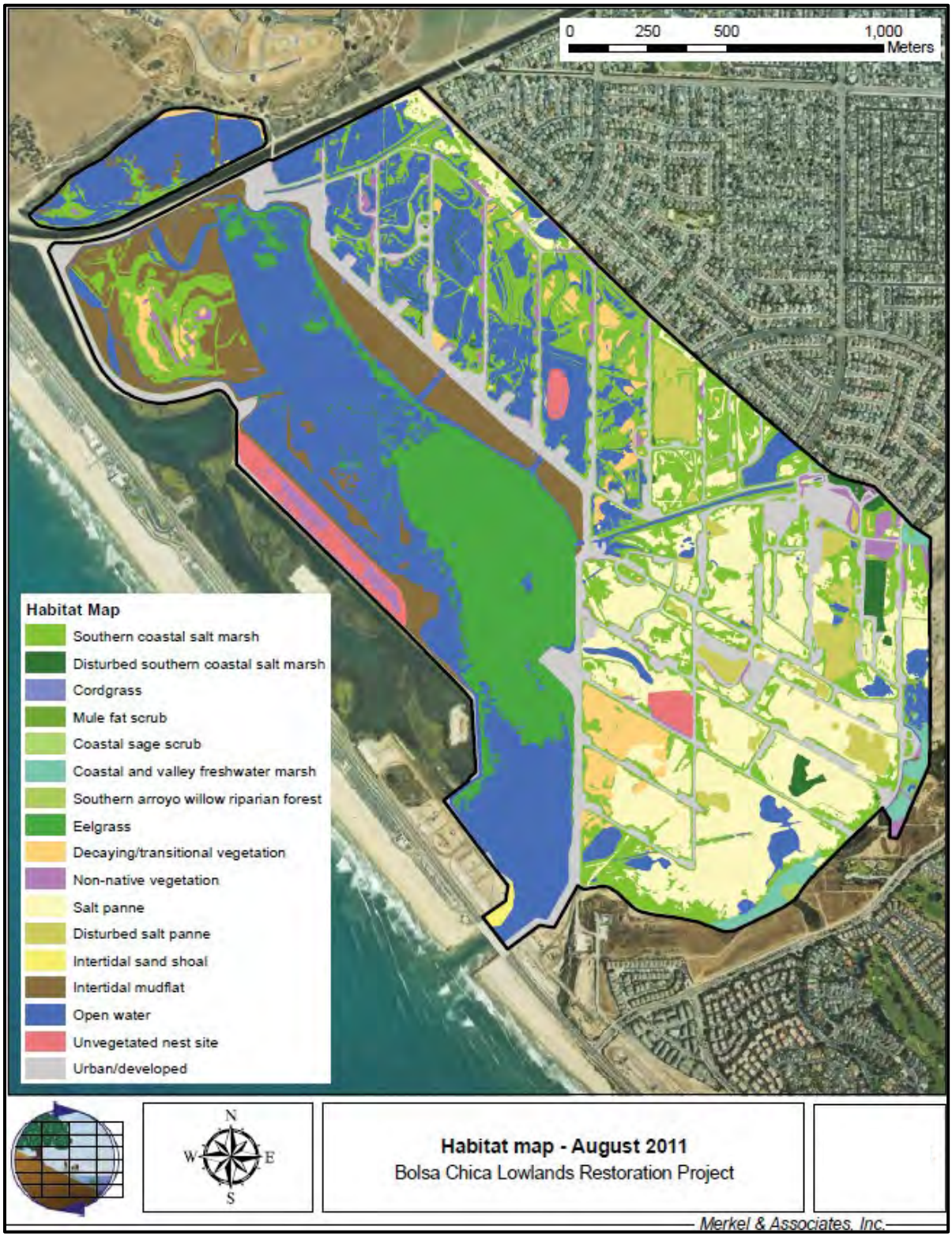

Figure 13: Habitats present within the Bolsa Chica Lowlands Restoration Project, including eelgrass(Merkel & Associates 2013)

4.1.1 Animal Resources

Watercourses within the project boundary include flood control channels. These watercourses are dynamic, high-energy systems and typically form the active part of the channel. They are generally devoid of vegetation either as a result of scouring, or from flood control channel maintenance activities. The specific wildlife species associated with the channels depends on the location and type of channel (e.g., earthen versus concrete, natural stream versus man-made drainage channel, etc.), intermixing with upland, ornamental landscapes, wetland communities, and availability of perennial and ephemeral water sources. Flood control channels with perennial and ephemeral water provide habitat (e.g., forage, movement corridor, etc.) for common species such as California king snake (*Lampropeltis getula californiae*), California striped racer (*Coluber lateralis lateralis*), Pacific ring-necked snake (*Diadophis punctatus amabilis*), southwestern pond turtle (*Actinemys pallida*), western toad (*Anaxyrus boreas*), Pacific treefrog (*Pseudacris regilla*), mallard (*Anas platyrhynchos*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), and coyote (*Canis latrans*).

While the flood control channels, which comprise a majority of the proposed project's action area, provide primarily low quality habitat for common species in a highly urbanized area, there are higher quality areas that are adjacent to the proposed project's action area. Those higher quality areas are the Bolsa Chica Ecological Reserve and the Seal Beach National Wildlife Refuge. The below sections generally describe the flora and fauna that have been observed within these adjacent higher quality areas.

4.1.1.1 Bolsa Chica Ecological Reserve

Vegetation

The BCER contains remnants of a once extensive wetland system. A tributary of the SAR called Freeman Creek flowed into the wetlands, creating a mixture of fresh and saltwater marsh, tidal sloughs, and swampland that supported dense vegetation; tulles, arroyo willows and thickets. Beginning in 2004, more than 500 acres of the Bolsa Chica Lowlands were reconstructed to its original conditions in the 1800s. The restoration has and will continue to gradually improve the habitat quality of Bolsa Chica.
Within Bolsa Chica there are plant species indicative of approximately six plant communities: sea grass beds, salt marsh, coastal strand/sand dune, coastal sage scrub, freshwater wetlands, and riparian woodland. The majority of Bolsa Chica is salt marsh. Similar to Animal Resources, special-status species were considered as those species that are 1) listed, proposed for listing, or candidates for listing under the ESA as threatened or endangered, 2) listed or candidates for listing under the CESA as threatened or endangered, 3) a CDFW fully protected species, 4) a CDFW species of special concern, 5) a CDFW watch list species or 6) species that have a California Rare Plant Rank of 1A, 1B, 2A, or 2B. Four special-status species are found in the reserve including eelgrass (*Zostera marina*), California seablite (*Suaeda californica*), eastuary seablite (*Suaeda esteroa*), and southern tarplant (*Hemizonia parryi ssp. australis*). Eelgrass is a unique underwater plant which creates its own multi-use habitat type for fish and which is protected by National Marine Fisheries Service (NMFS) as a Habitat of Particular Concern (a subset of EFH). California seablite is a federally listed endangered species. In addition, California seablite, southern tarplant, and estuary seablite are all California Rare Plant species that are considered either seriously endangered or fairly endangered in California. For a complete list of plants provided by the CDFW — and the plant communities they are associated with — that are found within the BCER refer to *Appendix F – Species Lists*.

Birds

The Bolsa Chica Wetlands host numerous species of wildlife. The wetlands are an especially important migratory stop as well as nesting grounds for many avian species. Out of 420 bird species recorded for Orange County, California, 321 of those species have been sighted at Bolsa Chica in the past decade. Approximately 189 bird species are frequently sighted at Bolsa Chica. Of those birds that are frequently

sighted, 27 are considered special-status species. The 27 species of special-status include brant (*Branta bernicla*), redhead (*Aythya americana*), common loon (*Gavia pacifica*), American white pelican (*Pelevanus erythrorhynchos*), brown pelican (*Pelecanus occidentalis*), least bittern (*Ixobrychus exilis*), white-faced ibis (*Plegadis chihi*), osprey (*Pandion haliaetus*), white-tailed kite (*Elanus leucurus*), Cooper's hawk (*Accipiter cooperii*), peregrine falcon (*Falco peregrinus*), long-billed curlew (*Numenius americanus*), California gull (*Larus californicus*), light-footed Ridgway's rail (*Rallus obsoletus levipes*), black tern (*Chlidonias niger*), elegant tern (*Thalasseus elegans*), black skimmer (*Rynchops niger*), burrowing owl (*Athene cunicularia*), Vaux's swift (*Chaetura vauxi*), olive-sided flycatcher (*Contopus cooperi*), willow flycatcher (*Empidonax traillii*), loggerhead shrike (*Lanius ludovicianus*), coastal California gnatcatcher (*Polioptila californica californica*), Belding's savannah sparrow (*Passerculus sandwichensis beldingii*), California least tern (*Sternula antillarum browni*), song sparrow (*Melospiza lincolnii*), and western snowy plover (*Charadrius nivosus nivosus*). Six of these species are listed, proposed for listing, or candidates for listing under ESA or CESA as threatened or endangered: light-footed Ridgway's rail, willow flycatcher, coastal California gnatcatcher, Belding's savannah sparrow, California least tern, and western snowy plover.

Approximately 112 bird species are infrequently sighted at Bolsa Chica. Of those birds that are infrequently sighted, 16 are considered special-status species for this report. The 16 species of special-status include fulvous whistling duck (*Dendrocygna bicolor*), harlequin duck (*Histrionicus histrionicus*), Barrow's goldeneye (*Bucephala clangula*), bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), prairie falcon (*Falco mexicanus*), mountain plover (*Charadrius montanus*), laughing gull (*Leucophaeus atricilla*), short-eared owl (*Asio flammeus*), black swift (*Cypseloides niger*), vermilion flycatcher (*Pyrocephalus rubinus*), purple martin (*Progne subis*), bank swallow (*Riparia riparia*), summer tanager (*Piranga rubra*), tricolored blackbird, and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). Of the aforementioned 16 special-status species, the tricolored blackbird is listed as threatened under the CESA. The bald eagle was formerly listed on the ESA, but was de-listed in 2007. However, it is still afforded protections from collection and "take" under the Bald and Golden Eagle Protection Act, as amended (16 U.S.C. § 668 et seq.). For a complete lists of bird species provided by the CDFW that are frequently and infrequently observed at BCER refer to *Appendix F – Species Lists*.

Fish

The Bolsa Chica wetlands serve as a nursery for many fish and shark species. Approximately 80 species of fish inhabit southern California bays and estuaries. At least 67 species of fish have been observed within the BCER, of which none are considered special-status species. However, the BCER does provide nesting/spawning habitat for various species including the California Grunion (*Leuresthes tenuis*). For a complete list of fish species that have been document at the BCER by the CDFW refer to *Appendix F – Species Lists*.

Aquatic Invertebrates

Numerous marine invertebrates inhabit Bolsa Bay and provide a food source for the plethora of avian species that come to the wetlands. Additionally, fish that breed and spawn in the Bolsa Chica wetlands also depend on these organisms as a food source. The CDFW provided a list of native invertebrates that inhabit in the BCER (refer to *Appendix F – Species Lists*). The list includes copepods, amphipods, mussels, clams, horn snails, worms, and crabs. None of the invertebrate species are considered special-status species. Non-native species that are found within the ecological reserve include oriental shrimp (*Palaemon macrodactylus*), burrowing Australasian isopod (*Sphaeroma quoyanum*), a bryozoan (*Zoobotryon verticillatum*), chain sea squirt (*Botrylloides* spp.), leathery tunicate (*Styela plicata*), Pacific oyster (*Cassostrea gigas*), ribbed horse mussel (*Geukensia demissa*), Japanese mussel (*Musculista senhousia*), and Mediterranean mussel (*Mytilus galloprovincialis*).

Terrestrial Invertebrates

Terrestrial invertebrates also utilize the BCER as documented by the CDFW (refer to *Appendix F – Species Lists*). The non-native brown widow spider (*Latrodectus geometricus*) has also been documented at the ecological reserve. None of the terrestrial invertebrate species are considered special-status species.

Reptiles and Amphibians

Reptiles may also often be seen at BCER. Lizards may be seen on the ground or along the wooden fences, basking in the sunlight. Snakes are seen less frequently, but are occasionally spotted from the walking trails. Rattlesnakes (*Crotalus sp.*) are also present at the ecological reserve. One amphibian has been documented at the ecological reserve, the Garden Slender Salamander (*Batrachoseps major*). The CDFW provided a list of common reptiles and amphibian that have been observed at the BCER. Three of the species on the list are considered special-status species. The three special-status species are the two-striped garter snake (*Thamnophis hammondii*), silvery legless lizard (*Anniella pulchra pulchra*), and green turtle (*Chelonia mydas*). Two of these species are listed, proposed for listing, or candidates for listing under the ESA or CESA as threatened or endangered: California legless lizard and green turtle.

Mammals

Several species of mammals may be seen at BCER. Eleven species of mammals have been observed at the reserve of which one is considered a special-status species. Only one mammal is considered a special status specie, the western red bat (*Lasiurus blossevillii*) which is a CDFW species of special concern. A non-native mammal that has been observed at the ecological reserve is the Virginia opossum (*Didelphis virginiana*). Refer to *Appendix F – Species Lists* for a list of mammals found at BCER as provided by the CDFW.

4.1.1.2 Seal Beach National Wildlife Refuge

The SBNWR was established in 1972 and is administered by the USFWS. The 965 acre refuge is located within the NWSSB in Orange County. The refuge serves as a critical stopover and wintering habitat for thousands of birds that migrate up and down the Pacific Flyway each year. It also serves as an island of habitat in the midst of a dense urban setting for a wide variety of fish, wildlife, and plants. *Figure 14* shows the habitat types found within SBNWR.

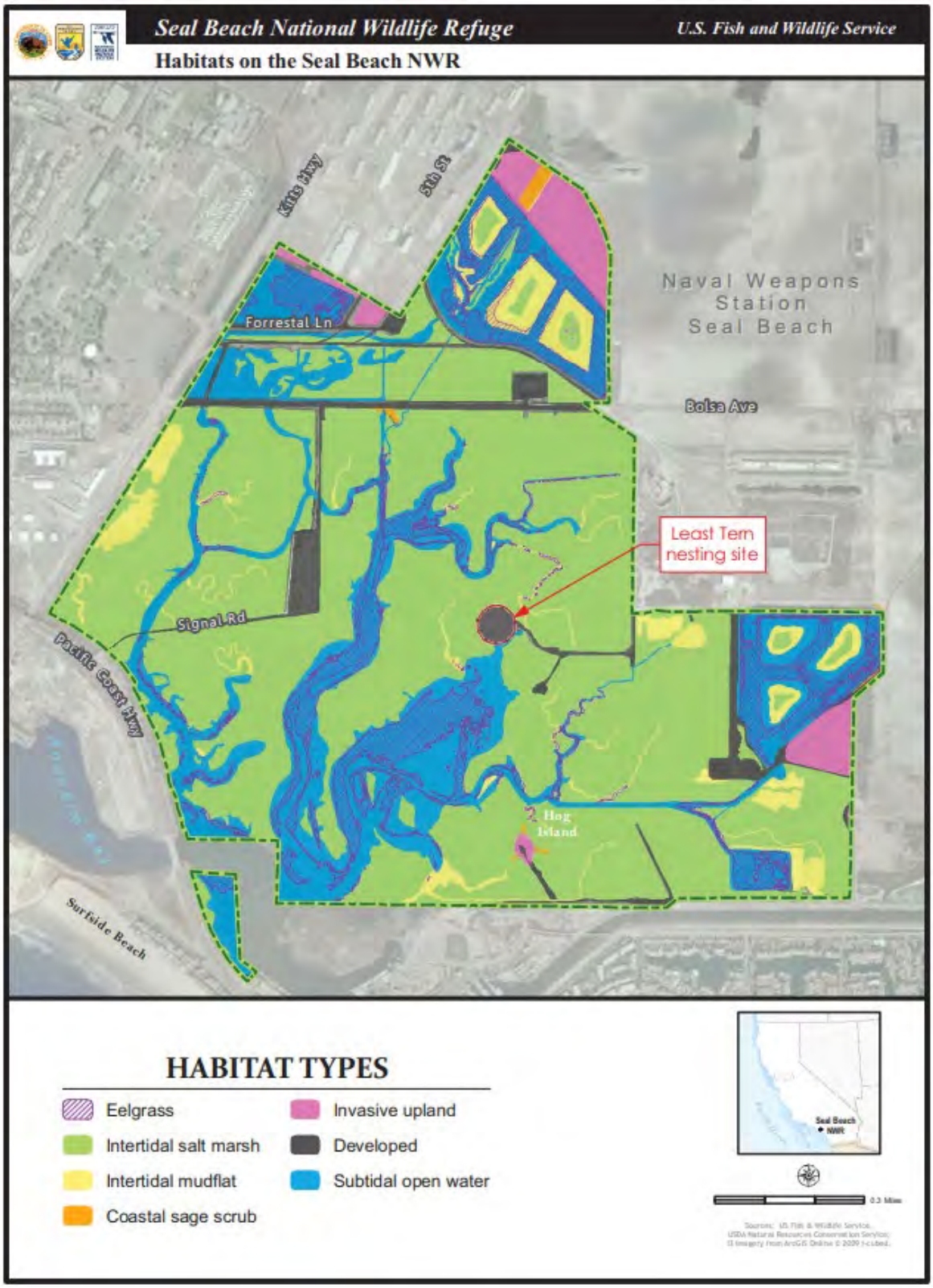

Figure 14: Habitat types in the SBNWR (Map from USFWS 2018)

Birds

The north coast of Orange County supports some of the most important remnant wetlands in southern California. Up until the early 1900s, this area was a vast network of coastal marshes. Today, portions of this coast are included in the Orange Coast Wetlands Important Bird Area (IBA). This IBA protects some of southern California's most extensive wetlands, and is most notable for its number of breeding terns. Huge flocks of migrating shorebirds (15-20,000 in fall, winter and spring, Page and Shuford 2000) and waterfowl, wintering geese, and foraging raptors travel freely up and down the coast here. Included in the IBA is SBNWR.

Two federally endangered bird species are known to breed at SBNWR, the California least tern and the light-footed Ridgway's rail. In regards to the California least tern, between 1986 and 1998 the NWR supported an average of 150 breeding pairs. The light-footed Ridgway's rail in 2017 had 60 breeding pairs at SBNWR, ranking it the third largest subpopulation in 2017 (Zembal et al. 2017). Other bird species that are considered USFWS birds of conservation concern, BLM sensitive species, and/or CDFW fully protected species/watchlist may be observed utilizing the habitat at SBNWR. The extensive grassland and open country habitat types present at SBNWR, along with the other wetlands included in the Orange Coast Wetlands IBA, represent a majority of the raptor habitat along the immediate coast of the Los Angeles Basin, with the hawk and owl community of SBNWR potentially being the largest and most diverse. Ferruginous hawk, prairie falcon, and short-eared owl are scarce, but regular winter residents of SBNWR, and burrowing owl nests in weep holes in the weapons storage units of NWSSB (one of two breeding colonies in coastal southern California). The sparse, flat grassland at SBNWR is one of just four sites in the U.S. that supports wintering Pacific golden-plover, and a handful of mountain plover has recently rediscovered the NWR as a wintering area. Hundreds of geese, representing all four regularly-occurring species, winter at SBNWR, the largest concentration in coastal southern California. Approximately 222 bird species have been observed at SBNWR. Of those 222 bird species, 29 are considered special-status species for this report. The 29 species of special-status include brant (*Branta bernicla*), redhead (*Aythya americana*), common loon (*Gavia immer*), American white pelican (*Pelecanus erythrorhynchos*), brown pelican (*Pelecanus occidentalis*), white-faced ibis (*Plegadis chihi*), Osprey (*Pandion haliaetus*), white-tailed kite (*Elanus leucurus*), bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), Cooper's hawk (*Accipiter cooperii*), Ferruginous hawk (*Buteo regalis*), merlin (*Falco columbarius*), prairie falcon (*Falco mexicanus*), peregrine falcon (*Falco peregrinus*), light-footed Ridgways rail (*Rallus longirostris levipes*), mountain plover (*Charadrius montanus*), long-billed curlew (*Numenius americanus*), California gull (*Larus californicus*), California least tern (*Sternula antillarum browni*), black tern (*Chlidonias niger*), elegant tern (*Thalasseus elegans*), black skimmer (*Rynchops niger*), short-eared owl (*Asio flammeus*), burrowing owl (*Athene cunicularia*), loggerhead shrike (*Lanius ludovicianus*), Belding's savannah sparrow (*Passerculus sandwichensis beldingii*), song sparrow (*Melospiza melodia*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*). Three of these species are listed, proposed for listing, or candidates for listing under ESA or CESA as threatened or endangered: light-footed Ridgway's rail, California least tern, and Belding's savannah sparrow. The bald eagle was formerly listed on the ESA, but was de-listed in 2007. However, it is still afforded protections from collection and "take" under the Bald and Golden Eagle Protection Act, as amended (16 U.S.C. § 668 et seq.). For complete lists of bird species observed at SBNWR refer to *Appendix F – Species Lists*.

Aquatic Invertebrates

In 2013, benthic invertebrate surveys were conducted within Anaheim Bay, including portions of SBNWR. During the surveys a total of 56 species were captured, and of these, 20 species were captured within the vicinity of SBNWR. Abundant species over the length of the surveys included the bubble snail (*Bulla gouldiana*), green shrimp/grass shrimp (*Hippolyte californiensis*), broken back shrimp (*Heptacarpus sp.*), and speckled scallop (*Argopecten ventricosus*). Also observed on the NWR in previous surveys was the California brackish water snail (*Tryonia imitator*), a species identified by the

State of California as imperiled. None of the aquatic invertebrate species observed during the 2013 surveys are considered special-status species. For a complete list of aquatic invertebrate species observed during 2013 surveys refer to *Appendix F – Species Lists*.

Fish

In 2013, fish surveys were also conducted within Anaheim Bay, including portions of SBNWR. A total number of 57 fish species were captured during the surveys, with 36 species identified within the vicinity of SBNWR. Abundant species over the length of the surveys included topsmelt (*Atherinop affinis*), northern anchovy (*Engraulis mordax*), and queenfish (*Seriphus politus*). Of the fish species observed, none are considered special-status species. For a complete list of fish species observed during the 2013 surveys within the vicinity of SBNWR refer to *Appendix F – Species Lists*.

5.0 Effects of the Action on Federally Managed Species

Seven federally listed species have potential to occur in the BSA: salt marsh bird's-beak, Ventura marsh milk-vetch, California least tern, green turtle, western snowy plover, coastal California gnatcatcher, light-footed Ridgway's rail, and California least tern (refer to Appendix G for maps showing general locations of where listed species are located in relation to the project area). The following analysis covers background information on these species; the presence of these species in the BSA; Avoidance and Minimization Measures; Project effects on these species; compensatory mitigation; and cumulative effects.

Figure 5 shows an overview of the Recommended Plan's BSA. The biological study area includes the potential extent of direct and indirect impacts to special status species due to implementation of the Recommended Plan. In addition, the BSA includes the potential extent of direct and indirect impacts to special status species from implementation of compensatory mitigation features.

5.1.1 Salt Marsh Bird's-Beak (*Cordylanthus maritimus* sp. *maritimus*)

5.1.1.1 Literature/Survey Results

According to the CNDDB, an extant population of salt marsh bird's-beak exists within the Seal Beach National Wildlife Refuge. The CNDDB states that the exact location of the species within the SBNWR is unknown, therefore, the entire marsh area was mapped. Field surveys of SBNWR in 1969, 1970, and 1980 failed to locate any plants. A reintroduction effort was made in 1981, and based on field surveys in 1983 and 1984 the introduction appears to have been successful. While the species appears to be present within the SBNWR, there is no indication that the species is present in the Proposed Project's action area. Correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019a) regarding the Proposed Project does not indicate that salt marsh bird's-beak is within the action area. The USFWS Draft CAR (2019a) states: "No sensitive or listed plant species are expected to occur within the likely Project footprint, due to a lack of suitable habitats, owing to past and ongoing disturbance, periodic vegetation maintenance within the channels, and existing structures."

5.1.1.2 Critical Habitat

No critical habitat has been proposed or designated by the USFWS for salt marsh bird's-beak.

5.1.1.3 Avoidance and Minimization Efforts

Although salt marsh bird's-beak was not observed during the 2019 reconnaissance level survey, and habitat to support the species does not occur within the BSA, avoidance and minimization efforts will be implemented prior and during construction to avoid and minimize potential impacts to the species if it is found during focused flora and fauna surveys conducted during PED:

- A qualified biologist will:
- Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
- Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:

- A detailed description of all listed species including color photographs;
- The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
- The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and
- A point of contact if listed species are observed.
- Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
- Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
- Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
- Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.
- Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
- Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.
- Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.

5.1.1.1 Project Effects

The Proposed Project is not expected to directly or indirectly impact salt marsh bird's-beak as a result of the avoidance and minimization measures described above.

5.1.1.2 Direct Effects

Although the location of the salt marsh bird's-beak population in SBNWR is unknown, the location where CNDDB has the population located is approximately 4,000 feet north of the Proposed Project's direct effect area. In addition, the species was not observed during the reconnaissance level survey of the Proposed Project's BSA and both CDFW and USFWS did not indicate presence of this species within the Proposed Project's BSA. Due to the distance of the species from the direct affect area and no indication of the species being present within the BSA, no direct effects to salt marsh bird's-beak are anticipated.

5.1.1.3 Indirect Effects

Although the location of the salt marsh bird's-beak population in SBNWR is unknown, the location where CNDDB has the population located is approximately 4,000 feet north of the Proposed Project's direct effect area. No indirect effects are expected to this species since the Proposed Project is not expected to alter the habitat within SBNWR which could in turn affect the ability of this species to survive within the SBNWR. Due to the distance of the species from the affect area and the Proposed

Project not expected to alter habitat within SBNWR where the species is found, no indirect effects to salt marsh bird's-beak are anticipated.

5.1.1.4 Compensatory Mitigation

Since no direct or indirect effects to this species are anticipated, no compensatory mitigation is proposed for this species.

5.1.1.5 Cumulative Effects

The closest population of salt marsh bird's-beak is located approximately 4,000 feet north of the Proposed Project's BSA. Due to the distance of the species from the action area, no cumulative effects to salt marsh bird's-beak are anticipated.

5.1.2 Ventura Marsh Milk-vetch (*Astragalus pycnostachyus var. lanosissimus*)

5.1.2.1 Literature/Survey Results

According to the CNDDB and historical data, Ventura marsh milk-vetch was once present in the Bolsa Chica Ecological Reserve. The species was collected in 1881 and 1882 (USFWS 2010). The species is currently presumed extirpated since it has not been collected in BCER since 1882 and was not observed during field surveys in 1987. In addition, correspondence from both the CDFW (Sevrens 2018) and USFWS (USFWS 2019a) regarding the proposed project does not indicate that Ventura marsh milk-vetch is within the action area. The USFWS Draft CAR (2019a) states: "No sensitive or listed plant species are expected to occur within the likely Project footprint, due to a lack of suitable habitats, owing to substantial past and ongoing disturbance, periodic vegetation maintenance within the channels, and existing structures."

5.1.2.2 Critical Habitat

No critical habitat has been proposed or designated by the USFWS for Ventura marsh milk-vetch.

5.1.2.3 Avoidance and Minimization Efforts

Although Ventura marsh milk-vetch was not observed during the 2019 reconnaissance level survey, and habitat to support the species does not occur within the BSA, avoidance and minimization efforts will be implemented prior and during construction to avoid and minimize potential impacts to the species if it is found during focused flora and fauna surveys conducted during PED:

- A qualified biologist will:
- Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
- Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:
- A detailed description of all listed species including color photographs;
- The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
- The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and

- A point of contact if listed species are observed.
- Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
- Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
- Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
- Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.
- Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
- Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.
- Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.

5.1.2.4 Project Effects

The Proposed Project is not expected to directly or indirectly impact Ventura marsh milk-vetch as a result of the avoidance and minimization measures described above.

5.1.2.5 Direct Effects

The Ventura marsh milk-vetch is presumed extirpated from the Proposed Project's BSA, therefore, no direct effect to Ventura marsh milk-vetch is anticipated.

5.1.2.6 Indirect Effects

The Ventura marsh milk-vetch is presumed extirpated from the Proposed Project's BSA, therefore, no indirect effect to Ventura marsh milk-vetch is anticipated.

5.1.2.7 Compensatory Mitigation

Since no direct or indirect effects to this species are anticipated, no compensatory mitigation is proposed for this species.

5.1.2.8 Cumulative Effects

The Ventura marsh milk-vetch is presumed extirpated from the Proposed Project's BSA, therefore, no cumulative effects to Ventura marsh milk-vetch are anticipated.

5.1.3 California Least Tern (*Sterna antillarum browni*), endangered

5.1.3.1 Literature/Survey Results

Near the BSA, breeding colonies of the California least tern are at the Bolsa Chica Ecological Reserve (Sevrens 2018) and the Seal Beach National Wildlife Refuge. In regards to the Bolsa Chica Ecological Reserve, nesting islands (i.e., north and south tern island) were created in 1978 prompting the species to begin nesting on the north tern island. In 2015, the CDFW noted that 204 nests were initiated at the BCER; however, only two of the five nesting colonies were successful. Based on field surveys it was estimated that the number of fledglings at Bolsa Chica in 2015 was between 55 and 65 (Bolsa Chica Land Trust 2015). Nesting and fledgling numbers were lower in 2015 than they were in 2014 when there were 301 nests and an estimated 80 fledglings (Bolsa Chica Land Trust 2015). In regards to Seal Beach National Wildlife Refuge, the Sea and Sage Audubon Society estimated that there were between 50-94.5 breeding pairs, 106 nests, and 51-53 fledglings (Sea and Sage Audubon 2016) in 2015. During reconnaissance level surveys in July 2019 of the channels within the Proposed Project's action area, the species was not observed in the BSA. Review of the CNDDB shows the location of where the species is typically found to nest within the BCER and SBNWR. Nest sites in the BCER are located approximately 2,000 feet southeast of the BSA while nest sites in the SBNWR are located approximately 2,200 feet north of the BSA. There is a documented occurrence of a California least tern nesting within Huntington Harbour near the Warner Avenue Bridge. The nest site at this location is approximately 1,700 feet north of the Warner Avenue Bridge BSA. The BSA is not expected to provide suitable habitat for California least tern nesting; however, it does provide suitable foraging habitat along the channels.

5.1.3.2 Critical Habitat

No critical habitat has been proposed or designated by the USFWS for the California least tern.

5.1.3.3 Avoidance and Minimization Efforts

Although the California least tern was not observed during the reconnaissance level survey, and no nesting habitat is expected to occur within the BSA, the Proposed Project may affect potential foraging habitat. Therefore, the following avoidance and minimization efforts will be implemented during construction to avoid and minimize potential impacts to the California least tern habitat:

- All demolition and construction activities and the operation of heavy construction equipment within Outer Bolsa Bay (OBB), C02 Reach 23 and C05 Reach 1 (including the tide gates at the downstream end of C05 Reach 1 and compensatory mitigation features) will be carried out between October 1 and February 28, outside of bird nesting season.
- To minimize impacts to wildlife species, a biologist that meets USFWS standard qualifications will conduct a biological resource sweep of the work area prior to any ground disturbing activities, dewatering activities, during project construction, and during demobilization of construction equipment. The biological resource sweep will include the following activities:
    - Inspect the work area, including along access roads, for any wildlife species and prepare a list of species observed and record their activity during construction of the project.
    - Implemented exclusionary or avoidance measures and/or relocate sensitive species if possible, and ensure that the quality of adjacent habitat outside of the construction zone is maintained.
    - In the event that sensitive (protected) wildlife species are present, determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area.

- A qualified biologist will:
    - Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
    - Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:
    - A detailed description of all listed species including color photographs;
    - The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
    - The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and
    - A point of contact if listed species are observed.
    - Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
    - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
    - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- A silent pile driver may be used instead of an impact or vibratory pile driver where sensitive ecological resources are nearby, especially within the vicinity of Warner Avenue Bridge, C02 Reach 23, and C05 Reach 1.
- To minimize noise impacts to biological resources the following measures will be implemented:
    - During nesting season portable acoustic panels will be placed where heavy equipment is operating to minimize construction noise levels.
    - If needed during the nesting season, portable acoustic panels will be placed along the perimeter of the channels where construction is occurring to reduce construction noise levels.
    - All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds.
    - Onsite generators and booster pumps will be enclosed entirely.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
    - Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.
    - Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.

  - Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.
  - Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.
- Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.
- Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.
- Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at dusk/night.

5.1.3.4 Project Effects

The Proposed Project is not expected to directly impact the California least tern as a result of avoidance and minimization measures described above and the limited potential of the California least tern to occur within the BSA. However, the Proposed Project may have direct and indirect effects to the California least tern through the temporary loss of potential foraging habitat.

5.1.3.5 Direct Effects

The California least tern has potential to forage in the open water in the BSA. The Proposed Project would not result in the direct permanent loss of foraging habitat, but would result in the temporary loss of approximately 12 acres of foraging habitat while construction activities are occurring. However, foraging habitat for the California least tern exists in other nearby areas, such as the Full Tidal Basin of the Bolsa Chica Ecological Reserve, Huntington Harbour, and Anaheim Bay. The temporary loss of foraging habitat would have no measurable effect on the least tern.

5.1.3.6 Indirect Effects

Noise

Construction activities would create airborne noise that has the potential to directly affect foraging behavior of California least terns. Limited noise threshold guidance has been developed to protect coastal marine birds (SAIC 2012). Although pile driving is included as part of the project, a Giken silent pile machine will be utilized for the insertion of the piles along C05 Reach 1 (i.e., adjacent to the BCER) and C02 Reach 23 (i.e., adjacent to SBNWR). The Giken machine pushes the pile into the ground without an impact hammer or vibration. The operation, with the exception of a crane engine (to hold the sheet) and the generator to power the Giken machine, is almost silent. In comparison, pneumatic and vibratory pile driving operations produce airborne noise levels of 101 A-weighted decibels (dBA) at a distance of 50 feet (15 m) from the source (U.S. Department of Transportation 2006). Therefore, use of the Giken machine would reduce airborne noise levels typically associated with pile driving. As mentioned, use of the Giken would require a crane and generator. A crane typically produces noise levels of 87 dBA at a distance of 50 feet (15 m) from the source while a generator typically produces noise levels of 81 dBA at a distance of 50 feet (15 m) from the source. However, as the distance from the construction operation increases, the level of disturbance from the noise quickly decreases. For example, sound levels attenuate or drops-off at a rate of 6 dBA for each doubling of the distance so that the noise level would drop to approximately 81 dBA at a distance of 150 feet away from the pile driving point source. Noise levels from equipment associated with the Giken at the North Tern Island in BCER, where California least terns nest, would be negligible in that area. It is also likely that this species is already habituated to the noise

levels associated with local traffic since the PCH is located approximately 550 feet west of the North Tern Island. Recent data on foraging behavior of California least terns during a pile driving for a pier construction project in San Diego Bay found all individual birds identified as foraging during pile driving successfully foraged (n=28, 100 percent), while a mixture of successful foraging (n=37, 86 percent) and unsuccessful foraging (n=6, 14 percent) was found during non-pile driving activities (Naval Facilities Engineering Command Southwest 2014).

Increased Sediment and Urban Pollutants

Impacts on biological resources in the area could occur as a result of changes in water quality. Runoff of silt from the BSA or improper disposal of petroleum and chemical products from construction equipment could temporarily impact water quality during construction. Adverse effects on water quality could affect populations of aquatic species (including special status species) by reducing the amount of available habitat and by smothering eggs of aquatic species; this may result in direct mortality. Adverse effects on water quality could also impact populations of terrestrial wildlife species that use the Westminster watershed drainage channels for foraging by (1) ingesting toxic chemicals; (2) ingesting aquatic species that have ingested toxic chemicals leading to bioaccumulation of toxics; or (3) decreasing the available prey within aquatic habitats. The indirect impact on water quality is considered a potentially substantial effect. The Project shall incorporate BMPs including applicable measures required through NPDES requirements, to ensure that the quantity and quality of runoff discharged does not adversely affect the BSA. The avoidance and minimization measures will ensure water quality levels would not be substantially affected. In particular, BMPs shall be designed to prevent (to the extent practicable) the runoff of toxins, chemicals, petroleum products, or other elements that might degrade biological resources in the drainage channels and the adjacent habitats. This can be accomplished by using a variety of methods, including detention basins, swales, or mechanical trapping devices to contain or treat runoff before it enters adjacent areas. Regular maintenance shall occur during operation of the Project to ensure effective operation of runoff control systems.

Night Lighting

Night lighting could inadvertently result in an indirect effect on the behavioral patterns of nocturnal and crepuscular (i.e., active at dawn and dusk) wildlife in adjacent open space on the BCER and SBNWR. Wildlife present in these areas may already be somewhat acclimated to current lighting associated with the existing roadways and development. Overhead lighting is not present along the drainage channels and no lighting is proposed as part of the project. In addition, all construction activities associated with the Proposed Project would occur during daylight hours; no nighttime lighting would be used during construction. Therefore, there would be no temporary light effects on aquatic or wildlife species during construction. There may be temporary lighting used at staging areas for safety purposes; however, lighting would be shielded therefore it is expected that there would be no substantial effect on wildlife in surrounding open space areas.

5.1.3.7 Compensatory Mitigation

To mitigate for the temporary loss of foraging habitat, the north and south tern islands located within the Bolsa Chica Ecological Reserve will have an approximately two foot sand addendum added to them. This will increase their height and resiliency to future sea level rise. Both of these islands are currently used by the California least tern as nesting habitat.

5.1.3.8 Cumulative Effects

Maintenance dredging occurs sporadically within the Huntington Harbour main channel and every 1-3 years within the ocean inlet for the BCER Full Tidal Basin. It is likely that maintenance dredging within Huntington Harbour would occur during implementation of the Proposed Project since construction of the Proposed Project would occur over approximately 15 years. However, the modification of the Warner

Avenue Bridge would be the primary concern regarding a cumulative impact, and the modification of the bridge would occur within the first three years of the project being implemented. Maintenance dredging within the secondary channels of Huntington Harbour has not occurred since the harbour was constructed. Modification of C02 Reach 23 under the Proposed Project would be the primary concern regarding a cumulative impact, however, the secondary channels have never been dredged and it is unlikely that they would have a need to be dredged during implementation of the Proposed Project. Maintenance dredging within the BCER Full Tidal Basin is outside of the Action Area and is not expected to result in cumulative impacts due to implementation of the Proposed Project. Overall, cumulative impacts from past, present, and future actions on biological resources within the Action Area would be less than significant because impacts associated with other actions occur outside of the Action Area and do not overlap in time with the Proposed Project.

5.1.4 Coastal California Gnatcatcher (*Polioptila californica californica*), threatened

5.1.4.1 Literature/Survey Results

The coastal California gnatcatcher is closely aligned with coastal sage scrub (USFWS 2010d). Within the Bolsa Chica Lowlands Project (*Figure 15*) there is no coastal sage scrub present, but there is marginal coastal sage scrub habitat present on the Bolsa Chica Mesa which is north of C02 Reach 1 (*Figure 16* and *Figure 17*). In regards to the Proposed Project, the coastal California gnatcatcher has been observed within the BSA, along C05 Reach 1 and the muted tidal pocket of the Bolsa Chica Ecological Reserve. In addition, the CDFW noted that the coastal California gnatcatcher does forage within the BCER (Sevrens 2018).

5.1.4.2 Critical Habitat

On December 19, 2007, the USFWS published a Final Rule revising critical habitat for the coastal California gnatcatcher. The revised critical habitat designates 197,303 acres of land in Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties (USFWS 2007a). The BSA is not within the revised critical habitat for this species.

5.1.4.3 Avoidance and Minimization Efforts

Although the coastal California gnatcatcher was not observed during the reconnaissance level survey, and no nesting habitat is expected to occur within the BSA, the Proposed Project may affect potential foraging habitat. Therefore, the following avoidance and minimization efforts will be implemented during construction to avoid and minimize potential impacts to the coastal California gnatcatcher habitat and would benefit this species:

- All demolition and construction activities and the operation of heavy construction equipment within Outer Bolsa Bay (OBB), C02 Reach 23 and C05 Reach 1 (including the tide gates at the downstream end of C05 Reach 1 and compensatory mitigation features) will be carried out between October 1 and February 28, outside of bird nesting season.
- To minimize impacts to wildlife species, a biologist that meets USFWS standard qualifications will conduct a biological resource sweep of the work area prior to any ground disturbing activities, dewatering activities, during project construction, and during demobilization of construction equipment. The biological resource sweep will include the following activities:
    - Inspect the work area, including along access roads, for any wildlife species and prepare a list of species observed and record their activity during construction of the project.
    - Implemented exclusionary or avoidance measures and/or relocate sensitive species if possible, and ensure that the quality of adjacent habitat outside of the construction zone is maintained.

  - In the event that sensitive (protected) wildlife species are present, determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area.
- A qualified biologist will:
  - Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
  - Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:
  - A detailed description of all listed species including color photographs;
  - The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
  - The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and
  - A point of contact if listed species are observed.
  - Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
  - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
  - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- A silent pile driver may be used instead of an impact or vibratory pile driver where sensitive ecological resources are nearby, especially within the vicinity of Warner Avenue Bridge, C02 Reach 23, and C05 Reach 1.
- To minimize noise impacts to biological resources the following measures will be implemented:
  - During nesting season portable acoustic panels will be placed where heavy equipment is operating to minimize construction noise levels.
  - If needed during the nesting season, portable acoustic panels will be placed along the perimeter of the channels where construction is occurring to reduce construction noise levels.
  - All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds.
  - Onsite generators and booster pumps will be enclosed entirely.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
  - Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.

  - Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
  - Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.
  - Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.
- Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.
- Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.
- Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at dusk/night.

5.1.4.4 Project Effects

The Proposed Project is not expected to directly impact the coastal California gnatcatcher as a result of the avoidance and minimization measures described above and the limited potential of the coastal California gnatcatcher to occur within the BSA. However, the Proposed Project may have direct and indirect effects to the coastal California gnatcatcher through the temporary loss of potential foraging habitat.

5.1.4.1 Direct Effects

The coastal California gnatcatcher has potential to forage along the coastal sage scrub located to the north of the muted tidal pocket in the Bolsa Chica Ecological Reserve. The Proposed Project would not result in the direct permanent loss of foraging habitat, but would result in the temporary loss of approximately 3.4 acres of foraging habitat while construction activities are occurring. However, foraging habitat for the coastal California gnatcatcher exists in other areas outside the BSA of the Proposed Project. The temporary loss of foraging habitat would have no measurable effect on the coastal California gnatcatcher.

5.1.4.2 Indirect Effects

Noise

Coastal California gnatcatchers would be affected by implementation of the Proposed Project in the same ways as those described for California least terns. Noise generated during construction activities could cause behavioral disturbance to resting or foraging gnatcatchers. Construction activities would create airborne noise that has the potential to directly affect nesting and foraging behavior of coastal California gnatcatcher's that are found within the BCER which is adjacent to the Action Area. Coastal California gnatcatchers are primarily associated with coastal sage scrub habitat which is not found within the Proposed Project Action Area but is found adjacent. Pile driving, which is included as part of the project, has the greatest potential to create airborne noise that would potentially disturb this species. However, the project would use a Giken silent pile machine for the insertion of piles along reaches that are adjacent to BCER. Therefore, use of the Giken machine would reduce airborne noise levels typically associated with pile driving. Use of the Giken machine would require a crane and generator which typically produce noise levels of 87 dBA and 81 dBA, respectively, at a distance of 50 feet from the source. As the distance from

the construction operation increases the level of disturbance from the noise quickly decreases, therefore, it is likely that this species would not be affected by noise as it would be similar to existing noise levels.

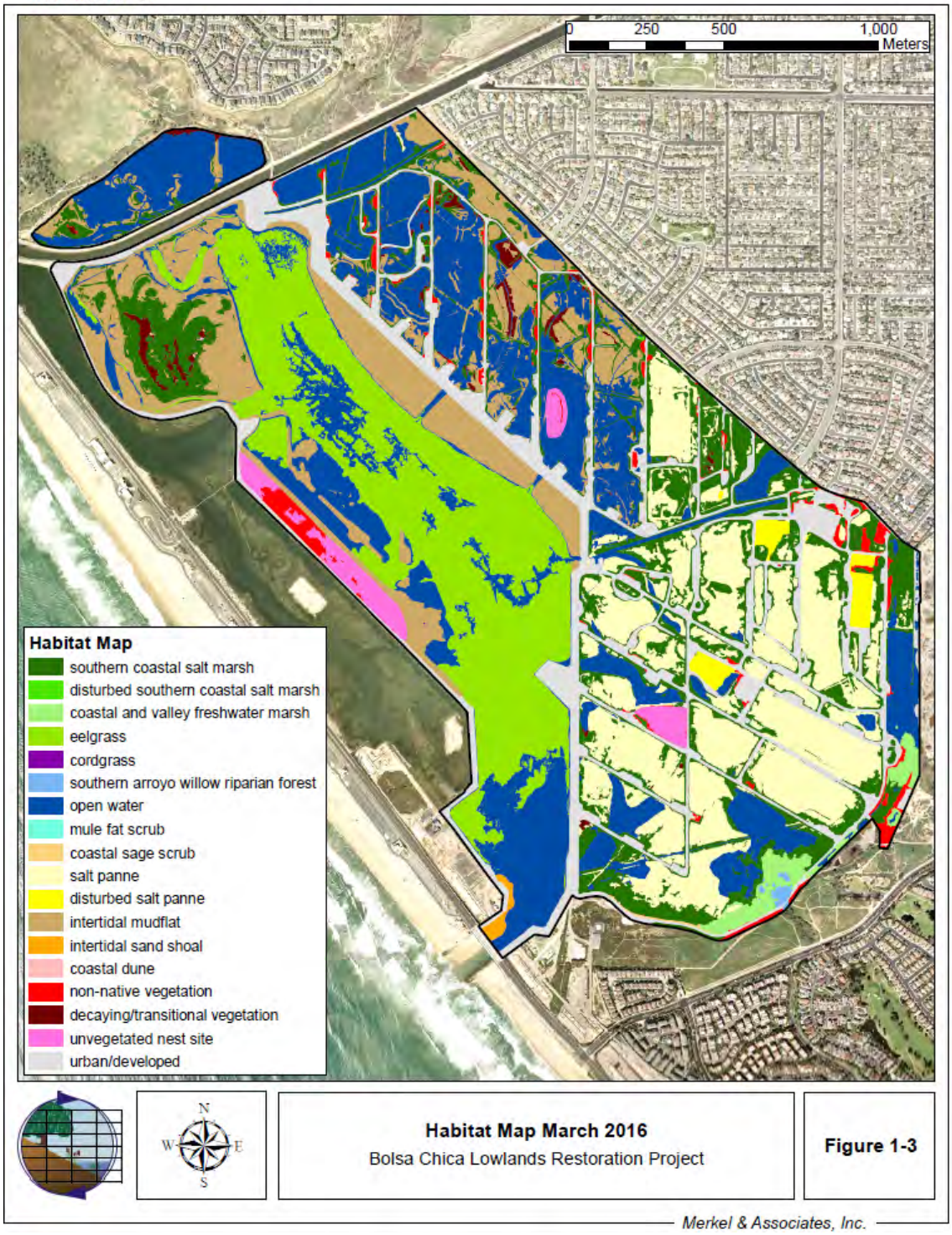

Figure 15: Bolsa Chica Lowlands Project Habitat Map (Source: Merkel & Associates Inc.)

Figure 16: City of Huntington Beach Habitat Map Showing Habitat for the Bolsa Chica Mesa (Source: City of Huntington Beach General Plan 2017).

Figure 17: Coastal Sage Scrub Habitat Within the Bolsa Chica Mesa (Red Outline).

Increased Sediment and Urban Pollutants

Impacts on biological resources in the area could occur as a result of changes in water quality. Runoff of silt from the BSA or improper disposal of petroleum and chemical products from construction equipment could temporarily impact water quality during construction. Adverse effects on water quality could affect populations of aquatic species (including special status species) by reducing the amount of available habitat and by smothering eggs of aquatic species; this may result in direct mortality. Adverse effects on water quality could also impact populations of terrestrial wildlife species that use the Westminster watershed drainage channels for foraging by (1) ingesting toxic chemicals; (2) ingesting aquatic species that have ingested toxic chemicals leading to bioaccumulation of toxics; or (3) decreasing the available prey within aquatic habitats. The indirect impact on water quality is considered a potentially substantial effect. The Project shall incorporate BMPs including applicable measures required through NPDES requirements, to ensure that the quantity and quality of runoff discharged does not adversely affect the BSA. The avoidance and minimization measures will ensure water quality levels would not be substantially affected. In particular, BMPs shall be designed to prevent (to the extent practicable) the runoff of toxins, chemicals, petroleum products, or other elements that might degrade biological resources in the drainage channels and the adjacent habitats. This can be accomplished by using a variety of methods, including detention basins, swales, or mechanical trapping devices to contain or treat runoff before it enters adjacent areas. Regular maintenance shall occur during operation of the Project to ensure effective operation of runoff control systems.

Night Lighting

Night lighting could inadvertently result in an indirect effect on the behavioral patterns of nocturnal and crepuscular (i.e., active at dawn and dusk) wildlife in adjacent open space on the BCER and SBNWR. Wildlife present in these areas may already be somewhat acclimated to current lighting associated with the existing roadways and development. Overhead lighting is not present along the drainage channels and no lighting is proposed as part of the project. In addition, all construction activities associated with the Proposed Project would occur during daylight hours; no nighttime lighting would be used during construction. Therefore, there would be no temporary light effects on aquatic or wildlife species during construction. There may be temporary lighting used at staging areas for safety purposes; however, lighting would be shielded therefore it is expected that there would be no substantial effect on wildlife in surrounding open space areas.

5.1.4.1 Compensatory Mitigation

No compensatory mitigation is proposed for this species to offset temporary direct impacts to foraging habitat during construction of the Proposed Project.

