



Memorandum

Project # 4628-03

November 1, 2023

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Subject: Humboldt Offshore Wind Port Upgrades, Shorebird Special Studies and Site Surveys

Background and Goals

The Humboldt Bay Harbor, Recreation, and Conservation District intends to remove an existing wharf (Redwood Marine Terminal I [RMTI]) and associated derelict pilings in Humboldt Bay, California and reconstruct the Redwood Marine Multipurpose Terminal (RMMT) to support the development of offshore wind and other industrial uses (the Project). The Project also will mitigate for the removal of eelgrass associated with construction by converting several potential identified areas of unvegetated substrate in Humboldt Bay into eelgrass habitat. Potential mitigation sites include Redwood Marine Multipurpose Terminal North (RMMT North), Clam Island, and King Salmon beach (Figure 1).

A series of *Shorebird/Brant Surveys* were conducted to observe and document shorebird and brant occurrence and use of the mudflat associated with RMMT. Two initial reconnaissance surveys were conducted in the RMMT Project Area, in addition to one at Clam Island and one at RMMT North (Figure 1). Following these initial surveys, eight and six surveys were then conducted in the RMMT Project Area and at RMMT North, respectively. This memo summarizes our findings.



Figure 1. Mitigation Sites and Survey Locations

Notes: This figure is adapted from Merkel & Associates' *Preliminary Eelgrass Mitigation and Monitoring Plan* (2022). The Redwood Marine Multipurpose Terminal (RMMT) Project Area encompasses the existing Redwood Marine Terminal I, which will be removed and reconstructed. Clam Island and King Salmon eelgrass mitigation sites are adjacent to Entrance Bay in the South Bay. The Redwood Marine Multipurpose Terminal North (RMMT North) eelgrass site is directly north of the RMMT footprint and is a site proposed for restoration.

Survey Results

All surveys were completed by local ornithologist Rob Fowler. The four initial reconnaissance site visits were completed between February 17 and May 3, 2023 (Attachment 1). The remainder of the surveys occurred bimonthly between July 25, 2023 and October 26, 2023. Since the purpose of these surveys was to document shorebird species composition and numbers of individuals of each species, site visits were conducted at low tide when shorebird habitat is maximized. The tidal data for each survey period are provided in Table 1. Binoculars and spotting scopes were used to make bird observations. The initial surveys primarily documented presence/absence and did not note the exact location of the observation. All birds observed or heard, whether flying overhead, nesting/roosting nearby, in the channel or on adjacent land areas, were noted, with comments associated with the observations, regardless of whether they were in the study site.

To better capture an understanding of shorebird habitat use (of the mudflats) and behavior in the RMMT Project Area, bimonthly surveys were conducted during the fall migration period between July 25, 2023 and October 26, 2023 and during these surveys more detailed data were collected using a more standardized methodology. The study area consisted of the marine development subarea and the adjacent upland subarea that is along the shoreline within the RMMT Project Area, as outlined in Figure 2. Transects targeted the coastal mudflats and started at the intersection between the marine development and habitat restoration subarea, extending south along the entire shoreline until the boundary of the RMMT Project Area (e.g., between two stars indicated in Figure 2). For each observation, information on presence (i.e., whether the bird was observed on pilings and structures, subtidal region, the mudflats or upland area) and behavior (i.e., foraging, loafing, fly by) were collected. Whether the observation was within the boundary of the study area was also indicated to differentiate between counts within the RMMT Project Area versus elsewhere within visual distance and comments associated with each observation were included if necessary. General meteorological data was obtained at the start of the survey, including wind speed, temperature, cloud cover, whether there was precipitation, and tidal information. These site visits were approximately 1 to 1.5 hours in duration. After the primary surveys of the RMMT Project Area, a brief site visit was conducted along the shoreline at RMMT North in the habitat restoration subarea but the duration was typically much shorter (Figure 2).

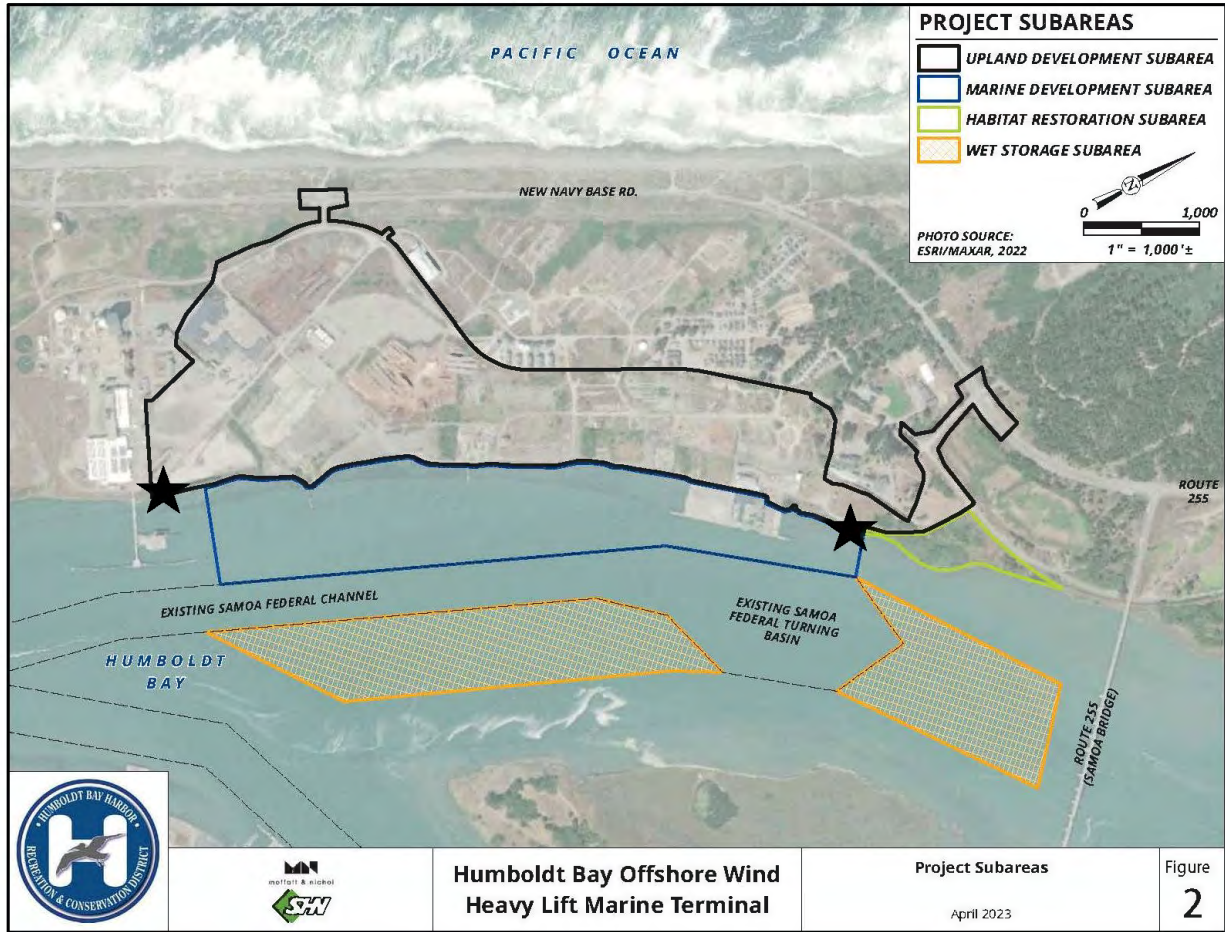


Figure 2. Project Subareas and Survey Locations

Notes: This figure is adapted from Figure 2 in District (2023). There are four subareas for the proposed Redwood Marine Multipurpose Terminal Project, which are outlined in distinct colors. The area surveyed includes the marine development subarea, which is outlined in blue and the adjacent upland area directly along the coastline. Visual, land based surveys and transects occurred between the two black stars. This encompasses the area where the old pier will be removed and reconstructed, and where there will be habitat change. There were additional, brief surveys of the mudflats adjacent to the habitat restoration subarea, which is the subarea outlined in yellow.