5.1.4.2 Cumulative Effects

Maintenance dredging occurs sporadically within the Huntington Harbour main channel and every 1-3 years within the ocean inlet for the BCER Full Tidal Basin. It is likely that maintenance dredging within Huntington Harbour would occur during implementation of the Proposed Project since construction of the Proposed Project would occur over approximately 15 years. However, the modification of the Warner Avenue Bridge would be the primary concern regarding a cumulative impact, and the modification of the bridge would occur within the first three years of the project being implemented. Maintenance dredging within the secondary channels of Huntington Harbour has not occurred since the harbour was constructed. Modification of C02 Reach 23 under the Proposed Project would be the primary concern regarding a cumulative impact, however, the secondary channels have never been dredged and it is unlikely that they would have a need to be dredged during implementation of the Proposed Project. Maintenance dredging within the BCER Full Tidal Basin is outside of the Action Area and is not expected to result in cumulative impacts due to implementation of the Proposed Project. Overall, cumulative impacts from past, present, and future actions on biological resources within the Action Area would be less than significant because impacts associated with other actions occur outside of the Action Area and do not overlap in time with the Proposed Project.

5.1.5 Light-footed Ridgway's Rail (*Rallus obsoletus levipes*), endangered

5.1.5.1 Survey/Literature Results

Light-footed Ridgway's rail does occur within the SBNWR and the BCER (USFWS 2013), which are adjacent to the BSA. In addition, it was noted by the CDFW in their letter dated January 12, 2018 that Ridway's rail nests within the BCER (Sevrens 2018).

5.1.5.2 Critical Habitat

No critical habitat has been proposed or designated by the USFWS for the light-footed Ridgway's rail.

5.1.5.3 Avoidance and Minimization Efforts

Although no light-footed Ridgway's rail were observed during the reconnaissance level survey, and construction would not occur during nesting season, the Proposed Project may affect potential foraging habitat. Therefore, the following avoidance and minimization efforts will be implemented during construction to avoid and minimize potential impacts to the light-footed Ridgway's rail habitat:

- All demolition and construction activities and the operation of heavy construction equipment within Outer Bolsa Bay (OBB), C02 Reach 23 and C05 Reach 1 (including the tide gates at the

downstream end of C05 Reach 1 and compensatory mitigation features) will be carried out between October 1 and February 28, outside of bird nesting season.

- To minimize impacts to wildlife species, a biologist that meets USFWS standard qualifications will conduct a biological resource sweep of the work area prior to any ground disturbing activities, dewatering activities, during project construction, and during demobilization of construction equipment. The biological resource sweep will include the following activities:
    - Inspect the work area, including along access roads, for any wildlife species and prepare a list of species observed and record their activity during construction of the project.
    - Implemented exclusionary or avoidance measures and/or relocate sensitive species if possible, and ensure that the quality of adjacent habitat outside of the construction zone is maintained.
    - In the event that sensitive (protected) wildlife species are present, determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area.
- A qualified biologist will:
    - Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
    - Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:
    - A detailed description of all listed species including color photographs;
    - The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
    - The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and
    - A point of contact if listed species are observed.
    - Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
    - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
    - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- A silent pile driver may be used instead of an impact or vibratory pile driver where sensitive ecological resources are nearby, especially within the vicinity of Warner Avenue Bridge, C02 Reach 23, and C05 Reach 1.
- To minimize noise impacts to biological resources the following measures will be implemented:
    - During nesting season portable acoustic panels will be placed where heavy equipment is operating to minimize construction noise levels.

  - If needed during the nesting season, portable acoustic panels will be placed along the perimeter of the channels where construction is occurring to reduce construction noise levels.
  - All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds.
  - Onsite generators and booster pumps will be enclosed entirely.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
  - Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.
  - Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
  - Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.
  - Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.
- Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.
- Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.
- Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at dusk/night.

5.1.5.4 Project Effects

The Proposed Project is not expected to directly impact the light-footed Ridgway's rail as a result of the avoidance and minimization measures described above and the limited potential of the light-footed Ridgway's rail to occur within the BSA. However, the Proposed Project may have direct and indirect effects to the light-footed Ridgway's rail through the temporary loss of potential foraging habitat.

5.1.5.5 Direct Effects

The light-footed Ridgway's rail has potential to forage within the muted tidal pocket and along Rabbit Island within the Bolsa Chica Ecological Reserve. The Proposed Project would not result in the direct permanent loss of foraging habitat, but would result in the temporary loss of approximately 38 acres of foraging habitat while construction activities are occurring. However, foraging habitat for the light-footed Ridgway's rail exists in other areas outside the BSA of the Proposed Project. The temporary loss of foraging habitat would have no measurable effect on the light-footed Ridgway's rail.

5.1.5.6 Indirect Effects

Noise

Construction activities would create airborne noise that has the potential to directly affect nesting and foraging behavior of light-footed Ridgway's rail that are found within the BCER which is adjacent to the Action area. Pile driving, which is included as part of the project, has the greatest potential to create airborne noise that would potentially disturb this species. However, the project would use a Giken silent pile machine for the insertion of piles along reaches that are adjacent to BCER and SBNWR. Therefore, use of the Giken machine would reduce airborne noise levels typically associated with pile driving. Use of the Giken machine would require a crane and generator which typically produce noise levels of 87 dBA and 81 dBA, respectively, at a distance of 50 feet from the source. As the distance from the construction operation increases the level of disturbance from the noise quickly decreases, therefore, it is likely that this species would not be affected by noise as it would be similar to existing noise levels.

Increased Sediment and Urban Pollutants

Impacts on biological resources in the area could occur as a result of changes in water quality. Runoff of silt from the BSA or improper disposal of petroleum and chemical products from construction equipment could temporarily impact water quality during construction. Adverse effects on water quality could affect populations of aquatic species (including special status species) by reducing the amount of available habitat and by smothering eggs of aquatic species; this may result in direct mortality. Adverse effects on water quality could also impact populations of terrestrial wildlife species that use the Westminster watershed drainage channels for foraging by (1) ingesting toxic chemicals; (2) ingesting aquatic species that have ingested toxic chemicals leading to bioaccumulation of toxics; or (3) decreasing the available prey within aquatic habitats. The indirect impact on water quality is considered a potentially substantial effect. The Project shall incorporate BMPs including applicable measures required through NPDES requirements, to ensure that the quantity and quality of runoff discharged does not adversely affect the BSA. The avoidance and minimization measures will ensure water quality levels would not be substantially affected. In particular, BMPs shall be designed to prevent (to the extent practicable) the runoff of toxins, chemicals, petroleum products, or other elements that might degrade biological resources in the drainage channels and the adjacent habitats. This can be accomplished by using a variety of methods, including detention basins, swales, or mechanical trapping devices to contain or treat runoff before it enters adjacent areas. Regular maintenance shall occur during operation of the Project to ensure effective operation of runoff control systems.

Night Lighting

Night lighting could inadvertently result in an indirect effect on the behavioral patterns of nocturnal and crepuscular (i.e., active at dawn and dusk) wildlife in adjacent open space on the BCER and SBNWR. Wildlife present in these areas may already be somewhat acclimated to current lighting associated with the existing roadways and development. Overhead lighting is not present along the drainage channels and no lighting is proposed as part of the project. In addition, all construction activities associated with the Proposed Project would occur during daylight hours; no nighttime lighting would be used during construction. Therefore, there would be no temporary light effects on aquatic or wildlife species during construction. There may be temporary lighting used at staging areas for safety purposes; however, lighting would be shielded therefore it is expected that there would be no substantial effect on wildlife in surrounding open space areas.

5.1.5.1 Compensatory Mitigation

No compensatory mitigation is proposed for this species to offset temporary direct impacts to foraging habitat during construction of the Proposed Project.

5.1.5.2 Cumulative Effects

Maintenance dredging occurs sporadically within the Huntington Harbour main channel and every 1-3 years within the ocean inlet for the BCER Full Tidal Basin. It is likely that maintenance dredging within Huntington Harbour would occur during implementation of the Proposed Project since construction of the Proposed Project would occur over approximately 15 years. However, the modification of the Warner Avenue Bridge would be the primary concern regarding a cumulative impact, and the modification of the bridge would occur within the first three years of the project being implemented. Maintenance dredging within the secondary channels of Huntington Harbour has not occurred since the harbour was constructed. Modification of C02 Reach 23 under the Proposed Project would be the primary concern regarding a cumulative impact, however, the secondary channels have never been dredged and it is unlikely that they would have a need to be dredged during implementation of the Proposed Project. Maintenance dredging within the BCER Full Tidal Basin is outside of the Action Area and is not expected to result in cumulative impacts due to implementation of the Proposed Project. Overall, cumulative impacts from past, present, and future actions on biological resources within the Action Area would be less than significant because impacts associated with other actions occur outside of the Action Area and do not overlap in time with the Proposed Project.

5.1.6 Western Snowy Plover (*Charadrius nivosus nivosus*), threatened

5.1.6.1 Survey/Literature Results

In Orange County, breeding is limited to the Bolsa Chica Ecological Reserve and the mouth of the Santa Ana River (Hamilton and Willick 1996). Western snowy plover migrants have been observed at San Joaquin Marsh in the late summer and early fall, and this species can be observed in moderate numbers along the coast in winter (Hamilton and Willick 1996), where they are found on many of the beaches used for nesting but also on manmade salt ponds and estuarine sand and mud flats (USFWS 2012). Suitable nesting and foraging habitat for the western snowy plover is located outside the BSA. Therefore, the western snowy plover has a limited potential to occur for foraging in the BSA, but is not expected to occur for nesting.

5.1.6.2 Critical Habitat

On September 29, 2005, the USFWS published a final critical habitat for the western snowy plover. This Final Rule designated 12,145 acres along the coast of Washington, Oregon, and California (USFWS 2005). Within California, critical habitat was designated in San Diego, Orange, Los Angeles, Ventura, Santa Barbara, San Luis Obispo, Monterey, Santa Cruz, San Mateo, Marin, Mendocino, Humboldt, and Del Norte counties. Following lawsuits, the USFWS proposed a revised critical habitat designation on March 22, 2011. This rule was finalized on June 19, 2012. The current final designation covers approximately 24,527 acres of critical habitat in Washington, Oregon, and California (USFWS 2011b). Included in this acreage is 475 acres of habitat within the Bolsa Chica Ecological Reserve (***Figure 18***) that have been designated as critical habitat for the western snowy plover (77 FR 36727). The BSA is not located in designated critical habitat for the western snowy plover.

Figure 18: Location of Designated Critical Habitat Within the BCER for the Western Snowy Plover (76 FR 16155)

5.1.6.3 Avoidance and Minimization Efforts

Although no western snowy plover were observed during the reconnaissance level survey, and no nesting or foraging habitat is expected to occur within the BSA, the following avoidance and minimization efforts will still be implemented during construction to avoid and minimize potential impacts to the species if it is found within the BSA during focused flora and fauna surveys conducted during PED:

- All demolition and construction activities and the operation of heavy construction equipment within Outer Bolsa Bay (OBB), C02 Reach 23 and C05 Reach 1 (including the tide gates at the downstream end of C05 Reach 1 and compensatory mitigation features) will be carried out between October 1 and February 28, outside of bird nesting season.
- To minimize impacts to wildlife species, a biologist that meets USFWS standard qualifications will conduct a biological resource sweep of the work area prior to any ground disturbing activities, dewatering activities, during project construction, and during demobilization of construction equipment. The biological resource sweep will include the following activities:
    - Inspect the work area, including along access roads, for any wildlife species and prepare a list of species observed and record their activity during construction of the project.
    - Implemented exclusionary or avoidance measures and/or relocate sensitive species if possible, and ensure that the quality of adjacent habitat outside of the construction zone is maintained.
    - In the event that sensitive (protected) wildlife species are present, determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area.
- A qualified biologist will:

  - Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
  - Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:
  - A detailed description of all listed species including color photographs;
  - The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
  - The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and
  - A point of contact if listed species are observed.
  - Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
  - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
  - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- A silent pile driver may be used instead of an impact or vibratory pile driver where sensitive ecological resources are nearby, especially within the vicinity of Warner Avenue Bridge, C02 Reach 23, and C05 Reach 1.
- To minimize noise impacts to biological resources the following measures will be implemented:
  - During nesting season portable acoustic panels will be placed where heavy equipment is operating to minimize construction noise levels.
  - If needed during the nesting season, portable acoustic panels will be placed along the perimeter of the channels where construction is occurring to reduce construction noise levels.
  - All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds.
  - Onsite generators and booster pumps will be enclosed entirely.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
  - Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.
  - Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
  - Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.

  - Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.
- Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.
- Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.
- Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at dusk/night.

5.1.6.4 Project Effects

The Proposed Project is not expected to directly or indirectly impact the western snowy plover as a result of the avoidance and minimization measures described above and the limited potential of the western snowy plover to occur within the BSA.

5.1.6.5 Direct Effects

Western snowy plovers typically forage in wet or dry beach sand, tide-cast kelp (*Macrocystis* sp.), low foredune vegetation (vegetation along the coastal dune or ridge that is parallel to the shoreline), and near water seeps in salt pans (76 FR 16047). This habitat is not present within the BSA, therefore, no direct impacts to western snowy plover foraging are anticipated.

5.1.6.6 Indirect Effects

Noise

Western snowy plovers would be affected by implementation of the Proposed Project in the same ways as those described for California least terns. Noise generated during construction activities could cause behavioral disturbances to resting or foraging plovers. In 2017, a survey was conducted which identified western snowy plover nest sites within the Bolsa Chica Ecological Reserve. Based on the 2017 nest locations within BCER, the closest snowy plover nest was approximately 1,200 feet southeast of the project action area. Beaches used for nesting are also often used for wintering, but birds will also winter at several beaches where nesting does not occur (76 FR 16048). Western snowy plover's also visit or nest at other non-beach habitats such as human-made salt ponds, and estuarine sand and mud flats (76 FR 16048). Western snowy plovers are known to overwinter at Bolsa Chica Ecological Reserve and likely use the same areas in winter that are used for breeding (Collier and Powell 2000). The Bolsa Chica Ecological Reserve supported an average wintering flock of 14 western snowy plovers from 2003 through 2010 (76 FR 16078).

Increased Sediment and Urban Pollutants

Impacts on biological resources in the area could occur as a result of changes in water quality. Runoff of silt from the BSA or improper disposal of petroleum and chemical products from construction equipment could temporarily impact water quality during construction. Adverse effects on water quality could affect populations of aquatic species (including special status species) by reducing the amount of available habitat and by smothering eggs of aquatic species; this may result in direct mortality. Adverse effects on water quality could also impact populations of terrestrial wildlife species that use the Westminster watershed drainage channels for foraging by (1) ingesting toxic chemicals; (2) ingesting aquatic species that have ingested toxic chemicals leading to bioaccumulation of toxics; or (3) decreasing the available prey within aquatic habitats. The indirect impact on water quality is considered a potentially substantial effect. The Project shall incorporate BMPs including applicable measures required through NPDES

requirements, to ensure that the quantity and quality of runoff discharged does not adversely affect the BSA. The avoidance and minimization measures will ensure water quality levels would not be substantially affected. In particular, BMPs shall be designed to prevent (to the extent practicable) the runoff of toxins, chemicals, petroleum products, or other elements that might degrade biological resources in the drainage channels and the adjacent habitats. This can be accomplished by using a variety of methods, including detention basins, swales, or mechanical trapping devices to contain or treat runoff before it enters adjacent areas. Regular maintenance shall occur during operation of the Project to ensure effective operation of runoff control systems.

Night Lighting

Night lighting could inadvertently result in an indirect effect on the behavioral patterns of nocturnal and crepuscular (i.e., active at dawn and dusk) wildlife in adjacent open space on the BCER and SBNWR. Wildlife present in these areas may already be somewhat acclimated to current lighting associated with the existing roadways and development. Overhead lighting is not present along the drainage channels and no lighting is proposed as part of the project. In addition, all construction activities associated with the Proposed Project would occur during daylight hours; no nighttime lighting would be used during construction. Therefore, there would be no temporary light effects on aquatic or wildlife species during construction. There may be temporary lighting used at staging areas for safety purposes; however, lighting would be shielded therefore it is expected that there would be no substantial effect on wildlife in surrounding open space areas.

5.1.6.7 Compensatory Mitigation

No compensatory mitigation is proposed for this species since no direct or indirect impacts to western snowy plover are anticipated.

5.1.6.8 Cumulative Effects

Maintenance dredging occurs sporadically within the Huntington Harbour main channel and every 1-3 years within the ocean inlet for the BCER Full Tidal Basin. It is likely that maintenance dredging within Huntington Harbour would occur during implementation of the Proposed Project since construction of the Proposed Project would occur over approximately 15 years. However, the modification of the Warner Avenue Bridge would be the primary concern regarding a cumulative impact, and the modification of the bridge would occur within the first three years of the project being implemented. Maintenance dredging within the secondary channels of Huntington Harbour has not occurred since the harbour was constructed. Modification of C02 Reach 23 under the Proposed Project would be the primary concern regarding a cumulative impact, however, the secondary channels have never been dredged and it is unlikely that they would have a need to be dredged during implementation of the Proposed Project. Maintenance dredging within the BCER Full Tidal Basin is outside of the Action Area and is not expected to result in cumulative impacts due to implementation of the Proposed Project. Overall, cumulative impacts from past, present, and future actions on biological resources within the Action Area would be less than significant because impacts associated with other actions occur outside of the Action Area and do not overlap in time with the Proposed Project.

5.1.7 Green Turtle (*Chelonia mydas*), threatened

5.1.7.1 Survey/Literature Results

An unknown number of green turtles transit through Anaheim Bay to the SBNWR and BCER. This species is likely most abundant and active in the Proposed Project's action area in summer months when water temperatures are warmest (Crear et al. 2016). However, the effects analysis in this document considers the significance of the Anaheim Bay area for green turtles throughout the entire year. Impacts on green turtles would primarily be from increases in noise generated by construction activities, potential

strikes from vessels, in-water construction equipment, fill activities, disturbance of soft-bottom benthic habitat from excavation activities, and changes to hydrology that may lead to a decrease in foraging habitat and loss of eelgrass.

5.1.7.2 Critical Habitat

On September 2, 1998, the USFWS designated critical habitat for the green turtle in coastal waters surrounding Culebra Island, Puerto Rico (NOAA 1998). The BSA is not within the critical habitat for the green turtle.

5.1.7.3 Avoidance and Minimization Efforts

Although green turtles were not observed during any surveys, and no breeding habitat is expected to occur within the BSA, the Proposed Project may affect potential habitat. Therefore, the following avoidance and minimization efforts will be implemented during construction to avoid and minimize potential impacts to the green turtle and/or its habitat and would benefit this species:

- All demolition and construction activities and the operation of heavy construction equipment within Outer Bolsa Bay (OBB), C02 Reach 23 and C05 Reach 1 (including the tide gates at the downstream end of C05 Reach 1 and compensatory mitigation features) will be carried out between October 1 and February 28, outside of bird nesting season.
- To minimize impacts to wildlife species, a biologist that meets USFWS standard qualifications will conduct a biological resource sweep of the work area prior to any ground disturbing activities, dewatering activities, during project construction, and during demobilization of construction equipment. The biological resource sweep will include the following activities:
    - Inspect the work area, including along access roads, for any wildlife species and prepare a list of species observed and record their activity during construction of the project.
    - Implemented exclusionary or avoidance measures and/or relocate sensitive species if possible, and ensure that the quality of adjacent habitat outside of the construction zone is maintained.
    - In the event that sensitive (protected) wildlife species are present, determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area.
- A qualified biologist will:
    - Visually monitor for the presence of green turtle in reaches of areas where the species may be present. If the green turtle is found to be present, then construction activities in that area will halt until the turtle has moved from the area. Construction within these areas may also be staged to occur when the green turtle would not be expected to be present. The green turtle is typically present between late spring through fall, so construction activities within OBB, C02 Reach 23, and C05 Reach 1 may be staged to occur outside this window.
    - Be responsible for conducting flora and fauna surveys one week prior to the start of initial construction activities within a designated reach to identify the occurrence of any special status species within the Proposed Project's action area.
    - Be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.
- An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the Proposed Project. Prior to the onset of construction activities, the Contractor will provide

all personnel who will be present on work areas within or adjacent to the Proposed Project action area the following information:
    - A detailed description of all listed species including color photographs;
    - The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act;
    - The protective measures being implemented to conserve all listed species during construction activities associated with the Proposed Project; and
    - A point of contact if listed species are observed.
    - Provisions of water quality Best Management Practices (BMPs) and provisions of the Storm Water Pollution Prevention Plan (SWPPP) will be provided along with consequences for violations incurred by non-compliance with BMPs and SWPPP provisions.
    - Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting of the listed species that may be encountered during construction.
    - Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.
- A silent pile driver may be used instead of an impact or vibratory pile driver where sensitive ecological resources are nearby, especially within the vicinity of Warner Avenue Bridge, C02 Reach 23, and C05 Reach 1.
- To minimize noise impacts to biological resources the following measures will be implemented:
    - During nesting season portable acoustic panels will be placed where heavy equipment is operating to minimize construction noise levels.
    - If needed during the nesting season, portable acoustic panels will be placed along the perimeter of the channels where construction is occurring to reduce construction noise levels.
    - All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds.
    - Onsite generators and booster pumps will be enclosed entirely.
- To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented:
    - Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction.
    - Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. Equipment maintenance and/or repair will be confined to one location. Runoff in this area will be controlled to prevent contamination of soils and water.
    - Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from OBB, SBNWR, and the BCER to eliminate risk of pollution from spills and contamination.
    - Standard BMPs accepted by the WQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.
- Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.

- Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.
- Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at dusk/night.

5.1.7.1 Project Effects

The Proposed Project is not expected to directly impact the green turtle as a result of the avoidance and minimization measures described above and the limited potential of the green turtle to occur within the BSA. However, the Proposed Project may have indirect effects to the green turtle through the temporary loss of potential foraging habitat.

5.1.7.2 Direct Effects

The Proposed Project would not have any direct impact on green turtle foraging habitat.

5.1.7.3 Indirect Effects

Foraging Habitat

Foraging habitat (i.e., eelgrass beds) for this species could be indirectly impacted by the Proposed Project. Water velocity plays an important role in determining where eelgrass can grow. However, eelgrass critical velocity thresholds are difficult to determine and very few studies have reported these thresholds. Fonseca et al. (1983) found that maximum velocity thresholds for eelgrass appear to range between 3.94 and 4.92 feet/second. The Proposed Project would increase velocities significantly above the existing condition velocities and the maximum velocity thresholds for eelgrass. Therefore, 1.7 acres of eelgrass that is located at the downstream end of C02 Reach 23 could be indirectly impacted, in turn impacting foraging habitat for green turtle.

Noise

Sea turtles most likely use sound to detect nearby broadband, continuous environmental sounds, such as the sounds of waves crashing on the beach. Exposure to intense sound may result in hearing loss, typically quantified as threshold shift, which persists after cessation of the noise exposure. Threshold shift is a loss of hearing sensitivity at an affected frequency of hearing. This noise-induced hearing loss may manifest as temporary threshold shift (TTS), if hearing thresholds recover over time, or permanent threshold shift (PTS), if hearing thresholds do not recover fully pre-exposure thresholds. Because there are no data on auditory effects on sea turtles, the ANSI Sound Exposure Guidelines (Popper et al. 2014) do not include numeric sound exposure thresholds for auditory effects on sea turtles. Rather, the guidelines qualitatively estimate that sea turtles are less likely to incur TTS or PTS with increasing distance from various sound sources. The guidelines also suggest that data from fishes may be more relevant than data from marine mammals when estimating impacts on sea turtles, because, in general, fish hearing range is more similar to the limited hearing range of sea turtles.

Although pile driving is included as part of the project, a Giken silent pile machine will be utilized for the insertion of piles along C05 Reach 1 (i.e., adjacent to the BCER) and C02 Reach 23 (i.e., adjacent to SBNWR). The Giken silent pile machine pushes the pile into the ground without an impact hammer or vibration. The operation, with the exception of a crane engine (to hold the sheet) and the generator to power the Giken machine, is almost silent. In comparison, pneumatic and vibratory pile driving operations produce airborne noise levels of 101 A-weighted decibels (dBA) at a distance of 50 feet (15 m) from the source (U.S. Department of Transportation 2006). The use of the Giken silent pile machine eliminates the need of an impact hammer to drive piles. Impulses from the impact hammer are the primary concern when pile driving and could affect the behavior of sea turtles in the area with typical behavioral responses being 1) increase swim speed, 2) change of position in the water column, and 3)

avoidance of the sound. Since the Giken pile machine would not use an impact hammer, and the only noise associated with the machine would be that of the crane required to hold the piles and a generator to operate the machine, no direct noise impacts to green turtles are anticipated.

Increased Sediment and Urban Pollutants

Impacts on biological resources in the area could occur as a result of changes in water quality. Runoff of silt from the BSA or improper disposal of petroleum and chemical products from construction equipment could temporarily impact water quality during construction. Adverse effects on water quality could affect populations of aquatic species (including special status species) by reducing the amount of available habitat and by smothering eggs of aquatic species; this may result in direct mortality. Adverse effects on water quality could also impact populations of terrestrial wildlife species that use the Westminster watershed drainage channels for foraging by (1) ingesting toxic chemicals; (2) ingesting aquatic species that have ingested toxic chemicals leading to bioaccumulation of toxics; or (3) decreasing the available prey within aquatic habitats. The indirect impact on water quality is considered a potentially substantial effect. The Project shall incorporate BMPs including applicable measures required through NPDES requirements, to ensure that the quantity and quality of runoff discharged does not adversely affect the BSA. The avoidance and minimization measures will ensure water quality levels would not be substantially affected. In particular, BMPs shall be designed to prevent (to the extent practicable) the runoff of toxins, chemicals, petroleum products, or other elements that might degrade biological resources in the drainage channels and the adjacent habitats. This can be accomplished by using a variety of methods, including detention basins, swales, or mechanical trapping devices to contain or treat runoff before it enters adjacent areas. Regular maintenance shall occur during operation of the Project to ensure effective operation of runoff control systems.

Night Lighting

Night lighting could inadvertently result in an indirect effect on the behavioral patterns of nocturnal and crepuscular (i.e., active at dawn and dusk) wildlife in adjacent open space on the BCER and SBNWR. Wildlife present in these areas may already be somewhat acclimated to current lighting associated with the existing roadways and development. Overhead lighting is not present along the drainage channels and no lighting is proposed as part of the project. In addition, all construction activities associated with the Proposed Project would occur during daylight hours; no nighttime lighting would be used during construction. Therefore, there would be no temporary light effects on aquatic or wildlife species during construction. There may be temporary lighting used at staging areas for safety purposes; however, lighting would be shielded therefore it is expected that there would be no substantial effect on wildlife in surrounding open space areas.

5.1.7.4 Compensatory Mitigation

Compensatory mitigation is proposed for the temporary impacts to green turtle. Compensatory mitigation would include enhancement of the muted tidal pocket in the Bolsa Chica Ecological Reserve.

5.1.7.5 Cumulative Effects

Maintenance dredging occurs sporadically within the Huntington Harbour main channel and every 1-3 years within the ocean inlet for the BCER Full Tidal Basin. It is likely that maintenance dredging within Huntington Harbour would occur during implementation of the Proposed Project since construction of the Proposed Project would occur over approximately 15 years. However, the modification of the Warner Avenue Bridge would be the primary concern regarding a cumulative impact, and the modification of the bridge would occur within the first three years of the project being implemented. Maintenance dredging within the secondary channels of Huntington Harbour has not occurred since the harbour was constructed. Modification of C02 Reach 23 under the Proposed Project would be the primary concern regarding a cumulative impact, however, the secondary channels have never been dredged and it is unlikely that they

would have a need to be dredged during implementation of the Proposed Project. Maintenance dredging within the BCER Full Tidal Basin is outside of the Action Area and is not expected to result in cumulative impacts due to implementation of the Proposed Project. Overall, cumulative impacts from past, present, and future actions on biological resources within the Action Area would be less than significant because impacts associated with other actions occur outside of the Action Area and do not overlap in time with the Proposed Project.

5.2 Proposed Species, Candidate Species and/or Proposed Critical Habitat Within the Action Area

No proposed species, candidate species, or proposed critical habitat occurs within the Proposed Project's action area.

5.3 Essential Fish Habitat

Essential Fish Habitat (EFH) means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For interpreting the definition of EFH, "waters" includes aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish where appropriate. "Substrate" includes sediment, hard bottom, structures underlying the water, and associated biological communities. The term "necessary" means the habitat required to support a sustainable fishery and a healthy ecosystem. The term "spawning, breeding, feeding, or growth to maturity" covers a species full life cycle.

EFH potentially present within the project area was queried using GIS data made available by the National Oceanic and Atmospheric Administration's (NOAA) NMFS. It was found that EFH for groundfish, coastal pelagic species, finfish, and market squid is present within Anaheim Bay, Huntington Harbour, and Outer and Inner Bolsa Bay. EFH for these species also extends upstream into reaches of channels C02 and C05 (*Table 3* and *Figure 19*). Outside of the project area, but within Anaheim Bay and along the coastline, EFH also exists for krill (i.e., *Euphausia pacifica*, *Thysanoessa spinifera*, and other krill species) as well as for the aforementioned species.

Coastal pelagic species that may be found in the area include Pacific sardine (*Sardinops sagex*), Pacific (chub) mackerel (*Scomber japonicus*), northern anchovy (*Engraulis mordax*) and jacksmelt (*Atherinopsis californiensis)*. Coastal pelagic species tend to be most common in the upper mixed layer of the ocean (above the thermocline) in a broad band (up to hundreds of miles wide) along the coast. Coastal pelagic species may occur in shallow embayments and brackish water, but do not depend on these habitats to any significant degree.

No Pacific Salmon EFH, HAPC, or EFH Areas Protected from Fishing (EFHA) were identified within the vicinity of the project. Additionally, EFH for Pacific Highly Migratory Species (PHMS) — thresher shark, bluefin tuna, dolphinfish (*Coryphaena hippurus)*, and swordfish (*Xiphias gladius*) — is located approximately one mile off the coast; therefore, these species are not anticipated to be within the vicinity of the project.

Table 3: Channel reaches with potential Essential Fish Habitat.

Channel	Species	Reach with EFH
C02	Groundfish	Reach 23
	Coastal Pelagic Species	
	Finfish and Market Squid	
C05	Groundfish	Reach 1
		Reach 2

Channel	Species	Reach with EFH
	Coastal Pelagic Species	Reach 1
	Finfish and Market Squid	Reach 1

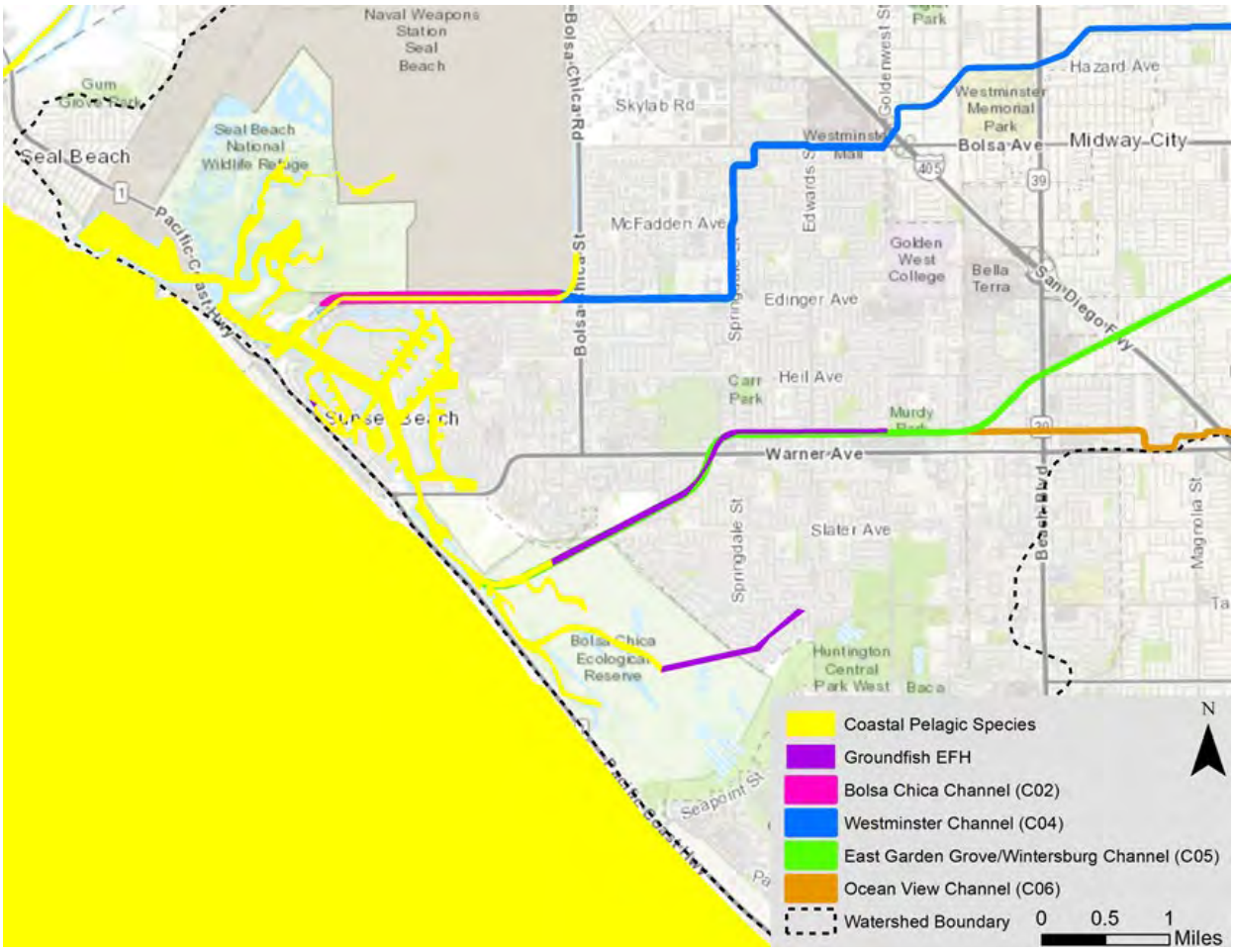

Figure 19: Location of Designated EFH within the Study Area.

Federally managed fish species occurring in estuarine waters within the study area are administered by two fishery management plans (FMP): the Pacific Groundfish FMP and the Coastal Pelagic Species FMP.

5.3.1 Pacific Groundfish Species

The only species from the Pacific Groundfish FMP that has been observed within the study area (i.e., Bolsa Chica Ecological Reserve) is the leopard shark.

5.3.1.1 Leopard Shark (*Triakus semifasicata*)

Distribution and Habitat. Leopard sharks are found from southern Oregon to Baja California, Mexico including the Gulf of California (PFMC 2016). A coastal species, the leopard shark is most abundant in northern California bays and estuaries and along southern California beaches. Although they are common in enclosed, muddy bays, other habitats of the leopard shark are flat, sandy areas, mud flats, sandy and muddy bottoms strewn with rocks near rocky reefs, and kelp beds. It is common in littoral waters and

around jetties and piers. It is also known to congregate around warm-water outfalls or power plants. The leopard shark occurs in polyhaline-euhaline waters (PFMC 2016).

Leopard sharks are most common on or near the bottom in waters less than 20 m deep, but have been caught as deep as 91 m (PFMC 2016). Estuaries and shallow coastal waters appear to be used as pupping and feeding/rearing grounds. Neonate pups occur in and just beyond the surf zone in areas of Southern California, such as Santa Monica Bay, and they are also found near eelgrass beds in other bays, such as San Francisco Bay and Humboldt Bay (PFMC 2016).

Life History. Leopard sharks often enter shallow bays and onto intertidal flats during high tides and retreat on ebb tides (PFMC 2016). Leopard sharks are active during the day, unlike other nocturnal sharks. In regards to seasonal migrations, tagging studies in San Francisco Bay showed that most leopard sharks resided in the bay during March through September, but they also occurred both inside and outside the bay from October to February (PFMC 2016).

The leopard shark utilizes several major food sources and food preference is dependent upon the size of the shark (PFMC 2016). Juveniles and adults are carnivorous, opportunistic, benthic and littoral feeders. Prey includes crabs and shrimp, echiuroid worms, clams, fishes, fish eggs, polychaete worms, octopi, herring eggs, topsmelt, jacksmelt, and midshipmen when available. Presence of mud-burrowing prey in their diet signifies that the leopard shark feeds very close to or in the mud (PFMC 2016).

Potential for Occurring in Project Area. The leopard shark has been observed within the Bolsa Chica Ecological Reserve by the CDFW, which is adjacent to the proposed project's action area.

5.3.2 Coastal Pelagic Species FMP

Species from Coastal Pelagic Species FMP that has been observed within the study area (i.e., Bolsa Chica Ecological Reserve and/or Seal Beach National Wildlife Refuge) are the Pacific sardine, Pacific (chub) mackerel, northern anchovy, and jacksmelt.

5.3.2.1 Pacific Sardine (*Sardinops sagax*)

Distribution and Habitat. Pacific sardine is found from southeastern Alaska, south to Baja California, Mexico (PFMC 1998). In regards to habitat, Pacific sardine, like other coastal pelagic species protected by the Coastal Pelagic Species FMP, are highly mobile and are generally associated with a range of thermal conditions rather than fixed physical habitat. In addition, coastal pelagic species like the Pacific sardine, are somewhat unpredictable and not particularly dependent on any single habitat type or spatially discrete location (PFMC 2019). Pacific sardine probably migrated extensively during historical periods when abundance was high, moving north as far as British Columbia in the summer and returning to southern California and northern Baja California in the fall (PFMC 1998).

Life History. Pacific sardine spawn in loosely aggregated schools in the upper 50 meters of the water column (PFMC 1998). Spawning occurs year-round in the southern stock and peaks April through August between Point Conception and Magdalena Bay, and January through April in the Gulf of California. Off California, sardine eggs are most abundant at sea surface temperatures of 14˚C to 16˚C and larvae are most abundant at 13˚C to 16˚C. The spatial and seasonal distribution of spawning is influenced by temperature. During periods of warm water, the center of sardine spawning shifts northward and spawning extends over a longer period of time. The main spawning area for the historical population off the U.S. was between Point Conception and San Diego, California, out to about 100 miles offshore, with

evidence of spawning as far as 250 miles offshore. Both eggs and larvae are found near the surface (PFMC 1998).

Sardine are planktivores that consume both phytoplankton and zooplankton (PFMC 1998). When biomass is high, Pacific sardine may consume a significant proportion of total organic production in the California Current system (PFMC 1998).

Potential for Occurring in Project Area. The Pacific sardine has been observed in both the Seal Beach National Wildlife Refuge and the Bolsa Chica Ecological Reserve, which are adjacent to the proposed project's action area.

5.3.2.2 Pacific (Chub) Mackerel (*Scomber japonicas*)

Distribution and Habitat. Pacific mackerel in the northeastern Pacific range from Banderas Bay, Mexico, to southeastern Alaska, including the Gulf of California (PFMC 1998). They are common from Monterey Bay, California, to Cabo San Lucas, Baja California, but are most abundant south of Point Conception. Pacific mackerel usually occur within 20 miles of shore, but have been taken as far offshore as 250 miles. Pacific mackerel adults are found in water ranging from 10˚C to 22.2˚C, and larvae may be found in water around 14˚C. There is an inshore-offshore migration off California, with increased inshore abundance from July to November and increased offshore abundance from March to May. Adult Pacific mackerel are commonly found near shallow banks. Juveniles are found off sandy beaches, around kelp beds, and in open bays. Adults are found from the surface to depths of 300 meters (PFMC 1998).

Life History. Pacific mackerel larvae eat copepods and other zooplankton including fish larvae (PFMC 1998). Juveniles and adults feed on small fish, fish larvae, squid, and pelagic crustaceans such as euphausids. Pacific mackerel in the northeastern Pacific stock spawn from Eureka, California, south to Cabo San Lucas in Baja California between three and 320 km from shore. They seldom spawn north of Point Conception. Spawning peaks from late April to July. Like most coastal pelagic species, Pacific mackerel have indeterminate fecundity and seem to spawn whenever sufficient food is available and appropriate environmental conditions prevail (PFMC 1998).

Potential for Occurring in Project Area. The Pacific (chub) mackerel has been observed in the Bolsa Chica Ecological Reserve by the CDFW, which is adjacent to the proposed project's action area.

5.3.2.3 Northern Anchovy (*Engraulis mordax*)

Distribution and Habitat. Northern anchovy are distributed from the Queen Charlotte Islands, British Columbia to Magdalena Bay, and Baja California, and in the Gulf of California (PFMC 1998). The central sub-population ranges from approximately San Francisco, California, to Punta Baja, Baja California. In regards to habitat, northern anchovy, like other coastal pelagic species protected by the Coastal Pelagic Species FMP, are highly mobile and are generally associated with a range of thermal conditions rather than fixed physical habitat. In addition, coastal pelagic species like the northern anchovy, are somewhat unpredictable and not particularly dependent on any single habitat type or spatially discrete location (PFMC 2019). Northern anchovy in the central subpopulation are typically found in waters that range from 12˚C to 21.5˚C. All life stages are found in the surface waters of the U.S. Exclusive Economic Zone (EEZ). Eggs and larvae are found near the surface, generally at depths of less than 50 meters and in the same areas as spawning adults (PFMC 1998).

Life History. Northern anchovy eat phytoplankton and zooplankton by either filter feeding or biting, depending on the size of the food (PFMC 1998). Anchovy spawn every month of the year, but spawning

increases in late winter and early spring and peaks from February to April. Preferred spawning temperature is 14˚C and eggs are most abundant at temperatures of 12˚C to 16˚C (PFMC 1998).

Potential for Occurrence in Project Area. The northern anchovy has been observed in the Seal Beach National Wildlife Refuge, which is adjacent to the proposed project's action area.

5.3.2.4 Jacksmelt (*Atherinopsis californiensis*)

Distribution and Habitat. Jacksmelt are found in estuaries and coastal marine environments from Yaquina Bay, Oregon to at least Bahia Magdalena, Baja California Sur (CWB 2019). In regards to habitat, jacksmelt, like other coastal pelagic species protected by the Coastal Pelagic Species FMP, are highly mobile and are generally associated with a range of thermal conditions rather than fixed physical habitat. In addition, coastal pelagic species like the jacksmelt, are somewhat unpredictable and not particularly dependent on any single habitat type or spatially discrete location (PFMC 2019).

Life History. The spawning season for jacksmelt is from October through March, with peak activity from January through March (CWB 2019). The females lay eggs on marine plants and other floating objects where fertilization by male jacksmelt occurs (CWB 2019).

Potential for Occurring in Project Area. The jacksmelt has been observed in both the Seal Beach National Wildlife Refuge and the Bolsa Chica Ecological Reserve, which are adjacent to the proposed project's action area.

5.3.3 Direct Effects

In regards to the modification of the Warner Avenue Bridge, construction activities would temporarily displace fish and macroinvertebrates from the vicinity of the construction site. Although modification of the bridge would not require complete closure and dewatering of the channel under the bridge, a portion of the channel would likely be coffer-dammed off for construction activities. Prior to construction at the bridge, macroinvertebrates and fish within the construction site will be manually relocated or coaxed to move elsewhere as appropriate. Once construction is complete, modification of the bridge will provide additional soft bottom habitat for fish and macroinvertebrates from the conversion of approximately 0.6 acres of adjacent upland habitat to open water.

A variety of nearshore fishes are known to swim into Bolsa Chica wetlands and are expected in the lower reaches of C02 and C05. Existing channel reaches that are concrete lined are considered low quality habitat and the proposed project would not result in a substantial, adverse impact to EFH in these reaches. Modifications of the concrete-lined reaches of the tidal portions of the channels would have minimal impact to EFH. Because the subject channel reaches have concrete sides and bottoms, they typically do not support wetlands habitat to provide substantial sources of food and/or cover for marine fishes. Only marine species that are tolerant of freshwater would be expected in areas at the farther upstream reach of the tidal influence. Channel reaches beyond the tidal influence in these channels would not be expected to support marine fishes at all. The concrete-lined reaches are expected to experience fluctuating salinity, provide no shelter and few food resources, and a low-quality habitat.

No Pacific Salmon EFH, Habitat Areas of Particular Concern (HAPC), or EFH Areas Protected from Fishing (EFHA) were identified within the vicinity of the proposed project action area. Additionally, EFH for Pacific Highly Migratory Species (PHMS) is located approximately 1 mile off the coast, therefore, these species are not anticipated to be within the vicinity of the proposed project action area and would not be impacted.

In terms of eelgrass within the channels, there is no eelgrass located within the channels that would be directly impacted by the Proposed Project.

5.3.4 Indirect Effects

Eelgrass located at the downstream end of C02 in Huntington Harbour could be indirectly impacted by the proposed project. Construction activities within the channels could temporarily increase downstream turbidity which could adversely impact eelgrass in Huntington Harbour. Once construction is complete, however, turbidity would be expected to decrease since the channels would be lined with concrete, subsequently reducing erosion and sediment transport within the channels downstream to Huntington Harbour. In addition, modification of the channels could increase storm-flow velocities at the downstream end of C02. These velocities could be greater than eelgrass is able to withstand, thereby resulting in an indirect impact to eelgrass.

In addition to indirect impacts to eelgrass, a potential substantial adverse impact to EFH would be in the event an accident occurred from equipment working within the proposed project action area, and that accident led to a major fuel spill that polluted quality EFH habitat in Outer Bolsa Bay and/or Huntington Harbour. In addition, lining the existing earthen and riprap trapezoidal channels with concrete would increase the flowrate within the channels, which may indirectly affect the use of the channels in the future by existing organisms. Since a majority of the channels (about 75 percent) have already been lined with riprap or concrete, the proposed project would not be expected to have a significant effect on habitat or habitat use. Standard Best Management Practices (BMPs) accepted by the Los Angeles Regional Water Quality Control Board would be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. Impacts to EFH also would be minimized because the channels would be dewatered during maintenance activities or water would be routed around equipment. Because the equipment will not be working in the wet, the chances of contaminants from a spill or leak entering channel waters is remote.

5.3.5 Compensatory Mitigation

Due to implementation of the Proposed Project, there could be an indirect impact to eelgrass located at the downstream end of C02 Reach 23. The estimated acreage of eelgrass that could be indirectly impacted by the Proposed Project is 1.7 acres. This would equate to a mitigation need of approximately 4.1 acres. The Conceptual Mitigation Strategy for the Proposed Project will provide a methodology for conducting in-kind (i.e., transplanting eelgrass in Outer Bolsa Bay) and out-of-kind (i.e., kelp and abalone restoration in Palos Verdes) mitigation to offset the possible mortality of eelgrass at the downstream end of C02 in Huntington Harbour.

5.3.6 Cumulative Effects

The cumulative setting for impacts related to biological resources is the project area including the BCER and the SBNWR. There is the potential for significant cumulative impacts to special status species, primarily special status birds and the green turtle, if the Recommended Plan and other projects were to occur at the same time. The other projects include construction activities associated with developments (i.e., the NWSSB project), but also maintenance dredging of Anaheim Bay/NWSSB, Huntington Harbour, and the ocean inlet to the full tidal basin at the BCER. Construction noise, equipment, and personnel associated with these projects could disturb nesting birds resulting in unsuccessful hatchings. The construction of the Recommended Plan, especially increasing the span of Warner Avenue Bridge, removal of the tide gates and replacement with an access bridge, and channel modifications along C02 Reach 23 and C05 Reach 1, could contribute to the significant cumulative impact to nesting and foraging

birds and foraging green turtles. However, with the implementation of mitigation measures, the impacts of the Recommended Plan would be reduced to less than significant. Therefore, the Recommended Plan would not contribute to a significant cumulative impact to biological resources.

5.4 Summary of Avoidance and Minimization Efforts

The following table (*Table 4*) provides a summary of the avoidance and minimization efforts that would be implemented prior to construction, during construction, or post construction to avoid and minimize impacts of the Proposed Action on protected species under ESA.

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Table 4. Mitigation Measures.