Table 1. Survey Information

Date and Location	Tides	Survey Start Time
February 17 Redwood Marine Multipurpose Terminal (RMMT)	Low of 3'19" (2:34 am) High of 8'3" (8:47 am) Low of -1' (4:02 pm) High of 5'10" (11:12 pm)	2:15 (low tide)
March 17 RMMT	Low of 3'8" (2:19 am) High of 7'4" (8:39 am) Low of -0'6" (3:45 pm) High of 5'7" (10:58 pm)	12:05 pm (low tide)
April 25 Clam Island Mitigation Site	High of 6'7" (3:38 am) Low of -0'1" (10:45 am) High of 4'11" (6:10 pm) Low of 3'8" (10:25 pm)	10:49 am (rising tide)
May 3 RMMT North	Low of 0'6" (5:25 am) High of 5'6" (11:47 am) Low of 1'5" (5:11 pm) High of 6'11" (11:41 pm)	8:46 am (rising tide)
July 25 RMMT	High of 4'9" (5:52 am) Low of 2'0" (11:14 pm) High of 6'8" (6:22 pm)	11:07 (lowering tide)
July 31 RMMT	Low of -1'6" (5:44 am) High of 5'8" (12:52 pm) Low of 3'2" (5:16 pm) High of 8'8" (11:35 pm)	7:40 am (low tide, rising)
August 18 RMMT RMMT North	High of 6'8" (1:34 am) Low of 0'1" (7:58 am) High of 6'2" (2:46 pm) Low of 2'3" (8:06 pm)	8:39 am (low tide, rising) 9:00 (rising)
August 31 RMMT RMMT North	High of 8'4" (12:23 am) Low of -1'2" (6:48 am) High of 6'11" (1:34 pm) Low of 1'2" (6:56 pm)	9:04 am (rising tide) 10:39 (rising tide)
September 16 RMMT RMMT North	High of 6'7" (1:24 am) Low of 0'11" (7:18 am) High of 6'9" (1:52 pm) Low of 1'1" (7:44 pm)	7:37 am (low tide and rising) 9:49 (rising tide)
September 30 RMMT RMMT North	High of 7'4" (1:12 am) Low of 0'6" (6:55 am) High of 8'0" (1:25 pm) Low of -0'5" (7:33 pm)	7:29 am (low tide and rising) 8:55 am (rising tide)
October 12		

Date and Location	Tides	Survey Start Time
RMMT	Low of 0'11" (5:08 am) High of 6'7" (11:47 am)	4:33 pm (lowering tide)
RMMT North	Low of 1'5" (5:37 pm) High of 6'3" (11:51 pm)	6:04 pm (rising tide)
October 26		
RMMT	Low of 0'4" (4:16 am) High of 7'5" (11:00 am)	4:30 pm (low tide and rising)
RMMT North	Low of 0'6" (4:59 pm) High of 6'8" (11:20 pm)	6:52 pm (rising)

Notes: This tidal information represents tides from a station at Eureka, California in Humboldt Bay on days when surveys occurred. Information was sourced from tides.net. These data contextualize the extent to which tides were dropping and rising for each survey and how fast they were changing. Whether the tide was falling or dropping during each respective survey is provided

RMMT Project Area Surveys

There was a total of ten surveys in the RMMT Project Area, including the initial site visits, counting 4,101 individual birds spanning 75 different species. A summary of each survey is provided in Table 2 and the full datasheets from each survey are provided in Appendix 1. The full datasheets (along with additional information) from the initial site visits were discussed in detail in a previous memo, which is provided as an attachment.

Table 2. Redwood Marine Multipurpose Terminal Survey Summary

Date	Total Counts	Species Observed	Notes
February 17	272	31	No behavior or exact location within the survey area was noted for these initial surveys. Counts were dominated by green-winged teal (GWTE; 100), dunlins (36), marbled godwits (MAGO; 25) and American wigeons (AMWI; 20). The documented birds were all observed south of the existing wharf.
March 17	214	21	No behavior or exact location within the survey area was noted for these initial surveys. Counts were dominated by GWTE (81), MAGO (43) and AMWI (19).
July 25	211	26	Dominated by double-crested cormorants (DCCO) loafing on piles/structures (66) and MAGO foraging in the mudflats (57), in addition to western gulls (WEGU; 34) loafing on piles/structures.
July 31	220	23	Dominated by DCCO loafing on pilings and structures (87;

Date	Total Counts	Species Observed	Notes
August 18	681	35	some were on occupied nests) and MAGO foraging in the mudflats (68), in addition to house finches (HOFI; 16) loafing in the uplands. Least sandpipers (LESA; 270) and western sandpipers (WESA; 121) foraging in the mudflats dominated counts. There were also a considerable number of HOFI (19) and California quail (CAQU; 14) foraging upland.
August 31	842	32	High total counts were dominated by WESA and LEA (330 and 160) that were foraging in the mudflats, European starlings (EUST; 87) loafing upland with some presence in the mudflats, MAGO (86) foraging in the mudflats, and WEGU and DCCO (41 and 35) loafing on piles and structures, including the existing RMMT Dock. There were also considerable counts of barn swallows and HOFI loafing upland on the power lines (24 and 19).
September 16	579	42	Dominated by EUST (120) foraging in the uplands and MAGO (85) foraging in the mudflats. There were also a considerable number of DCCO (63) loafing on piles and structures, although some of these were outside of the study area. There were also a number of Canada geese loafing and then flying off in the mudflats (49), and WEGU foraging in the mudflats and subtidal areas (46). Brandt's cormorants (BRAC; 43) were also commonly observed, but outside of the study area.
September 30	332	28	Dominated by MAGO foraging in mudflats (111) and DCCO loafing on pilings/structures (55).

Date	Total Counts	Species Observed	Notes
October 12	355	32	Dominated by MAGO and green-winged teals foraging in mudflats (85 and 46), and by WEGU loafing on piles/structure (51). There were considerable numbers of DCCO and BRAC that were loafing on piles and structures (40 and 34), but they were technically outside of the defined study area.
October 26	396	33	Counts were dominated by DCCO flying by off the nearby piles/structures (75). There were also a number of GWTE and MAGO (70 and 64) foraging in the mudflats.

Notes: This table summarizes all the data collected at the Redwood Marine Multipurpose Terminal. Survey specific data is available in Appendix 1 (except for the initial surveys that are provided in the attachment). For each survey (Date column), the total number of counts were summed together (Total Counts) and the number of distinct species observed are noted (Species Observed). The Notes column indicates the primary species observed that contribute to the Total Counts, and the typical behavior of those birds. The numbers in parentheses in this Notes column represent the counts for the species being referenced.

Mitigation Site Surveys

Other than the initial survey on May 3, the site visits to RMMT North were generally much shorter than those at RMMT. This is because the primary purpose of the surveys was to document use at the RMMT Project Area; however, because the mitigation site was nearby, observations were still taken. A total of 7 surveys documented 1,158 birds spanning 30 different species. A summary of each survey is provided in Table 3 and the full datasheets from each survey are provided in Appendix 2. The full datasheet (along with additional information) from the initial site visit on May 3, 2023 were discussed in detail in a previous memo, which is provided as an attachment.