Mitigation Measures	Timing	Responsible Party
All demolition and construction activities and the operation of heavy equipment within Outer Bolsa Bay, C02 Reach 24 and C05 Reach 1 (including the tide gates at the downstream end of C05 Reach 1) will be carried out between October 1 and February 28, outside of bird nesting season.	During construction	Construction contractor
To minimize impacts to wildlife species, a biologist that meets USFWS standard qualifications will conduct a biological resource sweep of the work area prior to any ground disturbing activities, dewatering activities, during project construction, and during demobilization of construction equipment. The biological resource sweep will include the following activities: • Inspect the work area, including along access roads, for any wildlife species and prepare list of species observed and record their activity during construction of the project. • Implement exclusionary or avoidance measures and/or relocate sensitive species if possible, and ensure that the quality of adjacent habitat outside of the construction zone is maintained. • In the event that sensitive (protected) wildlife species are present, determine if the activity would cause adverse impacts that have not been previously considered and evaluated. If it is determined that the activity could have the potential to adversely affect wildlife species in a manner not authorized by Federal or State permits, the activity will cease until the species is no longer in harm's way or is relocated outside of the construction activity impact area.	During construction	USACE, in coordination with the construction contractor.
A qualified biologist will: • Visually monitor for the presence of green turtle in reaches or areas where the species may be present. If the green turtle is found to be present, then construction activities in that area will halt until the turtle has moved from the area. Construction within these areas may also be staged to occur when the green turtle would not be expected to be present. The green turtle is typically present between late spring through fall, so construction activities within Outer Bolsa Bay and C02 Reach 23 and C05 Reach 1 may be staged to occur outside this window. • Will be responsible for overseeing compliance with protective measures for the biological resources during construction activities within designated areas.	During construction	USACE, in coordination with the construction contractor.
An employee education program will be developed. Each employee (including temporary, contractors, and subcontractors) will participate in a training/awareness program prior to working on the proposed project. Prior to the onset of construction activities, the Contractor will provide all personnel who will be present on work areas within or adjacent to the project area the following information: • A detailed description of all listed species including color photographs; • The protection listed species receive under the Endangered Species Act and possible legal action that may be incurred for violation of the Act; • The protective measures being implemented to conserve all listed species during construction activities associated with the proposed project; and • A point of contact if listed species are observed.	Prior to construction	USACE, in coordination with the construction contractor

Mitigation Measures	Timing	Responsible Party
• Provisions of water quality BMPs and provisions of the SWPPP will be provided along with consequences for violations incurred by non-compliance with BMP and SWPPP provisions. • Issue identification cards to shift supervisors with photos, descriptions, and actions to be taken upon sighting for the listed species that may be encountered during construction. • Discuss roles and responsibilities of Biologists hired to perform surveys and monitoring.		
A silent pile driver may be used instead of an impact or vibratory pile driver where sensitive ecological resources are nearby, especially within the vicinity of Warner Avenue Bridge, C02 Reach 23, and C05 Reach 1.	During construction	Construction contractor
To minimize noise impacts to biological resources the following measures will be implemented: • During nesting season portable acoustic panels will be placed where heavy equipment is operating to minimize construction noise levels. • If needed during the nesting season, portable acoustic panels will be placed along the perimeter of the channels where construction is occurring to reduce construction noise levels. • All construction equipment will be equipped with noise reduction features, such as mufflers and engine shrouds. • Onsite generators and booster pumps will be enclosed entirely.	During construction	Construction contractor
To minimize accidental hazardous material spill impacts to biological resources the following measures will be implemented: • Prior to and during operation of heavy construction equipment, a spill prevention and contingency plan will be prepared and implemented. The plan will include measures to prevent or avoid incidental leaks or spills, including identification of materials necessary for containment and clean up. Oil-absorbing floating booms will also be kept onsite and the contractor will respond to any aquatic spills during construction. • Vehicles and equipment will be kept in good repair, without leaks of hydraulic or lubricating fluids. If such leaks or drips do occur, they will be cleaned up immediately. The area will be controlled to prevent contamination of soils and water. • Vehicles and other equipment will be fueled, cleaned, and maintained in designated areas away from Outer Bolsa Bay and the BCER to eliminate risk of pollution from spills and contamination. • Standard BMPs accepted by the SARWQCB will be implemented to avoid degrading water quality. These BMPs include procedures to avoid leaks and spills and to contain and clean up contaminants in the unlikely event that a spill does occur. The project would employ dewatering or water routed around equipment to avoid and minimize release of contaminants during project activities.	During construction	Construction contractor
Construction personnel will utilize designated access roads or previously disturbed areas for vehicle access and staging of construction equipment.	During construction	Construction contractor

Mitigation Measures	Timing	Responsible Party
Speed limits of 15 miles per hour or less will be required at all times to avoid potential injury to wildlife in the area.	During construction	Construction contractor
Project-related vehicle travel and construction activities will be limited to daylight hours, as wildlife and some special-status species could be found on roadways primarily at dusk/night.	During construction	Construction contractor

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6.0 Conclusions and Determination

6.1 ESA Conclusions

The following information is provided in support of the determinations that follow in Section 6.2:

- Salt marsh bird's-beak occurs within the SBNWR, but suitable habitat does not exist within the BSA to support this species.
- Ventura marsh milk-vetch was collected in 1882 in BCER, but the species has not been collected since and is believed to be extirpated from the area. Suitable habitat does not exist within the BSA to support this species.
- The California least tern, coastal California gnatcatcher, light-footed Ridgway's rail, western snowy plover, and green turtle have limited potential to occur within the BSA primarily for foraging. Nesting habitat also occurs within the BSA, but construction activities will be scheduled so as to avoid nesting season.

6.2 ESA Determination

In conclusion, the following determinations have been made for each federally listed species that may be affected by the Proposed Project:

Table 5: Species with Determination of "may affect, not likely to adversely affect".

Species	ESA Listing Status
California least tern (*Sterna antillarum browni*)	Endangered
coastal California gnatcatcher (*Polioptila californica californica*)	Threatened
light-footed Ridgway's rail (*Rallus obsoletus levipes*)	Endangered
western snowy plover (*Charadrius alexandrinus nivosus*)	Threatened
green turtle (*Chelonia mydas*)	Endangered

Table 6: Species with Determination of "no effect".

Species	ESA Listing Status
salt marsh bird's-beak (*Cordylanthus maritimus* sp. *maritimus*)	Endangered
Ventura marsh milk-vetch (*Astragalus pycnostachyus var. lanosissimus*)	Endangered

6.3 EFH Conclusions

In conclusion, the Proposed Project will indirectly affect approximately 1.7 acres of eelgrass, resulting in the need for approximately 4.1 acres of mitigation. The eelgrass mitigation plan (which includes in-kind mitigation, out-of-kind mitigation, and monitoring) to be put into place will help to minimize the negative impacts, and the modification of the Warner Avenue Bridge will eventually provide additional soft-bottom habitat.

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8.0 Appendix A – Existing Conditions vs. Proposed Project Figures

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U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined
- Earthen

With-Project Features

- Channel Crossings Replaced
- C05R01 Sheetpile Walls North & South Levee w/ Toe Excavation; Soft Bottom

N
W E
S

1 inch = 0.21 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 01
70.72 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PC_DSFWS_Map_20NOV2019_ExistingVsProposed_arc.mxd 19/MAR/MB

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Concrete Lined

With-Project Features

Channel Crossings Replaced

C05R02 Concrete Rectangular

N
W E
S

1 inch = 0.04 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 02
7.15 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PC_DSFWS_Map_20NOV2019_ExistingVsProposed_arh.mxd 19/MAR/MB

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined

With-Project Features

- Channel Crossings Replaced
- C05R03 Concrete Rectangular

N
W E
S

1 inch = 0.088 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 03
13.44 Acres

G:\Projects_Misc\Westminster_CA_FRM_StudyMod\LRC Maps\PL_DSFWS_Map_22NOV2019_ExistingWPFeatures_arh.mxd 19PMPAHB

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined

With-Project Features

- Channel Crossings Replaced
- C05R04 Concrete Rectangular

N
W E
S

1 inch = 0.118 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 04
16.79 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DSHWS_Map_20NOV2019_ExistingVsProposed_arh.mxd YBP-MP-ARB

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined

With-Project Features

- Channel Crossings Replaced
- C05R05 Concrete Rectangular

N
W E
S

1 inch = 0.106 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 05
15.89 Acres

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Concrete Lined

With-Project Features

Channel Crossings Replaced

C05R06 Concrete Rectangular

N
W E
S

1 inch = 0.019 miles

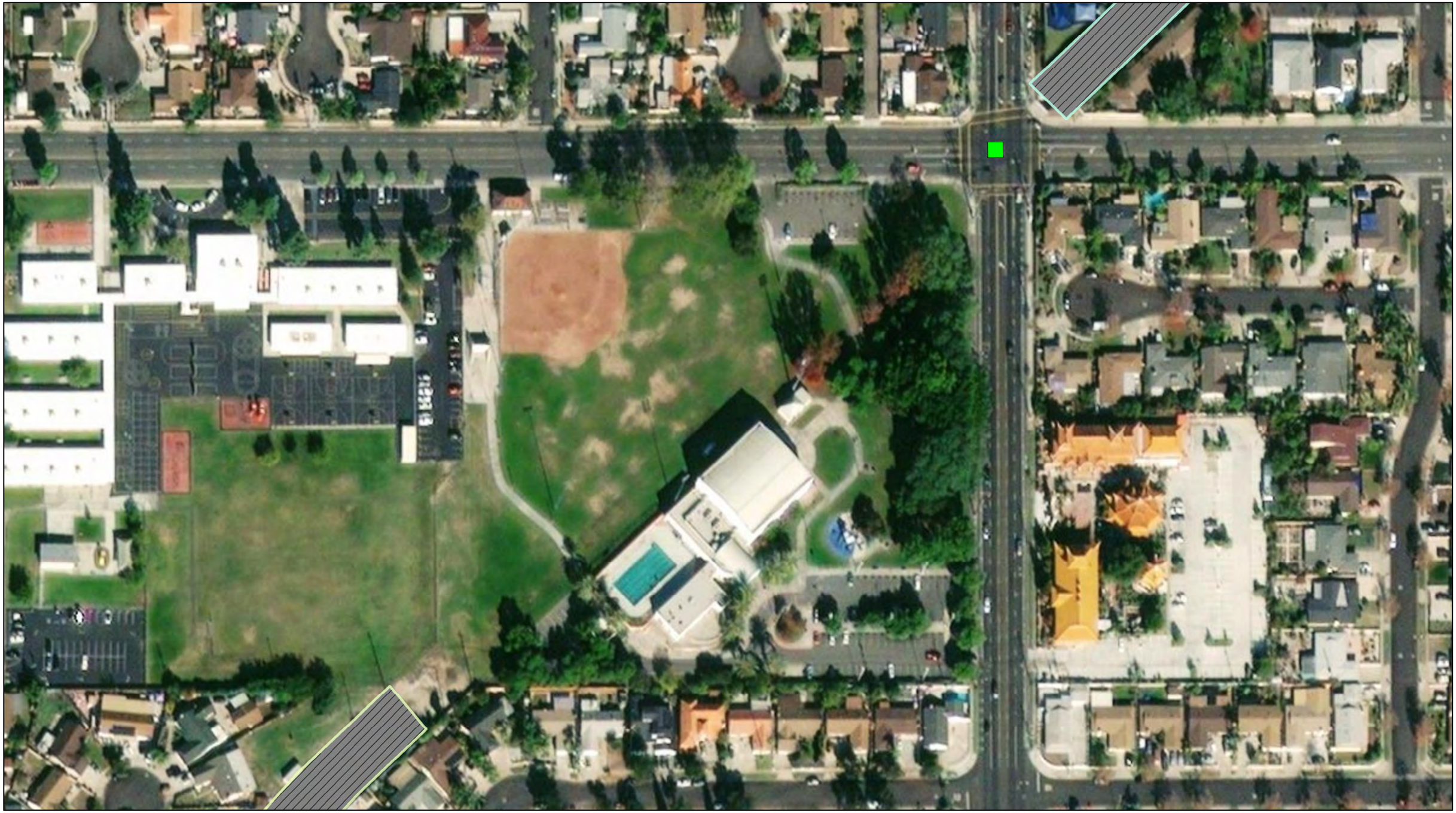
Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 06
1.34 Acres

G:\Projects_Mac\Westminster_CA_1100_StudyMXD\LRC Maps\PL_OSHWS_Map_20NOV2019_ExistingWP-topoaddr_alt.mxd 19P/AP/AN8



Existing Channel Bottom Condition

With-Project Features

Channel Crossings Replaced

U.S. Army Corps Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.021 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 07
1.72 Acres

Z:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_OSHWs_Map_20NOV2019_ExistingVsProposed_arr.mxd 19/MAR/Anita

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Concrete Lined

With-Project Features

Channel Crossings Replaced

C05R08 Concrete Rectangular

N
W E
S

1 inch = 0.109 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 08
5.86 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DSFWS_Map_20NOV2019_ExistingWP-Reposed_arh.mxd 19P/MPA/IS

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Concrete Lined

With-Project Features

Channel Crossings Replaced

C05R09 Concrete Rectangular

N
W E
S

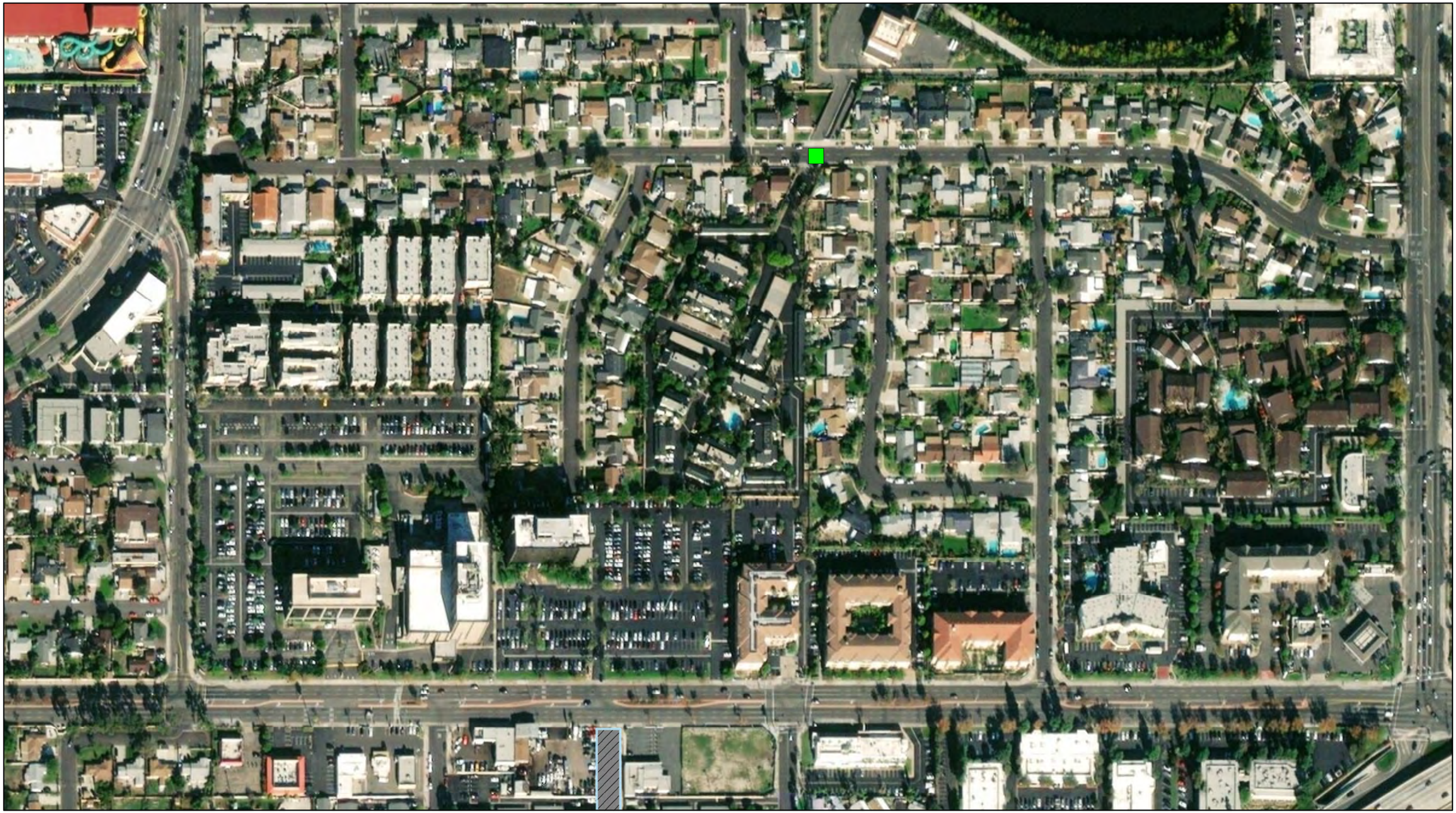
1 inch = 0.104 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 09
7.27 Acres



Existing Channel Bottom Condition

With-Project Features

Channel Crossings Replaced

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.036 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 10
1.68 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\FC_OSHWs_Map_26NOV2019_ExistingVsProposed_arh.mxd 11/5/2019

Existing Channel Bottom Condition

With-Project Features

U.S. Army Corps
Of Engineers ®
Chicago District

1 inch = 0.058 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 11
3.16 Acres

G:\Projects_Misc\westminster_CA_FRM_Study\MXD\LRC Maps\PL_OSHWs_Map_20NOV2019_ExistingVsProposed_arr.mxd IWP/MPAHS

Existing Channel Bottom Condition

With-Project Features

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.031 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 12
1.84 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_USFWS_Map_20NOV2019_ExistingVsProposed_arh.mxd HBPMPAHS

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined
- Earthen

With-Project Features

- Channel Crossings Replaced
- C06R13 Concrete Rectangular

N
W E
S

1 inch = 0.096 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 13
12.66 Acres

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Concrete Lined

With-Project Features

C06R14 Concrete Rectangular

N
W E
S

1 inch = 0.012 miles

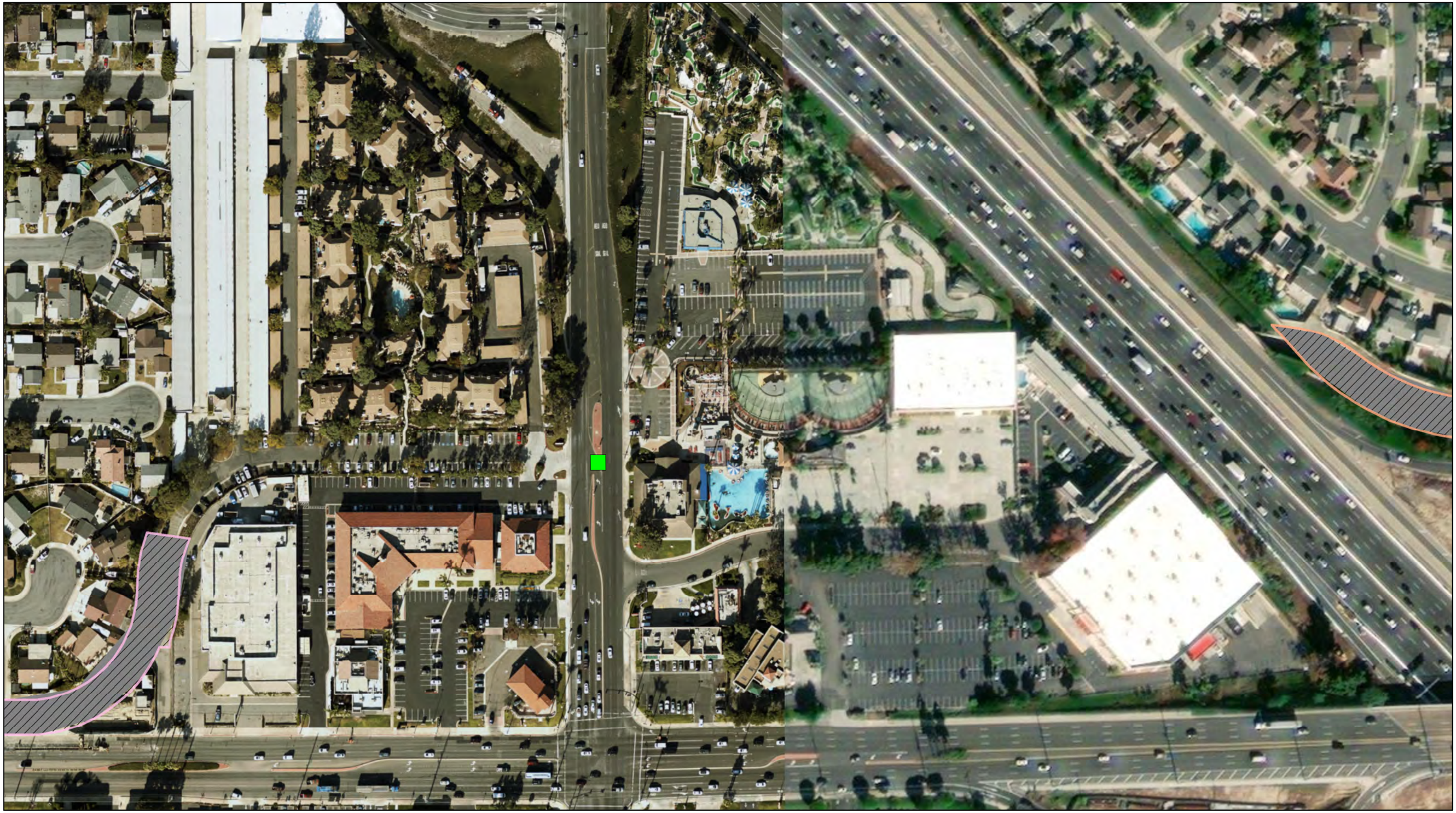
Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 14
1.20 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DSHWS_Map_20NOV2019_ExistingWithProposed_arm.mxd HBP-MPAHS



Existing Channel Bottom Condition

With-Project Features

Channel Crossings Replaced

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.027 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 15
2.91 Acres

C:\Projects_Misc\Westminster_CA_LPP\GIS\Study\MXD\LPP_Maps\PL_DSR\WS_Map_2NOV2019_ExistingVsProposed_arr.mxd 11/5/2019 8:

U.S. Army Corps Of Engineers ®
Chicago District

Existing Channel Bottom Condition
Concrete Lined

With-Project Features
C06R16 Concrete Rectangular

N
W E
S

1 inch = 0.02 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 16
2.08 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DSHWS_Map_20NOV2019_ExistingWP-Proposed_arm.mxd HBP-MPARB

U.S. Army Corps Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined
- Earthen

With-Project Features

- C06R17 Concrete Rectangular

N W E S

1 inch = 0.042 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 17
4.41 Acres

J:\Projects_Misc\westminster_CA_FRM_Study\MXD\LRC Maps\PL_DSHWS_Map_20NOV2019_ExistingWPProposed_arh.mxd 19/MAR/Arlis

Existing Channel Bottom Condition

With-Project Features

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.078 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 18
5.86 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DSHWS_Map_20NOV2019_ExistingVsProposed_arh.mxd 19/MAR/AHS

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined

With-Project Features

- C06R19Concrete Rectangular

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.039 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 19
3.90 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\FC_USFWS_Map_20NOV2019_ExistingWithProposed_arh.mxd 19/NOV/19

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Earthen

With-Project Features

C02R23 Sheetpile Wall South Levee w/ Toe Excavation; Slope Stabilization North Levee

N
W E
S

1 inch = 0.131 miles

Westminster

LPP - Maximum
CHANNEL 2

For Official Use Only
November 2019

Reach 23
57.01 Acres

U:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DistrWS_Map_20NOV2019_ExistingVsProposed_grn.mxd 11x17 ANSI

U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

- Concrete Lined
- Riprap Lined
- Earthen

With-Project Features

- Channel Crossings Replaced
- Diversion Channel (C04)
- C04R20 Concrete Rectangular; Middle 40-48 feet Remain Soft Bottom

N
W E
S

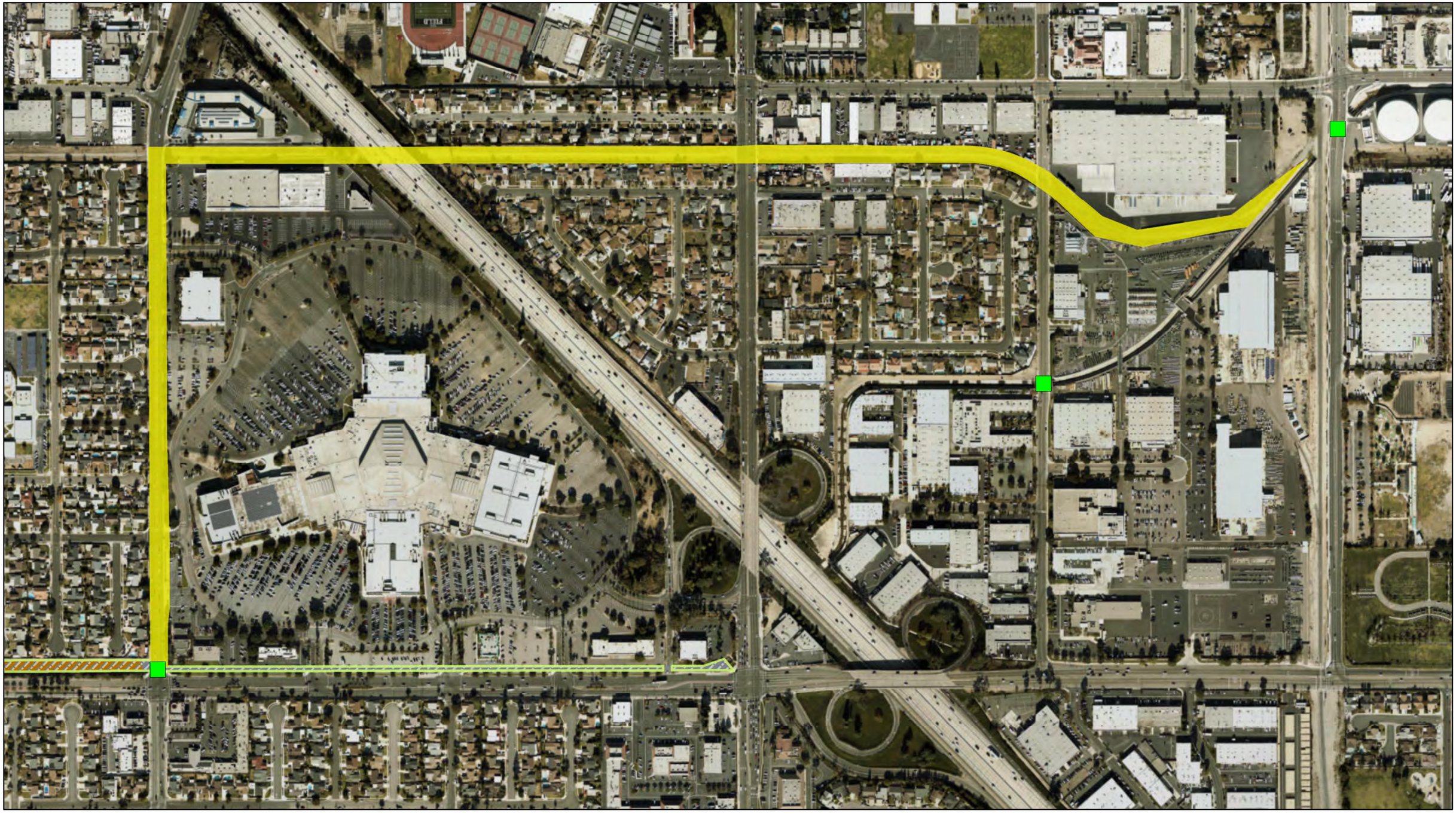
1 inch = 0.165 miles

Westminster

LPP - Maximum
CHANNEL 4

For Official Use Only
November 2019

Reach 20
27.80 Acres



U.S. Army Corps
Of Engineers ®
Chicago District

Existing Channel Bottom Condition

Concrete Lined

With-Project Features

Channel Crossings Replaced

Diversion Channel (C04)

C04R20 Concrete Rectangular; Middle 40-48 feet Remain Soft Bottom

N
W E
S

1 inch = 0.077 miles

Westminster

LPP - Maximum
DIVE. CHANNEL

For Official Use Only
November 2019

Diversion
13.47 Acres

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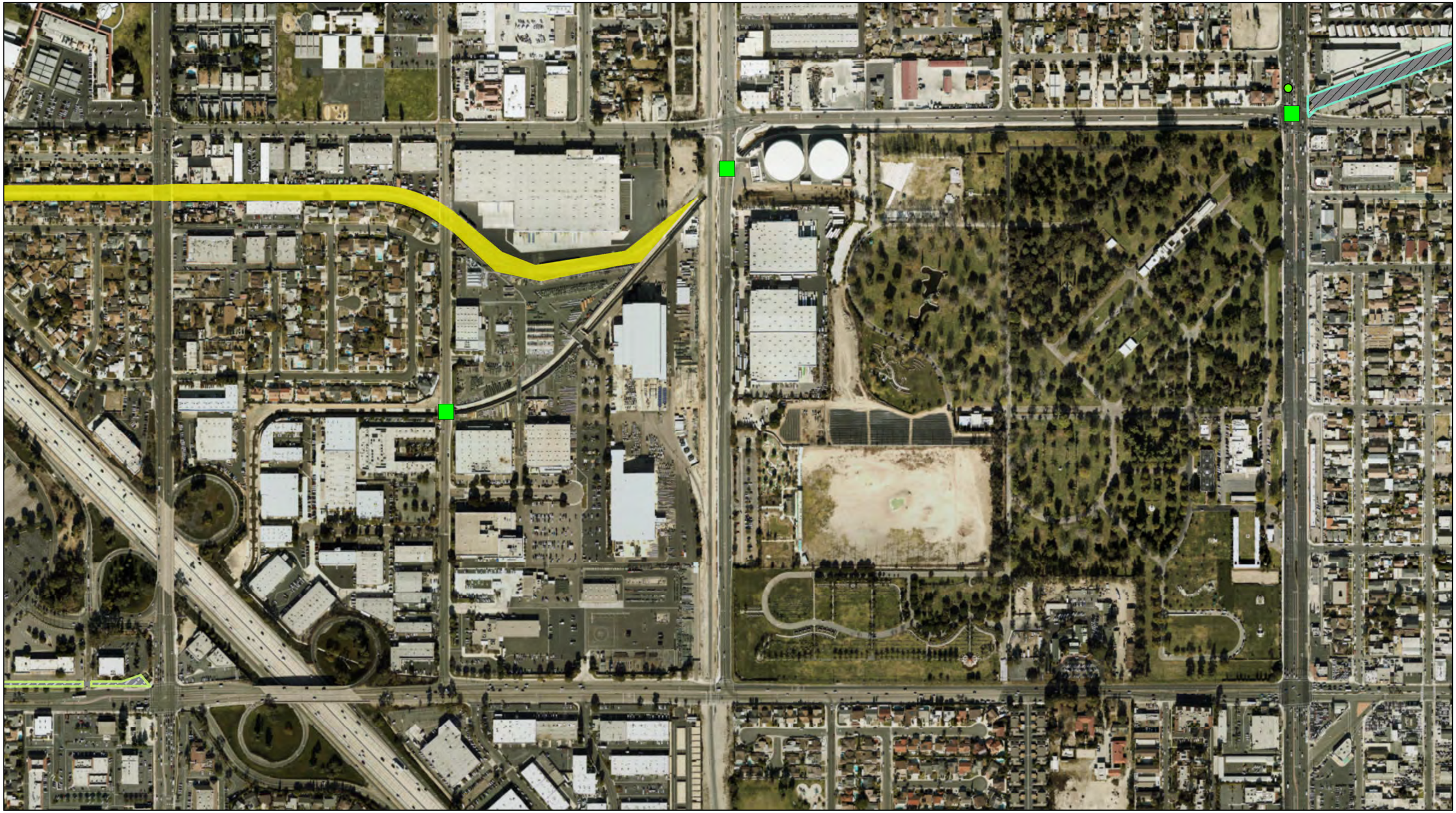

Existing Channel Bottom Condition

U.S. Army Corps Of Engineers ®
Chicago District

With-Project Features

- Channel Crossings Replaced
- Diversion Channel (C04)

N
W E
S

1 inch = 0.081 miles

Westminster

LPP - Maximum
CHANNEL 4

For Official Use Only
November 2019

Reach 21
8.69 Acres

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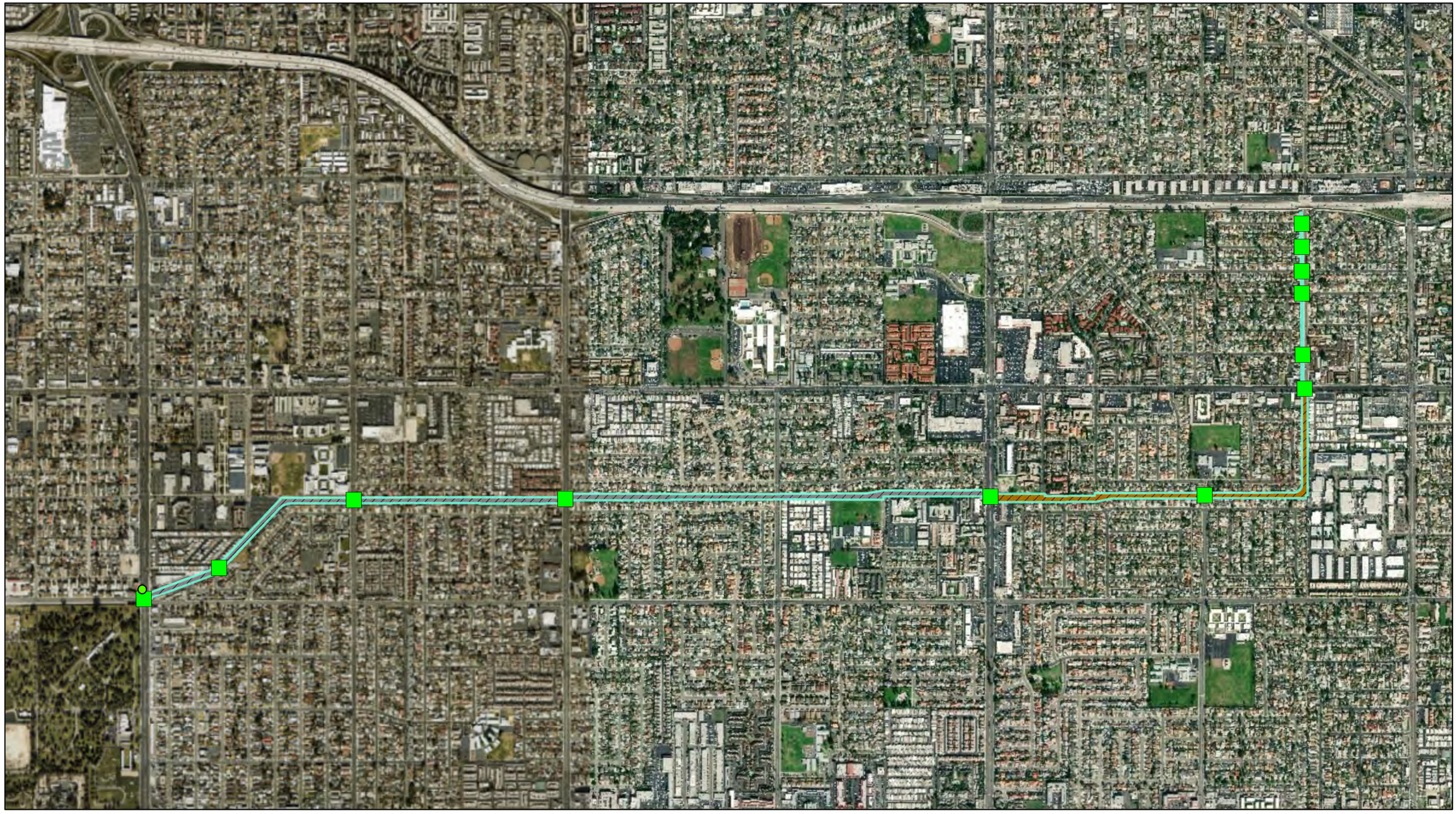

U.S. Army Corps Of Engineers ®
Chicago District

Existing Channel Bottom Condition
- Concrete Lined
- Riprap Lined

With-Project Features
- Channel Crossings Replaced
- C04R22 Concrete Rectangular

N W E S

1 inch = 0.214 miles

Westminster

LPP - Maximum
CHANNEL 4

For Official Use Only
November 2019

Reach 22
29.02 Acres

9.0 Appendix B – USFWS IPac List

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Carlsbad Fish And Wildlife Office
2177 Salk Avenue - Suite 250
Carlsbad, CA 92008-7385
Phone: (760) 431-9440 Fax: (760) 431-5901
http://www.fws.gov/carlsbad/

In Reply Refer To: November 02, 2017
Consultation Code: 08ECAR00-2018-SLI-0137
Event Code: 08ECAR00-2018-E-00309
Project Name: Westminster - East Garden Grove FRM

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, and proposed species, designated critical habitat, and candidate species that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the

human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Carlsbad Fish And Wildlife Office
2177 Salk Avenue - Suite 250
Carlsbad, CA 92008-7385
(760) 431-9440

Project Summary

Consultation Code: 08ECAR00-2018-SLI-0137

Event Code: 08ECAR00-2018-E-00309

Project Name: Westminster - East Garden Grove FRM

Project Type: STREAM / WATERBODY / CANALS / LEVEES / DIKES

Project Description: Location of the proposed project is in channels CO2 (Bolsa Chica Channel), CO4 (Westminster Channel), CO6 (Ocean View Channel) and CO5 (East Garden Grove/Wintersburg Channel). The scope of the project is to reduce flooding by potentially increasing the conveyance capacity of the aforementioned channels. The project is tentatively scheduled for public review summer/fall 2018.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/33.7289667955271N118.00425758765972W

Counties: Orange, CA

Endangered Species Act Species

There is a total of 11 threatened, endangered, or candidate species on this species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

Mammals

NAME	STATUS
Pacific Pocket Mouse *Perognathus longimembris pacificus*	Endangered

No critical habitat has been designated for this species.

Species profile: https://ecos.fws.gov/ecp/species/8080

Birds

NAME	STATUS
California Least Tern *Sterna antillarum browni* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/8104	Endangered
Coastal California Gnatcatcher *Polioptila californica californica* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8178	Threatened
Least Bell's Vireo *Vireo bellii pusillus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/5945	Endangered
Light-footed Clapper Rail *Rallus longirostris levipes* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6035	Endangered
Southwestern Willow Flycatcher *Empidonax traillii extimus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6749	Endangered
Western Snowy Plover *Charadrius alexandrinus nivosus* Population: Pacific Coast population DPS-U.S.A. (CA, OR, WA), Mexico (within 50 miles of Pacific coast) There is **final** critical habitat for this species. Your location overlaps the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/8035	Threatened

Crustaceans

NAME	STATUS
San Diego Fairy Shrimp *Branchinecta sandiegonensis* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/6945	Endangered

Flowering Plants

NAME	STATUS
Salt Marsh Bird's-beak *Cordylanthus maritimus ssp. maritimus* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/6447	Endangered
San Diego Button-celery *Eryngium aristulatum var. parishii* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/5937	Endangered
Ventura Marsh Milk-vetch *Astragalus pycnostachyus var. lanosissimus* There is **final** critical habitat for this species. Your location is outside the critical habitat. Species profile: https://ecos.fws.gov/ecp/species/1160	Endangered

Critical habitats

There is 1 critical habitat wholly or partially within your project area under this office's jurisdiction.

NAME	STATUS
Western Snowy Plover *Charadrius alexandrinus nivosus* https://ecos.fws.gov/ecp/species/8035#crithab	Final

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10.0 Appendix C – Reconnaissance Level Survey Report for the Feasibility Study in Support of the Westminster East Garden Grove Flood Risk Management Study

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RECONNAISSANCE LEVEL SURVEY REPORT FOR THE FEASIBILITY STUDY IN SUPPORT OF THE WESTMINSTER EAST GARDEN GROVE FLOOD RISK MANAGEMENT STUDY

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August 19, 2019

TABLE OF CONTENTS

Section **Page**

1.0 INTRODUCTION **3**
1.1 PROJECT LOCATION **3**
1.2 METHODS **5**
1.3 SURVEY DESCRIPTION **5**
1.4 FIELD SURVEY DATA RESULTS **6**

LIST OF FIGURES

1 Project location 4
2 Sampling Stations along the CO2 conveyance 4
3 Sampling Stations along the CO5 conveyance 5
4 Sampling Stations near the CO5 tidal gates 5

EXECUTIVE SUMMARY

This report summarizes the two-day field effort conducted by Anghera Environmental and Ecomarine Consulting LLC on July 6-7, 2019, in the vicinity of the CO2/CO4 and C05/C06 channels in Westminster and East Garden Grove. The channels were surveyed to determine the extent of seawater tidal intrusion in an effort to establish how far up the channels salinity conditions could support marine vegetation such as eelgrass (*Zostera marina*). Water birds, other vegetation and fish and invertebrates were also documented when practicable. No eelgrass was observed in any of the channel reaches. Salinity measurements indicate that conditions in the channels are not ideal for eelgrass to thrive.

1.0 INTRODUCTION

Anghera Environmental and Ecomarine Consulting LLC (Anghera and Ecomarine) were contracted by Chambers Group, Inc. (Chambers) to conduct reconnaissance level surveys for the presence of fish, wildlife, and seagrass within reaches of C02/C04 and C05/C06 in the Westminster/Bolsa Chica area in Huntington Beach, southern California. Anghera and Ecomarine were also contracted to conduct reconnaissance level surveys for fish, wildlife, and seagrass within the vicinity of Reach 1 C05 tide gates, along the Pacific Coast Highway where the floodwall is proposed to be constructed, within the vicinity of Warner Avenue Bridge, and the outlet of C02.

This report presents the findings of a two-day survey, conducted July 6 and 7, 2019. A description of the surveys include, but are not limited to: survey location and pertinent facts, description of methods, sample station locations, field data sheets, and a summary of resources (i.e. fish, marine mammals, wildlife, seagrass) encountered, with emphasis on sensitive or otherwise protected species.

1.1 PROJECT LOCATION

The surveys presented in this report were conducted within the CO2/CO4 and C05/C06 channels in Westminster and East Garden Grove and near the Bolsa Chica Ecological Reserve in Huntington Beach, California (Figure 1). The specific locations for the CO2/CO4 and C05/C06 channels are illustrated in Figures 2, 3 and 4.

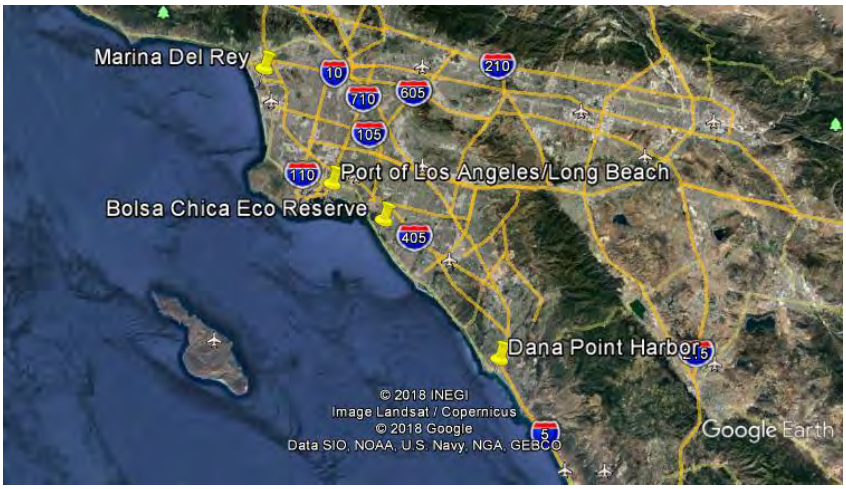

Figure 1. Project Location

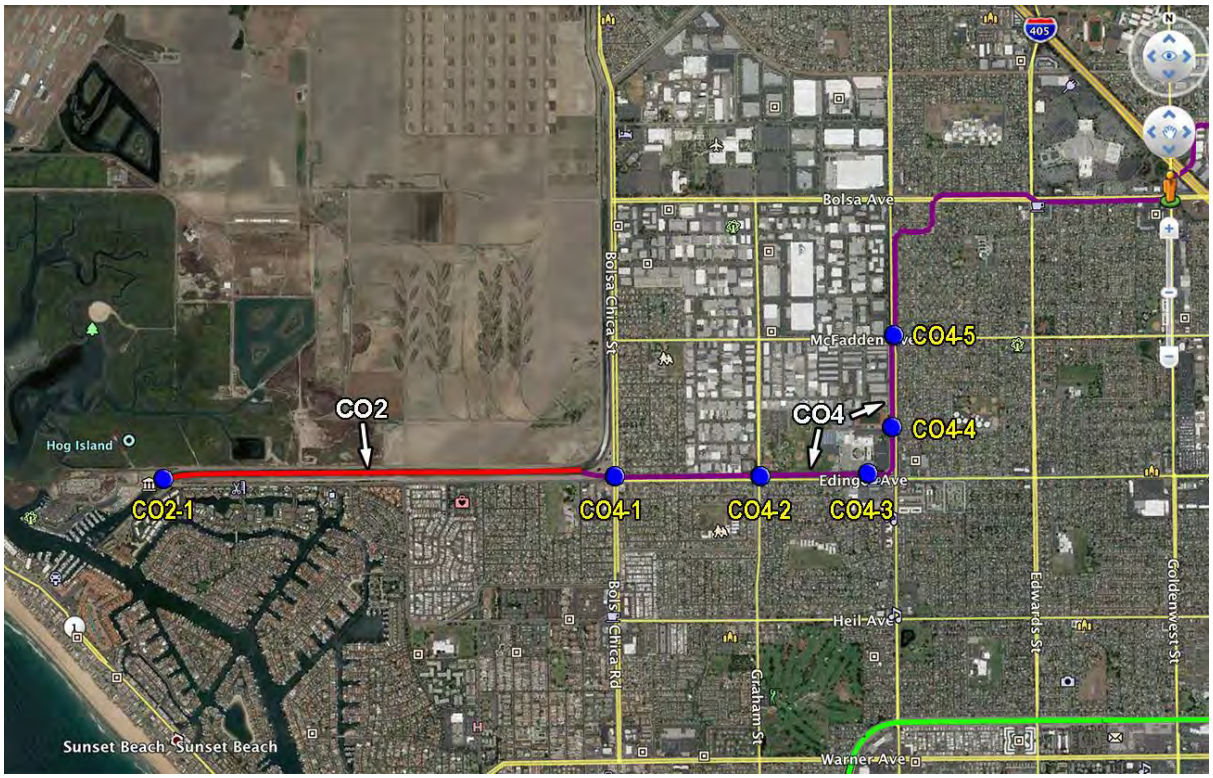

Figure 2. Sampling stations along the CO2 and CO4 conveyances

Figure 3. Sampling stations along the CO5 and CO6 conveyances

Figure 4. Sampling Stations near the CO5 tidal gates

1.2 METHODS

Using a hand held water quality monitoring instrument (YSI Professional Plus, quad senor unit with 30m data cable, calibrated prior to use), we monitored the salinity of the water at several locations along the channels in order to determine the sea water intrusion zone and the therefore the extent of the possible eelgrass (*Zostera marina*) habitat in the CO2, CO4 and CO5 channels. We noted the representative fauna and flora at each station to determine whether the habitat present was marine, fresh or brackish. Transects were conducted in areas where eelgrass was suspected, but not visually confirmed at surface.

1.3 SURVEY DESCRIPTION

C02, CO4 & CO5 Channel Reach Data Collection
Date: July 6, 2019
Personnel: Mike Anghera, Kimo Morris
Weather: Overcast, no wind
Time on Site: 0600
Tide: -0.8 ft @ 0702 +4.2 ft @ 1347

a.m. Sample: Started data collection at lower section of CO5 Reach 01 and worked our way up the channel as the tide receded for a total of six sampling stations. Moved to lower portion of CO2 and worked our way up the conveyance for a total of six sampling stations.

p.m. Sample: Resampled specific stations in both conveyances (CO5 and CO2) to determine tidal intrusion as the tide shifted from a flood tide to an ebb tide.
Pictures taken of sample collection stations and general vicinity

Date: July 7, 2019
Personnel: Mike Anghera, Kimo Morris
Weather: Overcast, no wind
Time on Site: 0900
Tide: -0.3 ft @ 0752 +5.5 ft @ 1244

a.m. Sample: Started data collection at lower section of CO2 Reach 01 and worked our way up the channel as the tide receded for a total of six sampling stations. Towed underwater sled with video and still cameras to record any eelgrass in the study area.

1.4 Field Survey Data Results

July 6, 2019 a.m. Survey

Station CO5-1A
Site Description: Upstream side of bridge above flood gates (Figure 4)
Time on Site: 0655
Field data collected: 0700
Coordinates of sample collection for this site: 33^0 42' 12.31" N, 118^0 03' 10.09" W
Habitat Type: Manmade channel with soft bottom
Sampling Conditions: Flood Tide
Water depth: 90cm
Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
Birds observed: Grey Egret (*Ardea cinereal*), Great Blue Heron (*Ardea herodias*), Snowy Egret (*Egretta thula*), Forster's Tern (*Sterna forsteri*), Black Skimmer (*Rynchops niger*), Least Tern (*Sternula antillarum*)

CO5-1A

pH	8.14
Temperature (C)	23.6
DO	5.07
Salinity (ppt)	14.9

Site CO5-1B
Site Description: Downstream side of bridge below flood gates (Figure 4)
Time on Site: 0655
Field data collected: 0710
Coordinates of sample collection for this site: 33^0 42' 12.40" N, 118^0 03' 10.66" W
Habitat Type: A man-made or altered waterway
Sampling Conditions: Flood Tide
Water depth: 75-90cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
No invertebrates or fish observed.
Birds observed: Grey Egret (*Ardea cinereal*), Great Blue Heron (*Ardea herodias*), Snowy Egret (*Egretta thula*), Forster's Tern (*Sterna forsteri*), Black Skimmer (*Rynchops niger*), Least Tern (*Sternula antillarum*)

C05-1B

pH	8.12
Temperature (C)	23.6
DO	4.4
Salinity (ppt)	16.81

Site: Bolsa Chica Eco Reserve Outfall:
Site Description: Downstream side of bridge below flood gates (Figure 4)
Time on Site: 0655
Field data collected: 0720
Coordinates of sample collection for this site: 33^0 42' 10.78" N, 118^0 03' 10.81" W
Habitat Type: A man-made or altered waterway
Sampling Conditions: Flood Tide
Water depth: 50 cm
Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
No invertebrates observed.
Fish observed in the area: Mullet (*Mugil cephalus*).
Birds observed: Grey Egret (*Ardea cinereal*), Great Blue Heron (*Ardea herodias*), Snowy Egret (*Egretta thula*), Forster's Tern (*Sterna forsteri*), Black Skimmer (*Rynchops niger*), Least Tern (*Sternula antillarum*)

Bolsa Chica Eco Reserve

pH	7.94
Temperature (C)	22.7
DO	4.17
Salinity (ppt)	33.3

Site CO5-2:
Site Description: First foot bridge over CO5 (Figure 3)
Time on Site: 0730
Field data collected: 0735
Coordinates of sample collection for this site: 33^0 42' 20.47" N, 118^0 02' 37.17" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 60 cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
No invertebrates or fish observed.
Birds observed: Snowy Egret (*Egretta thula*), Mallard ducks (*Anas platyrhynchos*), Canadian geese (*Branta canadensis*)

C05-2 Surface

pH	8.24
Temperature (C)	24.1
DO	4.19
Salinity (ppt)	5.95

C05-2 Bottom

pH	8
Temperature (C)	24.5
DO	2.68
Salinity (ppt)	16

Site CO5-3:
Site Description: Graham Street bridge over CO5 (Figure 3)
Time on Site: 0750
Field data collected: 0755
Coordinates of sample collection for this site: 33^0 42' 37.38" N, 118^0 01' 57.62" W
Habitat Type: Concrete lined channel
Sampling Conditions: Flood Tide
Water depth: 20-25cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Cattails (*Typha sp.*) observed 100m west of sampling point.
No invertebrates or fish observed.
Birds observed: Forster's Tern (*Sterna forsteri*), Swallows (*Petrochelidon pyrrhonota*), Cormorant (*pHalacrocorax sp*.)