Table 3. Redwood Marine Multipurpose Terminal North Mitigation Survey Summary

Date	Total Counts	Species Observed	Notes
May 3	312	38	No behavior or exact location within the survey area was noted for these initial surveys. The most commonly observed birds were western sandpipers (WESA; 100) and western gulls (WEGU; 70).
August 18	370	21	Dominated by observations of marbled godwits (MAGO) that were foraging in the mudflats north of the nearby bridge and outside of the

Date	Total Counts	Species Observed	Notes
August 31	454	15	study area. There were large numbers of loafing least or western sandpipers (60), and double-crested cormorants (DCCO) loafing in the mudflats (60 and 27), in addition to least sandpipers (LESA) foraging in the mudflats (23).
September 16	155	15	High counts of Canada goose (60) and MAGO (51) foraging in the mudflats.
September 30	123	9	MAGO and willets (WILL; 56 and 53) comprised over ¾ of the total counts.
October 12	51	8	MAGO (23) and WILL (20) foraging in the mudflats comprised over half of the counts.
October 26	5	3	Very minimal observations. A single DCCO loafing on nearby structures, BBPL (2) foraging in mudflats, and a single WEGU loafing in the mudflats.

Notes: This table summarizes all the data collected at the Redwood Marine Multipurpose Terminal North Eelgrass Mitigation Site. Survey specific data is available in Appendix 2. The initial survey from May 3 is available in the attachment. For each survey (Date column), the total number of counts were summed together (Total Counts) and the number of distinct species observed are noted (Species Observed). The Notes column indicates the primary species observed that contribute to the Total Counts, and the typical behavior of those birds. The numbers in parentheses in this Notes column represent the counts for the species being referenced.

Discussion

Shorebirds, waterfowl and brant and their use of the mudflats around RMMT is of particular interest because removing the existing RMTI and constructing the new facility will result in substantial habitat change, including conversion of existing intertidal mudflats into subtidal habitat. Humboldt Bay supports a rich shorebird species assemblage, largely because of the diverse foraging habitats such as sandy beaches, rocky intertidal zones, intertidal flats and seasonal wetlands (Schlosser and Eicher 2012). In fact, Humboldt Bay has been designated as a Site of International Importance in the Western Hemisphere Shorebird Reserve Network because it is an important estuary for migrating and wintering shorebirds in the Pacific flyway. Non-breeding shorebird species use intertidal mudflat areas of Humboldt Bay to forage although habitat use is different based on the species' morphology, habitat conditions and substrate type. Shorebirds consume a wide range of invertebrates and plants

and are opportunistic feeders, consuming prey that is available and concentrating where prey is most dense (Goss-Custard 1970, 1977, 1979 as cited *in* District 2015). Their distribution typically reflects the abundance of available prey. Shorebirds generally depart from roosts to feed in intertidal mudflats, and as high tides inundate mudflats, they return to their roosts. In addition to shorebirds, Humboldt Bay supports a variety of other waterbirds. In fact, Humboldt Bay is the primary waterbird migration stopover and wintering area between the Columbia River in Oregon and San Francisco Bay (District 2015). For the most part, shorebird and waterbird use of Humboldt Bay is well understood (Harris 2006).

The survey results presented in this memo provide useful site-specific data from a location in Humboldt Bay that has not previously been surveyed intensively. It offers initial information that can be incorporated into future quantitative analyses and impact studies once the design of the Project is finalized. There were certain species routinely observed in numbers in the RMMT Project Area. These include marbled godwits, and least and western sandpipers (primarily during the August surveys when they migrate) foraging in the mudflats. On certain occasions, these species were observed in the hundreds. Green-winged teals were also commonly observed foraging in the mudflats. Western gulls, and Brandt's and double-crested cormorants were routinely observed loafing on the piles and structures. Given the existing understanding of bird use of Humboldt Bay, our observations align with what we would have expected for surveys at low tide during this time of year. Note that these surveys represent a small snapshot in time and were not continuous nor extensive. They were only designed to provide some initial data that can be expanded on in the future and used to support additional studies.

References

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Appendix

A1. Project Site Surveys

Table A1.1. July 25 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
DCCO	Double-crested cormorant	66	Y					Y		Y	At least one on active nest.
MAGO	Marbled godwit	57			Y		Y			N	1 individual was flying by.
WEGU	Western gull	34	Y					Y		N	Two of these flew off.
BARS	Barn swallow	10				Y			Y	Y	
WHIM	Whimbrel	6			Y		Y			N	
LBCU	Long-billed curlew	5			Y			Y		N	
BRPE	Brown pelican	4		Y					Y	N	
LESA	Least sandpiper	4		Y	Y				Y	N	Some flew from the mudflat to the subtidal area, then out of the area. Others flew in directly to the mudflat.
OSPR	Osprey	4		Y				Y		N	One was loafing or nesting on piles/structures.
CATE	Caspian tern	3				Y			Y	N	
WILL	Willet	3	Y		Y		Y	Y		N	Some were loafing on piles and some were foaging in the mudflats.
AMGO	American goldfinch	1	NA	NA	NA	NA			Y		
BCCH	Black-capped chickadee	1	Y				U	U	U	N	
BEKI	Belted kingfisher	1	Y					Y		Y	
BLPH	Black phoebe	1				Y	Y			N	
BRAC	Brandt's cormorant	1	Y					Y		Y	
CANG	Canada goose	1			Y			Y		N	
CAQU	California quail	1				Y				N	
GBHE	Great blue heron	1	Y						Y	N	
GREG	Great egret	1			Y		Y			N	
HOFI	House finch	1							Y	N	
MALL	Mallard	1			Y					Y	Swimming.
SNEG	Snowy egret	1			Y		Y			N	
SOSP	Song sparrow	1				Y				N	
WCSP	White-crowned sparrow	1				Y	NA	NA	NA	N	Calling only.
WREN	Wrentit	1				Y	NA	NA	NA	N	Singing only.

Table A1.2. July 31 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
DCCO	Double-crested cormorant	87	Y					Y		N	A few occupied nests but most were roosting on pilings and docks.
MAGO	Marbled godwit	68			Y		Y			N	
HOFI	House finch	16				Y		Y		N	
OSPR	Osprey	9	Y				NA	NA	NA	N	Most on occupied nests.
BASH	Baralo shearwater	6				Y	Y			N	
WEGU	Western gull	5	Y				Y			N	One was loafing in the mudflats.
BBPL	Black-bellied plover	4			Y		Y			N	
HOSP	House sparrow	3				Y	NA	NA	NA	N	
WILL	Willet	3			Y		Y			N	
WREN	Wrentits	3				Y	NA	NA	NA	N	Calling from upland.
BCCH	Black-capped chickadee	2				Y	Y			N	One individual calling and the other singing.
BCNH	Black-crowned night heron	2			Y		Y			N	
PIGU	Pigeon guillemot	2							Y	N	Fly bys headed north.
BEWR	Bewick's wren	1			Y		NA	NA	NA	N	One singing bird singing a whisper-like song. Potentially dispersing hybrids.
BHCO	Brown-headed cowbird	1				Y	Y			N	
CANG	Canada goose	1		Y	Y		NA	NA	NA	N	Moved from mudflat to subtidal (fleeing).
CAQU	California quail	1				Y		Y		N	Calling from upland.
CATE	Caspian tern	1	NA	NA	NA	NA			Y	N	
GBHE	Great blue heron	1			Y		Y			N	
LBCU	Long-billed curlew	1			Y		Y				
PUFI	Purple finch	1				Y	Y			N	
SOSP	Song sparrow	1				Y	Y			N	
WHIM	Whimbrel	1			Y		Y			N	

Table A1.3. August 18 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
LESA	Least sandpiper	270			Y		Y			N	
WESA	Western sandpiper	121			Y		Y			N	
MAGO	Margbled godwit	100			Y		Y			N	
HOFI	House finch	50				Y	Y			N	
CAQU	California quail	19				Y	Y			N	
SOSP	Song sparrow	14				Y	NA	NA	NA	N	Calling; in the willow trees.
WILL	Willet	13			Y		Y			N	
DCCO	Double-crested cormorant	11	Y					Y		Y	One individual flew by; several active nests.
AMGO	American goldfinch	10				Y	Y			N	
BARS	Barn swallow	10				Y	Y			N	
LBCU	Long-billed curlew	7			Y		Y			N	
RBGU	Ring-billed gull	6			Y		Y			N	
WHIM	Whimbrel	6			Y		Y			N	
BHCO	Brown-headed cowbird	5				Y	Y			N	
WEGU	Western gull	5			Y		Y			N	Two were fly bys from the piles/structures.
EUST	Eurasian starling	4				Y		Y		N	
BCNH	Black-crowned night-heron	3			Y		Y			N	
OCWA	Orange-crowned warbler	3				Y	NA	NA	NA	N	Calling.
OSPR	Osprey	3	Y						Y	N	One juvenile in nest.
BCCH	Black-capped chickadee	2				Y	NA	NA	NA	N	Calling; in the willow trees.
BRPE	Brown pelican	2		Y			Y			Y	
COMU	Common murre	2	Y				Y			Y	
WCSP	White-crowned sparrow	2				Y	NA	NA	NA	N	Calling from the willow trees.
YEWA	Yellow warbler	2				Y	NA	NA	NA	N	Calling from the willow trees.
BEKI	Belted kingfisher	1	Y				Y			N	
BLTU	Black turnstone	1			Y		NA	NA	NA	N	Calling.
CANG	Canada goose	1		Y			NA	NA	NA	N	Swimming.
GBHE	Great blue heron	1		Y			Y			N	
LEGO	Lesser goldfinch	1				Y	NA	NA	NA	N	Calling.
MGWA	MacGillivray's warbler	1				Y	NA	NA	NA	N	Calling from the willow trees.
PESA	Pectoral sandpiper	1							Y	Y	Calling from Tulawat Island.
SBIG	Short-billed gull	1		Y			Y			Y	Rare! Foraging on the edge of the bay.
SNEG	Snowy egret	1			Y					N	
WIWA	wilson's warbler	1				Y	NA	NA	NA	N	Calling from the willow trees.
WREN	Wrentit	1				Y	NA	NA	NA	N	Calling from the willow trees.

Table A1.4. August 31 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)			Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes	
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
WESA	Western sandpiper	330			Y		Y			N	
LESA	Least sandpiper	160			Y		Y			N	
EUST	European starling	87				Y		Y		N	Most were present on the power lines, but some were on the mudflats.
MAGO	Marbled godwit	86			Y		Y			N	
WEGU	Western gull	41	Y					Y		N	All roosting on RMMT1 Dock.
DCCO	Double-crested cormorant	35	Y					Y		N	2 active nests.
BARS	Barn swallow	24				Y		Y		N	Most were present on the power lines, but four were foraging over the mudflats.
HOFI	House finch	19				Y		Y		N	Most were on powerlines.
CANG	Canada goose	15							Y	Y	
WILL	Willet	7			Y		Y			N	
AMGO	American goldfinch	5				Y	Y			N	
LBCU	Long-billed curlew	4			Y		Y			N	
OSPR	Osprey	4	Y					Y		N	Two of these were calling from the upland area.
SEPL	Semipalmated plover	3			Y					N	
BCCH	Black-capped chickadee	2				Y				N	Calling.
SOSP	Song sparrow	2				Y				N	Calling.
VSGW	Violet-green swallow	2				Y			Y	N	
WHIM	Whimbrel	2									
ANHU	Anna's hummingbird	1			Y					N	Calling.
BCNH	Black-crowned night-heron	1							Y	N	
BEKI	Belted kingfisher	1				Y		Y		N	Powerline.
BLPH	Black phoebe	1				Y				N	Calling.
CORA	Common raven	1				Y				N	Calling.
COYE	Common yellowthroat	1								N	Calling.
EUCD	Eurasian collared-dove	1				Y				Y	Singing south of the study area.
GBHE	Great blue heron	1	Y					Y		N	
GREG	Great egret	1			Y		Y			N	
GWGU	Glaucous-winged gull	1	Y					Y		N	All roosting on RMMT1 Dock.
LEGO	Lesser goldfinch	1				Y		Y		N	
OCWA	Orange-crowned warbler	1				Y				N	Calling.
WREN	Wrentit	1				Y				N	Calling.
YEWA	Yellow warbler	1				Y	Y				

Table A1.5. September 16 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
EUST	Eurasian starling	120				Y	Y			N	Foraging in wax myrtle.
MAGO	Marbled godwit	85			Y		Y			N	
DCCO	Double-crested cormorant	63	Y					Y		Y	23 of these were technically outside the study area, including one nest.
CANG	Canada goose	49			Y			Y	Y	N	Flew off on approach
WEGU	Western gull	46		Y			Y				A large portion of these were also foraging in the mudflats.
BRAC	Brandt's cormorant	43	Y					Y		Y	
BRPE	Brown pelican	19				Y		Y		Y	15 were roosting on Tulawat Island and the remainder were flying over the subtidal region.
WCSP	White-crowned sparrow	18				Y	Y			N	
AMGO	American goldfinch	17				Y		Y		N	Most were loafing, but several were heard only.
GWFG	Greater white-fronted goose	15	NA	NA	NA	NA			Y	Y	
CAQU	California Quail	12				Y	Y			N	
MALL	Mallard	11		Y			Y			N	Some were foraging in the eelgrass bed.
WILL	Willet	11			Y		Y			N	
HOSP	House sparrow	10				Y	NA	NA	NA	N	Calling.
HOFI	House finch	5				Y	NA	NA	NA	N	Calling.
SEPL	Semipalmated plover	5			Y		Y			N	
LESA	Least sandpiper	4			Y		Y			N	Two ended up flying off.
RBGU	Ring-billed gull	4			Y		Y			N	One was foraging in the subtidal habitat.
WHIM	Whimbrel	4			Y		Y			N	
YEWA	Yellow warbler	4				Y	Y			N	In willow trees.
BCNH	Black-crowned night-heron	3			Y		Y			N	One moved from foraging in the mudflats to loaf on piles and structures.
GBHE	Great blue heron	3		Y			Y			N	
LBCU	Long-billed curlew	3			Y		Y			N	
BBPL	Black-bellied plover	2			Y		Y			N	
BLPH	Black phoebe	2				Y	NA	NA	NA	N	Calling.
OCWA	Orange-crowned warbler	2				Y	Y			N	One of these was calling as well.
SBDO	Short-billed dowitcher	2			Y		Y			N	
SNEG	Snowy egret	2			Y		Y			N	One was foraging in the subtidal habitat.
WREN	Wrentit	2				Y	NA	NA	NA	N	Calling.
BCCH	Black-capped chickadee	1				Y	NA	NA	NA	N	Calling.
BEKI	Belted kingfisher	1	Y	Y			Y			N	
BEWR	Bewick's wren	1				Y	NA	NA	NA	N	Calling, rare around the bay.
BLTE	Black tern	1		Y			Y			N	
COLO	Common loon	1		Y				Y		Y	
COYE	Common yellowthroat	1				Y	NA	NA	NA	N	Calling.
DEJU	Dark-eyed junco	1				Y	Y			N	
FOSP	Fox sparrow	1				Y	Y			N	
GREG	Great egret	1		Y			Y			N	
NOFL	Pelagic cormorant	1	NA	NA	NA	NA	NA	NA	NA	Y	Calling from Tulawat Island.
PECO	Pelagic cormorant	1	Y					Y		Y	
SOSP	Song sparrow	1				Y	NA	NA	NA	N	Calling.
WESA	Western sandpiper	1			Y		Y			N	