C05-3

pH	8.85
Temperature (C)	23
DO	4.96
Salinity (ppt)	1.2

Site CO5-4:
Site Description: Warner Avenue bridge over CO5 (Figure 3)
Time on Site: 0805
Field data collected at 0810
Coordinates of sample collection for this site: 33^0 42' 54.95" N, 118^0 01' 36.75" W
Habitat Type: Concrete lined channel
Sampling Conditions: Flood Tide
Water depth: 40-50cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Cattails (*Typha sp*.) observed
No invertebrates, fish, or birds observed.

C05-4

pH	8.85
Temperature (C)	23
DO	4.96
Salinity (ppt)	1.2

Site CO5-5:

Site Description: Edwards Street bridge over CO5 (Figure 3)
Time on Site: 1115
Field data collected at 1120
Coordinates of sample collection for this site: 33^0 43' 02.75" N, 118^0 00' 55.71" W
Habitat Type: Concrete lined channel
Sampling Conditions: Flood Tide
Water depth: 20-25cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
Terrestrial weeds present in channel.
No invertebrates or fish observed.
Birds observed: Mallard ducks (*Anas platyrhynchos*), Curlews (*Numenius sp.*)

C05-5

pH	8.58
Temperature (C)	23.2
DO	8.89
Salinity (ppt)	0.84

Site CO2-1:

Site Description: Edinger Avenue and Sunset Way bridge over CO2 (Figure 2)
Time on Site: 0925
Field data collected at 0930
Coordinates of sample collection for this site: 33^0 43' 47.18" N, 118^0 04' 11.97" W
Habitat Type: Rip-rap lined channel. Historically eelgrass has been observed west of the bridge in the center of the channel.
Sampling Conditions: Flood Tide
Water depth: 20-25cm

Fauna/Flora Observations:
No fish observed
No evidence of eelgrass (*Zostera sp*.)
No birds observed

C02-1

pH	8.05
Temperature (C)	22.4
DO	5.11
Salinity (ppt)	33.11

Site CO4-1:
Site Description: Edinger Avenue and Bolsa Chica Street bridge over CO2 (Figure 2)
Time on Site: 0955
Field data collected at 1005
Coordinates of sample collection for this site: 33^0 43' 48.28" N, 118^0 02' 30.37" W
Habitat Type: Concrete lined channel
Sampling Conditions: Flood Tide
Water depth: 40-50cm
Fauna/Flora Observations:
No fish observed
No evidence of eelgrass (*Zostera sp*.). Ditch grass (*Ruppia maritima*) and slender grasswort (*Salicornia maritima*) present. Unknown filamentous green algae observed.
Birds observed: Swallows (*Petrochelidon pyrrhonota*)
Invertebrates: California horn snail (*Cerithideopsis californica*)

C04-1

pH	8.09
Temperature (C)	22.9
DO	5.54
Salinity (ppt)	15.36

Site CO4-2:
Site Description: Entrance to Marina High School on Springdale Street bridge over CO2 (Figure 2)
Time on Site: 1015
Field data collected at 1020
Coordinates of sample collection for this site: 33^0 43' 55.96" N, 118^0 01' 27.81" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 20-25cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) and Cattails (*Typha sp.*) present. Unknown filamentous green algae observed.
No invertebrates or fish observed.
Birds observed: Snowy Egret (*Egretta thula*)
Lots of trash (plastic wrappers) present.

C04-2

pH	8.31
Temperature (C)	21.9
DO	8.33
Salinity (ppt)	0.95

Site CO4-3:

Site Description: Entrance to Marina High School on Edinger Avenue bridge over CO2 (Figure 2)
Time on Site: 1030
Field data collected at 1035
Coordinates of sample collection for this site: 33^0 43' 48.56" N, 118^0 01' 31.91" W
Habitat Type: Small concrete lined channel
Sampling Conditions: Flood Tide
Water depth: 20-25cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) and Cattails (*Typha sp.*) present. Unknown filamentous green algae observed.
No invertebrates or fish observed.
Birds observed: Snowy Egret (*Egretta thula*)
Lots of trash (plastic wrappers) present.

C04-3

pH	8.11
Temperature (C)	21.8
DO	5.47
Salinity (ppt)	1.09

Site CO4-4:

Site Description: Edinger Avenue and Graham Street bridge over CO2 (Figure 2)
Time on Site: 1040
Field data collected at 1045
Coordinates of sample collection for this site: 33^0 43' 48.42" N, 118^0 01' 57.24" W

Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 20-25cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Ditch grass (*Ruppia maritima*) and slender grasswort (*Salicornia maritima*) present. Unknown filamentous green algae observed.
No invertebrates, fish or birds observed.

C04-4

pH	8.08
Temperature (C)	22.5
DO	6.77
Salinity (ppt)	3.71

Site CO4-5:
Site Description: McFadden Avenue and Springdale Street bridge over CO2 (Figure 2)
Time on Site: 1100
Field data collected at 1105
Coordinates of sample collection for this site: 33^0 44' 15.01"N, 118^0 01' 27.07" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 20-25cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Unknown filamentous green algae observed. Algal slick present on the concrete sides
No invertebrates, fish or birds observed.
Lots of trash (plastic wrappers) present.

C04-5

pH	8.35
Temperature (C)	22.9
DO	11.04
Salinity (ppt)	0.91

Site: Foot Bridge at Visitor's Center:
Site Description: Foot Bridge over CO5 at Bolsa Chica Conservancy Interpretative Center (Figure 2)
Time on Site: 09000
Field data collected at 0910
Coordinates of sample collection for this site: 33^0 42' 41.08" N, 118^0 03' 36.65" W

Habitat Type: Concrete line channel
Sampling Conditions: Flood Tide
Water depth: 40-60cm

Fauna/Flora Observations:
No evidence of eelgrass. Ditch grass (*Ruppia maritima*) and slender grasswort (*Salicornia maritima*)observed.
No invertebrates, fish or birds observed.

July 6, 2019 p.m. Survey

Site CO2-1:
Site Description: Edinger Avenue and Sunset Way bridge over CO2 (Figure 2)
Time on Site: 1335
Field data collected at 1340
Coordinates of sample collection for this site: 33^0 43' 47.18" N, 118^0 04' 11.97" W
Habitat Type: Rip-rap lined channel. Historically eelgrass has been observed west of the bridge in the center of the channel.
Sampling Conditions: Ebb Tide
Water depth: 20cm

Fauna/Flora Observations:
No fish observed
No evidence of eelgrass (*Zostera sp*.)
No birds observed

C02-1

pH	8.05
Temperature (C)	22.3
DO	5.39
Salinity (ppt)	33.39

Conclusion: tidal intrusion - marine

Site CO4-1:
Site Description: Edinger Avenue and Bolsa Chica Street bridge over CO2 (Figure 2)
Time on Site: 1320
Field data collected at 1325
Coordinates of sample collection for this site: 33^0 43' 48.28" N, 118^0 02' 30.37" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 30cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Ditch grass (*Ruppia maritima*) and slender grasswort (*Salicornia maritima*) present. Unknown filamentous green algae observed.
No invertebrates, fish or birds observed.

C04-1

pH	8.09
Temperature (C)	24.6
DO	6.47
Salinity (ppt)	30.22

Conclusion: tidal intrusion - marine

Site CO4-3:

Site Description: Entrance to Marina High School on Edinger Avenue bridge over CO2 (Figure 2)
Time on Site: 1255
Field data collected at 1300
Coordinates of sample collection for this site: 33^0 43' 48.56" N, 118^0 01' 31.91" W
Habitat Type: Small concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 15-20cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) and Cattails (*Typha sp.*) present. Unknown filamentous green algae observed.
No invertebrates or fish observed.
Birds observed: Snowy Egret (*Egretta thula*)

C04-3

pH	8.57
Temperature (C)	24.3
DO	13.09
Salinity (ppt)	1.04

Conclusion: no tidal intrusion. No need to resample stations CO2-3 and CO2-6

Site CO4-4:

Site Description: Edinger Avenue and Graham Street bridge over CO2 (Figure 2)
Time on Site: 1310
Field data collected at 1315
Coordinates of sample collection for this site: 33^0 43' 48.42" N, 118^0 01' 57.24" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 20cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Ditch grass (*Ruppia maritima*) and slender grasswort (*Salicornia maritima*) present. Unknown filamentous green algae observed. On surface, protein scum slick observed

No invertebrates, fish or birds observed.

C04-4

pH	8.25
Temperature (C)	24.6
DO	8.22
Salinity (ppt)	16.24

Conclusion: tidal intrusion - marine

Station CO5-1A

Site Description: Upstream side of bridge above flood gates (Figure 3)
Time on Site: 1455
Field data collected: 1500
Coordinates of sample collection for this site: 33^0 42' 12.31" N, 118^0 03' 10.09" W
Habitat Type: Manmade channel with soft bottom
Sampling Conditions: Ebb Tide
Water depth: 70cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.

No invertebrates observed.

Fish observed: Large school of mullet (*Mugilidae sp.*) and young of the year unknown fish.

Birds observed: Feeding shore birds

C05-1A

pH	7.97
Temperature (C)	23.8
DO	5.62
Salinity (ppt)	32.7

Conclusion: tidal intrusion - marine

Site CO5-1B

Site Description: Downstream side of bridge below flood gates (Figure 3)
Time on Site: 1455
Field data collected: 1505
Coordinates of sample collection for this site: 33^0 42' 12.40" N, 118^0 03' 10.66" W
Habitat Type: A man-made or altered waterway

Sampling Conditions: Ebb Tide
Water depth: 70cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
No invertebrates, fish or birds observed.

C05-1B

pH	8.03
Temperature (C)	24
DO	5.98
Salinity (ppt)	32.78

Conclusion: tidal intrusion. Tidal gates are shut, little to no mixing. - marine

Site: North Slough
Site Description: Upstream side of bridge above flood gates (Figure 3)
Time on Site: 1505
Field data collected: 1510
Coordinates of sample collection for this site: 33^0 42' 13.31" N, 118^0 03' 07.07" W
Habitat Type: A man-made or altered waterway
Sampling Conditions: EbbTide
Water depth: 50 cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
No invertebrates, fish or birds observed.

North Slough

pH	8.05
Temperature (C)	24
DO	5.59
Salinity (ppt)	32.76

Conclusion: tidal intrusion - marine

Site CO5-2:
Site Description: First foot bridge over CO5 (Figure 3)
Time on Site: 1445
Field data collected: 1450
Coordinates of sample collection for this site: 33^0 42' 20.47" N, 118^0 02' 37.17" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 50 cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present. No invertebrates, fish or birds observed.

C05-2 Surface

pH	8.29
Temperature (C)	26.3
DO	7.78
Salinity (ppt)	9.14

Conclusion: some tidal intrusion - brackish

Site CO5-3:

Site Description: Graham Street bridge over CO5 (Figure 3)
Time on Site: 1425
Field data collected: 1430
Coordinates of sample collection for this site: 33^0 42' 37.38" N, 118^0 01' 57.62" W
Habitat Type: Concrete lined channel
Sampling Conditions: Ebb Tide
Water depth: 20cm

Fauna/Flora Observations:

No evidence of eelgrass (*Zostera sp*.). Cattails (*Typha sp.*) observed 100m west of sampling point.
No invertebrates or fish observed.
Birds observed: Caspian Terns (*Hydroprogne caspia*), Great Egret (*Ardea alba*), Mallard Ducks (*Anas platyrhynchos*), Western Gull (*Larus occidentalis*)

C05-3

pH	8.93
Temperature (C)	26.1
DO	11.61
Salinity (ppt)	1.35

Conclusion: no tidal intrusion - freshwater

Site CO5-4:

Site Description: Warner Avenue bridge over CO5 (Figure 3)
Time on Site: 1415
Field data collected at 1420
Coordinates of sample collection for this site: 33^0 42' 54.95" N, 118^0 01' 36.75" W
Habitat Type: Concrete lined channel

Sampling Conditions: Ebb Tide
Water depth: 40cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Cattails (*Typha sp*.) observed
No invertebrates, fish or birds observed.

C05-4

pH	8.79
Temperature (C)	25
DO	7.3
Salinity (ppt)	1.08

Conclusion: no tidal intrusion - freshwater

Site CO5-5:
Site Description: Edwards Street bridge over CO5 (Figure 3)
Time on Site: 1400
Field data collected at 1405
Coordinates of sample collection for this site: 33^0 43' 02.75" N, 118^0 00' 55.71" W
Habitat Type: Concrete lined channel
Sampling Conditions: EbbTide
Water depth: 20cm

Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.). Slender grasswort (*Salicornia maritima*) present.
Terrestrial weeds present in channel
No invertebrates or fish observed.
Birds observed: Mallard ducks (*Anas platyrhynchos*)

C05-5

pH	9.02
Temperature (C)	27.5
DO	12.9
Salinity (ppt)	0.83

Conclusion: no tidal intrusion - freshwater

July 7, 2019 a.m. Survey

Site CO2-1:
Site Description: Edinger Avenue and Sunset Way bridge over CO2 (Figure 2)
Time on Site: 0900
Field data collected at 1025

Coordinates of transects at this site:
Transect 1: start-33^0 43' 43.76" N, 118^0 04' 13.08" W end-33^0 43' 40.80" N, 118^0 04' 19.20" W
Transect 2: start-33^0 43' 40.80" N, 118^0 04' 19.20" W end-33^0 43' 41.94" N, 118^0 04' 20.40" W
Transect 3: start-33^0 43' 41.94" N, 118^0 04' 20.40" W end-33^0 43' 47.34" N, 118^0 04' 11.46" W
Transect 4: start-33^0 43' 47.29" N, 118^0 04' 11.13" W end-33^0 43' 48.96" N, 118^0 03' 35.55" W

Habitat Type: Rip-rap lined channel. Historically eelgrass has been observed west of the bridge in the center of the channel.
Sampling Conditions: Ebb Tide
Water depth: 3.5m to 2m
Fauna/Flora Observations:
No evidence of eelgrass (*Zostera sp*.)
No invertebrates, fish or birds observed.

11.0 Appendix D – Jurisdictional Determination

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, LOS ANGELES DISTRICT
CARLSBAD FIELD OFFICE
5900 LA PLACE CT., SUITE 100
CARLSBAD, CALIFORNIA 92008

April 22, 2019

SUBJECT: Approved Jurisdictional Determination

Shawna Herleth-King
U.S. Army Corps of Engineers, Chicago District
231 S. LaSalle Street, Suite 1500
Chicago, Illinois 60604-1437

Dear Ms. Herleth-King:

I am responding to your request (File No. SPL-2019-00262-ERS) dated January 16, 2019, for an approved Department of the Army jurisdictional determination (JD) for the U.S. Army Corps of Engineers' federal Westminster Flood Risk Management Study (Study) located within the cities of Seal Beach, Huntington Beach, Santa Ana, Garden Grove, and unincorporated Orange County, California and centered at approximately 33.581771, -117.636084.

For the Study, we completed a JD that provides the extent of the Corps' geographic jurisdiction within the Study area (i.e., it is within a water of the United States). Depending on the activities proposed under a Federal project, it is anticipated that some activities could be regulated activity under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Because we have no specific activity-related information, this evaluation pertains only to geographic jurisdiction.

Based on available information, I have determined that there are waters of the United States within the Study area, in the locations depicted in Appendix A. The basis for our determination can be found in the enclosed JD form(s).

This letter includes an approved jurisdictional determination for the Corps' Westminster Flood Risk Management Study. As with non-Federal Corps projects, if you wish to submit new information regarding this jurisdictional determination, please do so within 60 days. We will consider any new information so submitted and respond within 60 days by either revising the prior determination, if appropriate, or reissuing the prior determination.

This determination has been conducted to identify the extent of the Corps' Section 404 Clean Water Act and Section 10 Rivers and Harbors Act jurisdiction within the Study area, as identified in your request, and is valid for five years from the date of this letter, unless new information warrants revision of the determination before the expiration date.

Thank you for inviting us to participate on the Project Delivery Team for the Study. Should you have any questions, Eric Sweeney may be reached at (760) 602-4837 or via e-mail at Eric.R.Sweeney@usace.army.mil. Please help me to evaluate and improve the regulatory

experience for others by completing the customer survey form at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

Sincerely,

Corice J. Farrar
Chief, Orange and Riverside Counties Section
South Coast Branch
Regulatory Division

Enclosures

Regulatory Program

INTERIM APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers
This form should be completed by following the instructions provided
in the Interim Approved Jurisdictional Determination Form User Manual.

SECTION I: BACKGROUND INFORMATION

A. COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (AJD): April 22, 2019

B. ORM NUMBER IN APPROPRIATE FORMAT (e.g., HQ-2015-00001-SMJ): SPL-2019-00262-ERS

C. PROJECT LOCATION AND BACKGROUND INFORMATION:
State:CA County/parish/borough: Orange City: Seal Beach, Huntington Beach, Santa Ana, Garden Grove, and unincorporated Orange County, California
Center coordinates of site (lat/long in degree decimal format): Lat. 33.730041, Long. -118.000158.
Map(s)/diagram(s) of review area (including map identifying single point of entry (SPOE) watershed and/or potential jurisdictional areas where applicable) is/are: ☒attached ☒ in report/map titled "Review Areas for Westminster AJD" (Appendix A, Figure 1). As shown in this map, the Corps evaluated for the presence of jurisdictional aquatic resources within six total reviews areas: 1) Warner Avenue Bridge (WAB) Review Area, 2) PCH Floodwall Review Area, 3) C02 Channel Review Area, 4) C04 Channel Review Area, 5) C05 Channel Review Area, and 6) C06 Channel Review Area.
☐ Other sites (e.g., offsite mitigation sites, disposal sites, etc.) are associated with this action and are recorded on a different jurisdictional determination (JD) form. List JD form ID numbers (e.g., HQ-2015-00001-SMJ-1): .

D. REVIEW PERFORMED FOR SITE EVALUATION:
☐ Office (Desk) Determination Only. Date: .
☒ Office (Desk) and Field Determination. Office/Desk Dates: Field Date(s): February 21, 2019, March 27, 2019, and April 16, 2019.

SECTION II: DATA SOURCES

Check all that were used to aid in the determination and attach data/maps to this AJD form and/or references/citations in the administrative record, as appropriate.
☐ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant. Title/Date: .
☐ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
  ☐ Data sheets/delineation report are sufficient for purposes of AJD form. Title/Date: .
  ☐ Data sheets/delineation report are not sufficient for purposes of AJD form. Summarize rationale and include information on revised data sheets/delineation report that this AJD form has relied upon: .
  Revised Title/Date: .
☒ Data sheets prepared by the Corps. Title/Date: Wetland data sheets prepared by the Corps to map wetlands within the Warner Avenue Bridge and PCH Floodwall Review Areas are included as Appendix D.
☐ Corps navigable waters study. Title/Date: .
☐ CorpsMap ORM map layers. Title/Date: .
☐ USGS Hydrologic Atlas. Title/Date: .
☐ USGS, NHD, or WBD data/maps. Title/Date: .
☐ USGS 8, 10 and/or 12 digit HUC maps. HUC number: .
☐ USGS maps. Scale & quad name and date: .
☐ USDA NRCS Soil Survey. Citation: .
☒ USFWS National Wetlands Inventory maps. Citation: GIS data accessed from https://www.fws.gov/wetlands/data/data-download.html.
☐ State/Local wetland inventory maps. Citation: .

☐ FEMA/FIRM maps. Citation: .
☒ Photographs: ☒ Aerial. Citation: Eagle Aerial Imagery (2018), accessed at https://data-ocpw.opendata.arcgis.com. or ☒ Other. Citation: Photos taken of study areas during field visits on March 27, 2019 and April 16, 2019 (see Appendix B).
☒ LiDAR data/maps. Citation: See below.
☐ Previous JDs. File no. and date of JD letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☒ Other information (please specify):

Data used to map High Tide Line (HTL) and Mean High Water (MHW) contour lines within the Warner Avenue Bridge and PCH Flood Wall Review Areas:
• USGS West Coast El-Nino Lidar Project (2016) LiDAR data were used to identify MHW and HTL contour lines within the Warner Avenue Bridge and PCH Flood Wall Review Areas. Contour lines were estimated for a few short incomplete segments within the Warner Avenue Bridge Review Area through extrapolation the surrounding contours and visual inspection of aerial imagery. This dataset was accessed using the National Oceanic and Atmospheric Administriction (NOAA) Data Access Viewer at https://coast.noaa.gov/dataviewer/#/.
• Contour lines were drawn based on NADV datum values of 4.5 feet for MHW and 6.82 for HTL. These values were derived based on NOAA tidal data obtained for the Newport Bay Entrance (NOAA tide station #9410580) at https://tidesandcurrents.noaa.gov/datums.html?id=9410580 and https://tidesandcurrents.noaa.gov/noaatideannual.html?id=9410580.

Data used to map the Ordinary High Water Mark (OHWM) within Westminster Channels C02, C04, C05, and C06:
• Hydrologic data modeling the spatial extent of the 10-year flood event was used to identify the OHWM within the Westminster Channels, as the 10-year event was determined to most accurately characterize flows that form "ordinary high" water conditions throughout the flood control channels. A 10-year flood inundation map shapefile showing this spatial extent was provided by the Corps Chicago District to support Regulatory's analysis.
• In limited portions of the 10-year inundation map where the 10-year event extended outside the channel boundaries, visual inspection of high resolution aerial imagery was used to identify channel boundaries as the top of the observed channel bank.
• For C02 Channel, National Wetland Inventory (NWI) data were used to identify the location within C02 at which the 10-year flood event indicator ceases to apply and is replaced by MHW and HTL indicators more appropriately suited for assessing jurisdiction within estuarine Bolsa Bay. This break was determined to be located approximately 800 feet downstream of the C02-C04 confluence where NWI distinguishes between "Estuarine and Marine Deepwater" to the west and "Riverine" to the the east.

Mapping the Section 10/Non-Section 10 boundaries (i.e., upstream tidal extent) within C02 and C05 was completed using 2009-2011 California Coastal Conservancy LiDAR data. This dataset was accessed using the National Oceanic and Atmospheric Administriction (NOAA) Data Access Viewer at https://coast.noaa.gov/dataviewer/#/.

The Corps mapped wetlands and mudflats within the Warner Avenue Bridge and PCH Flood Wall Review Areas using a Trimble Yuma sub-meter GPS unit during a field visit conducted on March 27, 2019. In addition, field validation of the inundation maps for the Westminster Channel Review Area was conducted using GPS on February 21, 2019. Note that in the PCH Floodwall Review Area, GPS measurements for the mudflats could not be obtained because these mudflats were not accessable by foot. For these mudflats, the lateral extent was instead estimated visually in the field and later verified using high resolution aerial imagery.

SECTION III: SUMMARY OF FINDINGS

Complete ORM "Aquatic Resource Upload Sheet" or Export and Print the Aquatic Resource Water Droplet Screen from ORM for All Waters and Features, Regardless of Jurisdictional Status – Required

A. RIVERS AND HARBORS ACT (RHA) SECTION 10 DETERMINATION OF JURISDICTION:

☐ "*navigable waters of the U.S.*" within RHA jurisdiction (as defined by 33 CFR part 329) in the review area.

- **Complete Table 1 - Required**

NOTE: If the navigable water is not subject to the ebb and flow of the tide or included on the District's list of Section 10 navigable waters list, DO NOT USE THIS FORM TO MAKE THE DETERMINATION. The District must continue to follow the procedure outlined in 33 CFR part 329.14 to make a Section 10 RHA navigability determination.

B. CLEAN WATER ACT (CWA) SECTION 404 DETERMINATION OF JURISDICTION: "*waters of the U.S.*" within CWA jurisdiction (as defined by 33 CFR part 328.3) in the review area. **Check all that apply.**

☒ (a)(1): All waters which are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide. (Traditional Navigable Waters (TNWs))

- **Complete Table 1 - Required**

☐ This AJD includes a case-specific (a)(1) TNW (Section 404 navigable-in-fact) determination on a water that has not previously been designated as such. Documentation required for this case-specific (a)(1) TNW determination is attached.

☐ (a)(2): All interstate waters, including interstate wetlands.

- **Complete Table 2 - Required**

☐ (a)(3): The territorial seas.

- **Complete Table 3 - Required**

☐ (a)(4): All impoundments of waters otherwise identified as waters of the U.S. under 33 CFR part 328.3.

- **Complete Table 4 - Required**

☒ (a)(5): All tributaries, as defined in 33 CFR part 328.3, of waters identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 5 - Required**

☒ (a)(6): All waters adjacent to a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3, including wetlands, ponds, lakes, oxbows, impoundments, and similar waters.

- **Complete Table 6 - Required**

☒ Bordering/Contiguous.

Neighboring:

☒ (c)(2)(i): All waters located within 100 feet of the ordinary high water mark (OHWM) of a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3.

☐ (c)(2)(ii): All waters located within the 100-year floodplain of a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3 and not more than 1,500 feet of the OHWM of such water.

☐ (c)(2)(iii): All waters located within 1,500 feet of the high tide line of a water identified in paragraphs (a)(1) or (a)(3) of 33 CFR part 328.3, and all waters within 1,500 feet of the OHWM of the Great Lakes.

☐ (a)(7): All waters identified in 33 CFR 328.3(a)(7)(i)-(v) where they are determined, on a case-specific basis, to have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 7 for the significant nexus determination. Attach a map delineating the SPOE watershed boundary with (a)(7) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

☐ (a)(8): All waters located within the 100-year floodplain of a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3 not covered by (c)(2)(ii) above and all waters located within 4,000 feet of the high tide line or OHWM of a water identified in paragraphs (a)(1)-(a)(5) of 33 CFR part 328.3 where they are determined on a case-specific basis to have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 8 for the significant nexus determination. Attach a map delineating the SPOE watershed boundary with (a)(8) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

C. NON-WATERS OF THE U.S. FINDINGS:

Check all that apply.

☐ The review area is comprised entirely of dry land.

☐ Potential-(a)(7) Waters: Waters that DO NOT have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 9 and attach a map delineating the SPOE watershed boundary with potential (a)(7) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

☐ Potential-(a)(8) Waters: Waters that DO NOT have a significant nexus to a water identified in paragraphs (a)(1)-(a)(3) of 33 CFR part 328.3.

- **Complete Table 9 and attach a map delineating the SPOE watershed boundary with potential (a)(8) waters identified in the similarly situated analysis. - Required**

☐ Includes water(s) that are geographically and physically adjacent per (a)(6), but are being used for established, normal farming, silviculture, and ranching activities (33 USC Section 1344(f)(1)) and therefore are not adjacent and require a case-specific significant nexus determination.

☒ Excluded Waters (Non-Waters of U.S.), even where they otherwise meet the terms of paragraphs (a)(4)-(a)(8):

- **Complete Table 10 - Required**

☐ (b)(1): Waste treatment systems, including treatment ponds or lagoons designed to meet the requirements of the CWA.
☐ (b)(2): Prior converted cropland.
☐ (b)(3)(i): Ditches with ephemeral flow that are not a relocated tributary or excavated in a tributary.
☐ (b)(3)(ii): Ditches with intermittent flow that are not a relocated tributary, excavated in a tributary, or drain wetlands.
☐ (b)(3)(iii): Ditches that do not flow, either directly or through another water, into a water identified in paragraphs (a)(1)-(a)(3).
☐ (b)(4)(i): Artificially irrigated areas that would revert to dry land should application of water to that area cease.
☐ (b)(4)(ii): Artificial, constructed lakes and ponds created in dry land such as farm and stock watering ponds, irrigation ponds, settling basins, fields flooded for rice growing, log cleaning ponds, or cooling ponds.
☐ (b)(4)(iii): Artificial reflecting pools or swimming pools created in dry land.[1]
☐ (b)(4)(iv): Small ornamental waters created in dry land.[1]
☐ (b)(4)(v): Water-filled depressions created in dry land incidental to mining or construction activity, including pits excavated for obtaining fill, sand, or gravel that fill with water.
☐ (b)(4)(vi): Erosional features, including gullies, rills, and other ephemeral features that do not meet the definition of tributary, non-wetland swales, and lawfully constructed grassed waterways.[1]
☐ (b)(4)(vii): Puddles.[1]
☒ (b)(5): Groundwater, including groundwater drained through subsurface drainage systems.[1]
☐ (b)(6): Stormwater control features constructed to convey, treat, or store stormwater that are created in dry land.[1]
☐ (b)(7): Wastewater recycling structures created in dry land; detention and retention basins built for wastewater recycling; groundwater recharge basins; percolation ponds built for wastewater recycling; and water distributary structures built for wastewater recycling.

☐ Other non-jurisdictional waters/features within review area that do not meet the definitions in 33 CFR 328.3 of (a)(1)-(a)(8) waters and are not excluded waters identified in (b)(1)-(b)(7).

- **Complete Table 11 - Required.**

D. ADDITIONAL COMMENTS TO SUPPORT AJD: A total of eight different aquatic resource types, summarized in Table 1 below, were identified throughout the six review areas studied as part of this AJD. In order to distinguish between the variety of environmental settings, Clean Water Rule (CWR) classifications, Special Aquatic Site categories, and jurisdictional designations represented across these resources, a four-term nomenclature was used to provide a full description of each resource. Each term used in this nomenclature is summarized below:

• Cowardin classification (first term): Each resource was characterized as "estuarine" or "riverine" based on the extent to which it was most appropriate considered as part of Bolsa Bay (estuarine) versus the flood control channel system (riverine). Corps jurisdictional limits for estuarine resources were based on tidal elevations (MHW for the Section 404/10 limit and HTL for Section 404-only limit) while Corps jurisdictional limits for riverine resources was based on OHWM, represented in this study by the spatial extent of the 10-year flood event.

• CWR designation (second term): Each resource was identified as "navigable" if classified as an (a)(1) TNW, "Tributary" if classified as an (a)(5) water, "bordering" if classified as an (a)(6) wetland/mudflat coinciding with the MHW line, or "neighboring" if classified as an (a)(6) wetland/mudflat located within 100 feet landward of the MHW line.

• Special Aquatic Site Status category (third term): Each resource was identified as "non-wetland" (not a special aquatic site), "wetland," or "mudflat" WOUS.

[1] In many cases these excluded features will not be specifically identified on the AJD form, unless specifically requested. Corps Districts may, in case-by-case instances, choose to identify some or all of these features within the review area.

• Jurisdictional designation (fourth term): Each resource's status as jurisdictional under both Section 404 and Section 10 ("404/10") or jurisdictional under only Section 404 ("404-only") was indicated by this term. Note that mudflats did not receive a jurisdictional designation because the spatial analysis produced small fragments on mudflat possessing the "404-only" classification (i.e., above MHW), which is not consistent with the understanding that mudflats are generally located in the lower-intertidal zone. Nevertheless, despite omission of this term for mudflats, all mudflats identified in this AJD should be considered Section 404-jurisdictional.

Throughout C02, C04, C05, and C06 Channels, the 10-year event OHWM was always located substantially higher than the channel bottom. Any wetlands that may have potentially formed along the channel bottom would not be adjacent to the OHWM and were therefore instead classified as part of the channel and as non-wetland WOUS. Within the estuarine portion of C02 in which jurisdiction was identified by MHW and HTL, potential vegetated wetland areas that appeared contiguous with the MHW line were evaluated and determined to be non-jurisdicitonal (Appendix D) and were therefore classified as non-wetland WOUS. Furthermore, GPS data obtained for the estuarine portion of C02 during the Corps' site visit on April 16, 2019 showed mudflats within this area to be located well below the MHW line and therefore would not be considered adjacent aquatic resources. For this reason, these mudflat areas were also classified as non-wetland WOUS.

Reinforced Concrete Boxes (RCBs) are prevalent throughout the Westminster Channel system where channels pass below surface infrastructure, namely roadways. In most locations, the subsurface waterway formed by an RCB was considered jurisdictional because the RCB conveys flows over a very short distance (e.g., under a road or road intersection). In several locations, however, the subsurface path was determined to be of sufficient length so as to represent an non-jurisdictional underground ("groundwater") break in the channel's path per 33 CFR §328.3(b)(5). The specific locations of these excluded underground ("groundwater") features are identified in Table 11 below.

Per Corps Chicago District's instructions, Haster Basin as well as stormwater conveyance features within Miles Square Golf Course were excluded from the C05 and C06 Channel Review Areas, respectively, because no flood control work is planned within these facilities.

As of the date of issuance of this AJD, Corps Civil Works is currently completing channel improvments within the segment of C06 Channel located between the C05-C06 confluence and Beach Boulevard. This work will repair the eroded, largely earthen, embankement and construct a new 2,110-foot-long trapezoidal concrete channel for the purpose of better protecting adjacent property owners from potential property loss due to erosion of the embankment. The Corps notes that the delineation documented herein is based on the pre-construction conditions of this segment of C06, despite the fact that some alteration to channel geometry, and therefore OHWM, is expected to occur as a result of the ongoing improvements work.

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Jurisdictional Waters of the U.S.

Jurisidcitional waters of the U.S. (WOUS) identified within each review area are shown in Appendix A. The total acreage of each identified jurisdicitonal resource type is summarized in the table below:

Table 1. Acres of each WOUS type within each Review Area

	Acres of WOUS within each Review Area					
WOUS type	**WAB**	**PCH Floodwall**	**C02**	**C04**	**C05**	**C06**
Estuarine Bordering Mudflat WOUS	0.01	0.57	-	-	-	-
Estuarine Bordering Wetland WOUS (404-only)	0.01	0.23	-	-	-	-
Estuarine Bordering Wetland WOUS (404/10)	0.02	0.13	-	-	-	-
Estuarine Navigable Non-Wetland WOUS (404-only)	0.19	0.13	4.83	-	-	-
Estuarine Navigable Non-Wetland WOUS (404/10)	1.73	4.20	21.03	-	-	-
Estuarine Neighboring Wetland WOUS (404-only)	0.11	-	-	-	-	-
Riverine Navigable Non-Wetland WOUS (404/10)	-	-	3.31	10.09	46.29	-
Riverine Tributary Non-Wetland WOUS (404-only)	-	-	-	28.55	38.80	11.40

The following shapefiles, which are included with and incorporated by reference in this AJD, provide complete geographic information describing the geographic boundaries of all jurisdictional aquatic resources identified within each review area:

- WAB Review Area: WarnerAvenueBridge_WOUS.shp
- PCH Floodwall Review Area: PCHFloodwall_WOUS.shp
- C02, C04, C05, and C06 Channel Review Areas: WestminsterChannels_WOUS.shp

Table 2. (a)(1) Traditional Navigable Waters

(a)(1) Waters Name	**(a)(1) Criteria**	**Rationale to Support (a)(1) Designation** **Include High Tide Line or Ordinary High Water Mark indicators, when applicable.**
WAB Estuarine Navigable Non-Wetland WOUS (404-only and 404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	These navigable WOUS are subject to the ebb and flow of the tide and are used, or are susceptable for use, to transport interstate or foreign commerce. The HTL was identified as 6.82 feet NADV, and MHW line identified as 4.5 feet, using USGS West Coast El-Nino Lidar Project (2016) LiDAR data (see Section II above). Aquatic resources within these review areas are located within Bolsa Bay, which has historically been considered by Los Angeles District to be Traditional Navigable Waters (Appendix C).
PCH Floodwall Estuarine Navigable Non-Wetland WOUS (404-only and 404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	
C02 Estuarine Navigable Non-Wetland WOUS (404-only and 404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide. This waterway includes an approximately 1.5-mile stretch of C02 starting at C02's outlet to Bolsa Bay at Edinger Bridge and ending approximately 800 feet downstream of the C02-C04 confluence.
C02 Riverine Navigable Non-Wetland WOUS (404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide, though upstream freshwater nuisance and stormwater flows are anticipated to contribute predominantly to hydrologic inputs. This waterway includes an approximately 800-foot stretch of C02

(a)(1) Waters Name	(a)(1) Criteria	Rationale to Support (a)(1) Designation Include High Tide Line or Ordinary High Water Mark indicators, when applicable.
		located between the C02-C04 confluence and a point approximately 800 feet downstream of the confluence.*
C04 Riverine Navigable Non-Wetland WOUS (404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide, though upstream freshwater nuisance and stormwater flows are anticipated to contribute predominantly to hydrologic inputs. This waterway includes an approximately 1.1-mile stretch of C04 starting at C04's confluence with C02 and ending upstream at C04's Section 10/non-Section 10 boundary.*
C05 Riverine Navigable Non-Wetland WOUS (404/10)	The waterbody is subject to Section 9 or 10 of the Rivers and Harbors Act	This (a)(1) waterway was classified as a TNW because it is subject to the ebb and flow of the tide, though upstream freshwater nuisance and stormwater flows are anticipated to contribute predominantly to hydrologic inputs. This waterway includes an approximately 3.5-mile stretch of C05 starting at C05's outlet to Bolsa Bay and ending at C05's Section 10/non-Section 10 boundary.*

* The spatial extent of the 10-year flood event was selected for use as the OHWM for "riverine" (a)(1) waters above considering the dominant role of stormwater flows in producing "ordinary high" water levels within these flood control channels.

Table 3. (a)(2) Interstate Waters

(a)(2) Waters Name	Rationale to Support (a)(2) Designation
N/A	N/A

Table 4. (a)(3) Territorial Seas

(a)(3) Waters Name	Rationale to Support (a)(3) Designation
N/A	N/A

Table 5. (a)(4) Impoundments

(a)(4) Waters Name	Rationale to Support (a)(4) Designation
N/A	N/A
N/A	N/A

Table 6. (a)(5)Tributaries

(a)(5) Waters Name	Flow Regime	(a)(1)-(a)(3) Water Name to which this (a)(5) Tributary Flows	Tributary Breaks	Rationale for (a)(5) Designation and Additional Discussion. Identify flowpath to (a)(1)-(a)(3) water or attach map identifying the flowpath; explain any breaks or flow through excluded/non-jurisdictional features, etc.
C04 Riverine Tributary Non-Wetland WOUS (404-only)	Perennial	C04 Riverine Navigable Non-Wetland WOUS (404/10)	No	This (a)(5) waterway flows to C04 Riverine Navigable Non-Wetland WOUS (404/10), an (a)(1) WOUS.
C05 Riverine Tributary Non-Wetland WOUS (404-only)	Perennial	C05 Riverine Navigable Non-Wetland WOUS (404/10)	No	This (a)(5) waterway flows to C05 Riverine Navigable Non-Wetland WOUS (404/10), an (a)(1) WOUS.
C06 Riverine Tributary Non-Wetland WOUS (404-only)	Perennial	C05 Riverine Navigable Non-Wetland WOUS (404/10)	No	This (a)(5) waterway flows to C05 Riverine Tributary Non-Wetland WOUS (404-only), which in turn flows to C05 Riverine Navigable Non-Wetland WOUS (404/10), an (a)(1) WOUS.

Table 7. (a)(6) Adjacent Waters

(a)(6) Waters Name	(a)(1)-(a)(5) Water Name to which this Water is Adjacent	Rationale for (a)(6) Designation and Additional Discussion. Identify the type of water and how the limits of jurisdiction were established (e.g., wetland, 87 Manual/Regional Supplement); explain how the 100-year floodplain and/or the distance threshold was determined; whether this water extends beyond a threshold; explain if the water is part of a mosaic, etc.
WAB Mudflat WOUS	WAB Estuarine Navigable Non-Wetland WOUS (404/10)	These (a)(6) waters, which are located in the southwest corner of the review area, are considered adjacent (bordering) jurisdictional waters because they coincide with the MHW line.
WAB Estuarine Bordering Wetland WOUS (404-only)		
WAB Estuarine Bordering Wetland WOUS (404/10)		
WAB Estuarine Neighboring Wetland WOUS (404-only)	WAB Estuarine Navigable Non-Wetland WOUS (404/10)	These (a)(6) waters are considered adjacent jurisdictional waters because they are located within 100 feet of the MHW line. One neighboring wetland was identified in the northern portion of the review area. This muted tidal wetland is separated from Bolsa Bay by an approximately 10-foot-long culvert that conveys flows to the wetland only during the highest tides (i.e., when tide levels are above MHW).
PCH Floodwall Mudflat WOUS	PCH Floodwall Estuarine Navigable Non-Wetland WOUS (404/10)	These (a)(6) waters are considered adjacent (bordering and contiguous) jurisdictional waters because they directly abut jurisdictional wetlands that are in turn adjacent to the MHW line. These waters also coincide with the MHW line in some areas.
PCH Floodwall Estuarine Bordering Wetland WOUS (404-only)	PCH Floodwall Estuarine Navigable	These (a)(6) waters are considered adjacent (bordering and contiguous) jurisdictional waters because they coincide with the MHW line.

PCH Floodwall Estuarine Bordering Wetland WOUS (404/10)	Non-Wetland WOUS (404/10)	

Table 8. (a)(7) Waters

SPOE Name	(a)(7) Waters Name	(a)(1)-(a)(3) Water Name to which this Water has a Significant Nexus	Significant Nexus Determination Identify SPOE watershed; discuss whether any similarly situated waters were present and aggregated for SND; discuss data, provide analysis, and summarize how the waters have more than speculative or insubstantial effect on the physical, chemical, or biological integrity of the (a)(1)-(a)(3) water, etc.
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Table 9. (a)(8) Waters

SPOE Name	(a)(8) Waters Name	(a)(1)-(a)(3) Water Name to which this Water has a Significant Nexus	Significant Nexus Determination Identify SPOE watershed; explain how 100-yr floodplain and/or the distance threshold was determined; discuss whether waters were determined to be similarly situated to subject water and aggregated for SND; discuss data, provide analysis, and then summarize how the waters have more than speculative or insubstantial effect the on the physical, chemical, or biological integrity of the (a)(1)-(a)(3) water, etc.
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Non-Jurisdictional Waters

Table 10. Non-Waters/No Significant Nexus

SPOE Name	Non-(a)(7)/(a)(8) Waters Name	(a)(1)-(a)(3) Water Name to which this Water DOES NOT have a Significant Nexus	Basis for Determination that the Functions DO NOT Contribute Significantly to the Chemical, Physical, or Biological Integrity of the (a)(1)-(a)(3) Water. Identify SPOE watershed; explain how 100-yr floodplain and/or the distance threshold was determined; discuss whether waters were determined to be similarly situated to the subject water; discuss data, provide analysis, and summarize how the waters did not have more than a speculative or insubstantial effect on the physical, chemical, or biological integrity of the (a)(1)-(a)(3) water.
N/A	N/A	N/A	N/A
N/A	N/A	N/A	N/A

Table 11. Non-Waters/Excluded Waters and Features

Paragraph (b) Excluded Feature/Water Name	Rationale for Paragraph (b) Excluded Feature/Water and Additional Discussion.
Westminster Mall Underground Conveyance	This approximately 3,100-foot underground conveyance, which passes under Westminster Mall, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents two breaks in C04 Channel, one spanning from approximately 33.745979, -118.005944 to approximately 33.744789, -118.007247 and another spanning from approximately 33.744713, -118.007577 to approximately 33.744650, -118.015853.
Hazard Avenue and Beach Boulevard Underground Conveyance	This approximately 325-foot underground conveyance, which passes under the intersection of Hazard Avenue and Beach Boulevard, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break in C04 Channel spanning from approximately 33.752306, -117.989363 to approximately 33.751990, -117.990388.
Warner Avenue and Magnolia Street Underground Conveyance	This approximately 1,800-foot break, which passes under I-405 as well as a commercial area near the intersection of Warner Avenue and Magnolia Street, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break in C06 Channel spanning from approximately 33.717636, -117.968448 to approximately 33.716250, -117.974231.
Rosita Park Underground Conveyance	This approximately 1,080-foot underground conveyance, which passes under Rosita Park near the intersection of Hazard Avenue and Newhope Street, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break C05 Channel spanning from approximately 33.752614, -117.928698 to approximately 33.750509, -117.931268.
Orange County Transportation Facility Underground Conveyance	This approximatly 300-foot underground conveyance, which passes under the Orange County Transportation Facility at 11790 Cardinal Circle, was determined to be non-jurisdictional underground ("groundwater") flow per 33 CFR §328.3(b)(5). This non-jurisdictional feature represents a break C05 Channel spanning from approximately 33.763921, -117.923657 to approximately 33.763227, -117.924225.

Table 12. Non-Waters/Other

Other Non-Waters of U.S. Feature/Water Name	Rationale for Non-Waters of U.S. Feature/Water and Additional Discussion.
N/A	N/A

Appendix A

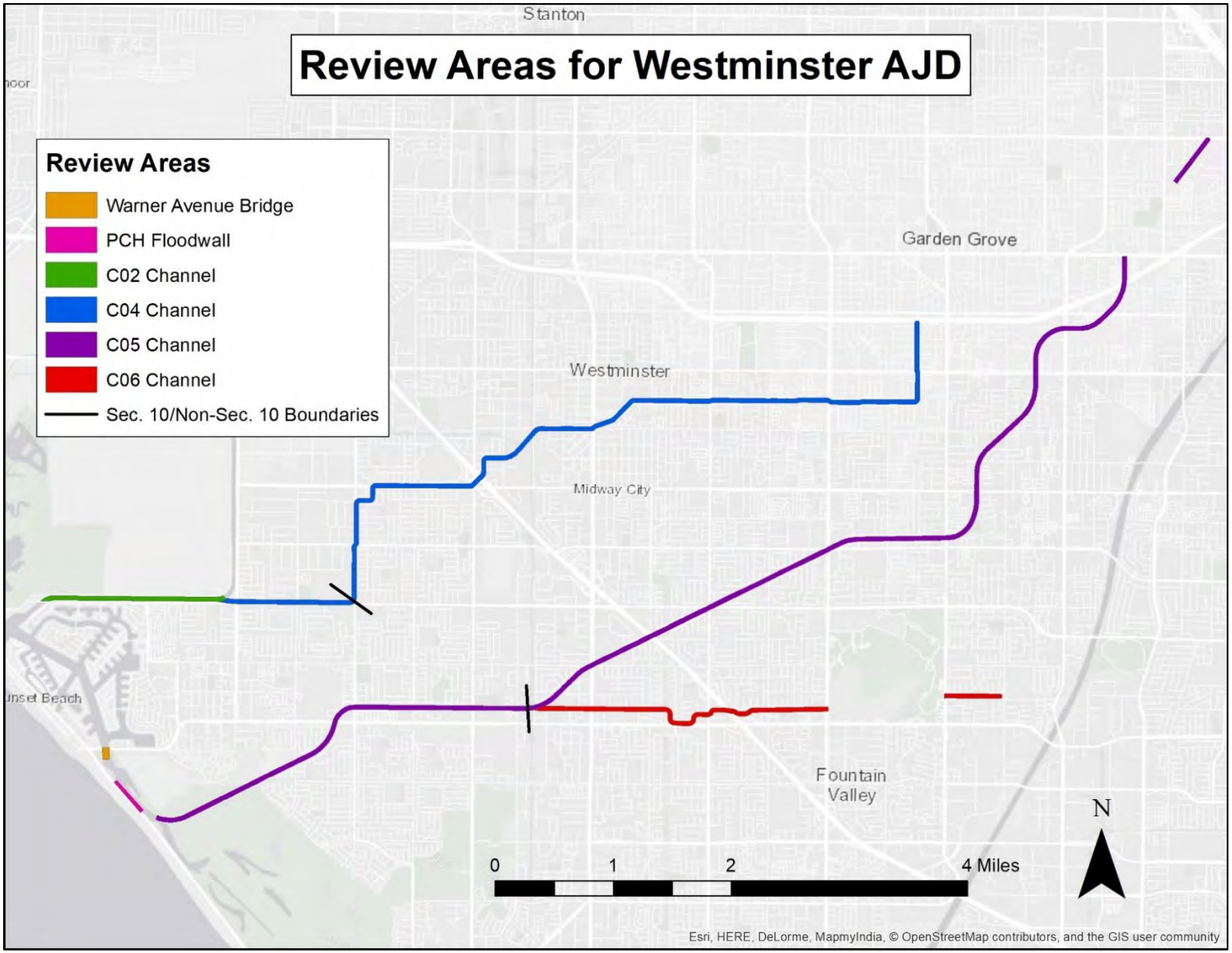

Figure 1 Review Areas evaluated for the Westminster Flood Risk Management Study AJD.