Table A1.6. September 30 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By	Outside Study	Notes
MAGO	Marbled godwit	111			Y		Y			N	
DCCO	Double-crested cormorant	55	Y					Y		N	
BARS	Barn swallow	20				Y		Y		N	
HOFI	House finch	20				Y	NA	NA	NA	N	Heard only.
WILL	Willet	16			Y		Y			N	
SEPL	Semipalmated plover	14			Y		Y			N	
WEGU	Western gull	12	Y					Y		N	Combination of loafing on piles and foraging on structures (equally split).
RBGU	Ring-billed gull	11			Y		Y			N	
BRAC	Brandt's cormorant	8	Y					Y		N	
CAQU	California quail	8				Y	Y			N	
EUST	European starling	8				Y		Y		N	
MALL	Mallard	7		Y			Y			N	
BBPL	Black-bellied plover	4			Y		Y			N	
WREN	Wrentit	4				Y	NA	NA	NA	N	Heard only.
GBHE	Great blue heron	3		Y			Y			N	
GCSP	Golden-crowned sparrow	3				Y	Y			N	
LBCU	Long-billed curlew	3			Y		Y			N	
SOSP	Song sparrow	3				Y	Y			N	
WHIM	Whimbrel	3			Y		Y			N	
BCNH	Black-crowned night-heron	1			Y		Y			N	
COLO	Common loon	1		Y				Y		N	
CORA	Common rosefinch	1				Y			Y	N	
FOSP	Fox sparrow	1				Y	NA	NA	NA	N	Heard only.
GREG	Great egret	1		Y			Y			N	
GWGU	Glaucous-winged gull	1			Y			Y		N	
NOFL	Northern flicker	1				Y	NA	NA	NA	N	Heard only.
SNEG	Snowy egret	1			Y		Y			N	
WCSP	White-crowned sparrow	1				Y	NA	NA	NA	N	Heard only.

Table A1.7. October 12 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Piles & Structure	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By	Outside Study	Notes
MAGO	Marbled godwit	85			Y		Y			N	
WEGU	Western gull	51	Y					Y		N	Several of these were hybrids.
GWTE	Green-winged teal	46			Y		Y			N	
DCCO	Double-crested cormorant	40	Y					Y		N	A portion of these were technically outside the study area.
BRAC	Brandt's cormorant	34	Y					Y		Y	
MYWA	Myrtle warbler	14				Y	NA	NA	NA	N	10 were calling only and not seen, but four were observed foraging upland.
SUSC	Surf scoter	11	NA	NA	NA	NA	NA	NA	NA	Y	10 of these were outside the study area and in the Bay, but one was observed loafing in the subtidal habitat of the study area.
WILL	Willet	11			Y		Y			N	One of these was loafing on piles/structures.
CAQU	California quail	10				10	NA	NA	NA	N	Running into willows.
BCCH	Black-capped chickadee	6				Y	NA	NA	NA	N	Calling only.
HOSP	House sparrow	5				Y	NA	NA	NA	N	Calling only.
SNEG	Snowy egret	5			Y		Y			N	
BBPL	Black-bellied plover	4			Y		Y			N	One of these was loafing on piles/structures.
GBHE	Great blue heron	4		Y			Y			N	
COLC	Colombian crane	3	NA	NA	NA	NA	NA	NA	NA	Y	In Bay.
GREG	Great egret	3			Y		Y			N	
PECO	Pelagic cormorant	3	Y					Y		Y	
RBGU	Ring-billed gull	3			Y		Y			N	One was observed loafing.
GCSP	Golden-crowned sparrow	2				Y	NA	NA	NA	N	Fished out.
KILL	Killdeer	2	NA	NA	NA	NA			Y	N	Flyovers.
LBCU	Long-billed curlew	2			Y		Y			N	
AUWA	Audobon's warbler	1				Y	NA	NA	NA	N	Calling only.
BCNH	Black-crowned night-heron	1	Y					Y		N	
BEKI	Belted kingfisher	1	Y					Y		N	
BLPH	Black phoebe	1				Y		Y		N	Calling on wire.
FOSP	Fox sparrow	1				Y	NA	NA	NA	N	Calling only.
RCKI	Ruby-crowned kinglet	1				Y	NA	NA	NA	N	Calling only.
RTLO	Red-throated loon	1	NA	NA	NA	NA	NA	NA	NA	Y	In Bay
SEPL	Semipalmated plover	1			Y			Y		N	
SOSP	Song sparrow	1				Y	NA	NA	NA	N	Heard only.
WCSP	White-crowned sparrow	1				Y	NA	NA	NA	N	Fished out.
WHIM	Whimbrel	1			Y		Y			N	

Table A2.8. October 26 Survey at Redwood Marine Multipurpose Terminal

Species Information			Presence in Project Area (Y/N)			Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes	
4-Letter Code	Common Name	Count	Piles & Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
DCCO	Double-crested cormorant	75	Y						Y	Y	25 of these were loafing on piles/structures within the study area.
GWTE	Green-winged teal	70			Y		Y			N	
MAGO	Marbled godwit	64			Y		Y			N	
CAQU	California quail	30				30	NA	NA	NA	N	Flushed.
BRAC	Brandt's cormorant	25	Y						Y	Y	
WILL	Willet	25			Y		Y			N	
WCSP	White-crowned sparrow	21				Y	Y			N	
WEGU	Western gull	21	Y					Y		N	Most were loafing on piles/structures; six were foraging in the mudflats, one foraging in the subtidal zone.
GCSP	Golden-crowned sparrow	9				Y	Y			N	
BBPL	Black-bellied plover	7			Y		Y			N	
SBIG	Short-billed gull	8		Y			Y			N	Four of these were foraging on the mudflats.
MYWA	Myrtle warbler	5				Y	NA	NA	NA	N	
SNEG	Snowy egret	5			Y		Y			N	
AMPI	American pipet	4				Y				N	Heard only.
GBHE	Great blue heron	4			Y		Y			N	One of these was foraging in the subtidal zone.
RBGU	Ring-billed gull	3			Y		Y			N	
SOSP	Song sparrow	3				Y	Y			N	
PECO	Pelagic cormorant	2	Y						Y	Y	
AUWA	Audobon's warbler	1				Y	NA				Heard only.
BCCH	Black-capped chickadee	1				Y	NA				Heard only.
BCNH	Black-crowned night-heron	1	Y					Y		N	
BLPH	Black phoebe	1				Y	NA	NA	NA	N	Heard only.
BLTU	Black turnstone	1			Y				Y	N	Heard only.
BRPE	Brown pelican	1		Y			Y			N	
COLO	Common loon	1		Y			Y			N	
FOSP	Fox sparrow	1				Y	NA	NA	NA	N	
GREG	Great egret	1			Y		Y				
GRYE	Greater yellowlegs	1			Y		Y			N	
LBCU	Long-billed curlew	1			Y		Y			N	
NOHA	Northern harrier	1				Y	Y			Y	
PEFA	Peregrine falcon	1	NA	NA	NA	NA			Y	N	
RTLO	Red throated loon	1		Y				Y		N	
SUSC	Surf scoter	1		Y			Y			N	

A2. RMMT North Site Surveys

Table A2.1. August 18th Survey at Redwood Marine Multipurpose Terminal North Mitigation Site

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Nearby Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
MAGO	Marbled godwit	164			Y		Y			Y	All north of the bridge.
PEEP	Least or Western sandpiper	60			Y			Y		N	
DCCO	Double-crested cormorant	27			Y			Y		N	Of the ones in the study area (22), most were loafing in the mudflats, but two were loafing on nearby structures and five were foraging in the subtidal habitat. Five were outside of the study area, loafing on the nearby bridge.
LESA	Least sandpiper	23			Y		Y			N	
WILL	Willet	18			Y		Y			N	
WEGU	Western gull	16			Y		Y	Y		N	
BRPE	Brown pelican	11	Y					Y		N	Two of these were foraging in the subtidal habitat outside of the survey area, and four were loafing in the mudflats within the study area.
SEPL	Semipalmated plover	10			Y		Y			N	
CANG	Canada goose	9			Y			Y		N	
WESA	Western sandpiper	6			Y		Y			N	
RECR	Red crossbill	5				Y			Y	N	
AMGO	American goldfinch	4				Y	NA	NA	NA	Y	Calling only.
RBGU	Ring-billed gull	4			Y		Y			N	One of these was loafing in the mudflats and not foraging.
LBCU	Long-billed curlew	3			Y		Y			N	
WHIM	Whimbrel	3			Y		Y			N	
CEDW	Cedar waxwing	2				Y	NA	NA	NA	Y	Calling only.
GREG	Great egret	1		Y			Y			N	
LBDO	Long-billed dowitcher	1			Y		Y			N	
OCWA	Orange-crowned warbler	1				Y	NA	NA	NA	Y	Calling only.
SPSA	Spotted sandpiper	1			Y		Y			N	
WREN	Wrentits	1				Y	NA	NA	NA	Y	Calling only.

Table A2.2. August 31st Survey at Redwood Marine Multipurpose Terminal North Mitigation Site

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Nearby Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
LESA	Least sandpiper	160			Y		Y			N	
MAGO	Marbled godwit	150			Y		Y			N	
WESA	Western sandpiper	80			Y		Y			N	
CANG	Canada goose	20			Y			Y		N	
AMGO	American goldfinch	10				Y	NA	NA	NA	N	Calling only.
RBGU	Ring-billed gull	6			Y			Y		N	
SEPL	Semipalmated plover	6			Y		Y			N	
WILL	Willet	5			Y		Y			N	
DCCO	Double-crested	4			Y			Y		N	
SBDO	Short-billed dowitcher	4			Y		Y			N	
WEGU	Western gull	3			Y		Y			N	
WHIM	Whimbrel	3			Y		Y			N	
BRPE	Brown pelican	1			Y			Y		N	
LBDO	Long-billed dowitcher	1			Y		Y			N	
RUTU	Ruddy turnstone	1			Y		Y			N	

Table A2.3. September 16th Survey at Redwood Marine Multipurpose Terminal North Mitigation Site

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Nearby Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
CANG	Canada goose	60			Y		Y			N	These appeared to be drinking, and potentially were the same birds on the previous survey at the project site
MAGO	Marbled godwit	51			Y		Y			N	
WILL	Willet	15			Y		Y			N	
WEGU	Western gull	6			Y		Y			N	
DCCO	Double-crested cormorant	4	Y					Y		N	
LESA	Least sandpiper	4			Y		Y			N	
SEPL	Semipalmated sandpiper	4			Y		Y			N	
BCCH	Black-capped chickadee	3			Y		Y			N	
LBCU	Long-billed curlew	2			Y		Y			N	
BRPE	Brown pelican	1				Y	Y			N	
FOSP	Fox sparrow	1			Y		Y			N	
GREG	Great egret	1		Y			Y			N	
GWTE	Great-winged teal	1			Y			Y		N	
WHIM	Whimbrel	1			Y		Y			N	
WREN	Wrentit	1			Y		Y			N	

Table A2.4. September 30th Survey at Redwood Marine Multipurpose Terminal North Mitigation Site

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Nearby Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
MAGO	Marbled godwit	56			Y		Y			N	
WILL	Willet	53			Y		Y			N	
WEGU	Western gull	5			Y			Y		N	
AMGO	American goldfinch	2				Y	NA	NA	NA	N	Calling only.
LBCU	Long-billed curlew	2			Y		Y			N	
PUFI	Purple finch	2				Y	NA	NA	NA	N	Calling only.
MYWA	Myrtle warbler	1				Y	NA	NA	NA	Y	Calling only.
WREN	Wrentits	1				Y	NA	NA	NA	N	Calling only.
DCCO	Double-crested cormorant	1	Y				Y			N	

Table A2.5. October 12th Survey at Redwood Marine Multipurpose Terminal North Mitigation Site

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Nearby Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
MAGO	Marbled godwit	23			Y		Y			N	
WILL	Willet	20			Y		Y			N	
LBCU	Long-billed curlew	2			Y		Y			N	
WEGU	Western gull	2			Y			Y		N	
BBPL	Black-bellied plover	1			Y		Y			N	
DCCO	Double-crested cormorant	1	Y					Y		N	
GBHE	Great blue heron	1			Y		Y			N	
GREG	Great egret	1			Y		Y			N	

Table A2.6. October 26th Survey at Redwood Marine Multipurpose Terminal North Mitigation Site

Species Information			Presence in Project Area (Y/N)				Behavior Information (Y/N)			Outside Study Area (Y/N)	Notes
4-Letter Code	Common Name	Count	Nearby Structures	Subtidal	Mudflat	Upland	Foraging	Loafing	Fly By		
DCCO	Double-crested cormorant	1	Y				Y			N	
BBPL	Black-bellied plover	2			Y		Y			N	
WEGU	Western gull	2			Y			Y		N	



Memorandum

Project # 4628-02

May 30, 2023

To: Adam Wagschal, Senior Coastal Planner, Moffatt & Nichol

From: H. T. Harvey & Associates:
Sophie Bernstein, Marine Ecologist
Rob Fowler, Ornithologist
Sharon Kramer, Senior Marine Ecologist and Principal
Scott Terrill, Senior Avian Ecologist and Principal

Subject: Humboldt Offshore Wind Port Upgrades, Shorebird Special Studies and Site Surveys

Background and Goals

The Humboldt Bay Harbor, Recreation, and Conservation District intends to remove an existing wharf (Redwood Marine Terminal I [RMTI]) and associated derelict pilings in Humboldt Bay, California and reconstruct the Redwood Marine Multipurpose Terminal (RMMT) to support the development of offshore wind and other industrial uses (the Project). The Project also will mitigate for the removal of eelgrass associated with construction by converting several potential identified areas of unvegetated substrate in Humboldt Bay into eelgrass habitat. Potential mitigation sites include Redwood Marine Multipurpose Terminal North (RMMT North), Clam Island, and King Salmon beach (Figure 1).

A series of *Shorebird/Brant Surveys* were conducted to observe and document shorebird and brant occurrence: two reconnaissance surveys were conducted within the RMMT Project Area, one reconnaissance survey at Clam Island and one at RMMT North. A reconnaissance survey was intended at King Salmon beach; however, since no shorebirds were present at this mitigation site during the previous few visits to the area, it was not resurveyed (R. Fowler Pers. Comm., 2023). This memo summarizes our findings.



Figure 1. Mitigation Sites and Survey Locations

Notes: This figure is adapted from Merkel & Associates' *Preliminary Eelgrass Mitigation and Monitoring Plan* (2022). The Redwood Marine Multipurpose Terminal (RMMT) Project Area encompasses the existing Redwood Marine Terminal I, which will be removed and reconstructed. Clam Island and King Salmon eelgrass mitigation sites are adjacent to Entrance Bay in the South Bay. The Redwood Marine Multipurpose Terminal North (RMMT North) eelgrass site is directly north of the RMMT footprint.

Survey Results

Four reconnaissance site visits of approximately 1 to 1.5 hours duration per site were completed by local ornithologist Rob Fowler between February 17 and May 3, 2023. Since the purpose of these surveys was to document shorebird species composition and numbers of individuals of each species, site visits were conducted at low tide when shorebird habitat is maximized. Binoculars and spotting scopes were used to make bird observations. All results were submitted to eBird (Sullivan et al. 2009). Although the goal was to improve understanding of shorebird use of the mudflats associated with the Project Area and the mitigation sites, all birds observed whether flying overhead, nesting/roosting nearby, in the channel or on adjacent land areas, were noted, with comments associated with the observations.

Survey 1: Redwood Marine Multipurpose Terminal

The first survey was conducted on February 17 at the RMMT Project Area. No shorebirds were documented at the RMTI wharf within the RMMT Project Area, because the wharf extends out onto the bay and covers the available mudflats. It also appears that the RMMT North mitigation site has high elevation mudflats that slope steeply into the bay, resulting in no avian activity at low tide, except for a roosting green-winged teal.