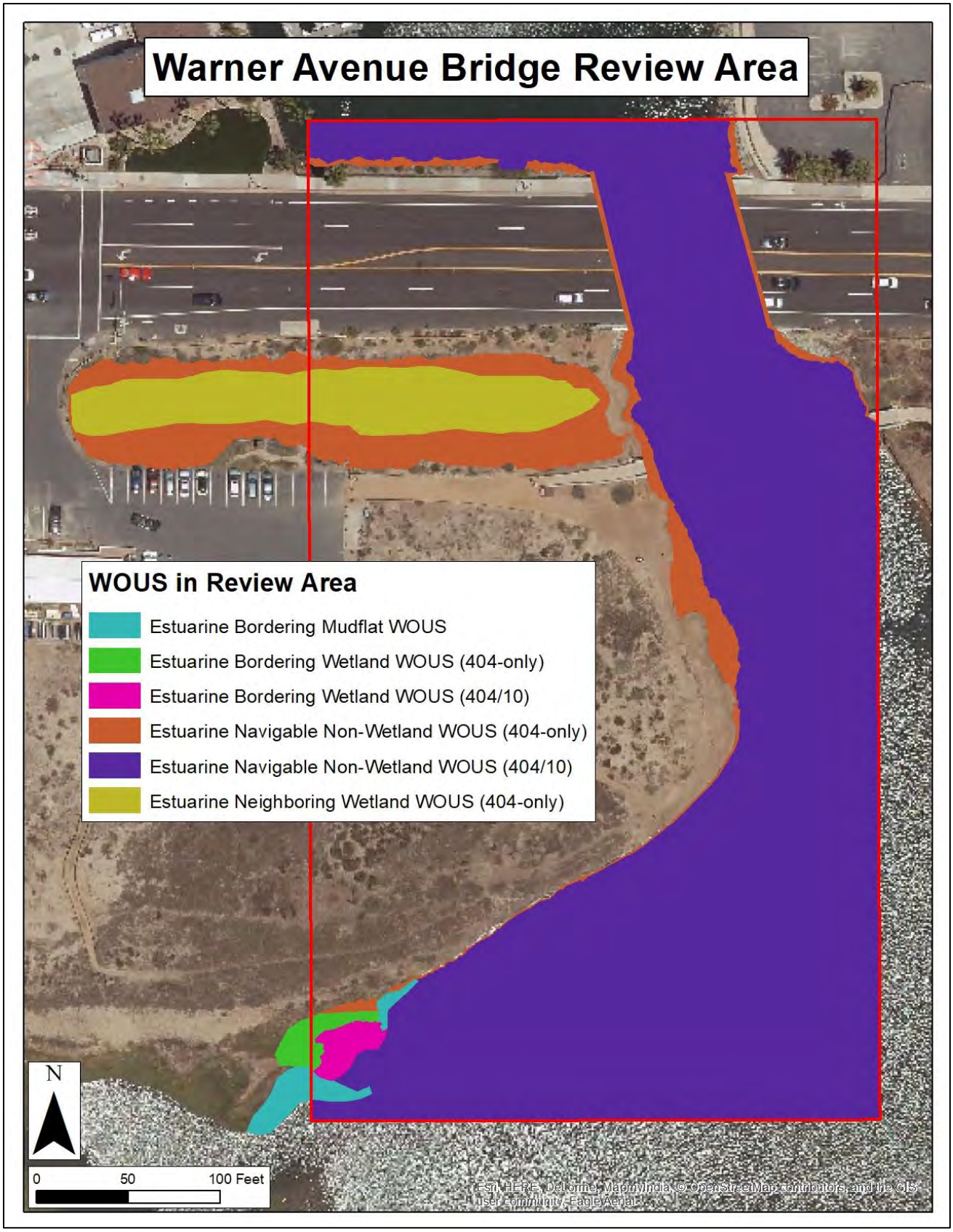

Figure 2 Jurisdictional waters of the U.S. within the Warner Avenue Bridge Review Area.

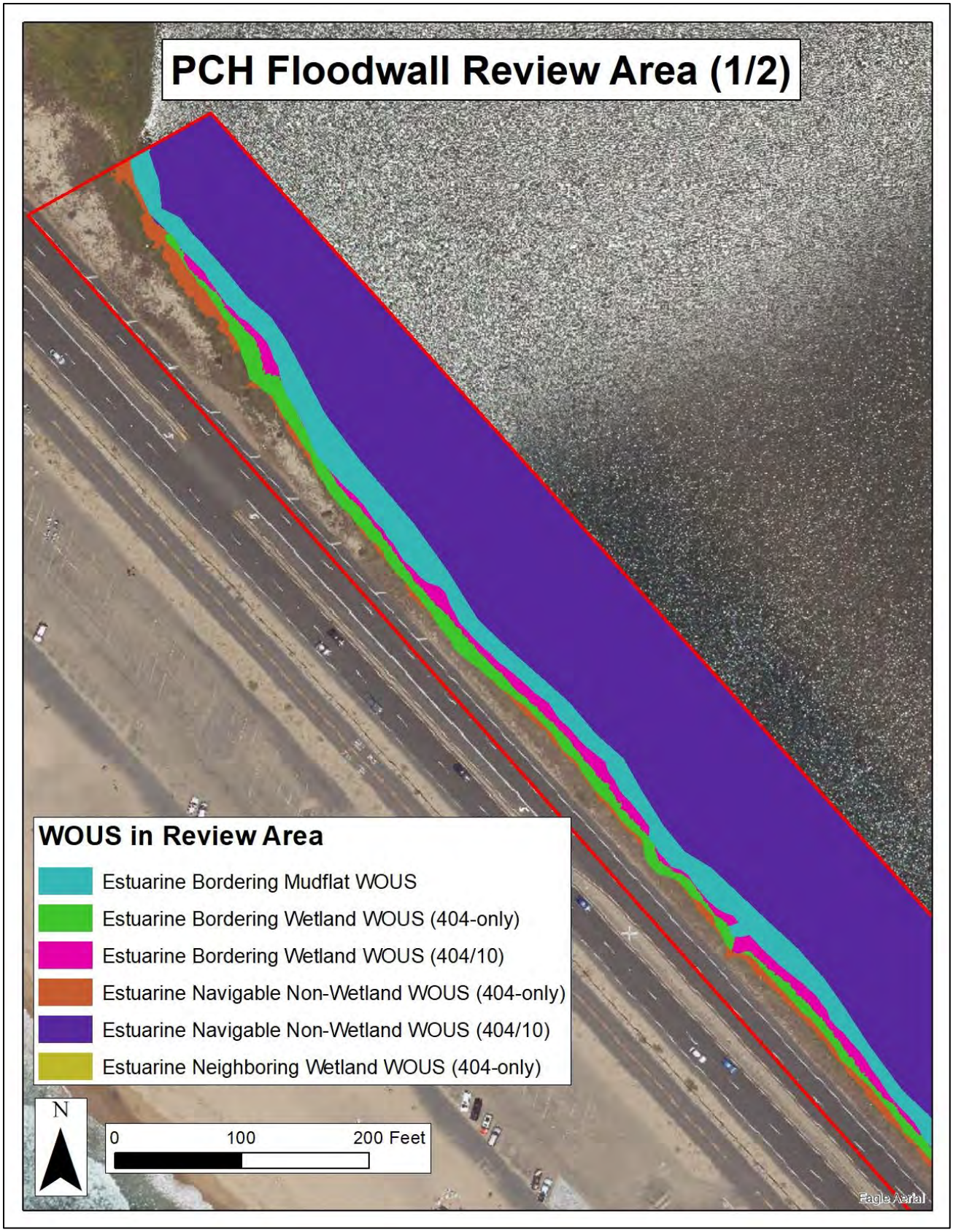

Figure 3 Jurisdictional waters of the U.S. within the PCH Floodwall Review Area (1 of 2).

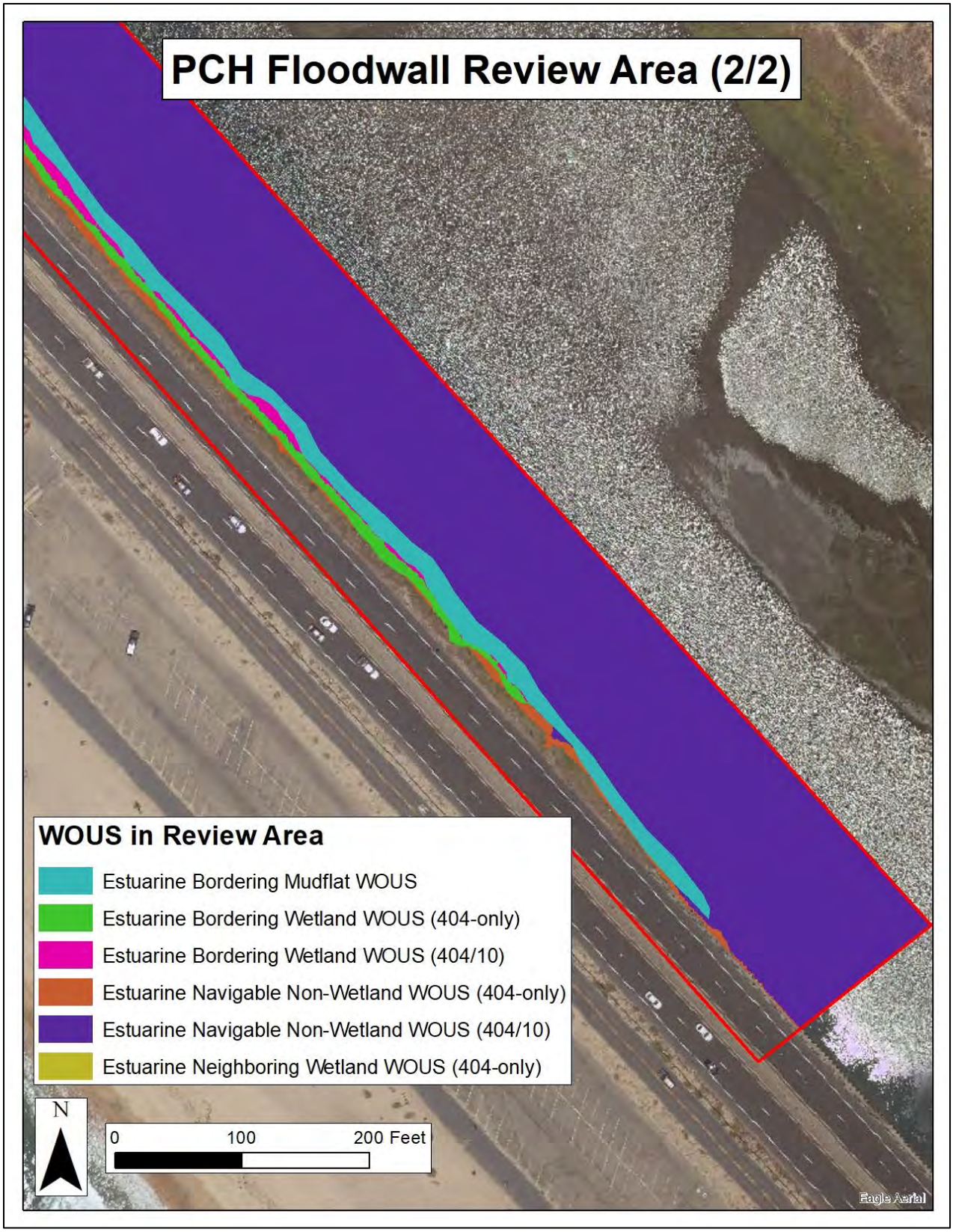

Figure 4 Jurisdictional waters of the U.S. within the PCH Floodwall Review Area (2 of 2).

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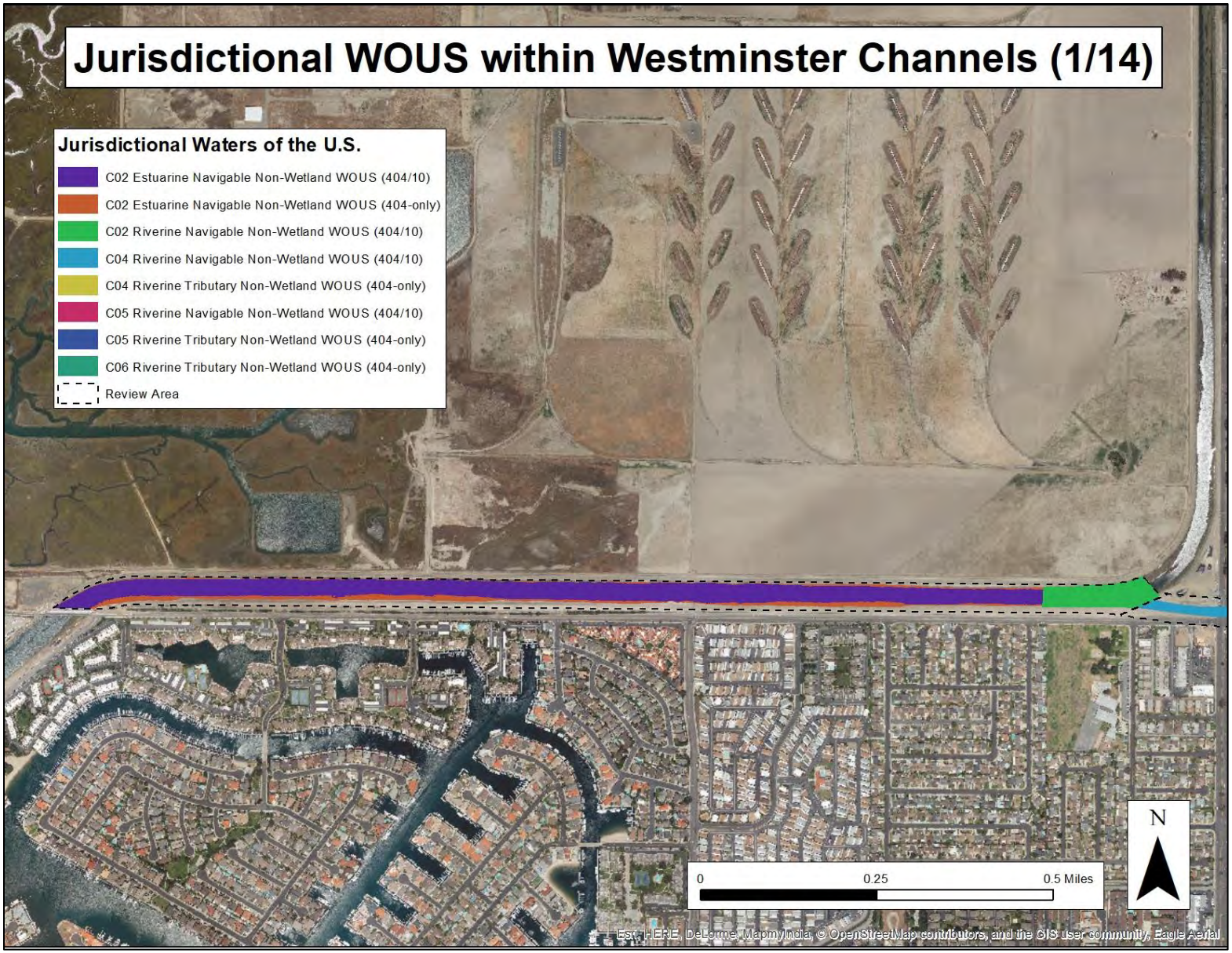

Figure 5 Jurisdictional waters of the U.S. identified within the Westminster Channels (1 of 14).

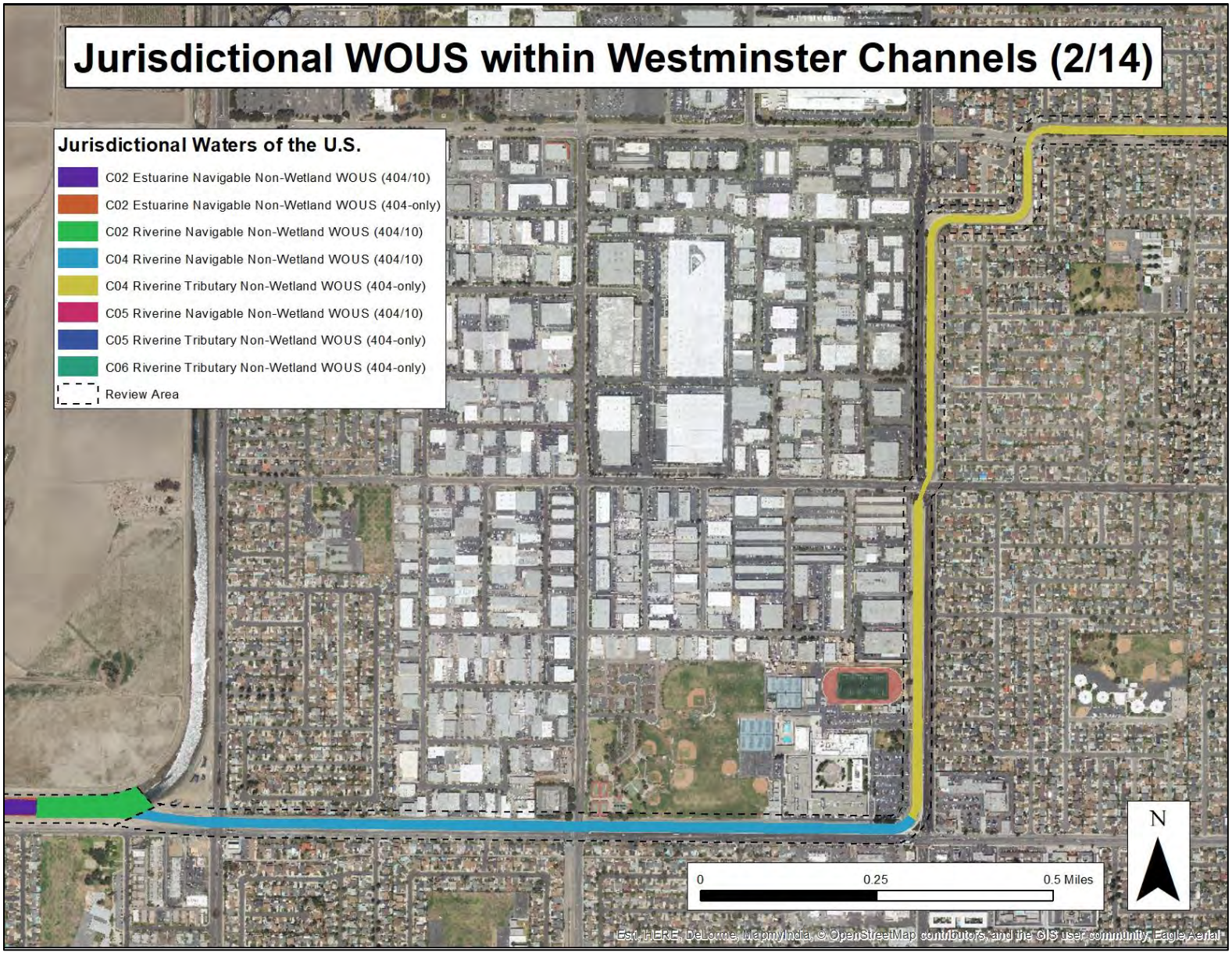

Figure 6 Jurisdictional waters of the U.S. identified within the Westminster Channels (2 of 14).

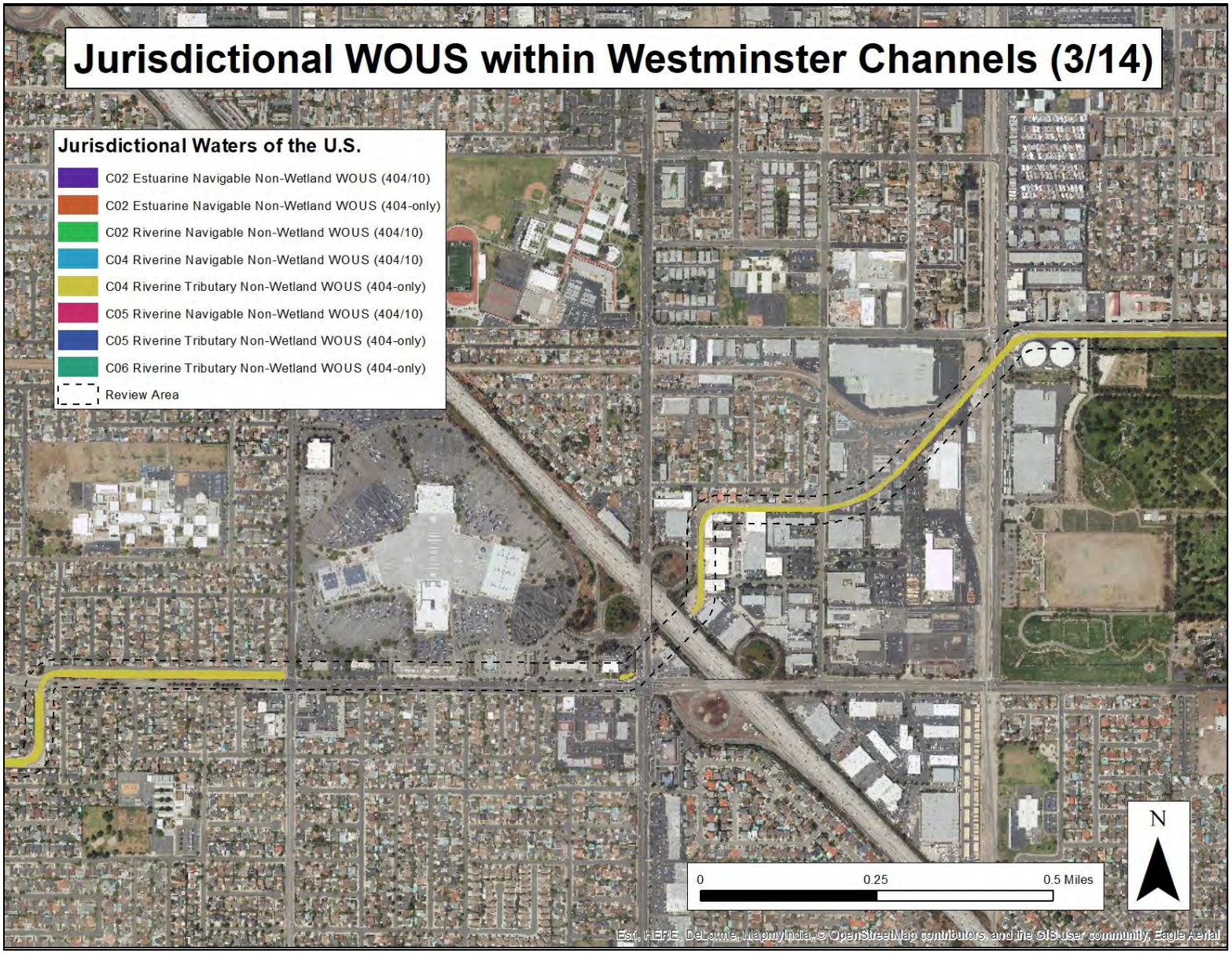

Figure 7 Jurisdictional waters of the U.S. identified within the Westminster Channels (3 of 14).

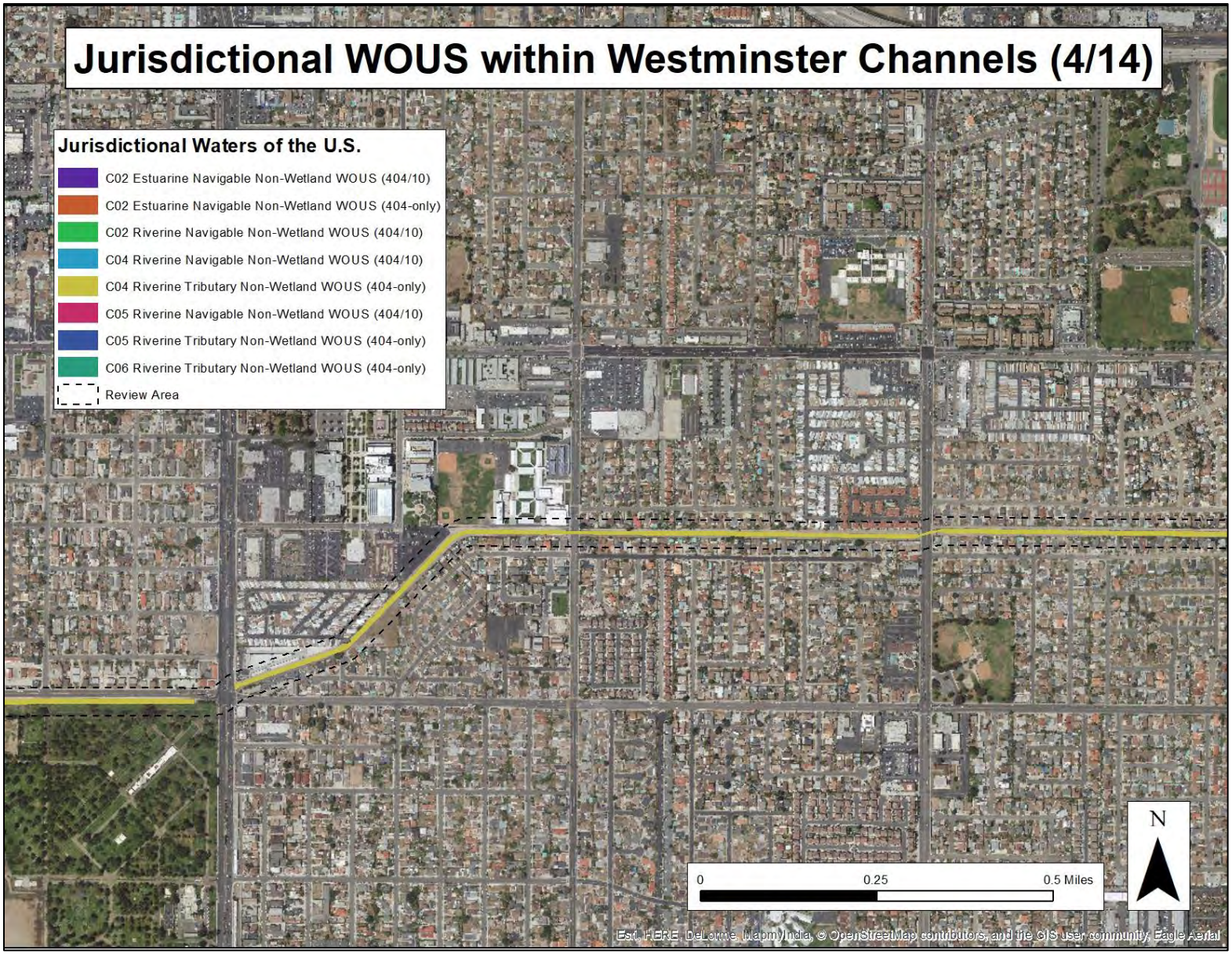

Figure 8 Jurisdictional waters of the U.S. identified within the Westminster Channels (4 of 14).

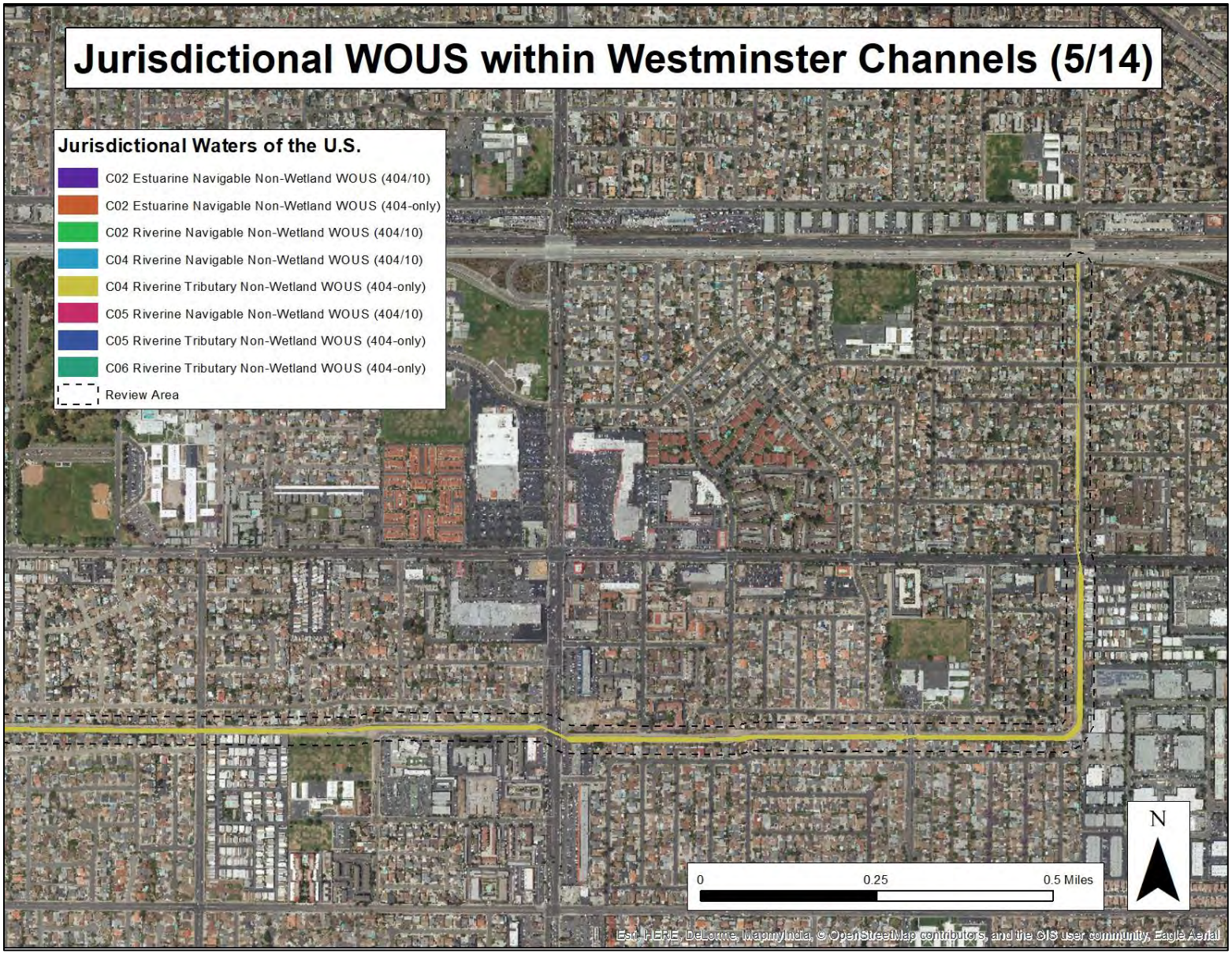

Figure 9 Jurisdictional waters of the U.S. identified within the Westminster Channels (5 of 14).

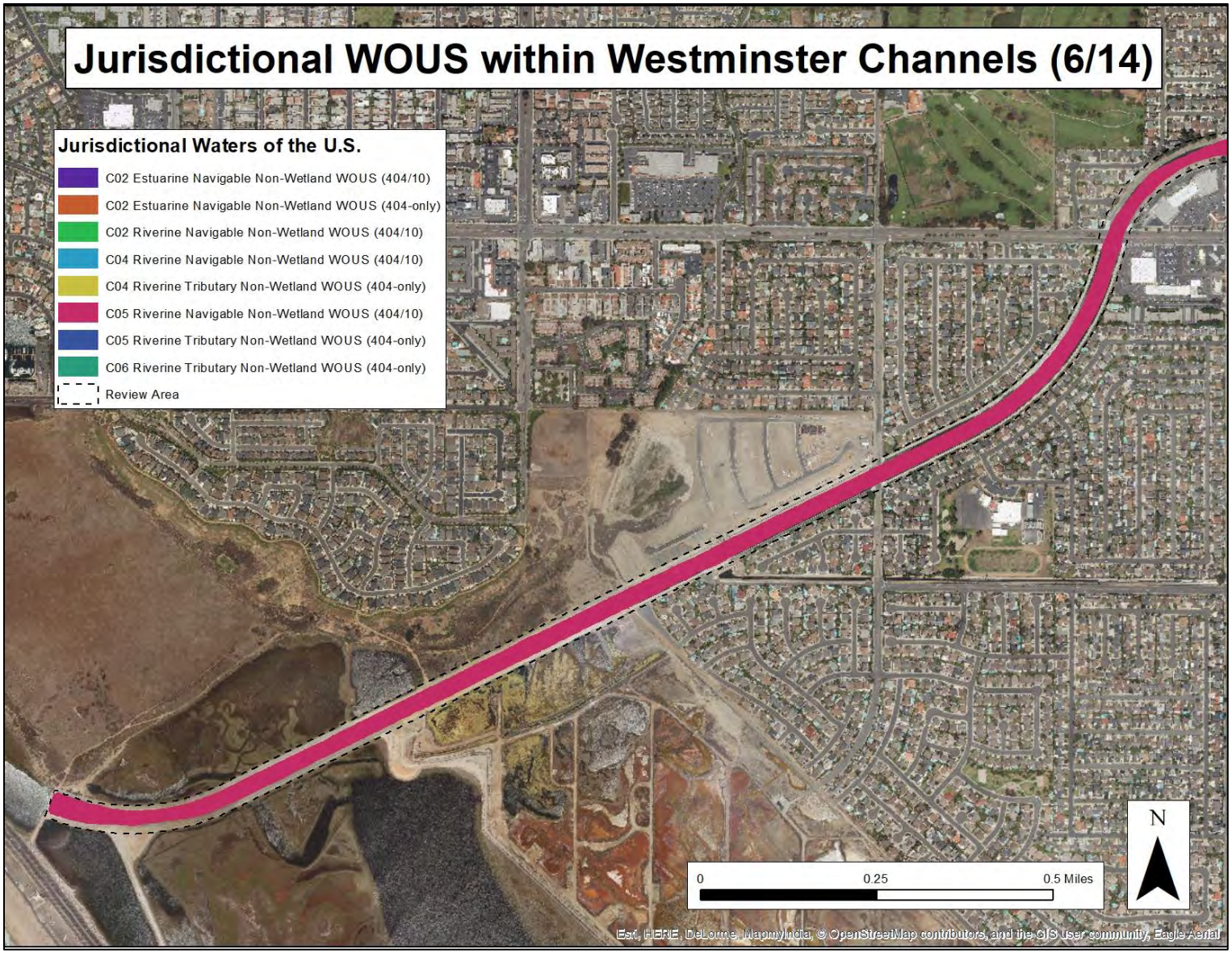

Figure 10 Jurisdictional waters of the U.S. identified within the Westminster Channels (6 of 14).

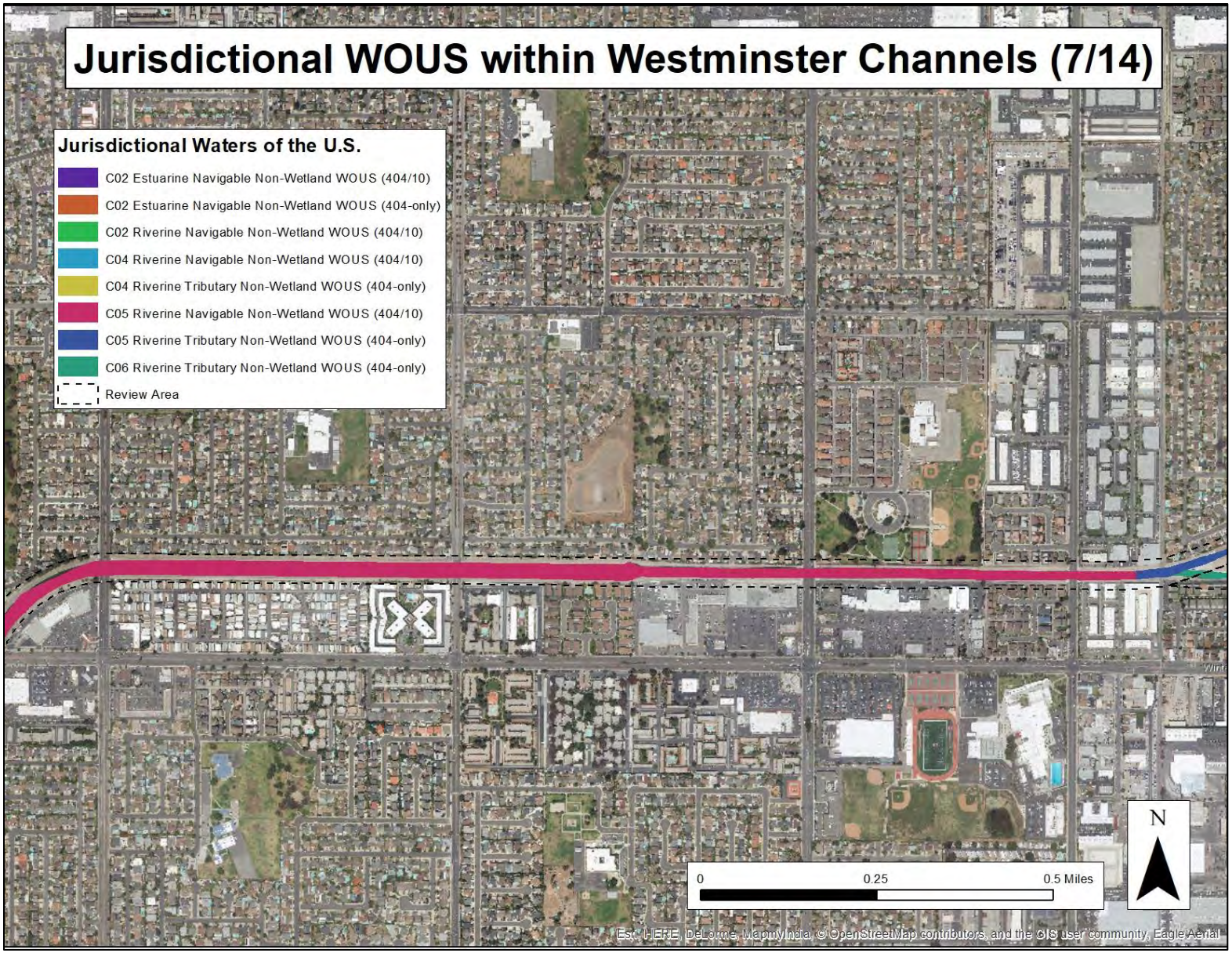

Figure 11 Jurisdictional waters of the U.S. identified within the Westminster Channels (7 of 14).

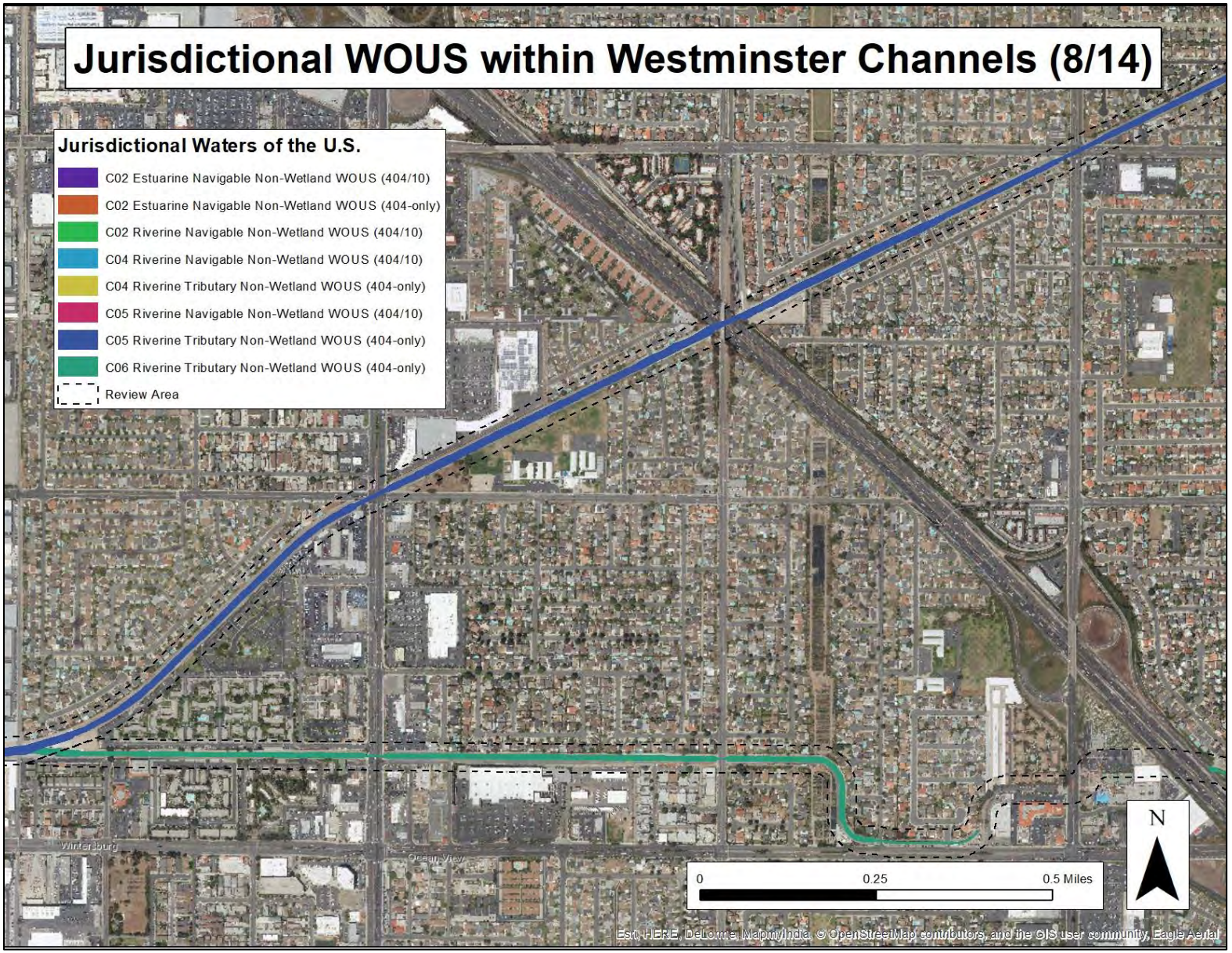

Figure 12 Jurisdictional waters of the U.S. identified within the Westminster Channels (8 of 14).

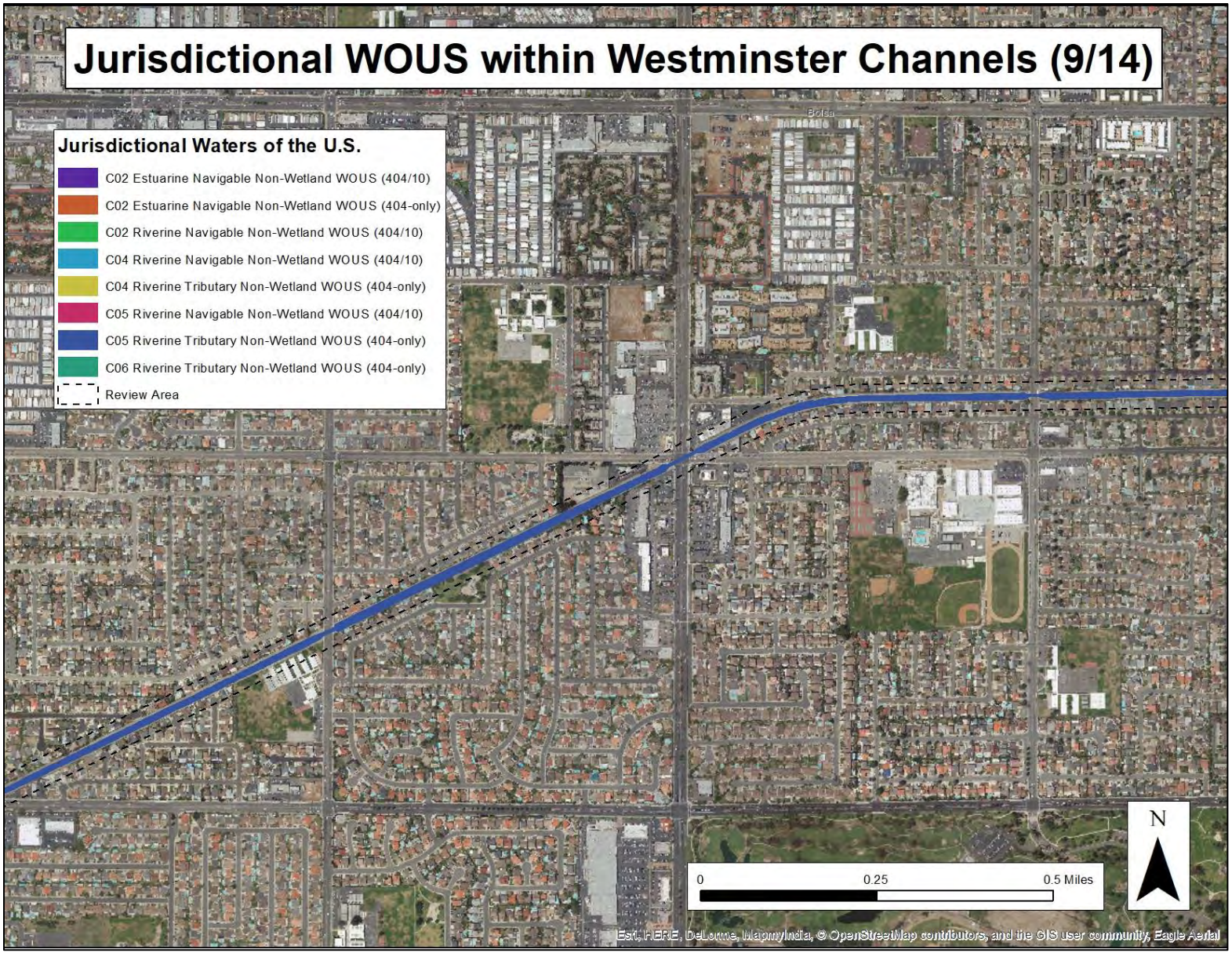

Figure 13 Jurisdictional waters of the U.S. identified within the Westminster Channels (9 of 14).

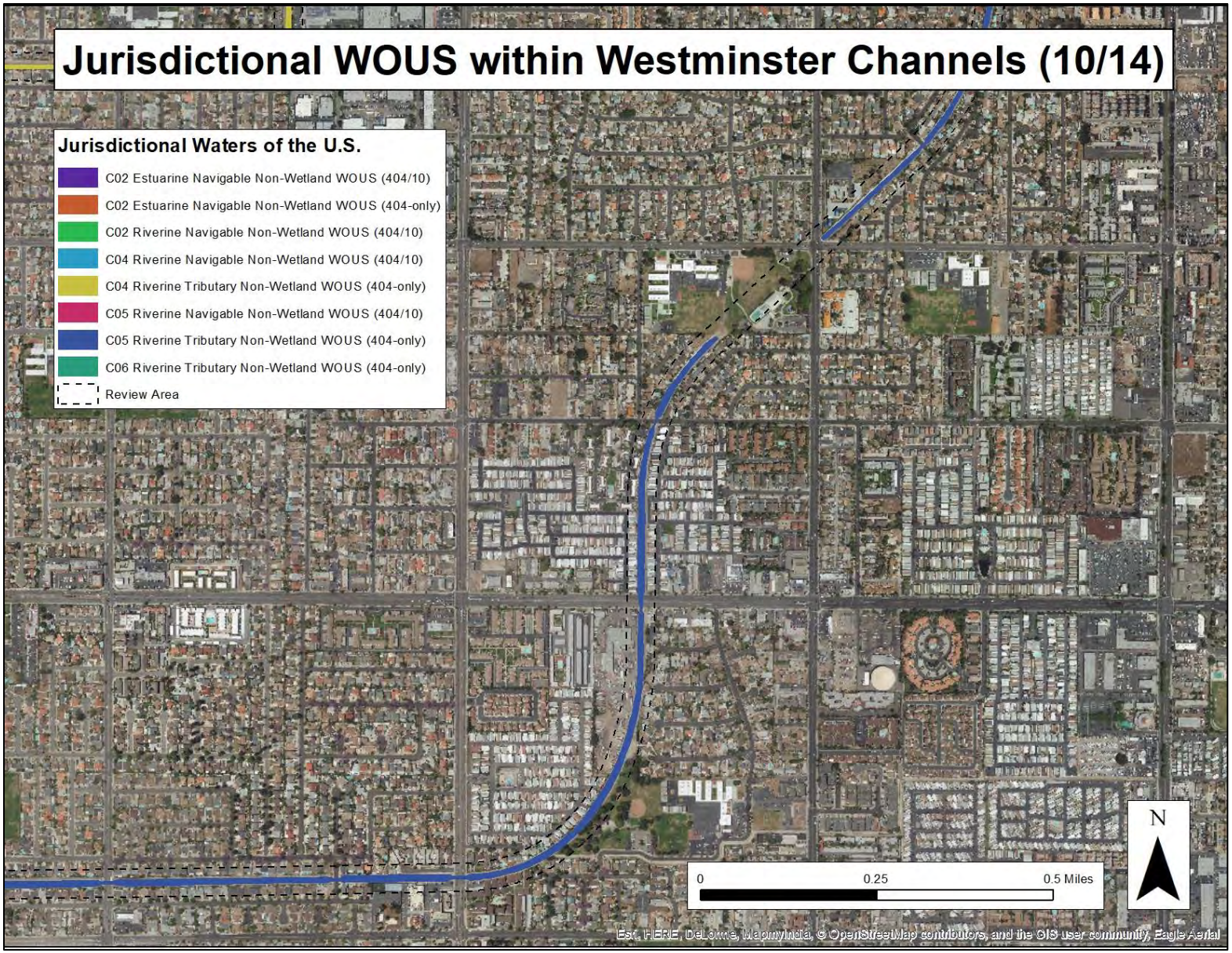

Figure 14 Jurisdictional waters of the U.S. identified within the Westminster Channels (10 of 14).