The documented birds were observed south of the existing RMTI wharf, starting at 40.815207°N, -124.183073°W through 40.808474°N, -124.188135°W (Figure 2). A total of 272 individuals was observed comprising 31 species (Table 1). This survey is associated with the eBird submission #5128814620 (Fowler 2023a). Observations were made at low tide between 2:15 and 3:45 pm (see Table 2 for tidal data during the survey periods).

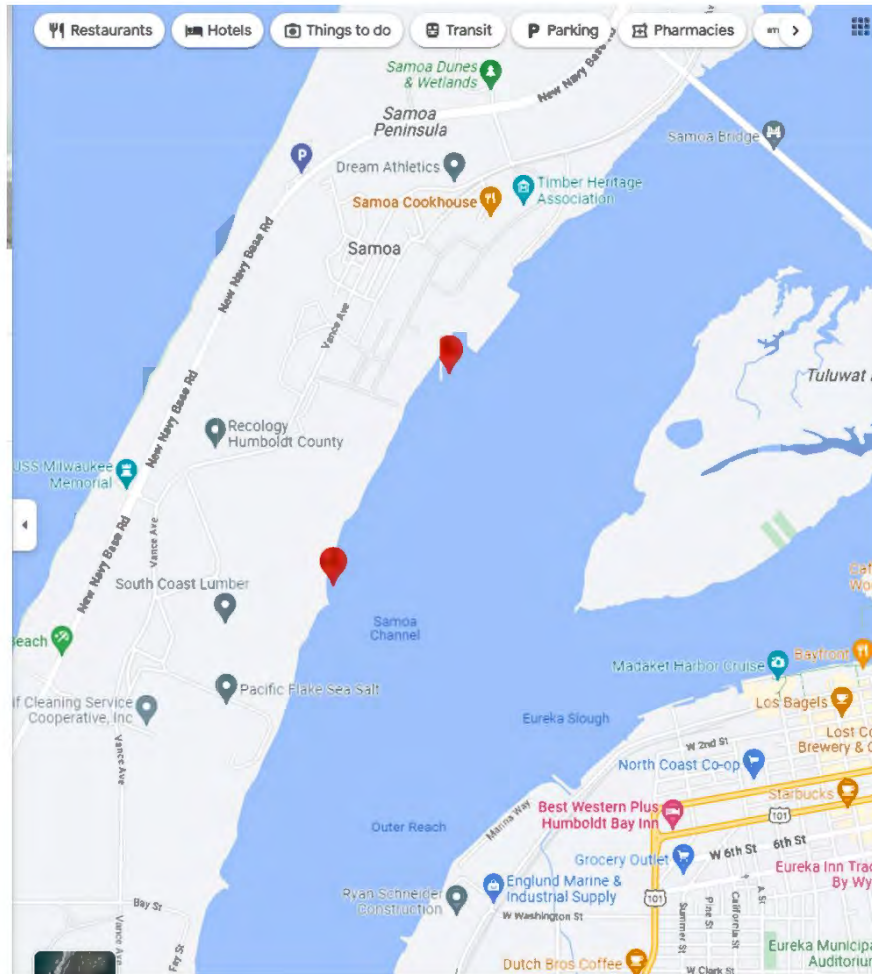


Figure 2. Extent of Observations from February Survey

Notes: No shorebirds were observed at the existing Redwood Marine Terminal I (RMTI) because the wharf itself covers the available mudflats. Avian species were observed between the northern and southern points marked in red on the above map south of RMTI.

Table 1. Redwood Marine Multipurpose Terminal Vicinity¹ February Survey Results

Species	Number Observed	Observation Notes ²
Canada goose	1	
American wigeon	20	
Green-winged teal	100	Observed at 40.822036°N, - 124.173872°W.
Lesser scaup	2	
Bufflehead	5	
Hooded merganser	3	
California quail	1	
Pied-billed grebe	1	

Species	Number Observed	Observation Notes²
Horned grebe	3	
Western grebe	13	
Clark's grebe	1	
Black-bellied plover	5	Observed at 40.8144761°N, - 124.1842915°W.
Semipalmated plover	3	
Whimbrel	3	
Long-billed curlew	2	
Marbled godwit	25	Observed at 40.8144761°N, - 124.1842915°W.
Dunlin	36	Observed at 40.8144761°N, - 124.1842915°W.
Greater yellowlegs	1	
Willet	8	
Ring-billed gull	1	
Western gull	6	
Glaucous-winged gull	1	
Western x glaucous-winged gull (hybrid)	2	
Red-throated loon	5	
Common loon	3	
Brandt's cormorant	10	Observed at 40.8049703°N, - 124.1877100°W. This is one of only breeding locations in the bay and not within the Project area.
Double crested cormorant	1	
Great blue heron	2	
Belted kingfisher	1	
House finch	1	
Fox sparrow (sooty)	1	
Golden-crowned sparrow	3	
Yellow-rumped warbler (Myrtle)	2	

¹This list contains species observed in the vicinity of the proposed Redwood Marine Multipurpose Terminal but not on any mitigation site itself. Only one species, a green-winged teal, was observed at Redwood Marine Multipurpose Terminal North Mitigation Site.

²Only birds using the mudflats within the RMMT Project Area have coordinates associated with them in the observation notes, other birds listed were observed in habitats other than the mudflats.

Table 2. Tidal Data for Survey Dates, from Eureka, Humboldt Bay California

Date	Survey Location	Tides	Survey Start Time
February 17	Redwood Marine Multipurpose Terminal	Low of 3'19" (2:34 am) High of 8'3" (8:47 am) Low of -1' (4:02 pm) High of 5'10" (11:12 pm)	2:15 (low tide)
March 17	Redwood Marine Multipurpose Terminal	Low of 3'8" (2:19 am) High of 7'4" (8:39 am) Low of -0'6" (3:45 pm) High of 5'7" (10:58 pm)	12:05 pm (low tide)
April 25	Clam Island Mitigation Site	High of 6'7" (3:38 am) Low of -0'1" (10:45 am) High of 4'11" (6:10 pm) Low of 3'8" (10:25 pm)	10:49 am (rising tide)
May 3	Redwood Marine Multipurpose Terminal North Mitigation Site	Low of 0'6" (5:25 am) High of 5'6" (11:47 am) Low of 1'5" (5:11 pm) High of 6'11" (11:41 pm)	8:46 am (rising tide)

This tidal information represents tides from a station at Eureka, California in Humboldt Bay from days when surveys occurred. Information was sourced from tides.net. This data contextualizes the extent to which tides were dropping and rising for each survey and how fast they were changing. Whether the tide was falling or dropping during each respective survey is provided

Survey 2: Redwood Marine Multipurpose Terminal

A second survey was conducted at RMMT on March 17. This survey was conducted along a falling tide and when mudflats started to get exposed. The tide was too high to survey at 10:30 am (3.45 ft) (Table 2). The survey officially started at 12:05 pm (1.77 ft tide) and spanned the RMMT Project Area south of the RMTI wharf (Figure 1), ending at 1:20 pm.

A total of 214 individuals was observed across the entire transect, including 21 distinct species (Table 3, Figure 2). This survey is associated with the eBird submission #S131153720 (Fowler 2023b). Only one species was present at the RMMT North mitigation site, a foraging green-winged teal.