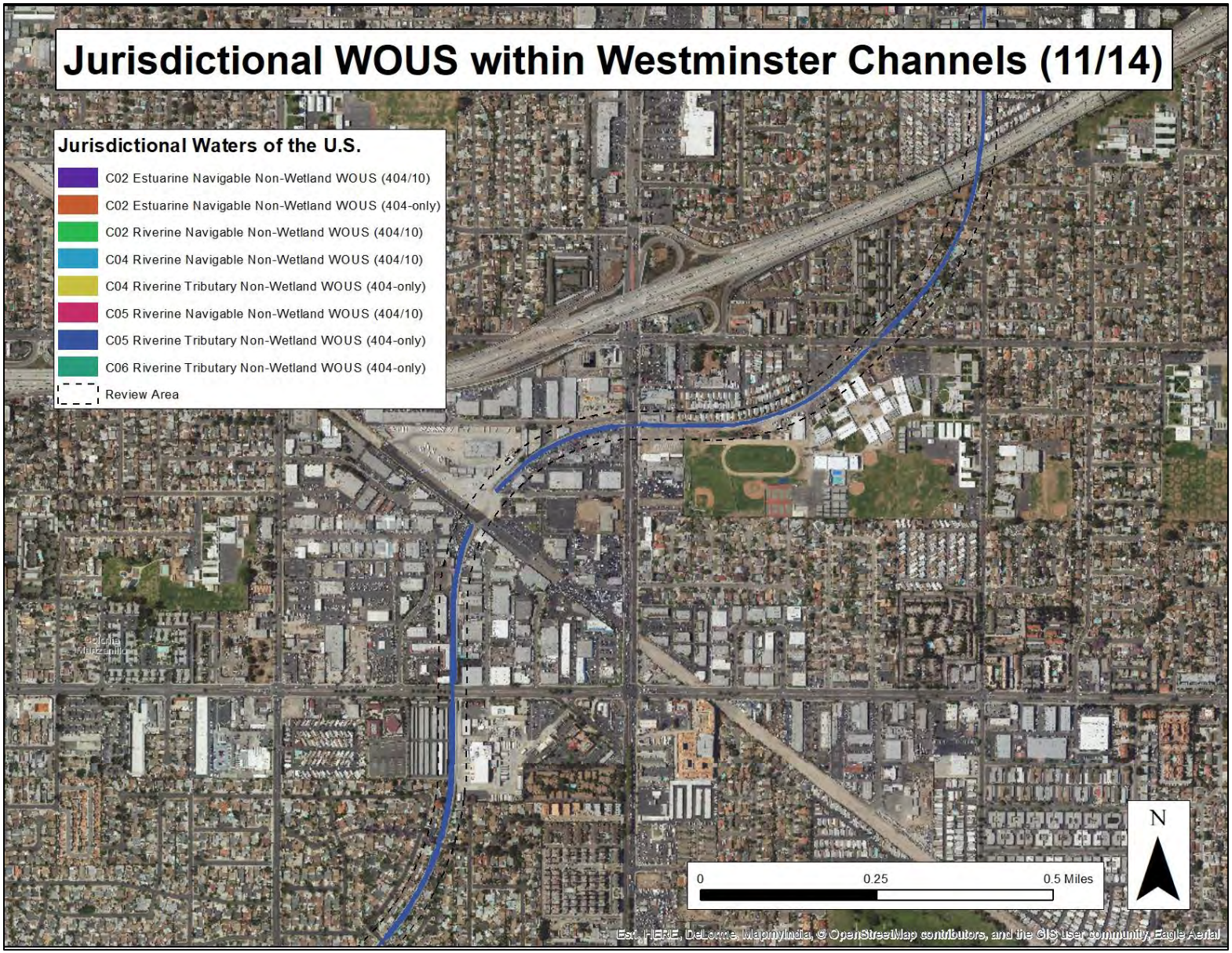

Figure 15 Jurisdictional waters of the U.S. identified within the Westminster Channels (11 of 14).

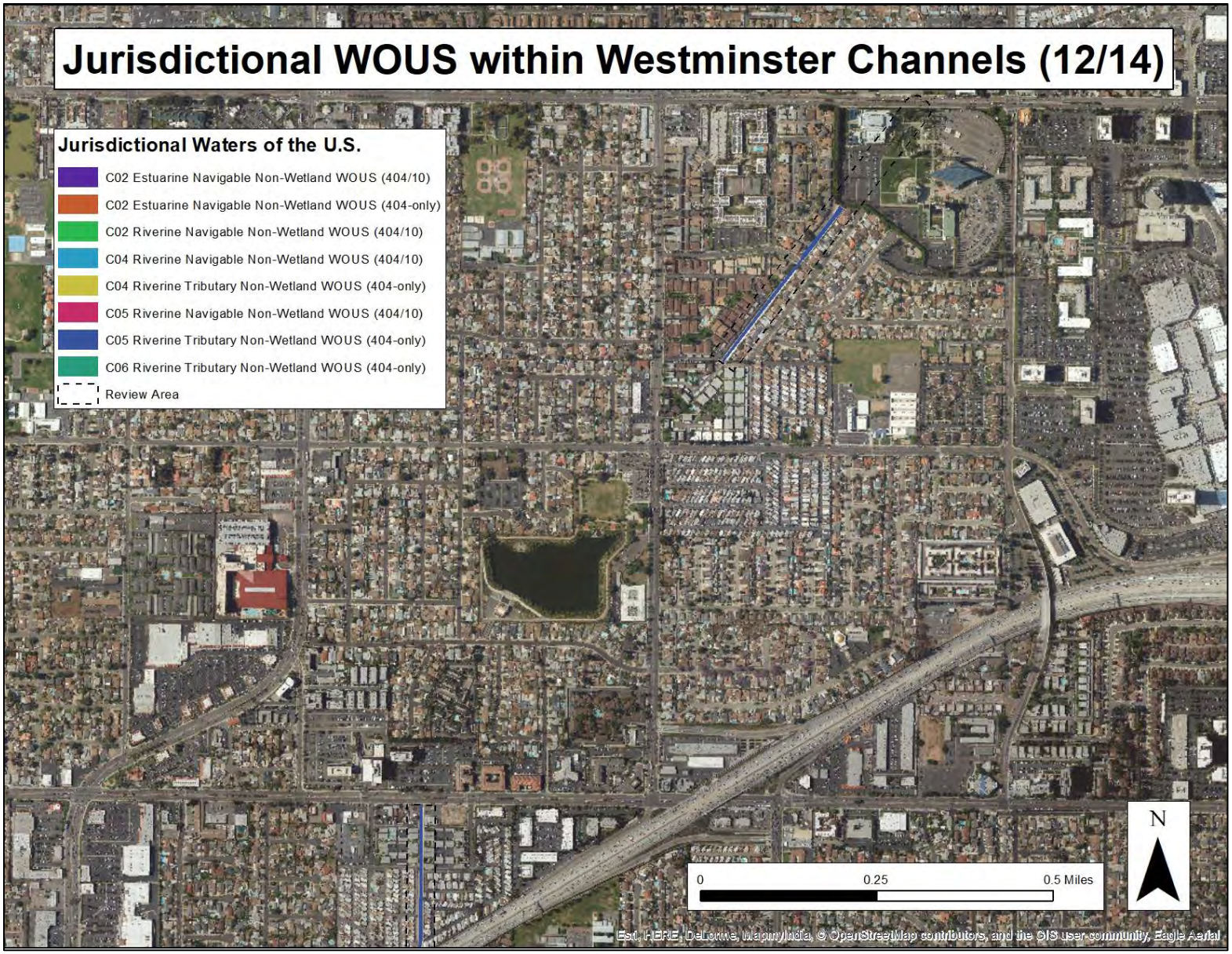

Figure 16 Jurisdictional waters of the U.S. identified within the Westminster Channels (12 of 14).

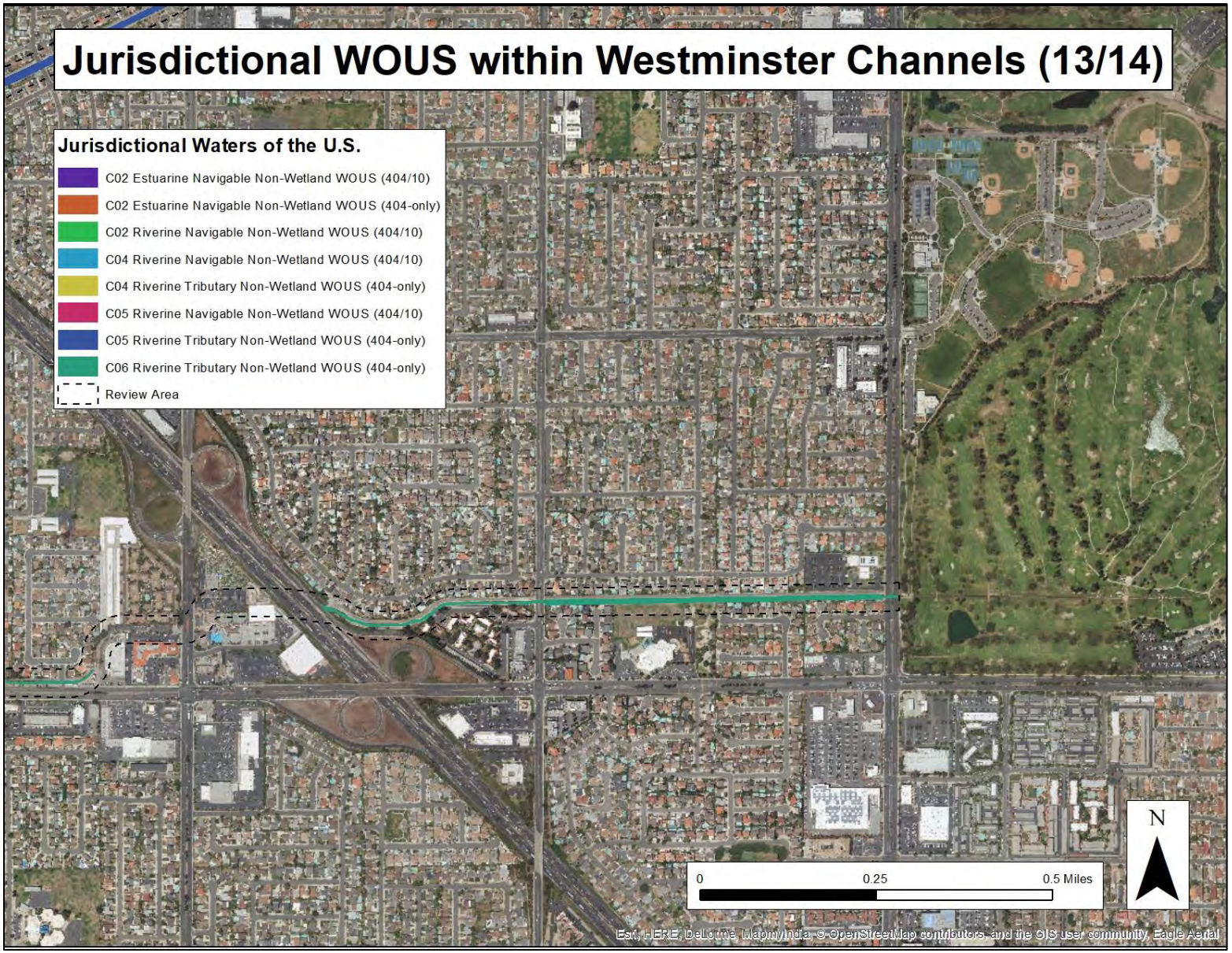

Figure 17 Jurisdictional waters of the U.S. identified within the Westminster Channels (13 of 14).

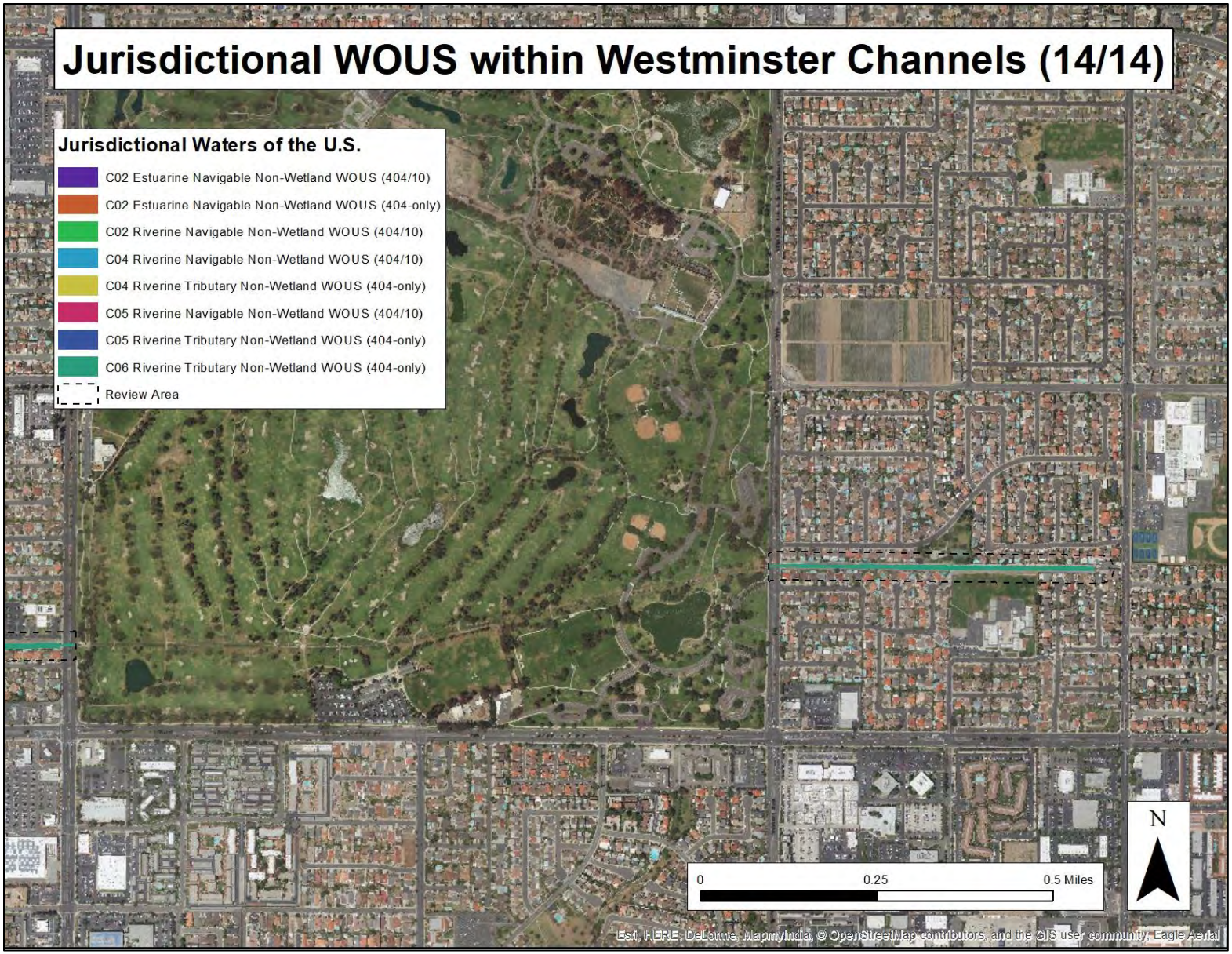

Figure 18 Jurisdictional waters of the U.S. identified within the Westminster Channels (14 of 14).

Appendix B

Figure 1 Muted tidal wetland identified within the Warner Avenue Bridge Review Area during a site visit completed on March 27, 2019. The wetland receives only the highest tidal flows through a culvert that inlets water from the adjacent Bolsa Bay. The view shown here is oriented toward the east, with Warner Avenue Bridge and Bolsa Bay located behind the wetland.

Figure 2 View of the muted tidal wetland within the Warner Avenue Bridge Review Area, oriented to the west.

Figure 3 View, oriented north, of tidal wetland and mudflat areas within the PCH Floodwall Review Area as observed during the March 27, 2019 site visit.

Figure 4 View, oriented south, of tidal wetland and mudflat areas within the PCH Floodwall Review area.

Figure 5 View of Bolsa Chica Channel (C02), oriented west, as observed during an April 16, 2019 site visit.

Figure 6 View of Bolsa Chica Channel (C02), oriented to the east.

Figure 7 Cattail (*Typha domingensis*) sprouts present along the C02 channel fringe, a potential indicator of disturbance and brackish conditions within C02 Channel.

Appendix C

PUBLIC NOTICE
RELATIVE TO NAVIGABLE WATERS WITHIN
THE LOS ANGELES DISTRICT

Date Received

DEPARTMENT OF THE ARMY
LOS ANGELES DISTRICT, CORPS OF ENGINEERS
P. O. BOX 2711
LOS ANGELES, CALIFORNIA 90053

	Act'n	Info
		✓
		✓
	✓	✓

29 November 1972

Send copies to CCCD 12 (Coun) + Compt (WBR). KEEP THIS. SAT 12/1/72

TO WHOM IT MAY CONCERN:

This Public Notice is issued to inform all interested parties of the definition of navigable waters of the United States subject to the regulatory authorities of the Corps of Engineers, Los Angeles District, as established by the River and Harbor Act of 1899. As a general proposition, limits of jurisdiction over tidal waters of the Pacific Ocean from the Mexican-California border to Cape San Martin shall extend to the line on shore reached by the mean of the higher high waters. For the specific areas set forth below, waters of the Pacific Ocean currently regarded as navigable waters of the United States to the limits indicated are as follows:

San Simeon Bay - San Luis Obispo County 2.5 ft. m.s.l.
Lower Morro Bay - San Luis Obispo County 2.4 ft. m.s.l.
San Luis Obispo Creek - San Luis Obispo County 2.5 ft. m.s.l.
Pismo & Arroyo Grande Creeks - San Luis Obispo County 2.5 ft. m.s.l.
Santa Maria River - Santa Barbara County 2.5 ft. m.s.l.
Santa Ynez River - Santa Barbara County 2.5 ft. m.s.l.
Devareaux Ranch Lagoon - Santa Barbara County 2.5 ft. m.s.l.
Goleta Slough - Santa Barbara County 2.5 ft. m.s.l.
Carpinteria (El Estero) Marsh - Santa Barbara County 2.5 ft. m.s.l.
Ventura River - Ventura County 2.6 ft. m.s.l.
Mugu Lagoon - Ventura County 2.5 ft. m.s.l.
Calleguas Creek - Ventura County 2.5 ft. m.s.l.
Ballona Creek - Los Angeles County 2.6 ft. m.s.l.
Los Angeles River - Los Angeles County 2.5 ft. m.s.l.
San Gabriel River - Orange County 2.5 ft. m.s.l.
Anaheim Bay - Orange County 2.5 ft. m.s.l.
Bolsa Bay - Orange County 2.5 ft. m.s.l.
Upper Newport Bay - Orange County 2.5 ft. m.s.l.
San Juan Creek - Orange County 2.6 ft. m.s.l.
San Mateo Creek - San Diego County 2.6 ft. m.s.l.
Santa Margarita River - San Diego County 2.5 ft. m.s.l.
San Luis Rey River - San Diego County 2.5 ft. m.s.l.
Buena Vista Lagoon - San Diego County 2.5 ft. m.s.l.
Agua Hedionda Lagoon - San Diego County 2.5 ft. m.s.l.
Batiquitos Lagoon - San Diego County 2.5 ft. m.s.l.
San Elijo Lagoon - San Diego County 2.5 ft. m.s.l.

San Dieguito River - San Diego County 2.5 ft. m.s.l.
Los Penasquitos Lagoon - San Diego County 2.5 ft. m.s.l.
Upper Mission Bay - San Diego County 2.6 ft. m.s.l.
San Diego River - San Diego County 2.7 ft. m.s.l.
Lower San Diego Bay - San Diego County 3.0 ft. m.s.l.
Tijuana Estuary - San Diego County 2.5 ft. m.s.l.

Federal Laws prohibit work or construction in such waters unless recommended by the Chief of Engineers and authorized by the Secretary of the Army prior to commencement of the work. The authorization is ordinarily granted in the form of a permit. Applications for such permits in the navigable waters of the Pacific Ocean described herein should be forwarded to the District Engineer, Attn: SPLCO-O at the above address. This notice will be added to the listing of navigable waters within the Los Angeles District issued on 30 June 1965.

H. McK. ROPER, JR.
COL, CE
District Engineer

Appendix D

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 1

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Slight depression Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): C Lat: 33.711447 Long: -118.060868 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Emergent wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

Wetland is a muted tidal wetland, since it only receives water during the highest tides.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	95	Yes	OBL
2. Salicornia pacifica	50	Yes	OBL
3. Limonium californicum	5		
4. Frankenia salina	1		
5.			
6.			
7.			
8.			
	151 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 4/1	95	10YR 4/6	5	C	PL	Clay/Loa	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 2

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Slight depression Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): C Lat: 33.711416 Long: -118.060865 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Emergent wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes _____ No _____	
Wetland Hydrology Present?	Yes _____ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	70	Yes	OBL
2. Salicornia pacifica	40	Yes	OBL
3. Limonium californicum	10		
4. Frankenia salina	5		
5.			
6.			
7.			
8.			
	125 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100					Sand	
6-15	10YR 4/1	95	10YR 4/6	5	C	PL	Clay/Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 3

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Slight depression Local relief (concave, convex, none): Convex Slope (%): 0

Subregion (LRR): C Lat: 33.711391 Long: -118.060883 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Emergent wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	95 = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	45	Yes	OBL
2. Salicornia pacifica	30	Yes	OBL
3. Limonium californicum	10		FACW
4. Frankenia salina	10		FACW
5.			
6.			
7.			
8.			
	_____ = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/2	100					Sand	
5-12	10YR 3/3	100					Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 4

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.710498 Long: -118.060857 Datum: NAD 1983

Soil Map Unit Name: Marina loamy sand NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	80	Yes	OBL
2. Salicornia pacifica	90	Yes	OBL
3. Batis maritima	10		OBL
4. Suaeda esteroa	1		FACW
5.			
6.			
7.			
8.			
	181 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 5/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ✓ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 5

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.710509 Long: -118.060905 Datum: NAD 1983

Soil Map Unit Name: Marina loamy sand NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	50	Yes	OBL
2. Salicornia pacifica	30	Yes	OBL
3. Batis maritima	5		OBL
4. Frankenia salina	10		FACW
5.			
6.			
7.			
8.			
	95 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10YR 3/1	95	10YR 3/6	5	C	PL	Clay/Loa+	
8-15	10YR 3/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ✓ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** _____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 6

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.710551 Long: -118.060902 Datum: NAD 1983

Soil Map Unit Name: Marina loamy sand NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Batis maritima	20	Yes	OBL
2. Salicornia pacifica	10		OBL
3. Frankenia Salina	40	Yes	FACW
4.			
5.			
6.			
7.			
8.			
	70 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-15	10YR 3/2	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ✓ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 7

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 20

Subregion (LRR): C Lat: 33.707427 Long: -118.058737 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	40	Yes	OBL
2. Salicornia pacifica	30		OBL
3. Batis maritima	25		OBL
4. Frankenia salina	25		FACW
5. Distichlis littoralis	50	Yes	OBL
6.			
7.			
8.			
	170 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 4/1	85	10YR 3/6	15	C	PL	Clay/Loa	Adundant oxidized living roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 8

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 20

Subregion (LRR): C Lat: 33.707418 Long: -118.058746 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 meters)			
1. Jaumea carnosa	50	Yes	OBL
2. Salicornia pacifica	50	Yes	OBL
3. Batis maritima	20		OBL
4. Frankenia salina	30		FACW
5. Distichlis littoralis	60	Yes	OBL
6.			
7.			
8.			
	210 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 4/1	100					Clay/Loa+	
4-12	10YR 3/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Warner Avenue Bridge Review Area City/County: Huntington Beach Sampling Date: 3/27/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 9

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): Shoreline Local relief (concave, convex, none): None Slope (%): 20

Subregion (LRR): C Lat: 33.710498 Long: -118.060857 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: _____)			
1. Jaumea carnosa	40	Yes	OBL
2. Salicornia pacifica	40	Yes	OBL
3. Batis maritima	20		OBL
4. Frankenia salina	35		FACW
5. Distichlis littoralis	60	Yes	OBL
6.			
7.			
8.			
	195 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 3/2	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: C02 Channel Review Area City/County: Huntington Beach Sampling Date: 4/16/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 10

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): C Lat: 33.730109 Long: -118.051273 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. Frankenia salina	35	Yes	FACW
2. Batis maritima	40	Yes	OBL
3. Salicornia pacifica	5		OBL
4.			
5.			
6.			
7.			
8.			
	80 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/2	100					Clay/Loa+	
9-14	10YR 2/1	100					Clay/Loa+	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ✓ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: C02 Channel Review Area City/County: Huntington Beach Sampling Date: 4/16/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 11

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): None Slope (%): 0

Subregion (LRR): C Lat: 33.730136 Long: -118.051382 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. Frankenia salina	4		
2. Salicornia pacifica	1		
3. Batis maritima	1		
4. Typha domingensis	50	Yes	OBL
5.			
6.			
7.			
8.			
	56 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 3/1	95	10YR 3/6	5	C	M	Clay/loam	
2-9	10YR 3/1	100					Clay/loam	
9-12	10YR 4/1	100					Clay/loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ✓ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): _____

Water Table Present? Yes _____ No ✓ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes ✓ No _____ Depth (inches): 0 - 12

Wetland Hydrology Present? Yes ✓ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: C02 Channel Review Area City/County: Huntington Beach Sampling Date: 4/16/19

Applicant/Owner: USACE Chicago District State: CA Sampling Point: 12

Investigator(s): Eric Sweeney Section, Township, Range: N/A

Landform (hillslope, terrace, etc.): terrace Local relief (concave, convex, none): None Slope (%): 10

Subregion (LRR): C Lat: 33.730152 Long: -118.051435 Datum: NAD 1983

Soil Map Unit Name: Beaches NWI classification: Estuarine wetland

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
Herb Stratum (Plot size: 5 feet)			
1. Frankenia salina	5		
2. Batis maritima	1		
3. Salicornia pacifica	1		
4. Typha domingensis	30	Yes	OBL
5.			
6.			
7.			
8.			
	37 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____ % Cover of Biotic Crust _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks:

SOIL

Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	95	10YR 3/6	5	C	M	Clay/loam	
3-12	10YR 4/1	100					Clay/loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) (**LRR C**)
- ___ 1 cm Muck (A9) (**LRR D**)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) (**LRR C**)
- ___ 2 cm Muck (A10) (**LRR B**)
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1) (**Nonriverine**)
- ___ Sediment Deposits (B2) (**Nonriverine**)
- ___ Drift Deposits (B3) (**Nonriverine**)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ✓ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) (**Riverine**)
- ___ Sediment Deposits (B2) (**Riverine**)
- ___ Drift Deposits (B3) (**Riverine**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes ✓ **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

12.0 Appendix E – Jurisdictional Determination Results vs. Project Project Modifications Figures

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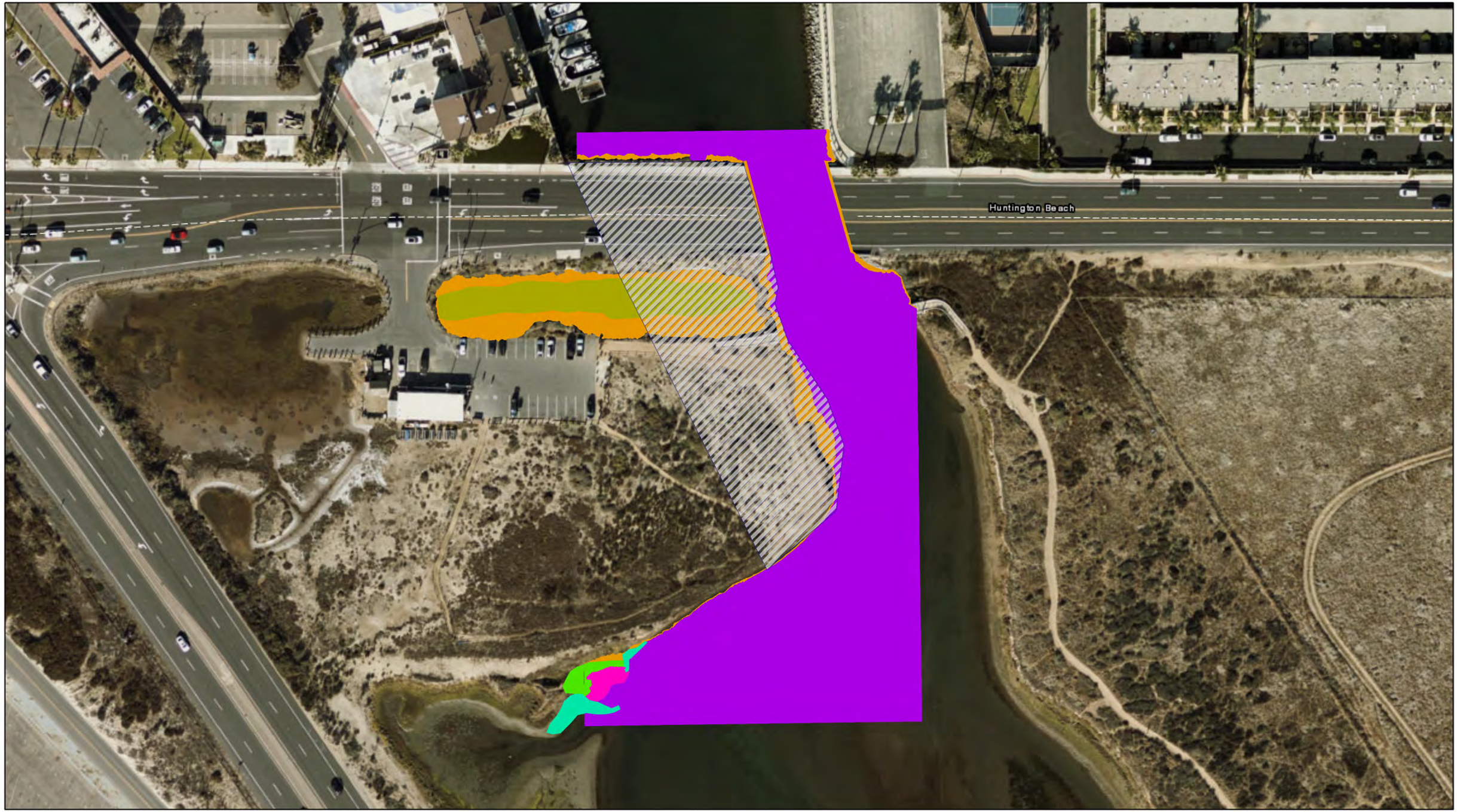


U.S. Army Corps
Of Engineers ®
Chicago District

N
W E
S

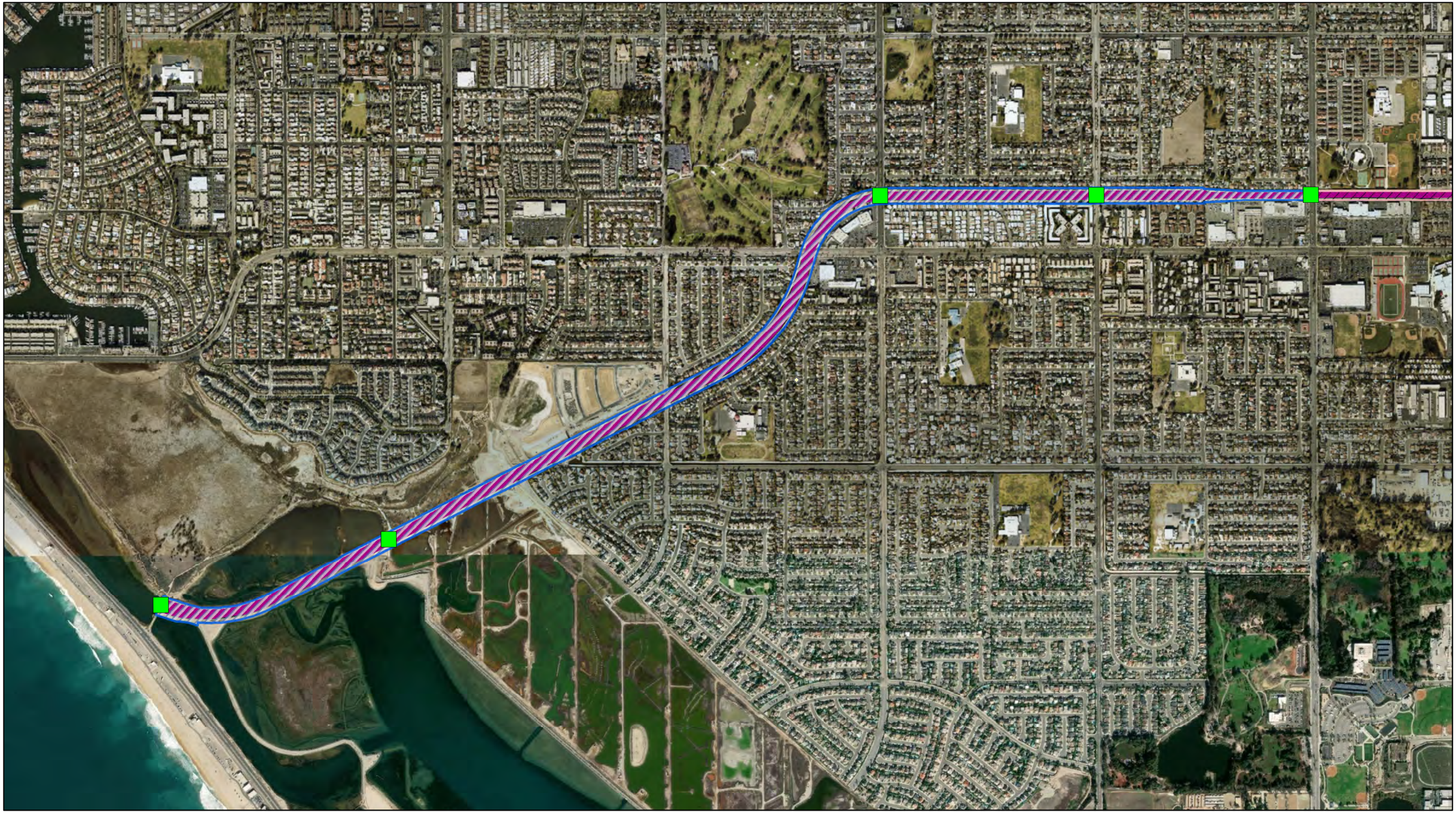
1 inch = 0.016 miles

Westminster

LPP - Maximum

For Official Use Only
November 2019

Warner Avenue Bridge
1.05 Acres



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Chicago District

Channel Crossings Replaced

C05R01 Sheetpile Walls North & South Levee w/ Toe Excavation; Soft Bottom

C05 Riverine Navigable Non-Wetland WOUS (404/10)

N
W E
S

1 inch = 0.21 miles

Westminster

LPP - Maximum
CHANNEL 5

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November 2019

Reach 01
70.72 Acres

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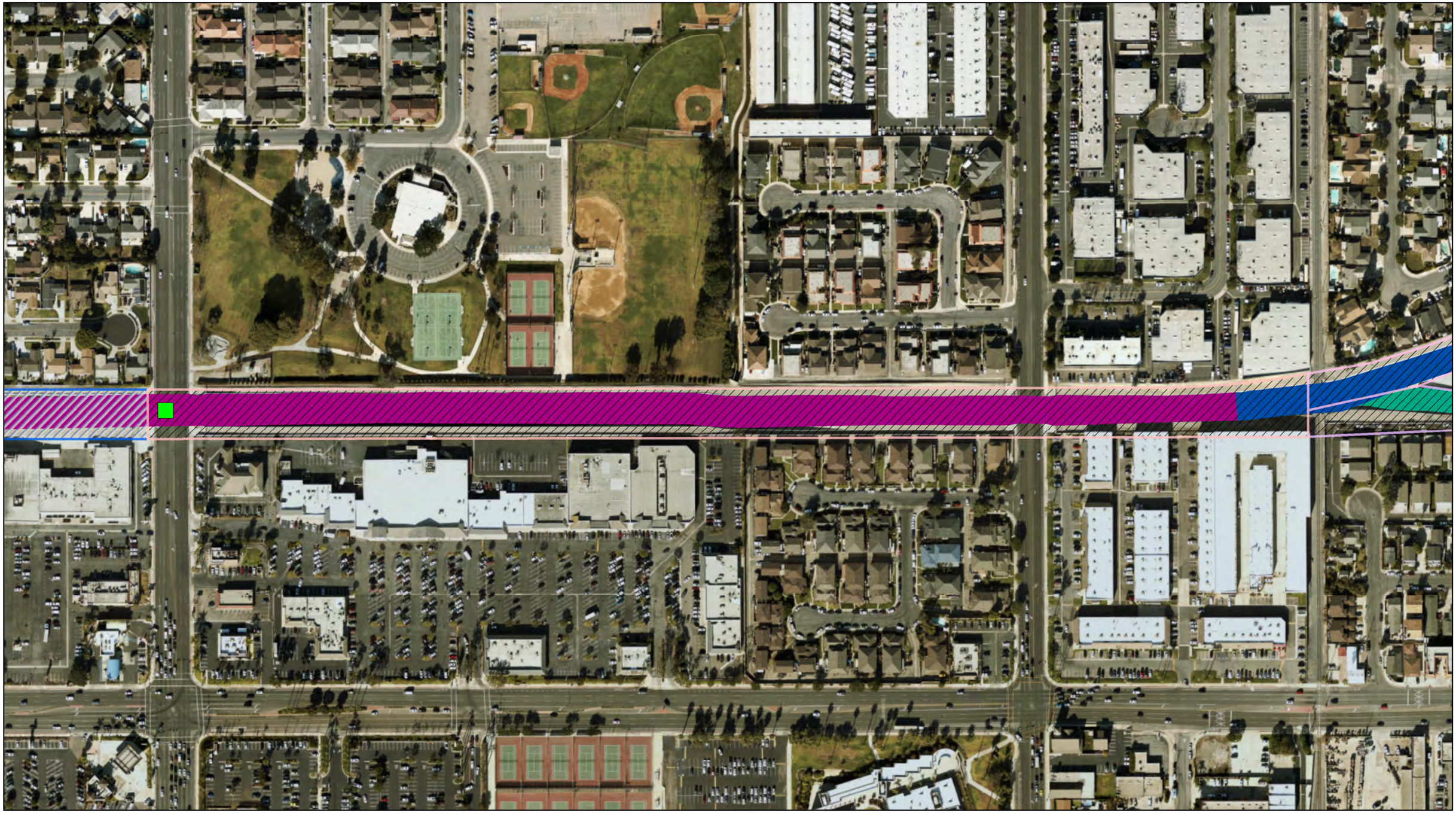

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Chicago District

Channel Crossings Replaced
C05R02 Concrete Rectangular
C05 Riverine Navigable Non-Wetland WOUS (404/10)
C05 Riverine Tributary Non-Wetland WOUS (404-only)

N
W E
S

1 inch = 0.04 miles

Westminster

LPP - Maximum
CHANNEL 5

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November 2019

Reach 02
7.15 Acres

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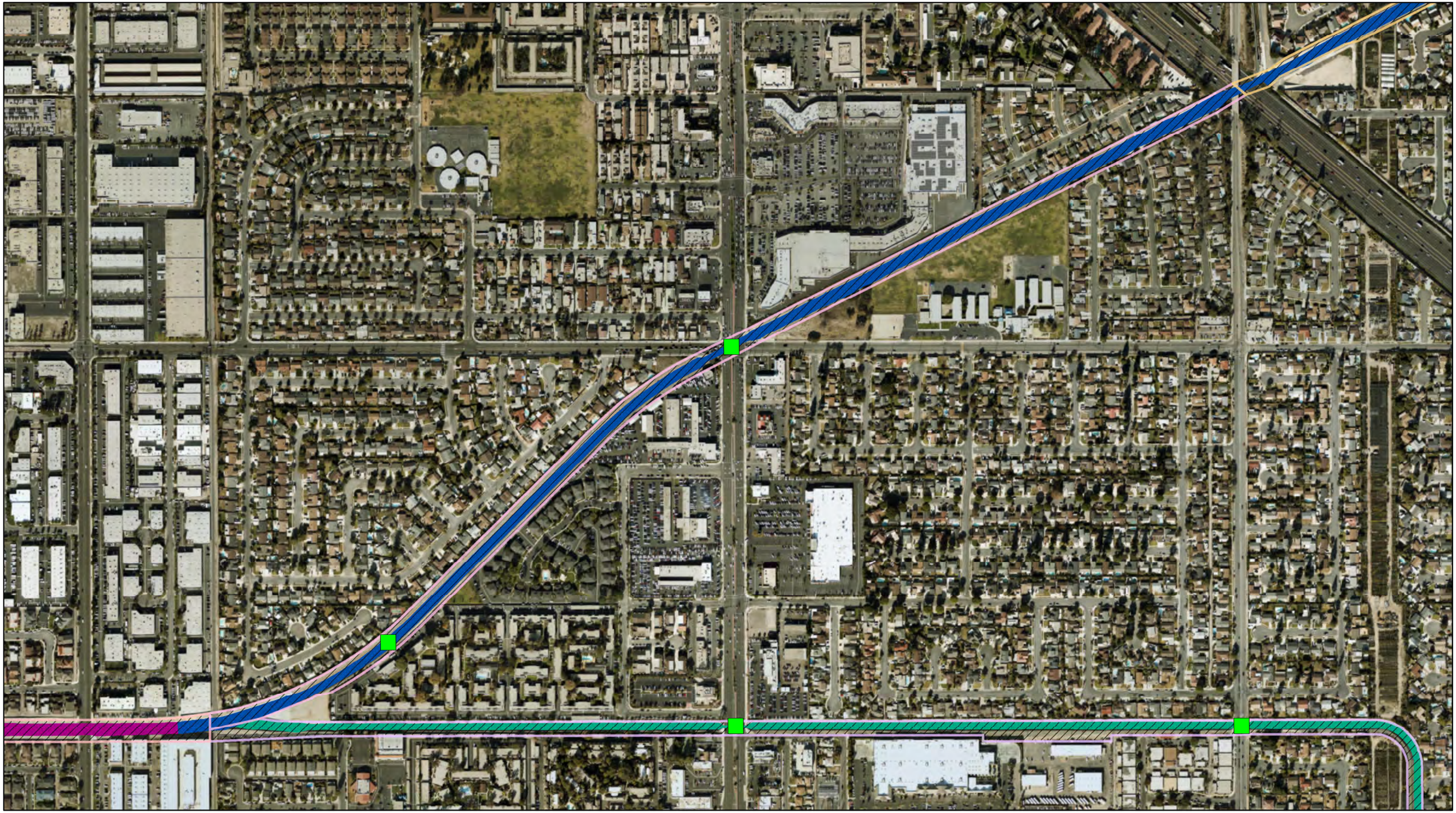

U.S. Army Corps Of Engineers ®
Chicago District

Channel Crossings Replaced
C05R03 Concrete Rectangular
C05 Riverine Tributary Non-Wetland WOUS (404-only)
C06 Riverine Tributary Non-Wetland WOUS (404-only)

N
W E
S

1 inch = 0.088 miles

Westminster

LPP - Maximum
CHANNEL 5

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November 2019

Reach 03
13.44 Acres

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Channel Crossings Replaced

C05 Riverine Tributary Non-Wetland WOUS (404-only)

C05R04 Concrete Rectangular

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.118 miles

Westminster

LPP - Maximum
CHANNEL 5

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November 2019

Reach 04
16.79 Acres

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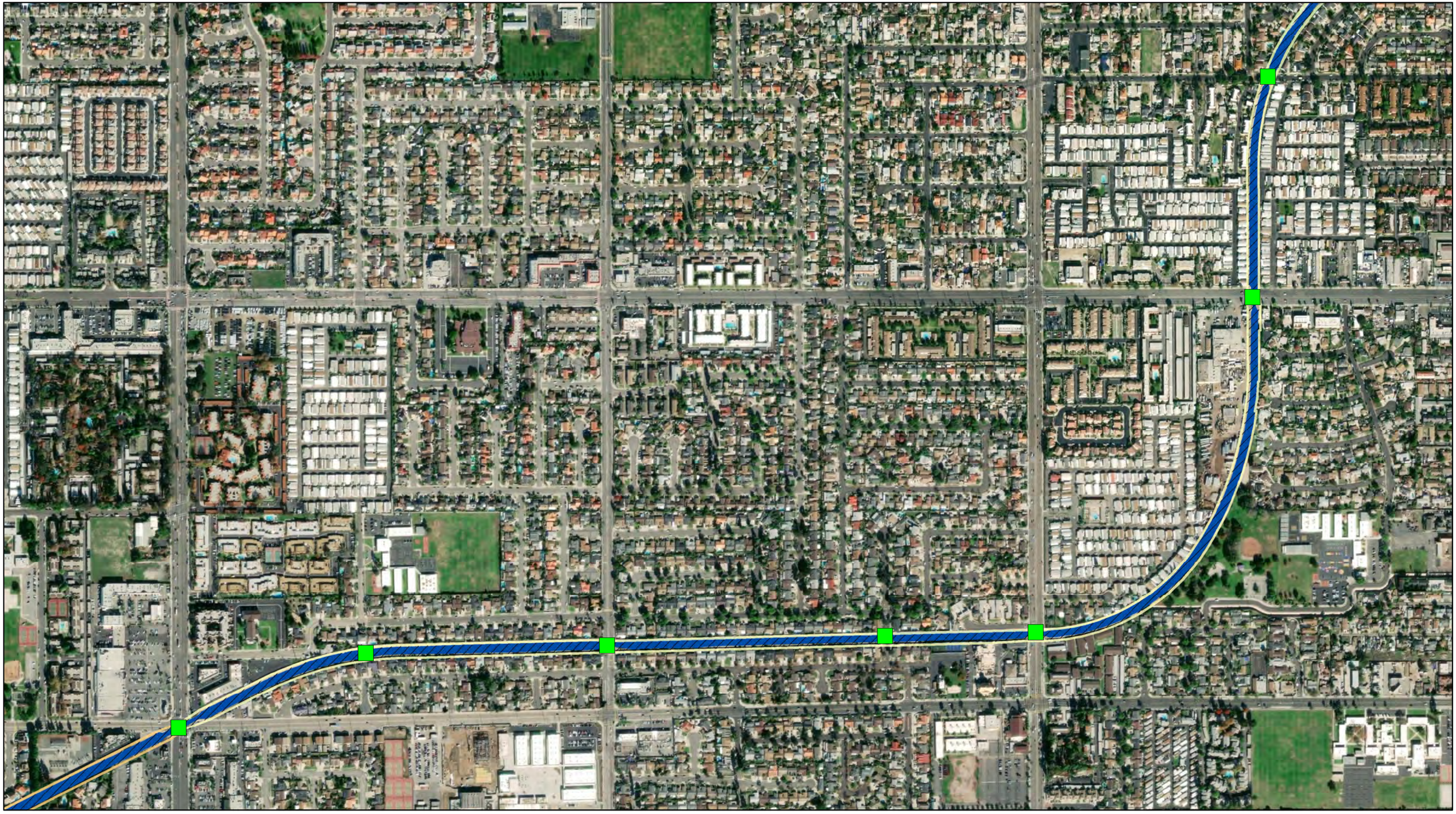
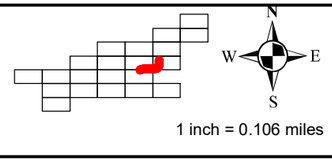


Channel Crossings Replaced

C05 Riverine Tributary Non-Wetland WOUS (404-only)

C05R05 Concrete Rectangular

U.S. Army Corps Of Engineers ®
Chicago District



1 inch = 0.106 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 05
15.89 Acres

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Channel Crossings Replaced

C05 Riverine Tributary Non-Wetland WOUS (404-only)

C05R06 Concrete Rectangular

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.019 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 06
1.34 Acres

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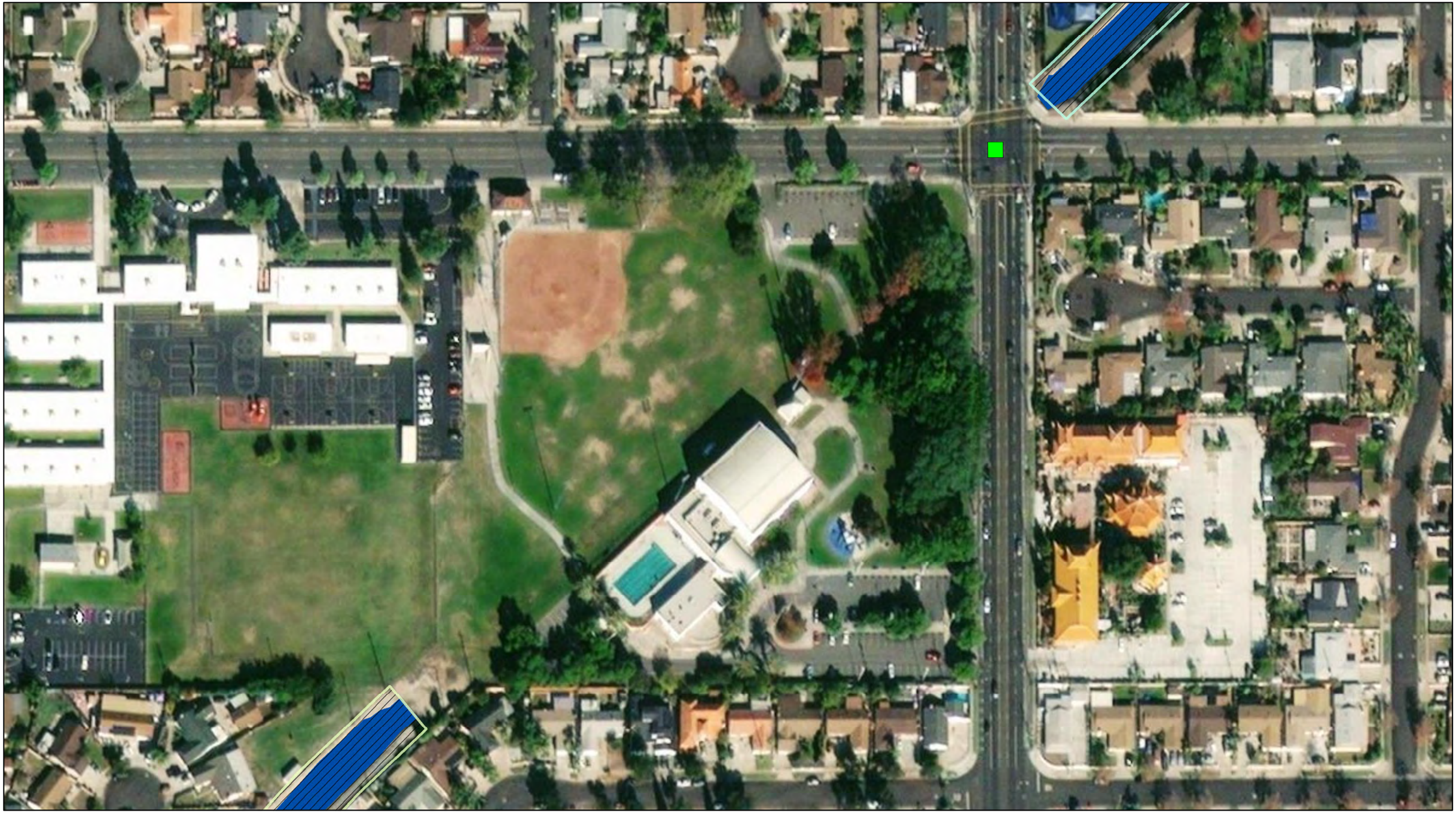

Channel Crossings Replaced

C05 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.021 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 07
1.72 Acres

U.S. Army Corps
Of Engineers ®
Chicago District

Channel Crossings Replaced

C05R08 Concrete Rectangular

C05 Riverine Tributary Non-Wetland WOUS (404-only)

N
W E
S

1 inch = 0.109 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 08
5.86 Acres

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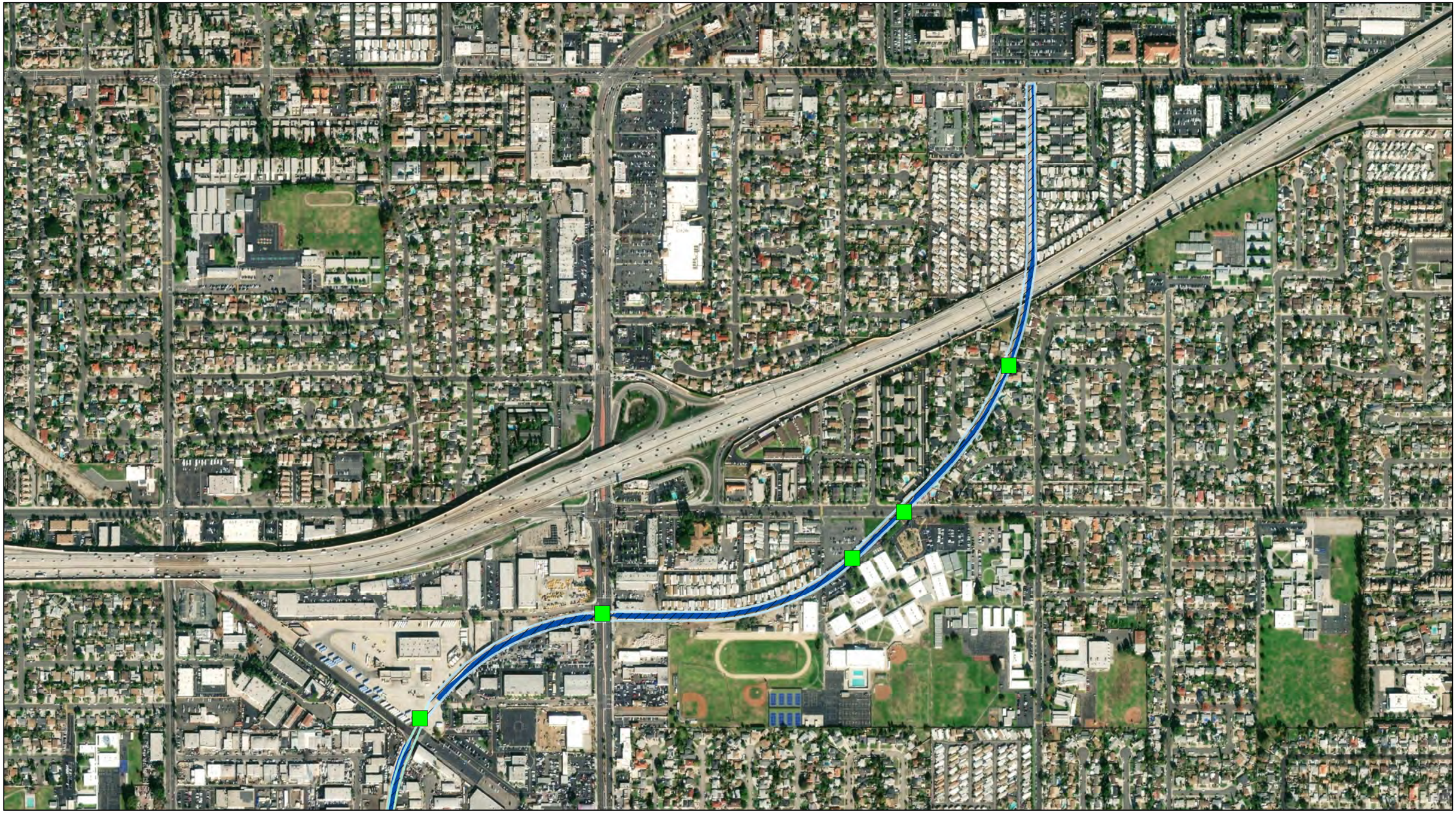


Channel Crossings Replaced

C05 Riverine Tributary Non-Wetland WOUS (404-only)

C05R09 Concrete Rectangular

U.S. Army Corps Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.104 miles

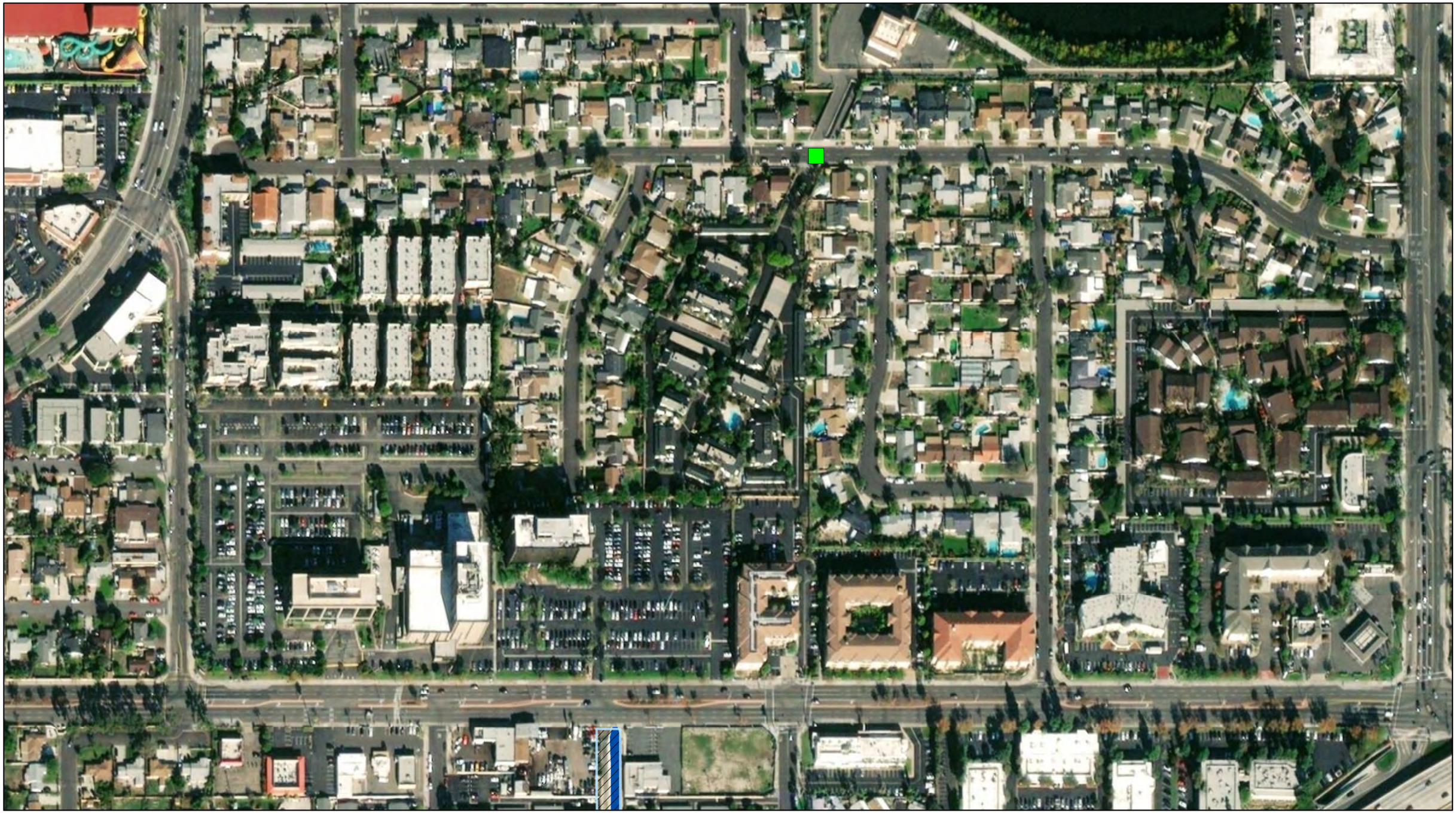
Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 09
7.27 Acres

G:\Projects_Misc\Westminster_CA_Fld_Study\MXD\LRC Maps\PL_USHWs_Map_20NOV2019_Jurisdictional_alt.mxd mbehrens



Channel Crossings Replaced

C05 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps Of Engineers ®
Chicago District

1 inch = 0.036 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 10
1.68 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_OHWs_Map_26NOV2019_Jurisdictional_ark.mxd 11/26/2019

C05 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps
Of Engineers ®
Chicago District

1 inch = 0.058 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 11
3.16 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_OHWM_Map_2NOV2019_JurisdictionalLimit.mxd mbrannons

C05 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps
Of Engineers ®
Chicago District

1 inch = 0.031 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 12
1.84 Acres

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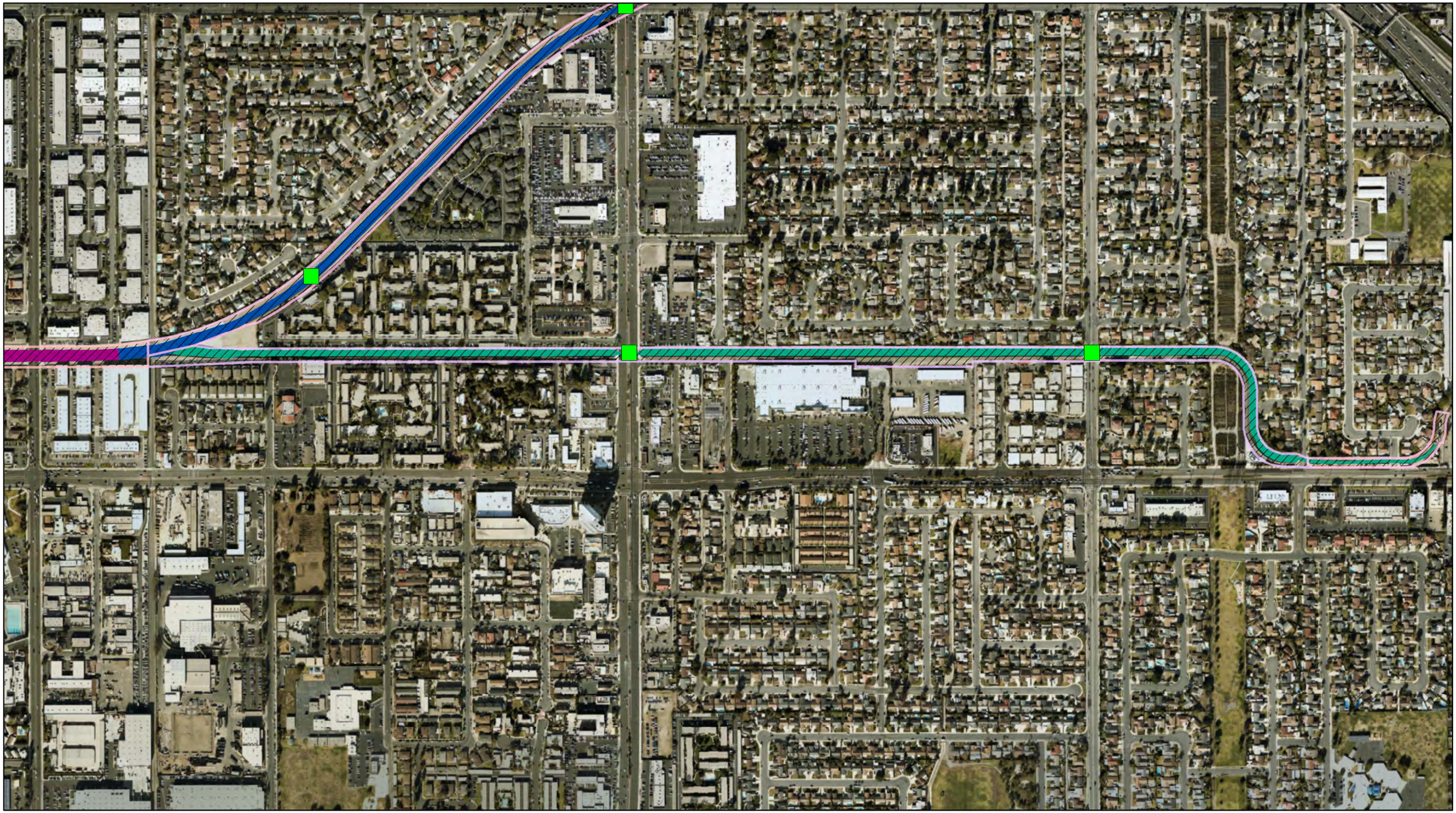

U.S. Army Corps Of Engineers ®
Chicago District

Channel Crossings Replaced
C06R13 Concrete Rectangular
C05 Riverine Tributary Non-Wetland WOUS (404-only)
C06 Riverine Tributary Non-Wetland WOUS (404-only)

N
W E
S

1 inch = 0.096 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 13
12.66 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\FC_OSHWs_Map_26NOV2019_Jurisdictional_alt.mxd 11/26/2019 8

C06R14Concrete Rectangular C06 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps
Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.012 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 14
1.20 Acres

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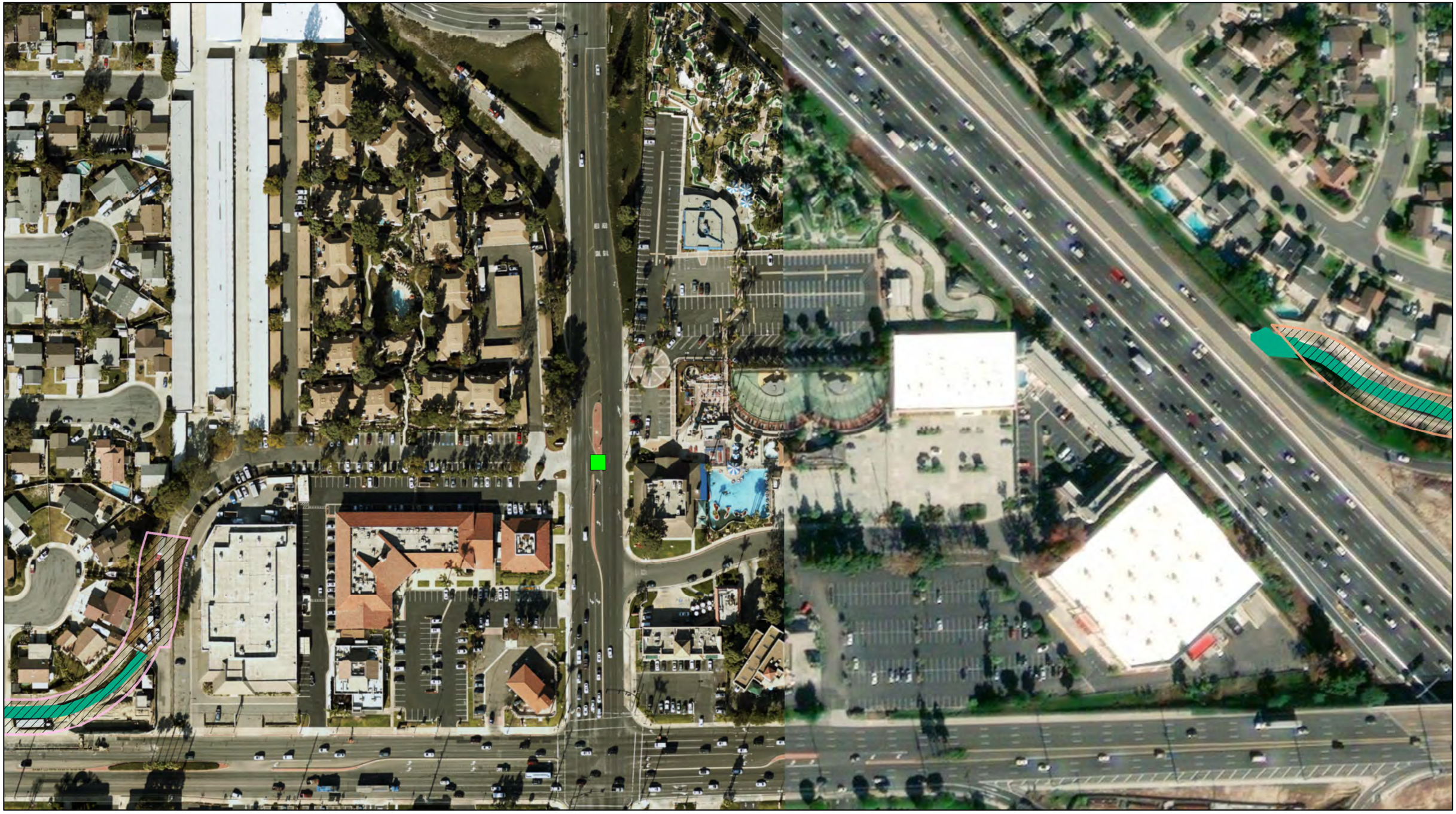


Channel Crossings Replaced

C06 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.027 miles

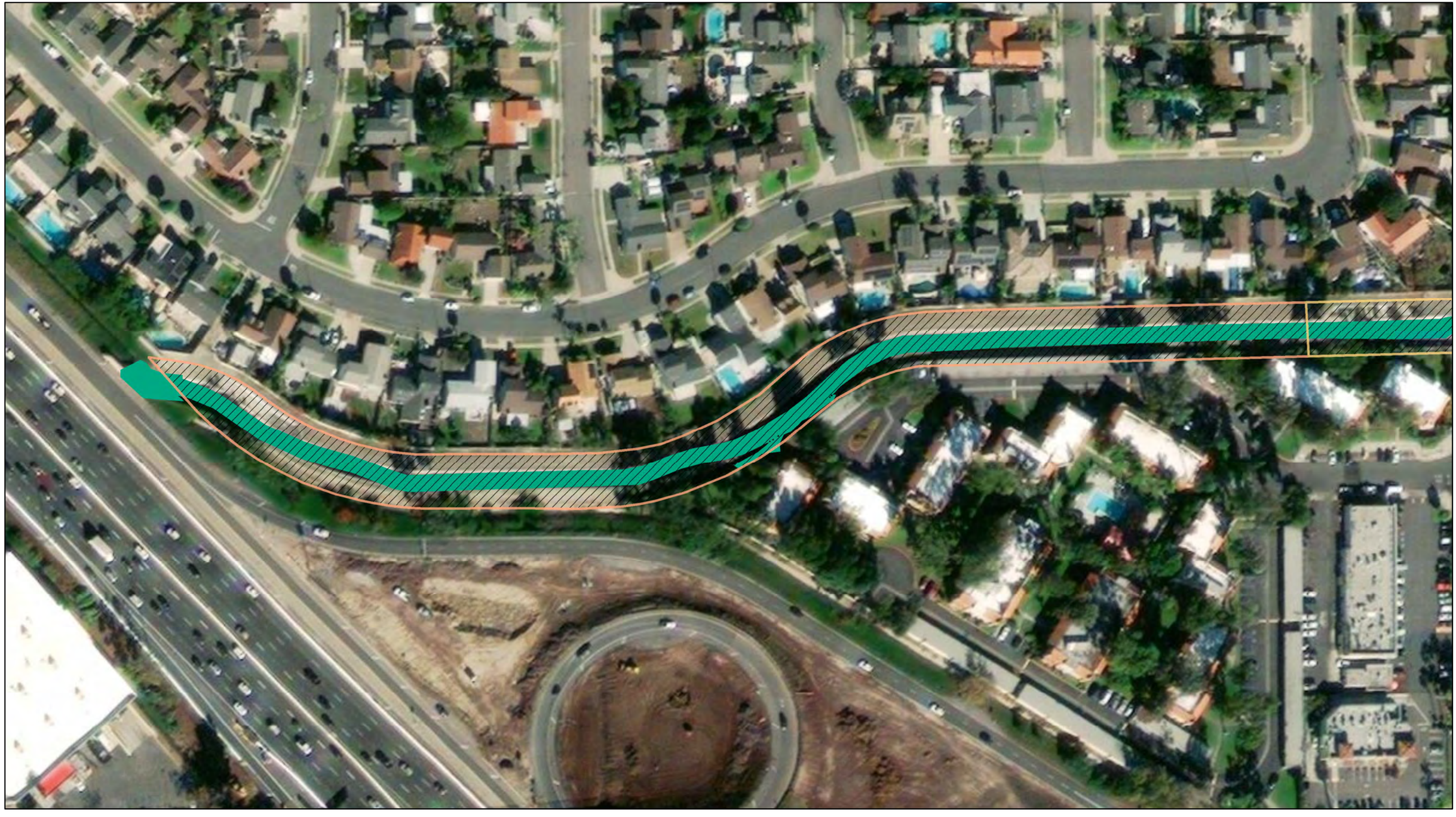
Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 15
2.91 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PC_OSHWs_Map_20NOV2019_Jurisdictional_alt.mxd HMMorris



C06R16 Concrete Rectangular

C06 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps
Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.02 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 16
2.08 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DistrWs_Map_20NOV2019_Jurisdictional_alm.mxd 11BPMAR8

C06R17 Concrete Rectangular

C06 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps
Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.042 miles

Westminster

LPP - Maximum
CHANNEL 6

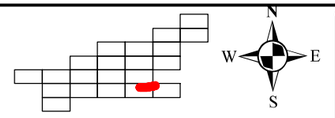
For Official Use Only
November 2019

Reach 17
4.41 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_OSHWs_Map_2NOV2019_3Fractional_arc.mxd 11/4/2019 9

C06 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps Of Engineers ®
Chicago District



1 inch = 0.078 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 18
5.86 Acres

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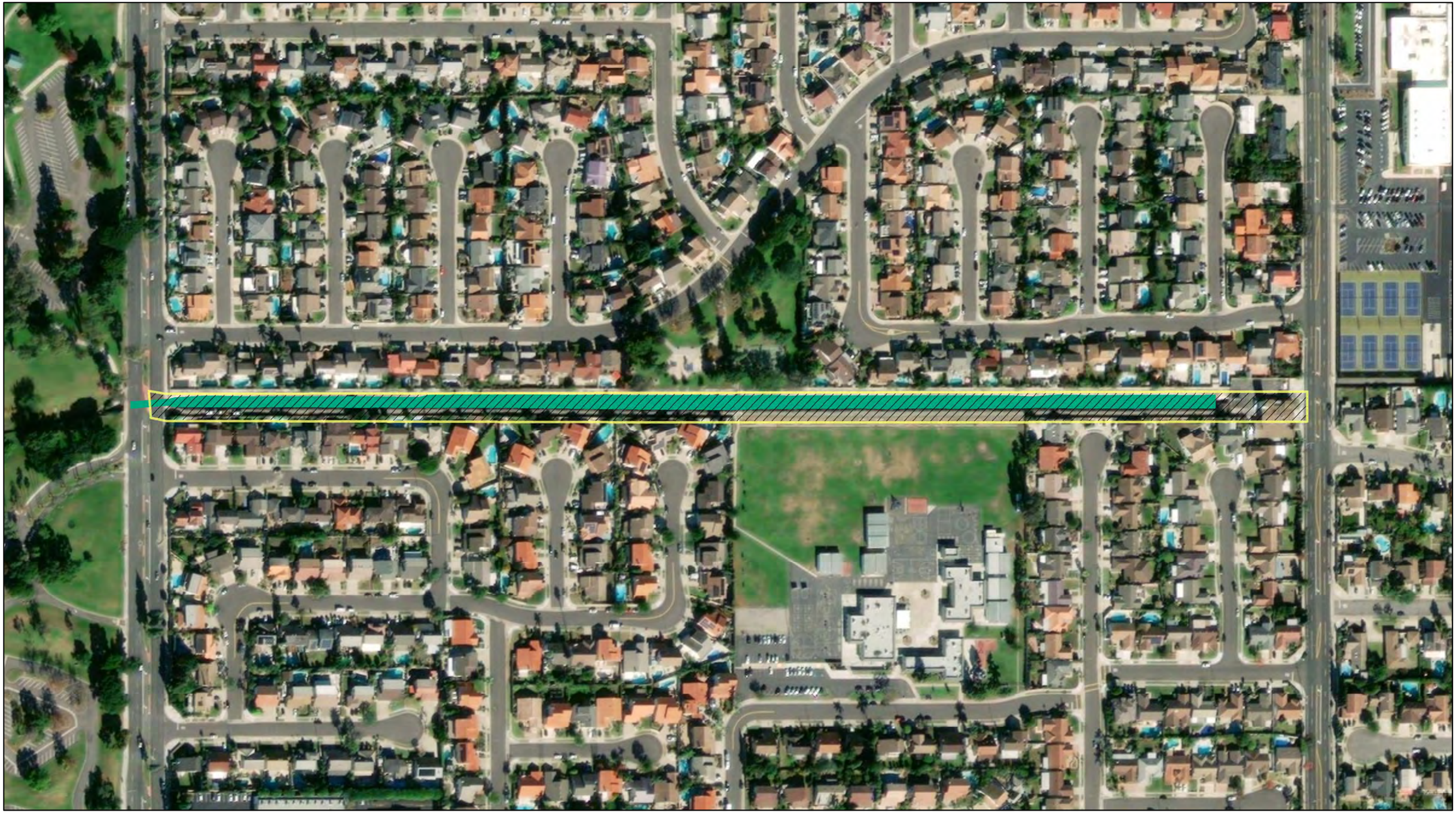


C06R19Concrete Rectangular

C06 Riverine Tributary Non-Wetland WOUS (404-only)

U.S. Army Corps Of Engineers ®
Chicago District

N
W E
S

1 inch = 0.039 miles

Westminster

LPP - Maximum
CHANNEL 6

For Official Use Only
November 2019

Reach 19
3.90 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PC_USFWS_Map_20NOV2019_Jurisdictional_alt.mxd RBPMRKHI

U.S. Army Corps
Of Engineers ®
Chicago District

C02R23 Sheetpile Wall South Levee w/ Toe Excavation; Slope Stabilization North Levee

C02 Estuarine Navigable Non-Wetland WOUS (404-only)

C02 Estuarine Navigable Non-Wetland WOUS (404/10)

C02 Riverine Navigable Non-Wetland WOUS (404/10)

N
W E
S

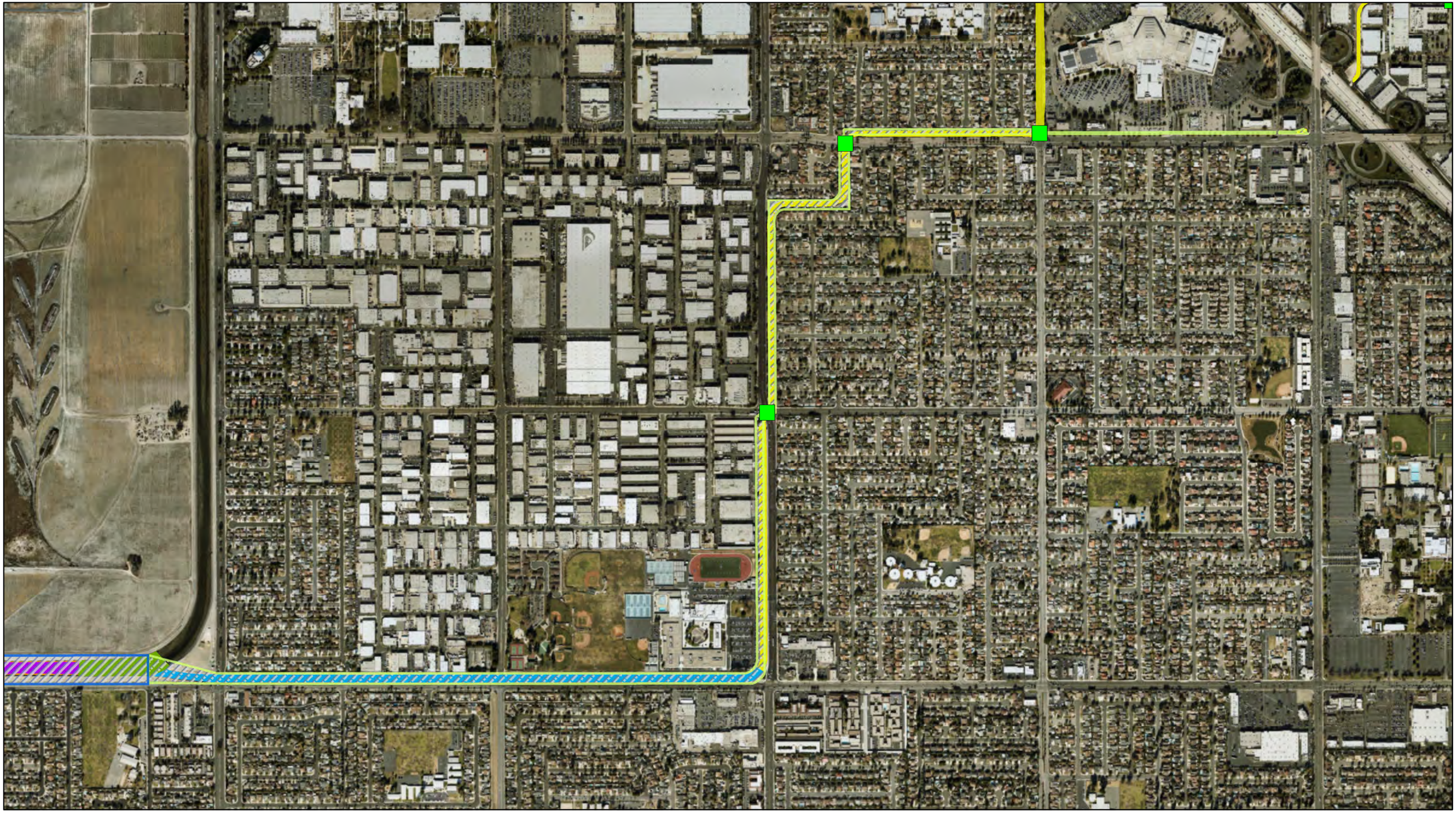
1 inch = 0.131 miles

Westminster

LPP - Maximum
CHANNEL 2

For Official Use Only
November 2019

Reach 23
57.01 Acres



U.S. Army Corps Of Engineers ®
Chicago District

- Channel Crossings Replaced
- Diversion Channel (C04)
- C04R20 Concrete Rectangular; Middle 40-48 feet Remain Soft Bottom
- C02 Riverine Navigable Non-Wetland WOUS (404/10)
- C04 Riverine Navigable Non-Wetland WOUS (404/10)
- C04 Riverine Tributary Non-Wetland WOUS (404-only)

N W E S

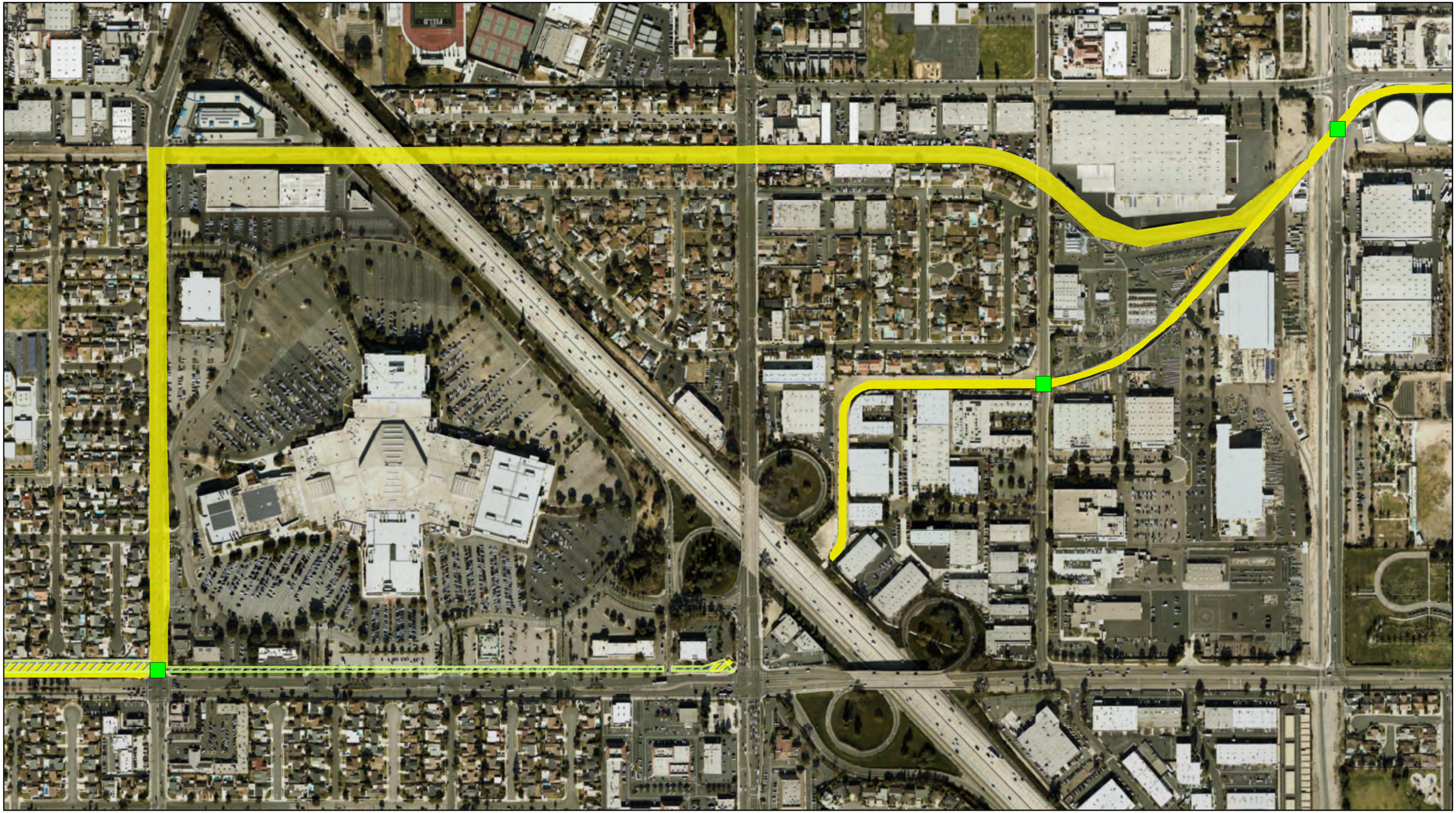
1 inch = 0.165 miles

Westminster

LPP - Maximum
CHANNEL 4

For Official Use Only
November 2019

Reach 20
27.80 Acres



U.S. Army Corps Of Engineers ®
Chicago District

Channel Crossings Replaced
Diversion Channel (C04)
C04R20 Concrete Rectangular; Middle 40-48 feet Remain Soft Bottom
C04 Riverine Tributary Non-Wetland WOUS (404-only)

N
W E
S

1 inch = 0.077 miles

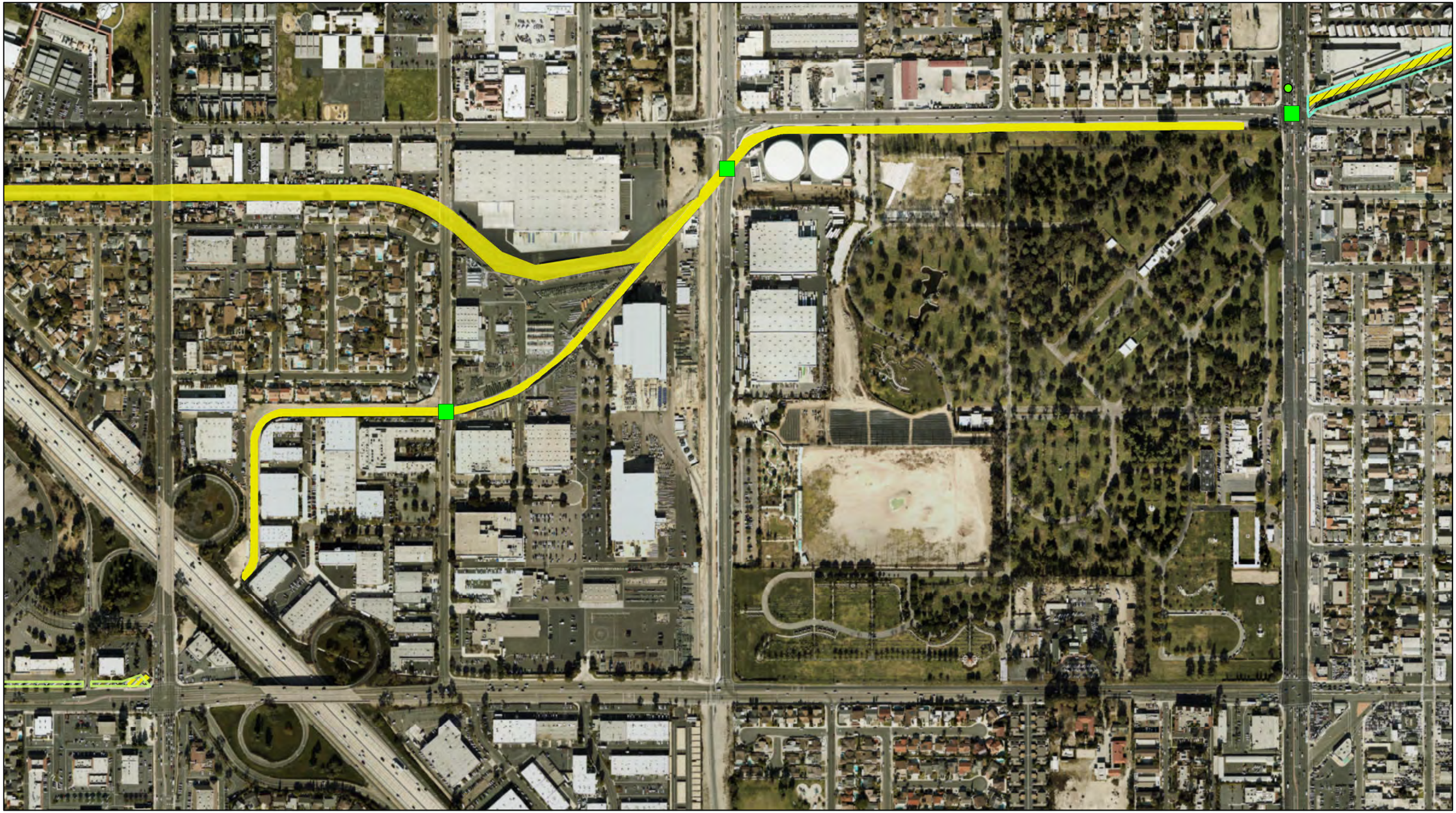
Westminster

LPP - Maximum
DIVE. CHANNEL

For Official Use Only
November 2019

Diversion
13.47 Acres

U:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_DiaWs_Map_20NOV2019_2Sections_alt.mxd RBPMorris

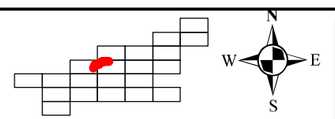


Channel Crossings Replaced

C04 Riverine Tributary Non-Wetland WOUS (404-only)

Diversion Channel (C04)

U.S. Army Corps Of Engineers ®
Chicago District



1 inch = 0.081 miles

Westminster

LPP - Maximum
CHANNEL 4

For Official Use Only
November 2019

Reach 21
8.69 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\PL_USFWS_Map_2NOV2019_12Reach21_arc.mxd RBRMorris

U.S. Army Corps
Of Engineers ®
Chicago District

Channel Crossings Replaced

C04 Riverine Tributary Non-Wetland WOUS (404-only)

C04R22 Concrete Rectangular

N
W E
S

1 inch = 0.214 miles

Westminster

LPP - Maximum
CHANNEL 4

For Official Use Only
November 2019

Reach 22
29.02 Acres

G:\Projects_Misc\Westminster_CA_FRM_Study\MXD\LRC Maps\FC_USFWS_Map_20NOV2019_Jurisdictional_alt.mxd RBPMPKins

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13.0 Appendix F – Species Lists

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13.1 Biological Resources

13.1.1 Animal Resources

13.1.1.1 Bolsa Chica Ecological Reserve

Table 7: List of plant species found within the Bolsa Chica Ecological Reserve (Courtesy of the CDFW)

Common Name	Scientific Name		Common Name	Scientific Name
Seagrass Beds				
Eelgrass	*Zostera marina*			
Salt Marsh				
Alkali Heath	*Frankenia salina*		Alkali Weed	*Cressa truxillensis*
Cordgrass	*Spartina foliosa*		Marsh Jaumea/Salty Susan	*Jaumea carnosa*
Pacific Pickleweed	*Salicornia pacifica*		Parry's Pickleweed	*Arthrocnemum subterminale*
Saltgrass	*Distichlis spicata*		Saltwort	*Batis maritime*
California Seablite[a,b]	*Suaeda californica*		Sea Lavender/Marsh Rosemary	*Limonium californicum*
Shoregrass/Salt Cedargrass	*Distichlis littoralis*		Spiny Rush	*Juncus acutus*
Woolly Seablite	*Suaeda taxifolia*		Estuary Seablite[b]	*Suaeda esteroa*
Coastal Strand/Sand Dune				
Beach Evening Primrose	*Carnissonia cheiranthifolia*		Miner's Lettuce	*Claytonia perfoliata*
Coast Woolly-heads	*Nemecaulis denudata var. denudata*		Salt Heliotrope/Seaside Heliotrope	*Heliotropium curassavicum*
Pink Sand Verbena	*Abronia umbellata*		Red Sand Verbena	*Abronia maritima*
Beach Morning Glory	*Calystegia soldanella*		Western Ragweed	*Ambrosia psilostachya*
Silver Beach Bur	*Ambrosia chamissonis*			
Coastal Sage Scrub				
Ashy-leaf Buckwheat	*Eriogonum cinereum*		Bush Monkeyflower	*Mimulus aurantiacus*
Black Sage	*Salvia mellifera*		Bladderpod	*Cleome isomeris, Isomeris arborea*
California Boxthorn	*Lycium californicum*		Seacliff Buckwheat	*Eriogonum parvifolium*
California Buckwheat	*Eriogonum fasciculatum*		California Poppy	*Eschscholzia californica*
Coastal Sagebrush	*Artemisia californica*		Coast Goldenbush	*Isocoma menziesii*
Coastal Bush Sunflower	*Encelia californica*		Coastal Cholla	*Opuntia prolifera*
Deerweed	*Acmispon glaber*		Purple Sage	*Salvia leucophylla*
Coastal Prickly Pear	*Opuntia littoralis*		Coyote Bush	*Baccharis pilularis*
Fourwing Saltbush	*Atriplex canescens*		Fascicled Tarplant	*Deinandra fasciculata*
Santa Barbara Milkvetch	*Astragalus trichopodus*		Telegraph Weed	*Heterotheca grandiflora*
Saltbush	*Atriplex lentiformis*		Southern Tarplant[b]	*Centromadia parryi ssp. australis*
Douglas Nightshade	*Solanum douglasii*		Yarrow	*Achillea millefolium*

Common Name	Scientific Name		Common Name	Scientific Name
White Sage	*Salvia apiana*			
Freshwater Wetlands				
California Bulrush	*Schoenoplectus californicus*		Common Cattail	*Typha latifolia*
Salt Marsh Fleabane	*Pluchea odorata*		Mulefat	*Baccharis salicifolia*
Yerba Mansa	*Anemopsis californica*		Cocklebur/Common Cocklebur	*Xanthium strumarium*
Riparian Woodland				
Arroyo Willow	*Salix lasiolepis*		Black Willow	*Salix gooddingii*
Western Sycamore	*Platanus racemosa*			

Sources: CDFW 2018 and California Native Plant Society 2018.
[a] federal listed – endangered
[b] California Rare Plant

Table 8: Frequently observed bird species at Bolsa Chica Ecological Reserve (Courtesy of the CDFW).

Common Name	Scientific Name		Common Name	Scientific Name
Brant[f]	*Branta bernicla*		Black Tern[f]	*Chlidonias niger*
Canada Goose[a]	*Branta canadensis*		Common Tern	*Sterna hirundo*
Gadwall[a]	*Anas strepera*		Forester's Tern[a]	*Sterna forsteri*
American Wigeon	*Ana Americana*		Royal Tern[a]	*Thalasseus maximus*
Mallard[a]	*Anas platyrhynchos*		Elegant Tern[a,g]	*Thalasseus elegans*
Blue-winged Teal[a]	*Anas discors*		Black Skimmer[a,f,h]	*Rynchops niger*
Cinnamon Teal[a]	*Anas cyanoptera*		Rock Pigeon[a]	*Columba livia*
Northern Shoveler	*Anas clypeata*		Eurasian Collared-dove	*Streptopelia decaocto*
Northern Pintail[a]	*Anas acuta*		Mourning Dove[a]	*Zenaida macroura*
Green-winged Teal	*Anas carolinensis*		Barn Owl	*Tyto alba*
Redhead[a,f]	*Aythya americana*		Great Horned Owl[a]	*Bubo virginianus*
Greater Scaup	*Aythya marila*		Burrowing Owl[a,f,h,i]	*Athene cunicularia*
Lesser Scaup	*Aythya affinis*		Vaux's Swift[f]	*Chaetura vauxi*
Surf Scoter	*Melanitta perspicillata*		White-throated Swift	*Aeronautes saxatalis*
Bufflehead	*Bucephala albeola*		Black-chinned Hummingbird	*Archilochus alexandri*
Red-breasted Merganser	*Mergus serrator*		Anna's Hummingbird[a]	*Cal*
Ruddy Duck[a]	*Oxyura jamaicensis*		Rufous Hummingbird	*Selaphorus rufus*
Red-throated Loon	*Gavia stellate*		Allen's Hummingbird[a]	*Selaphorus sasin*
Pacific Loon	*Gavia pacifica*		Belted Kingfisher	*Megaceryle alcyon*
Common Loon[f]	*Gavia immer*		Nuttall's Woodpecker	*Dryobates nuttallii*
Pied-billed Grebe[a]	*Podilymbus podiceps*		Downy Woodpecker	*Dryobates pubescens*
Horned Grebe	*Podiceps nigricollis*		Northern Flicker	*Colaptes auratus*
Eared Grebea	*Podiceps nigricollis*		Olive-sided Flycatcher[f,h]	*Contopus cooperi*
Western Greb[e]	*Aechmophorus occidentalis*		Western Wood-peewee	*Contopus sordidulus*
Clark's Grebe	*Aechmophorus clarkia*		Willow Flycatcher[b,h,k]	*Empidonax traillii*
Double-crested Cormorant[a]	*Phalacrocorax auritus*		Pacific-slope Flycatcher	*Empidonax difficilis*
American White Pelican[a,f]	*Pelevanus erythrorhynchos*		Black Phoebe[a]	*Sayornis nigricans*
Brown Pelican[f]	*Pelecanus occidentalis*		Say's Phoebe[a]	*Sayornis saya*

Biological Evaluation
November 2019

Common Name	Scientific Name		Common Name	Scientific Name
American Bittern	*Botaurus lentiginosus*		Ash-throated Flycatcher	*Myiarchus cinerascens*
Least Bittern[a,f,h]	*Ixobrychus exilis*		Cassin's Kingbird	*Tyrannus vociferans*
Great Blue Heron[a,j]	*Ardea herodias*		Western Kingbird	*Tyrannus verticalis*
Great Egret[j]	*Ardea alba*		Loggerhead Shrike[a,f,h]	*Lanius ludovicianus*
Snowy Egret	*Egretta thula*		Warbling Vireo	*Vireo gilvus*
Reddish Egret	*Egretta rufescens*		American Crow[a]	*Corvus brachyrhynchos*
Green Heron[a]	*Butorides virescens*		Common Raven[a]	*Corvus corax*
Black-crowned Night Heron[a]	*Nycticorax*		Horned Lark[a]	*Eremophila alpestris*
White-faced Ibis[g]	*Plegadis chihi*		Tree Swallow	*Tachycineta bicolor*
Turkey Vulture	*Cathartes aura*		Violet-green Swallow	*Tachycineta thalassina*
Osprey[g,j]	*Pandion haliaetus*		Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
White-tailed Kite[a,e,i]	*Elanus leucurus*		Cliff Swallow[a]	*Petrochelidon pyrrhonota*
Northern Harrier[a]	*Circus hudsonius*		Barn Swallow[a]	*Hirundo rustica*
Sharp-shinned hawk	*Accipiter striatus*		Bushtit[a]	*Psaltriparus minimus*
Cooper's Hawk[a,g]	*Accipiter cooperii*		House Wren[a]	*Troglodytes aedon*
Red-shouldered Hawk	*Buteo lineatus*		Marsh Wren[a]	*Cistothorus palustris*
Red-tailed Hawk[a]	*Buteo jamaicensis*		Blue-grey Gnatcatcher	*Polioptila caerulea*
American Kestrel[a]	*Falco sparverius*		Coastal California Gnatcatcher[a,c,f]	*Polioptila californica*
Merlin[g]	*Falco columbarius*		Ruby-crowned Kinglet	*Regulus calendula*
Peregrine Falcon[a,e,h,j]	*Falco peregrinus*		Western Bluebird	*Sialia mexicana*
Virginia Rail[a]	*Rallus limicola*		Swainson's Thrush	*Catharus ustulatus*
Sora[a]	*Porzana carolina*		Hermit Thrush	*Catharus guttatus*
Common Gallinula	*Porphyrio martinica*		American Robin	*Turdus migratorius*
American Coot[a]	*Fulica americana*		Northern Mockingbird[a]	*Mimus polyglottos*
Black-bellied Plover	*Pluvialis squatarola*		European Starling[a]	*Sturnus vulgaris*
Pacific Golden-plover	*Pluvialis fulva*		American Pipit	*Anthus rubescens*
Snowy Plover[a]	*Charadrius alexandrines*		Cedar Waxwing	*Bombycilla cedrorum*
Semipalmated Plover	*Charadrius semipalmatus*		Orange-crowned Warbler	*Oreothlypis celata*
Killdeer[a]	*Charadrius vociferous*		Nashville Warbler	*Oreothlypis ruficapilla*
Black-necked Stilt[a]	*Himantopus mexicanus*		MacGillivray's Warbler	*Oporornis tolmiei*
American Avocet[a]	*Recurvirostra americana*		Common Yellowthroat	*Geothlypis trichas*
Spotted Sandpiper	*Actitis macularius*		Yellow Warbler	*Dendroica petechial*
Solitary Sandpiper	*Tringa solitaria*		Yellow-rumped Warbler	*Dendroica coronate*
Greater Yellowlegs	*Tringa melanoleuca*		Black-throated Gray Warbler	*Setophaga nigrescens*
Willet	*Tringa semipalmata*		Townsend's Warbler	*Dendroica townsendii*
Lesser Yellowlegs	*Tringa flavipes*		Wilson's Warbler	*Cardellina pusilla*
Whimbrel	*Numenius phaeopus*		Spotted Towhee	*Pipilo maculatus*
Long-billed Curlew[g,h]	*Numenius americanus*		California Towhee[a]	*Melozone crissalis*
Marbled Godwit	*Limosa fedoa*		Brewer's Sparrow[h]	*Spixella breweri*
Ruddy Turnstone	*Arenaria interpres*		Vesper Sparrow	*Pooecetes gramineus*

Common Name	Scientific Name		Common Name	Scientific Name
Surfbird	*Aphriza virgata*		Lark Sparrow	*Chondestes grammacus*
Red Knot	*Calidris canutus*		Common Savannah Sparrow	*Passerculus sandwichensis*
Sanderling	*Calidris alba*		Belding's Savannah Sparrow[a,b]	*Passerculus sandwichensis beldingi*
Semipalmated Sandpiper	*Calidris pusilla*		California Least Tern[b,d,e]	*Sternula antillarum browni*
Western Sandpiper	*Calidris mauri*		Fox Sparrow	*Passerella iliaca*
Least Sandpiper	*Calidris minutilla*		Song Sparrow[a,f]	*Melospiza melodia*
Baird's Sandpiper	*Calidris bairdii*		Lincoln's Sparrow	*Melospiza lincolnii*
Pectoral Sandpiper	*Calidris melanotos*		White-crowned Sparrow	*Zonotrichia leucophrys*
Dunlin	*Calidris alpine*		Golden-crowned Sparrow	*Zonotrichia atricapilla*
Stilt Sandpiper	*Calidris himantopus*		Dark-eyed Junco	*Junco hyemalis*
Short-billed Dowitcher	*Limnodromus griseus*		Western Tanager	*Piranga ludoviciana*
Long-billed Dowitcher	*Limnodromus scolopaceus*		Black-headed Grosbeak	*Pheucticus melanocephalus*
Wilson's Snipe	*Gallinago delicate*		Blue Grosbeak	*Passerina caerulea*
Wilson's Phalarope	*Phalaropus tricolor*		Lazuli Bunting	*Passerina amoena*
Red-necked Phalarope	*Phalaropus lobatus*		Red-winged Blackbird[a]	*Agelaius phoeniceus*
Bonaparte's Gull	*Chroicocephalus philadelphia*		Western Meadowlark	*Sturnella neglecta*
Heermann's Gull	*Larus heermanni*		Brewer's Blackbird	*Euphagus cyanocephalus*
Ring-billed Gull	*Larus delawarensis*		Great-tailed Grackle	*Quiscalus mexicanus*
Western Gull	*Larus occidentalis*		Brown-headed cowbird	*Molothrus ater*
California Gull[g]	*Larus californicus*		Hooded Oriole[a]	*Icterus cucullatus*
Herring Gull	*Larus argentatus*		Bullock's Oriole	*Icterus bullockii*
Thayer's Gull	*Larus thayeri*		House Finch[a]	*Carpodacus mexicanus*
Glaucous-winged Gull	*Larus glaucescens*		Lesser Goldfinch[a]	*Carduelis mexicanus*
Least Tern[a]	*Sternula antillarum*		American Goldfinch	*Spinus tristis*
Gull-billed Tern[f,h]	*Gelochelidon nilotica*		House Sparrow	*Passer domesticus*
Caspian Tern[a,h]	*Hydroprogne caspia*		Western Snowy Plover[c,f,h]	*Charadrius nivosus*
Ridgway's Tail[b,d,e]	*Rallus obsoletus levipes*			

[a] Species that have nested at Bolsa Chica Ecological Reserve
[b] state listed - endangered
[c] federal listed - threatened
[d] federal listed – endangered
[e] CDFW fully protected species
[f] CDFW species of special concern
[g] CDFW watch list
[h] USFWS birds of conservation concern
[i] BLM sensitive species
[j] CDF sensitive species
[k] USFS sensitive species

Table 9: Less Frequently Observed Bird Species at Bolsa Chica Ecological Reserve (Courtesy of the CDFW).