Table 3. Redwood Marine Multipurpose Terminal Vicinity¹ March Survey Results

Species	Number Observed	Observation Notes
Brant (black)	8	Observed across the channel at Tuluwat Island; 40.8063595°N, -124.1790985°W.
Canada goose	1	
American wigeon	19	
Green-winged teal	81	Observed on mudflats at proposed RMMT North mitigation site; 40.8206091°N, -124.1740572°W.
Surf scoter	4	
Bufflehead	4	

Species	Number Observed	Observation Notes
Red-breasted merganser	1	
Horned grebe	4	
Western grebe	6	
Anna's hummingbird	1	
Long-billed curlew	2	Observed at the only real exposed mudflat at 2.17 foot (ft) tide; 40.8155756°N, -124.1830225°W.
Marbled godwit	43	Seven were observed at 40.8077385°N, -124.1885784°W. The remainder were seen foraging on the south end of Tuluwat Island at 40.8063595°N, -124.1790985°W.
Willet	2	Observed with the long-billed curlew at the only real exposed mudflat at 2.17 ft tide; 40.8155756°N, -124.1830225°W. Another Willet observed at 40.8077385°N, -124.1885784°W.
Western gull	1	
Common loon	2	
Brandt's cormorant	6	Present on the same platform as February's survey, which is outside (south) of the Project Area; 40.8049683°N, -124.1877137°W.
Pelagic cormorant	4	Observed at the same location as the Brandt's cormorant; 40.8049683°N, -124.1877137°W.
Snowy egret	2	
Osprey	6	
Northern flicker (red-shafted)	1	
Black phoebe	1	
Black-capped chickadee	4	Mixed flock with chickadees at 40.8111468°N, -124.1873117°W, on the adjacent vegetated shore.
Violet-green swallow	1	
Bushtit	4	
Ruby-crowned kinglet	1	
White-crowned kinglet	1	
Golden-crowned kinglet	1	
Song sparrow	1	
Orange-crowned warbler (lutescens)	1	
Yellow-rumped warbler (Audubon's)	1	

¹This list contains species observed in the vicinity of the proposed Redwood Marine Multipurpose Terminal but not on any mitigation site itself. Only one species, a green-winged teal, was observed at the Redwood Marine Terminal North Mitigation Site.

Survey 3: Clam Island

Clam Island was surveyed on April 25 from the Fields Landing boat ramp. Observations started at 10:49 am at a -0.1 ft tide. The survey finished when the tide was at 1.76 ft, at which point almost all of Clam Island was submerged, except for a small sliver on the north end that is within the proposed mitigation area. A total of 4,940 individuals were observed during this survey, including 48 species, one hybrid and one taxonomic group (Table 4). This survey is associated with the eBird submission #S135132408 (Fowler 2023c).

Table 4. Clam Island Survey Results

Species	Number Observed	Observation Notes
Brant (black)	1300	All present on the south spit side of the bay.
Cackling goose (Aleutian)	30	One single bird foraging and roosting in grass near parking lot. The rest were flyovers.
Northern Shoveler	1	Foraging on edge of Clam Island on rising tide.
Gadwall	2	Foraging on edge of Clam Island on rising tide.
Eurasian wigeon	1	Foraging on edge of Clam Island on rising tide.
American wigeon	2	Foraging on edge of Clam Island on rising tide.
Mallard	2	Foraging on edge of Clam Island on rising tide.
Northern pintail	155	Foraging on edge of Clam Island on rising tide, and somewhat interesting to have such high observation numbers this late in April.
Greater scaup	40	
Lesser scaup	15	
Surf scoter	85	
Bufflehead	40	
Common goldeneye	6	
Red-breasted merganser	4	
Horned grebe	3	
Red-necked grebe	1	
Eared grebe	20	
Western grebe	8	
Clark's Grebe	2	
Black-bellied plover	40	All foraging on Clam Island.
Semipalmated plover	50	Mostly flyovers.
Whimbrel	6	All foraging on Clam Island.

Species	Number Observed	Observation Notes
Marbled godwit	680	Counted and estimated by 10s. All present in Clam Island
Sanderling	20	All foraging on Clam Island.
Dunlin	60	All foraging on Clam Island.
Least sandpiper	1	Audibly observed.
Western sandpiper	40	All foraging on Clam Island.
Peep sp.	1700	Small individuals that weren't dunlin flushed up from Clam Island.
Short-billed dowitcher	415	All observed foraging on Clam Island. Total number was estimated via counting and estimated by 10s.
Willet (Western)	10	All foraging on Clam Island.
Pigeon guillemot	2	FOY
Ring-billed gull	10	All foraging on Clam Island.
Western gull	20	Many of those observed were foraging on Clam Island.
Glaucous-winged gull	2	
Western x Glaucous-winged (hybrid) gull	1	
Caspian tern	32	
Red-throated loon	2	
Common loon	15	
Double crested cormorant	60	
Great blue heron	5	
Great egret	33	
Snowy egret	4	
Turkey vulture	1	
Osprey	2	Observed on an occupied nest.
American crow	4	
Tree swallow	1	
Violet-green swallow	1	
House sparrow	2	
Song sparrow	1	Singing bird, potentially.

It appears as though shorebirds preferred using Clam Island over the other potential mudflats seen within the vicinity of Fields Landing. A large portion of Clam Island was covered in eelgrass and nearly every shorebird observed was foraging within the eelgrass zone. The shorebirds started foraging on the higher portions of the island that were too high for eelgrass growth once the eelgrass itself was covered by the rising tide. Most birds, however, flew off and roosted south of Fields Landing instead of foraging in the part of the Clam Island that

remained available but lacked eelgrass. Some large shorebirds (godwits and dowitchers) remained at the exposed portion of Clam Island.

The proposed eelgrass mitigation at Clam Island involves lowering the elevation of the mudflats to promote eelgrass growth. Based on these observations, it seems unlikely to adversely impact shorebirds (R. Fowler Pers. Comm., 2023). However, it is important to consider whether shorebirds will have less time to forage on Clam Island prior to departing to roost, and whether foraging opportunities with expanded eelgrass beds post mitigation would be higher quality.

Survey 4: Redwood Marine Multipurpose Terminal North

The final survey was conducted at the proposed RMMT North eelgrass mitigation site on May 3. Observations began at 8:46 am at a 3.46 ft tide from 40.82390°N, -124.17441°W. By 9:15 am, all of the mudflats south of Samoa Bridge were covered by the incoming tide. All mudflats were covered by 9:45 am. A total of 312 individuals were observed during this survey, including 38 species and one bird identified to genus (Table 5). This survey is associated with the eBird submission #S136065331 (Fowler 2023d).

Table 5. Redwood Marine Multipurpose Terminal North Survey Results

Species	Number Observed	Observation Notes
Brant (black)	12	
Canada goose	12	
Greater scaup	10	
Bufflehead	3	
Western grebe	10	
Anna's hummingbird	1	
Rufous/Allen's Hummingbird	1	
Whimbrel	4	Observed at Samoa bridge mudflats.
Long-billed curlew	2	One was observed on the Tuluwat mudflats and one on Samoa bridge mudflats
Western sandpiper	100	Observed flying around, and only briefly landed on the extreme north end of the Samoa bridge mudflat at 40.826529°N, -124.167320°W.
Spotted sandpiper	2	Both observed on the last remaining mudflat under the bridge until 9:44 am.
Willet	4	All observed on the Tuluwat mudflats.
Western gull	70	
Glaucous-winged gull	1	
Caspian tern	6	
Common Loon	1	

Species	Number Observed	Observation Notes
Double-crested cormorant	4	
Brown pelican	2	
Great blue heron	7	
Great egret	17	On occupied nest.
Osprey	1	
Pacific-slope flycatcher	1	
Common raven	5	
Black-capped chickadee	1	
Violet-green swallow	4	
Barn swallow	1	
Cliff swallow	10	
Wrentit	2	
Swainson's thrush	1	
American robin	1	
Cedar waxwing	2	
Purple finch (western)	1	
White-crowned sparrow	5	
Song sparrow	2	
Brown-headed cowbird	1	
Brewer's blackbird	1	
Orange-crowned warbler (lutescens)	1	
Yellow-rumped warbler (Audobon's)	1	
Wilson's Warbler	1	

Only a select few shorebirds (e.g. whimbrel and long-billed curlews) were using the mudflats on the rising tide during this survey. Based on these observations, reducing the elevation of these mudflats may not severely impact shorebird use (R. Fowler Pers. Comm., 2023). It may even increase shorebird presence because it will increase foraging opportunities in the eelgrass beds.

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