Biological Evaluation
November 2019

Common Name	Scientific Name		Common Name	Scientific Name
Fulvous Whistling Duck[e]	*Dendrocygna bicolor*		Yellow-billed Cuckoo	*Coccyzus americanus*
Greater White-fronted Goose	*Anser albifrons*		Short-eared Owl[e]	*Asio flammeus*
Snow Goose	*Chen caerulescens*		Common Poorwill	*Phalaenoptilus nuttallii*
Ross's Goose	*Chen rossii*		Black Swift[e,f]	*Cypseloides niger*
Cackling Goose	*Branta hutchinsii*		Costa's Hummingbird[f]	*Calypte costae*
Wood Duck	*Aix sponsa*		Calliope Hummingbird	*Stellula calliope*
Eurasian Wigeon	*Anas Penelope*		Red-breasted Sapsucker	*Sphyrapicus ruber*
Canvasback	*Aythya valisineria*		Hairy Woodpecker	*Picoides villosus*
Common Pochard	*Aythya ferina*		Least Flycatcher	*Empidonax minimus*
Ring-necked Duck	*Aythya collaris*		Hammond's Flycatcher	*Empidonax hammondii*
Harlequin Duck[e]	*Histrionicus histrionicus*		Gray Flycatcher	*Empidonax wrightii*
White-winged Scoter	*Melanitta deglandi*		Dusky Flycatcher	*Empidonax oberholseri*
Black Scoter	*Melanitta americana*		Eastern Phoebe	*Sayornis phoebe*
Long-tailed Duck	*Clangula hyemalis*		Vermilion Flycatcher[e]	*Pyrocephalus*
Common Goldeneye	*Bucephala clangula*		Tropical Kingbird	*Tyrannus melancholicus*
Barrow's Goldeneye[e]	*Bucephala islandica*		Bell's Vireo	*Vireo bellii*
Hooded Merganser	*Lophodytes cucullatus*		Cassin's Vireo	*Vireo cassinii*
Common Merganser	*Mergus merganser*		Curlew Sandpiper	*Calidris ferruginea*
Red-necked Grebe	*Podiceps grisegena*		Buff-breasted Sandpiper	*Tryngites subruficollis*
Red-tailed Tropicbird	*Phaethon rubricauda*		Hutton's Vireo	*Vireo huttoni*
Magnificent Frigatebird	*Fregata magnificens*		Red-eyed Vireo	*Vireo olivaceus*
Brandt's Cormorant	*Phalacrocorax penicillatus*		Purple Martin[e]	*Progne subis*
Pelagic Cormorant	*Phalacrocorax pelagicus*		Bank Swallow[c,g]	*Riparia riparia*
Little Blue Heron	*Egretta caerulea*		Verdin	*Auriparus flaviceps*
Tricolored Heron	*Egretta tricolor*		Red-breasted Nuthatch	*Sitta canadensis*
Cattle Egret	*Bubulcus ibis*		White-breasted Nuthatch	*Sitta carolinensis*
Bald Eagle[a,b,f,g,h,i,j]	*Haliaeetus leucocephalus*		Rock Wren	*Salpinctes obsoletus*
Ferruginous Hawk[k]	*Buteo regalis*		Bewick's Wren	*Thryomanes bewickii*
Rough-legged Hawk	*Buteo lagopus*		Pacific Wren	*Troglodytes pacificus*
Prairie Falcon[f,k]	*Falco mexicanus*		Mountain Bluebird	*Sialia currucoides*
Clapper Rail	*Rallus longirostris*		Sage Thrasher	*Oreoscoptes montanus*
Lesser Sand Plover	*Charadrius mongolus*		California Thrasher	*Toxostome redivivum*
Wilson's Plover	*Charadrius wilsonia*		Red-throated Pipit	*Anthus cervinus*
Mountain Plover[e,f,g]	*Charadrius montanus*		Phainopepla	*Phainopepla nitens*
Wandering Tattler	*Tringa incana*		Lapland Longspur	*Calcarius lapponicus*

Common Name	Scientific Name		Common Name	Scientific Name
White-rumped Sandpiper	*Calidris fuscicollis*		Chestnut-collared Longspur	*Calcarius ornatus*
Sharp-tailed Sandpiper	*Calidris acuminate*		Ovenbird	*Seiurus aurocapilla*
Curlew Sandpiper	*Calidris ferruginea*		Northern Waterthrush	*Parkesia noveboracensis*
Buff-breasted Sandpiper	*Tryngites subruficollis*		Black-and-White Warbler	*Mniotilta varia*
Ruff	*Philomachus pugnax*		Palm Warbler	*Dendroica palmarum*
Red Phalarope	*Phalaropus fulicarius*		Yellow-breasted Chat	*Icteria virens*
Black-legged Kittiwake	*Rissa tridactyla*		Green-tailed Towhee	*Pipilo chlorurus*
Sabine's Gull	*Xema sabini*		Cassin's Sparrow	*Peucaea cassinii*
Laughing Gull[k]	*Leucophaeus atricilla*		Chipping Sparrow	*Spizella passerine*
Franklin's Gull	*Leucophaeus pipixcan*		Clay-colored Sparrow	*Spizella pallida*
Mew Gull	*Larus canus*		Black-throated Sparrow	*Amphispiza bilineata*
Lesser Black-backed Full Glaucous Gull	*Larus fuscus*		Nelson's Sparrow	*Ammodramus nelson*
Sooty Tern	*Onychoprion fuscatus*		White-throated Sparrow	*Zonotrichia albicollis*
Bridled Tern	*Onychoprion anaethetus*		Summer Tanager[e]	*Piranga rubra*
Arctic Tern	*Sterna paradisaea*		Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Sandwich Tern	*Thalasseus sandviciensis*		Bobolink	*Dolichonyx oryzivorus*
Pomarine Jaeger	*Stercorarius pomarinus*		Tricolored Blackbird[d,e,f,g]	*Agelaius tricolor*
Parasitic Jaeger	*Stercorarius parasiticus*		Yellow-headed Blackbird[e]	*Xanthocephalus xanthocephalus*
Spotted Dove	*Streptopelia chinensis*		Red Crossbill	*Loxia curvirostra*
White-winged Dove	*Zenaida asiatica*		Pine Siskin	*Cardeulis pinus*
Common Ground Dove	*Columbina passerina*		Lawrence's Goldfinch	*Carduelis lawrencei*

[a] state listed – endangered
[b] federally delisted - recovered
[c] state listed - threatened
[d] state candidate – threatened or endangered
[e] CDFW species of special concern
[f] USFWS birds of conservation concern
[g] BLM sensitive species
[h] CDF sensitive species
[i] CDFW fully protected species
[j] USFS sensitive species
[k] CDFW watch list

Table 10: List of fish species documented at Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
Bonefish	*Albula vulpes*		Bay Goby	*Lepiodogobius lepidus*
Topsmelt	*Atherinops affinis*		California Butterfly Ray	*Gymnura marmorata*

Common Name	Scientific Name		Common Name	Scientific Name
Jacksmelt	*Atherinopsis californiensis*		Salema	*Xenistius californiensis*
California Grunion	*Leuresthes tenuis*		Sargo	*Anisotremus davidsonii*
Specklefin Midshipman	*Porichthys myriaster*		Zebra Perch Sea Chub	*Hermosilla azurea*
California Needlefish	*Strongylura exilis*		Striped Bass	*Morone saxatalis*
Bay Blenny	*Hypsoblennius gentilis*		Striped Mullet	*Mugil cephalus*
Speckled Sanddab	*Citharichthys stigmaeus*		Bat Ray	*Myliobatis californica*
Jack Mackerel	*Trachurus japonicas*		California Halibut	*Paralichthys californicus*
Gray Smoothhound Shark	*Mustelus californicus*		Thornback Ray	*Platyrhinoidis triseriata*
Leopard Shark	*Triakis semifasciata*		Diamond Turbot	*Hypsopsetta guttulata*
Giant Kelpfish	*Heterostichus rostratus*		Hornyhead Turbot	*Pleuronichthys verticalis*
Pacific Sardine	*Sardinops sagax*		Giant Sea Bass	*Stereolepis gigas*
Pacific Herring	*Clupea pallasi*		Blacksmith	*Chromis punctipinnis*
Threadfin Shad	*Dorosoma petenense*		Shovelnose Guitarfish	*Rhinobatos productus*
Staghorn Sculpin	*Leptocottus armatus*		Queenfish	*Seriphus politus*
California Tonguefish	*Symphurus atricauda*		White Seabass	*Atractoscion nobilis*
Diamond Stingray	*Dasyatis brevis*		Yellowfin Croaker	*Umbrina roncador*
Barred Surfperch	*Amphistichus argenteus*		White Croaker	*Genyonemus lineatus*
Shiner Surfperch	*Cymatogaster aggregata*		Spotfin Croaker	*Rondacor stearnsii*
Pile Surfperch	*Damalichthys vacca*		California Corbina	*Menticirrhus undulates*
Walleye Surfperch	*Hyperprosopon argenteum*		Black Croaker	*Cheilotrema saturnum*
Dwarf Surfperch	*Micrometrus minimus*		Pacific (chub) Mackerel	*Scomber japonicas*
Black Surfperch	*Embiotoca jacksoni*		Spotted Scorpionfish	*Scorpaneana guttata*
Northern Anchovy	*Engraulus mordax*		Spotted Sand Bass	*Paralabrax maculatofasciatus*
Deep Body Anchovy	*Anchoa compressa*		Barred Sand Bass	*Paralabrax nebulifer*
Slough Anchovy	*Anchoa delicatissima*		Kelp Bass	*Paralabrax clathratus*
California Killifish	*Fundulus parvipinnis*		California Barracuda	*Sphyraena argentea*
Opaleye	*Girella nigricans*		Barred Pipefish	*Syngnathus auliscus*
Arrow Goby	*Clevelandia ios*		Bay Pipefish	*Syngnathus leptorhynchus*
Shadow Goby	*Quietula y-cauda*		Kelp Pipefish	*Syngnathus californiensis*
Cheekspot Goby	*Ilypnus gilbert*		Snubnose Pipefish	*Cosmoscampus arctus*
Longjaw Mudsucker	*Gillichthys mirabilis*		Round Stingray	*Urobatis halleri*
Yellowfin Goby	*Acanthogobius flavimanus*			

Table 11: List of aquatic invertebrates documented at Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
Acorn Barnacle	*Balanus glandula*		Barrel Shell	*Acteon punctocaelatus*
Crab	*Cancer sp.*		Brown Sea Hare	*Aplysia californica*
California Bay Shrimp	*Crangon franciscorum*		Black Sea Hare	*Aplysia vaccaria*
Pacific Sponge Crab	*Cryptodromiopsis larraburei*		Pacific Calico Scallop	*Argopecten ventricosus*
Hermit Crabs	Family Paguridae		Bubble Snail	*Bulla gouldiana*
Crenulated Fiddler Crab	*Gelasimus crenulatus*		California Horn Snail	*Cerithidea californica*
Yellow Shore Crab	*Hernigrapsus oregonensis*		Chione Clams	*Chione sp.*
California Green Shrimp	*Hippolyte californiensis*		American Slipper Limpet	*Crepidula fornicate*
Kelp Humpback Shrinp	*Hippolyte clarki*		Pacific Stomach Wing	*Gatropteron pacificum*
Black-clawed Crab	*Lophopanopeus bellus*		Kellet's Whelk	*Kelletia kelleti*
Burrowing Crab	*Malacoplax californiensis*		Egg Cockle	*Laevicardium substriatum*
Bay Ghost Shrimp	*Neotrypaea californiensis*		Wavy Top Turban Snail	*Lithopoma undosum*
Lined Shore Crab	*Pachgrapsus crassipes*		Owl Limpet	*Lottia gigantean*
Pink Shrimp	*Pandalus sp.*		California Lyonsia	*Lyonsia californica*
Brown Shrimp	*Panaeus californicus*		Rough Limpet	*Maclintokia scabra*
Swimming Crab	*Portunus xantussii*		Lion's Melibe	*Melibe leonine*
Shield-backed Kelp Crab	*Pugettia product*		Bay Mussel	*Mytilus trossulus*
American Spider Crab	*Pyromaia tuberculata*		Covered-lip Nassa	*Nassarius tegula*
Furrowed Rock Crab	*Romelean branneri*		Navanax	*Navanax inermis*
Bryozoan	*Bugula sp.*		Lewis' Moon Snail	*Neverita lewisii*
Bryozoan	*Lichenopora sp.*		Smooth Brown Turban	*Norrisis norrisi*
Bryozoan	*Thalamoporella californica*		Two-spot Octopus	*Octopus bimaculoides*
Solitary Tunicate	Order Ascidiacea		Olympia Oyster	*Ostreola conchaphila*
Colonial Tunicate	Order Ascidiacea		Taylor's Sea Hare	*Phyllapylsia taylori*
Moon Jelly	*Aurelia sp.*		Black Dorid	*Polycera atra*
Anemone	Class Anthozoa		Clam	*Protothaca sp.*
Bell Jelly	*Polyorchis sp.*		Rosy Jackknife Clam	*Solen rostriformis*
Comb Jelly	*Phylum Ctenophora*		Jackknife Clam	*Tagelus californianus*
Sand Dollar	*Dendraster excentricus*		Black Turban Snail	*Tegula funebralis*
White Sea Urchin	*Lytechnius anamesus*		Clam	*Tellina sp.*
Ochre Sea Star	*Pisaster ochraceus*		Yellow Sponge	Phylum Porifera
Purple Sea Urchin	*Strongylocentrotus purpuratus*			

Table 12: List of terrestrial invertebrates documented at the Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
Wandering Skipper	*Panoquina errans*		Mudflat Tiger Beetle	*Cicindela trifasciata sigmoidea*
Common Hairstreak Butterfly	*Strymon melinux*		Salt Marsh Moth	*Estigmene acrea*
Fiery Skipper Butterfly	*Hylephila phyleus*		Western Black Widow Spider	*Latrodectus hesperus*
Monarch Butterfly[a]	*Danaus plexippus*		Funnel Spider/Grass Spider	*Agelenopsis spp.*
Flame Skimmer Dragonfly	*Libellula saturata*			

[a] USFS sensitive species

Table 13: List of reptiles documented at the Bolsa Chica Ecological Reserve by the California Department of Fish and Wildlife.

Common Name	Scientific Name		Common Name	Scientific Name
Southern Pacific Rattlesnake	*Crotalus oreganus helleri*		Foothill Alligator Lizard	*Gerrhonotus multicarinatus*
Western Rattlesnake	*Crotalus viridis helleri*		Western Fence Lizard	*Sceloporus occidentalis*
Common King Snake	*Lampropeltis getulus*		Side-blotched Lizard	*Uta stansburiana*
Gopher Snake	*Pituophis melanoleucus*		Western Skink	*Eumeces skiltonianus*
Two-striped Garter Snake[b,c,d]	*Thamnophis hammondii*		Garden Slender Salamander	*Batrachoseps major major*
California Legless Lizard[a,c]	*Anniella pulchra pulchra*		Green Turtle[a]	*Chelonia mydas*

[a] federal listed - threatened
[b] BLM sensitive species
[c] CDFW species of special concern
[d] USFS sensitive species

Table 14: List of mammals documented at the Bolsa Chica Ecological Reserve by the CDFW.

Common Name	Scientific Name		Common Name	Scientific Name
Northern Raccoon	*Procyon lotor*		Mexican Free-tailed Bat	*Tadarida brasiliensis*
Audubon's Cottontail	*Sylvilagus auduboni*		Yuma Myotis Bat[a]	*Myotis yumanensis*
California Ground Squirrel	*Otospermophilus beechii*		Western Red Bat[b]	*Lasiurus blossevillii*
Pocket Gopher	*Thomomys bottae*		California Myotis Bat	*Myotis californicus*
California Vole	*Microtus californicus*		Coyote	*Canis latrans*
Striped Skunk	*Mephitis mephitis*			

[a] BLM sensitive species
[b] CDFW species of special concern

13.1.1.2 Seal Beach National Wildlife Refuge

Table 15: Birds Observed at Seal Beach National Wildlife Refuge.

Common Name	Scientific Name		Common Name	Scientific Name
Brant[f]	*Branta bernicla*		California Gull[g]	*Larus californicus*
Greater White-fronted Goose	*Anser albifrons*		Ring-billed Gull	*Larus delawarensis*
Canada Goose[a]	*Branta canadensis*		Western Gull	*Larus occidentalis*

Biological Evaluation
November 2019

Common Name	Scientific Name		Common Name	Scientific Name
Cackling Goose	*Branta hutchinsii*		Red-necked Phalarope	*Phalaropus lobatus*
Snow Goose	*Chen caerulescens*		Bonaparte's Gull	*Chroicocephalus philadelphia*
Ross's Goose	*Chen rossii*		Herring Gull	*Larus argentatus*
Tundra Swan	*Cygnus colmbianus*		Glaucous-winged Gull	*Larus glaucescens*
Mute Swan	*Cygnus olor*		Glaucous Gull	*Larus hyperboreus*
Gadwall[a]	*Anas strepera*		California Least Tern[a,d]	*Sternula antillarum browni*
American Wigeon	*Ana americana*		Caspian Tern[a,h]	*Hydroprogne caspia*
Eurasian Wigeon	*Anas penelope*		Black Tern[f]	*Chlidonias niger*
Mallard[a]	*Anas platyrhynchos*		Common Tern	*Sterna hirundo*
Blue-winged Teal[a]	*Anas discors*		Forester's Tern[a]	*Sterna forsteri*
Cinnamon Teal[a]	*Anas cyanoptera*		Royal Tern[a]	*Thalasseus maximus*
Northern Shoveler	*Anas clypeata*		Elegant Tern[a,g]	*Thalasseus elegans*
Northern Pintail[a]	*Anas acuta*		Black Skimmer[a,f,h]	*Rynchops niger*
Green-winged Teal	*Anas carolinensis*		Rock Pigeon[a]	*Columba livia*
Redhead[a,f]	*Aythya americana*		Mourning Dove[a]	*Zenaida macroura*
Ring-necked Duck	*Aythya collaris*		Spotted Dove	*Spilopelia chinensis*
Greater Scaup	*Aythya marila*		Common Ground Dove	*Columbina passerine*
Lesser Scaup	*Aythya affinis*		Barn Owl	*Tyto alba*
Canvasback	*Aythya valisineria*		Great Horned Owl[a]	*Bubo virginianus*
Long-tailed Duck	*Clangula hyemalis*		Short-eared Owl[e]	*Asio flammeus*
Surf Scoter	*Melanitta perspicillata*		Burrowing Owl[a,f,h,i]	*Athene cunicularia*
Bufflehead	*Bucephala albeola*		Lesser Nighthawk	*Chordeiles acutipennis*
Common Goldeneye	*Bucephala clangula*		White-throated Swift	*Aeronautes saxatalis*
Hooded Merganser	*Lophodytes cucullatus*		Black-chinned Hummingbird	*Archilochus alexandri*
Common Merganser	*Mergus merganser*		Anna's Hummingbird[a]	*Calypte anna*
Red-breasted Merganser	*Mergus serrator*		Costa's Hummingbird[h]	*Calypte costae*
Ruddy Duck[a]	*Oxyura jamaicensis*		Rufous Hummingbird	*Selaphorus rufue*
Red-throated Loon	*Gavia stellata*		Allen's Hummingbird[a]	*Selaphorus sasin*
Pacific Loon	*Gavia pacifica*		Belted Kingfisher	*Megaceryle alcyon*
Common Loon[f]	*Gavia immer*		Red-breasted Sapsucker	*Sphyrapicus ruber*
Pied-billed Grebe[a]	*Podilymbus podiceps*		Downy Woodpecker	*Dryobates pubescens*
Horned Grebe	*Podiceps auritus*		Northern Flicker	*Colaptes auratus*
Red-necked Grebe	*Podiceps grisegena*		Western Wood-Peewee	*Contopus sordidulus*
Eared Grebe[a]	*Podiceps nigricollis*		Hammond's Flycatcher	*Empidonax hammondii*
Western Grebe	*Aechmophorus occidentalis*		Pacific-slope Flycatcher	*Empidonax difficilis*
Clark's Grebe	*Aechmophorus clarkia*		Black Phoebe[a]	*Sayornis nigricans*

Biological Evaluation
November 2019

Common Name	Scientific Name		Common Name	Scientific Name
Double-crested Cormorant[a]	*Phalacrocorax auritus*		Say's Phoebe[a]	*Sayornis saya*
Pelagic Cormorant	*Phalacrocorax pelagicus*		Ash-throated Flycatcher	*Myiarchus cinerascens*
Brandt's Cormorant	*Phalacrocorax penicillatus*		Cassin's Kingbird	*Tyrannus vociferans*
American White Pelican[a,f]	*Pelecanus erythrorhynchos*		Western Kingbird	*Tyrannus verticalis*
Brown Pelican[f]	*Pelecanus occidentalis*		Horned Lark[a]	*Eremophila alpestris*
American Bittern	*Botaurus lentiginosus*		Tree Swallow	*Tachycineta bicolor*
Great Blue Heron[a,j]	*Ardea herodias*		Violet-green Swallow	*Tachycineta thalassina*
Great Egret[j]	*Ardea alba*		Northern rough-winged Swallow	*Stelgidopteryx serripennis*
Cattle Egret	*Bubulcus ibis*		Cliff Swallow[a]	*Petrochelidon pyrrhonota*
Little Blue Heron	*Egretta caerulea*		Barn Swallow[a]	*Hirundo rustica*
Snowy Egret	*Egretta thula*		Bushtit[a]	*Psaltriparus minimus*
Tricolored Heron	*Egretta tricolor*		House Wren[a]	*Troglodytes aedon*
Reddish Egret	*Egretta rufescens*		Marsh Wren[a]	*Cistothorus palustris*
Green Heron[a]	*Butorides virescens*		Rock Wren	*Salpinctes obsoletus*
Black-crowned Nigh Heron[a]	*Nycticorax nycticorax*		Bewick's Wren	*Thryomanes bewickii*
White-faced Ibis[g]	*Plegadis chihi*		Blue-grey Gnatcatcher	*Polioptila caerulea*
Turkey Vulture	*Cathartes aura*		Ruby-crowned Kinglet	*Regulus calendula*
Osprey[g,j]	*Pandion haliaetus*		Mountain Bluebird	*Sialia currucoides*
White-tailed Kite[a,e,i]	*Elanus leucurus*		Western Bluebird	*Sialia mexicana*
Bald Eagle[b,e,h,i,j,k]	*Haliaeetus leucocephalus*		Hermit Thrush	*Catharus guttatus*
Golden Eagle[e,g,h,i,j]	*Aquila chrysaetos*		American Robin	*Turdus migratorius*
Northern Harrier[a]	*Circus hudsonius*		Northern Mockingbird[a]	*Mimus polyglottos*
Sharp-Shinned Hawk	*Accipiter striatus*		European Starling[a]	*Sturnus vulgaris*
Cooper's Hawk[a,g]	*Accipiter cooperii*		American Pipit	*Anthus rubescens*
Red-Shouldered Hawk	*Buteo lineatus*		Sage Thrasher	*Oreoscoptes montanus*
Red-Tailed Hawk[a]	*Buteo jamaicensis*		California Scrub Jay	*Aphelocoma californica*
Ferruginous Hawk[g]	*Buteo regalis*		American Crow[a]	*Corvus brachyrhynchos*
Swainson's Hawk	*Buteo swainsoni*		Common Raven[a]	*Corvus corvax*
American Kestrel[a]	*Falco sparverius*		Cedar Waxwing	*Bombycilla cedrorum*
Merlin[g]	*Falco columbarius*		Loggerhead Shrike[a,f,h]	*Lanius ludovicianus*
Prairie Falcon[g,h]	*Falco mexicanus*		Warbling Vireo	*Vireo gilvus*
Peregrine Falcon[a,e,hj]	*Falco peregrinus*		Orange-Crowned Warbler	*Oreothlypis celata*
Clapper Rail	*Rallus crepitans*		Nashville Warbler	*Oreothlypis ruficapilla*
Virginia Rail[a]	*Rallus limicola*		Common Yellowthroat	*Geothlypis trichas*
Light-footed Ridway's Rail[b,d]	*Rallus longirostris levipes*		Yellow Warbler	*Dendroica petechia*
Sora[a]	*Porzana Carolina*		Yellow-Rumped Warbler	*Dendroica coronata*

Biological Evaluation
November 2019

Common Name	Scientific Name		Common Name	Scientific Name
American Coot[a]	*Fulica Americana*		Black-Throated Gray Warbler	*Setophaga nigrescens*
Black-Bellied Plover	*Pluvialis squatarola*		Townsend's Warbler	*Dendroica townsendii*
Pacific Golden-Plover	*Pluvialis fulva*		Hermit Warbler	*Setophaga occidentalis*
Snowy Plover[a]	*Charadrius alexandrinus*		Wilson's Warbler	*Cardellina pusilla*
Mountain Plover[f,h,i]	*Charadrius montanus*		Green-Tailed Towhee	*Pipilo chlorurus*
Semipalmated Plover	*Charadrius semipalmatus*		Spotted Towhee	*Pipilo maculatus*
Killdeer[a]	*Charadrius vociferous*		California Towhee[a]	*Melozone crissalis*
Black Oystercatcher	*Haematopus bachmani*		Chipping Sparrow	*Spizella passerina*
Black-Necked Stilt[a]	*Himantopus mexicanus*		Lark Sparrow	*Chondestes grammacus*
American Avocet[a]	*Recurvirostra americana*		Common Savannah Sparrow	*Passerculus sandwichensis*
Greater Yellowlegs	*Tringa melanoleuca*		Belding's Savannah Sparrow[a,b]	*Passerculus sandwichensis beldingi*
Willet	*Tringa semipalmata*		Large-billed Savannah Sparrow	*Passerculus sandwichensis rostratus*
Lesser Yellowlegs	*Tringa flavipes*		Nelson's Sharp-Tailed Sparrow	*Ammodramus nelsoni*
Wanderling Tattler	*Tringa incana*		Fox Sparrow	*Passerella iliaca*
Whimbrel	*Numenius phaeopus*		Song Sparrow[a,f]	*Melospiza melodia*
Long-Billed Curlew[g,h]	*Numenius americanus*		Lincoln's Sparrow	*Melospiza lincolnii*
Marbled Godwit	*Limosa fedoa*		White-Crowned Sparrow	*Zonotrichia leucophrys*
Ruddy Turnstone	*Arenaria interpres*		Golden-Crowned Sparrow	*Zonotrichia atricapilla*
Black Turnstone	*Arenaria melanocephala*		Western Tanager	*Piranga ludoviciana*
Surfbird	*Aphriza virgate*		Black-Headed Grosbeak	*Pheucticus melanocephalus*
Red Knot	*Calidris canutus*		Blue Grosbeak	*Passerina caerulea*
Sanderling	*Calidris alba*		Lazuli Bunting	*Passerina amoena*
Spotted Sandpiper	*Actitis macularius*		Lapland Longspur	*Calcarius lapponicus*
Western Sandpiper	*Calidris mauri*		House Sparrow	*Passer domesticus*
Least Sandpiper	*Calidris minutilla*		Red-Winged Blackbird[a]	*Agelaius phoeniceus*
Baird's Sandpiper	*Calidris bairdii*		Tricolored Blackbird	*Agelaius tricolor*
Pectoral Sandpiper	*Calidris melanotos*		Western Meadowlark	*Sturnella neglecta*
Dunlin	*Calidris alpine*		Yellow-Headed Blackbird[f]	*Xanthocephalus xanthocephalus*
Stilt Sandpiper	*Calidris himantopus*		Brewer's Blackbird	*Euphagus cyanocephalus*
Ruff	*Philomachus pugnax*		Brown-Headed Cowbird	*Molothrus ater*
Short-Billed Dowitcher	*Limnodromus griseus*		Hooded Oriole[a]	*Icterus cucullatus*
Long-Billed Dowitcher	*Limnodromus scolopaceus*		Bullock's Oriole	*Icterus bullockii*

Common Name	Scientific Name		Common Name	Scientific Name
Common Snipe	*Gallinago gallinago*		House Finch[a]	*Carpodacus mexicanus*
Wilson's Phalarope	*Phalaropus tricolor*		Lesser Goldfinch[a]	*Carduelis psaltria*
Red Phalarope	*Phalaropus fulicarius*		American Goldfinch	*Spinus tristis*
Heermann's Gull	*Larus heermanni*		Northern Red Bishop	*Euplectes franciscanus*

[a] Species that have nested at Bolsa Chica Ecological Reserve
[b] state listed - endangered
[c] federal listed - threatened
[d] federal listed – endangered
[e] CDFW fully protected species
[f] CDFW species of special concern
[g] CDFW watch list
[h] USFWS birds of conservation concern
[i] BLM sensitive species
[j] CDF sensitive species
[k] USFS sensitive species

Table 16: Benthic Invertebrates Observed within Vicinity of Seal Beach NWR during 2013 surveys.

Phylum	Scientific Name	Common Name
Bryozoa	*Zoobotryon verticillatum*	Spaghetti Bryozoan
Mollusca	*Arcularia tiarula*	Mud Dog Whelk
	Argopectem ventricosus	Speckled Scallop
	Bulla gouldiana	Bubble Snail
	Caesia perpinguis	Western Fat Dog Whelk
	Cerithidea californica	California Hornsnail
	Crepidula sp.	Slipper Shell
	Kelletia kelletii	Kellet's Whelk
	Laevicardium substriatum	Pacific Egg Cockle
	Navanax inermis	Navanax
Arthoropoda	*Cancer oregonensis*	Pygmy Rock Crab
	Emerita sp.	Mole Crab
	Farfantepenaeus californiensis	Brown Shrimp
	Hemigrapsus oregonensis	Yellow Shore Crab
	Heptacarpus sp.	Broken Back Shrimp
	Hippolyte sp.	Grass Shrimp
	Pachygrapsis crassipes	Lined Shore Crab
	Palaemon macrodactylus	Oriental Shrimp
	Portunus xantusii	Xantu's Swimming Crab
	Pugettia producta	Northern Kelp Crab

Source: USFWS 2014

Table 17: Fish Species Observed within Vicinity of Seal Beach NWR during 2013 surveys.

Scientific Name	Common Name
Atherinop affinis	Topsmelt
Engraulis mordax	Northern Anchovy
Seriphus politus	Queenfish
Cymatogaster aggregata	Shiner Surfperch
Paralabrax nebulifer	Barred Sand Bass
Urobatis halleri	Round Stingray
Ilypnus gilberti	Cheekspot Goby
Leuresthes tenuis	California Grunion
Leptocottus armatus	Staghorn Sculpin
Sardinops sagax	Pacific Sardine
Syngnathus leptorhynchus	Bay Pipefish

Scientific Name	Common Name
Heterostichus rostratus	Giant Kelpfish
Clevelandia ios	Arrow/Shadow Goby
Paralichthys californicus	California Halibut
Paralabrax clathratus	Kelp Bass
Roncador stearnsii	Spotfin Croaker
Paralabrax maculatofasciatus	Spotted Sand Bass
Umbrina roncador	Yellowfin Croaker
Fundulus parvipinnis	California killifish
Hyperprosopon argenteum	Walleye Surfperch
Hypsoblennius gentilis	Bay Blenny
Acanthogobius flavimanus	Yellowfin Goby
Porichthys myriaster	Specklefin Midshipman
Anisotremus davidsonii	Sargo
Xenistius californiensis	Salema
Syngnathus auliscus	Barred Pipefish
Atractoscion nobilis	White Seabass
Mustelus californicus	Gray Smooth-hound Shark
Anchoa compressa	Deepbody Anchovy
Strongylura exilis	California Needlefish
Atherinopsis californiensis	Jacksmelt
Embiotoca jacksoni	Black Surfperch
Symphurus atricaudus	California Tonguefish
Gymnura marmorata	California Butterfly Ray

Source: USFWS 2014

13.2 Bibliography

USFWS, 2014, Final Initial Study/Environmental Assessment – Seal Beach National Wildlife Refuge Thin-layer Salt Marsh Sediment Augmentation Pilot Project (Orange County, California), U.S. Fish and Wildlife Service, Chula Vista, California. Accessed 12 July 2018. Available at http://scc.ca.gov/webmaster/ftp/pdf/sccbb/2014/1410/20141002Board11_Seal_Beach_Sediment_Augmentation_Ex4.pdf

14.0 Appendix G – Threatened and Endangered Species Figures

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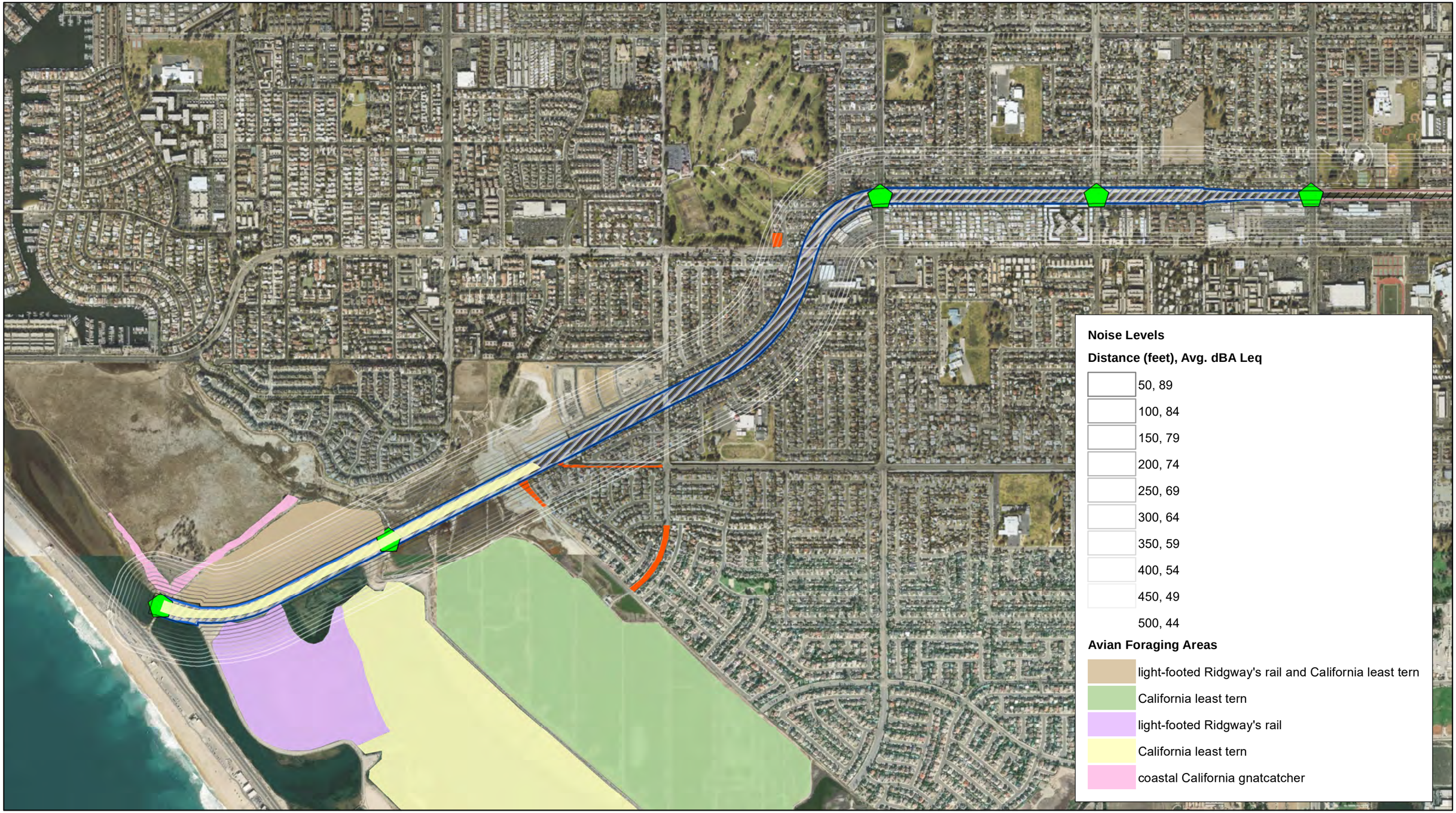

U.S. Army Corps Of Engineers ®
Chicago District

Potential Staging Areas
Channel Crossings Replaced
C05R01 Sheetpile Walls North & South Levee w/ Toe Excavation; Soft Bottom
C05R02 Concrete Rectangular

N
W E
S
1 inch = 0.21 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 01
70.72 Acres

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U.S. Army Corps Of Engineers ®
Chicago District

Potential Staging Areas
Channel Crossings Replaced
C05R01 Sheetpile Walls North & South Levee w/ Toe Excavation; Soft Bottom
C05R02 Concrete Rectangular

N
W E
S
1 inch = 0.21 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 01
70.72 Acres

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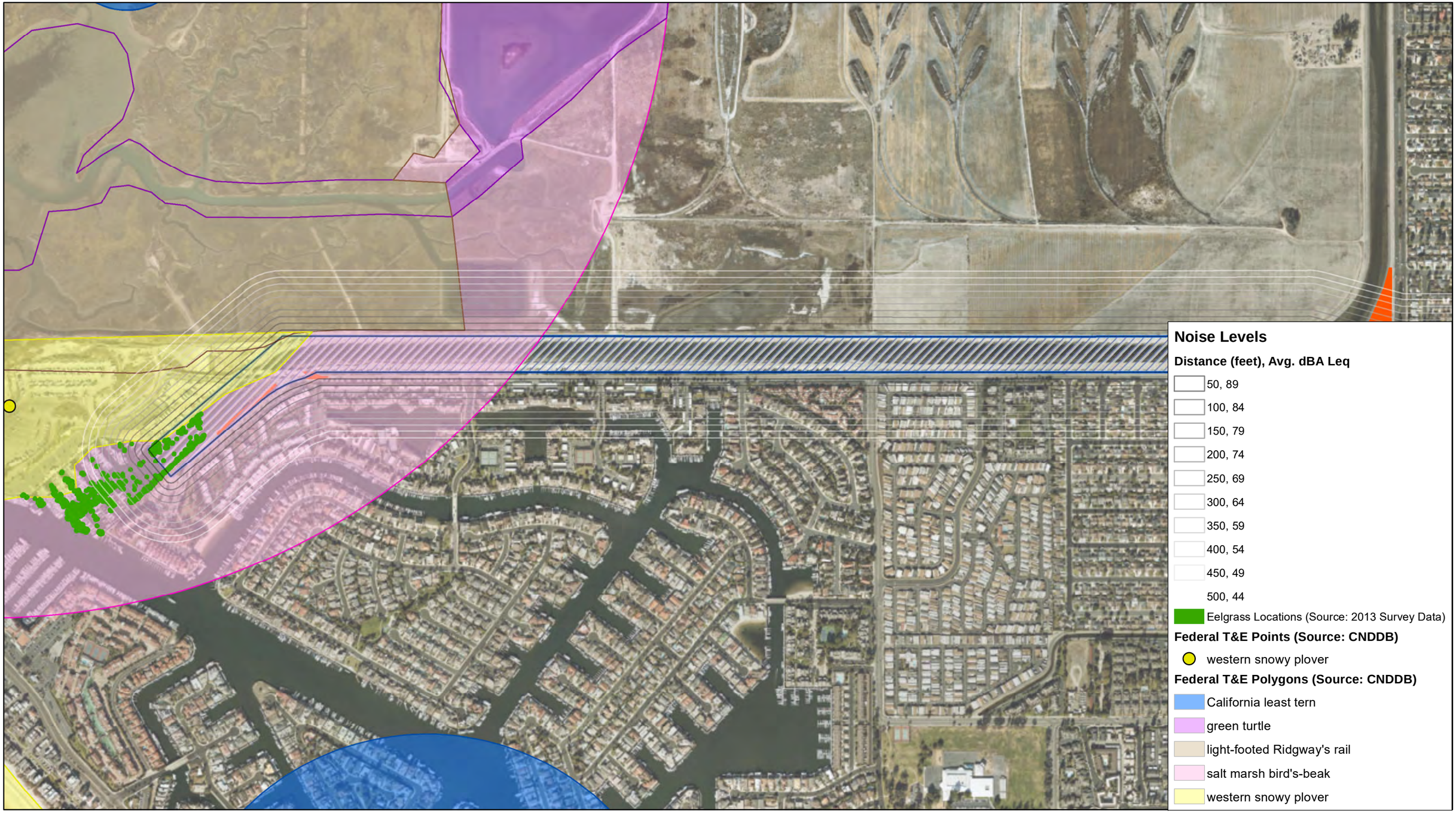

U.S. Army Corps
Of Engineers ®
Chicago District

Potential Staging Areas
C04R20 Concrete Rectangular; Middle 40-48 feet Remain Soft Bottom
C02R23 Sheetpile Wall South Levee w/ Toe Excavation; Slope Stabilization North Levee

N
W E
S
1 inch = 0.131 miles

Westminster

LPP - Maximum
CHANNEL 2

For Official Use Only
November 2019

Reach 23
57.01 Acres

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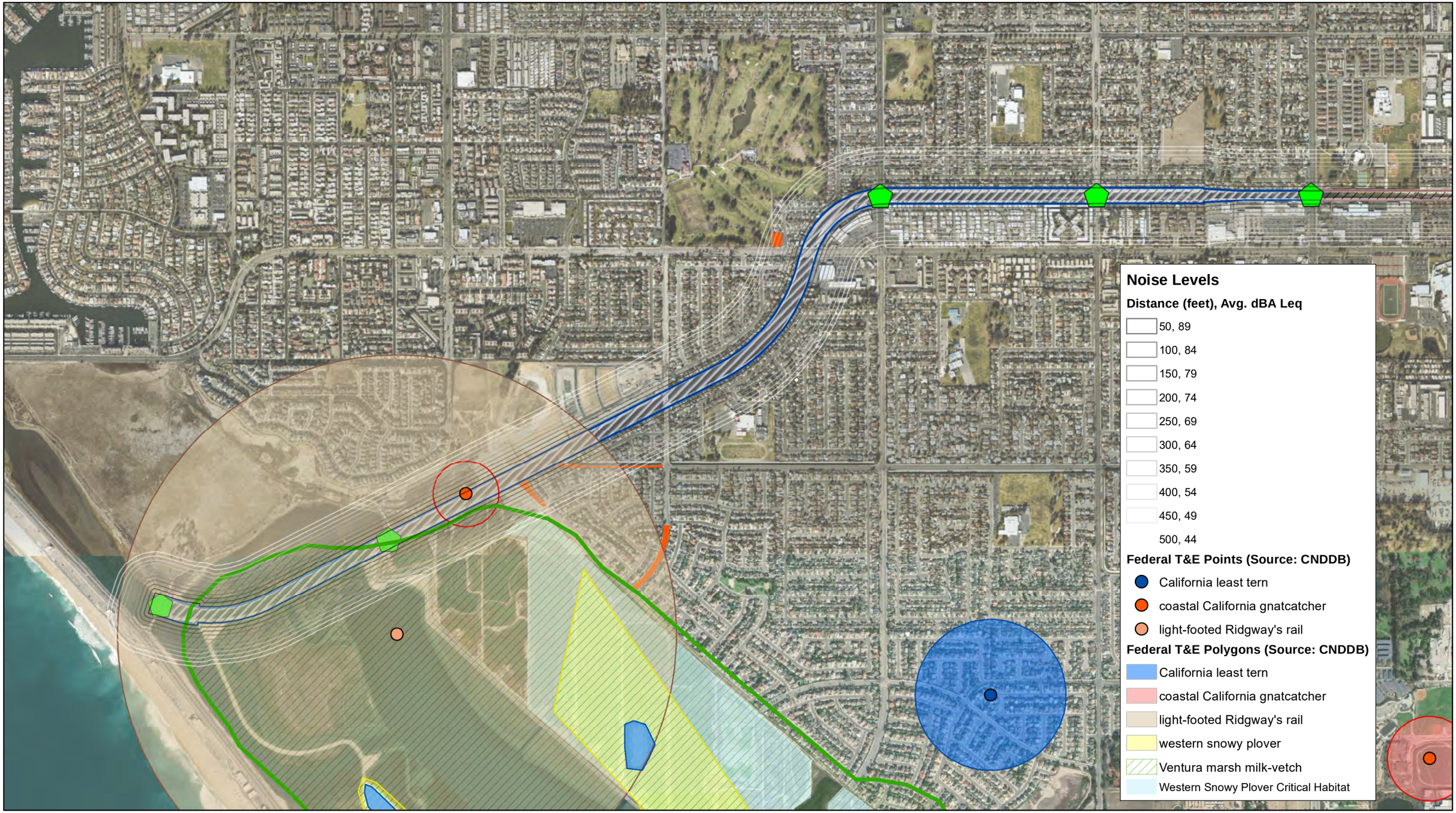

U.S. Army Corps Of Engineers ®
Chicago District

Potential Staging Areas
Channel Crossings Replaced
C05R01 Sheetpile Walls North & South Levee w/ Toe Excavation; Soft Bottom
C05R02 Concrete Rectangular

N
W E
S

1 inch = 0.21 miles

Westminster

LPP - Maximum
CHANNEL 5

For Official Use Only
November 2019

Reach 01
70.72 Acres

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U.S. Army Corps
Of Engineers ®
Chicago District

Potential Staging Areas
Eelgrass Locations (Source: 2013 Survey Data)
Warner Avenue (Excavation/Lengthening bridge span)

N
W E
S

1 inch = 0.016 miles

Westminster

LPP - Maximum

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