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(City of Fort Bragg)

December 11, 2025

APPENDICES

Appendix A – Applicant Proposed Mitigation

Appendix B – Environmental Monitoring Plan

Appendix C – Brine Discharge Modeling Report

Appendix D – Entanglement Plan

Appendix E – Oil Spill Prevention Plan

Appendix F – NPDES Permit



Appendix A: Applicant Proposed Mitigation

3 APPLICANT PROPOSED MITIGATION

APM BIO-1 The nearshore environment of Mill Bay is dynamic. To minimize any impacts to sensitive habitat that may develop between when the surveys discussed in the Project Description (Appendix 1) were completed and when the Iceberg installation occurs, a new pre-construction survey of the pipeline pathway will be completed. This survey will be completed to verify conditions observed previously reported in the Project Description (Appendix 1) and identify the best current alignment for the permeate pipeline to shore. The best alignment will be one that avoids vegetated hard substrate and prefers either soft-bottom habitat or denuded hard substrate. The survey will also inspect for any abalone that may have moved to the area. The new survey will be completed between 30 and 90 days, weather permitting, before the installation begins. A post-construction survey will be completed to confirm that the placement and removal of the Iceberg, its mooring system, and conveyance pipeline to shore with its associated anchorage occurred within planned specifications and resulted in minimal, if any, permanent changes to the seafloor habitat. The comparison between the new pre-construction and post-construction surveys will also identify if any habitat impacts have occurred that would require additional mitigation.

APM BIO-2 As detailed in Appendix 1. After consulting with staff from the State Water Resources Control Board and the North Coast Regional Water Quality Control Board, we propose the following mitigation for impacts to all forms of marine life. Mitigation for all forms of marine life entrained will follow the procedure for interim mitigation of once-through-cooled power plant entrainment by calculating a fee per volume of water circulated, with an additional monitoring and maintenance fee. The Iceberg deployment schedule is dependent on the date all permits are received. Therefore, the minimum and maximum fees were calculated for different years as presented in Table 4. The minimum fee assumes the field deployment occurs only in 2025 resulting in a mitigation fee of \$372.49. If the full field deployment occurs in 2026, the maximum mitigation fee would be \$383.66. The final mitigation fee, dependent upon when the Iceberg is deployed, will be donated to a group conducting marine mitigation within the CFB area, identified by the City and Oneka, and agreed upon by the North Coast Regional Water Quality Control Board.

Table 4. Proposed Mitigation for Impacts to All Forms of Marine Life Resulting from Entrainment through the Iceberg’s Fine Mesh Intake Screen.

Year	2024 Fee/MG	3% Annual Escalation	Max MGD	Total Annual Project Flow (MG)	Subtotal	Final with 20% M&M
2025	\$12.51	\$12.89	0.066	24.09	\$310.41	\$372.49
2026	\$12.51	\$13.27	0.066	24.09	\$319.72	\$383.66

APM BIO-3 As detailed in Section 2 of the Environmental Monitoring Plan (Appendix 2), a Marine Mammal Monitoring Plan will be implemented during the installation and removal of all marine components: the Iceberg, the Iceberg’s mooring system, the permeate pipeline, and the pipeline’s anchoring system.



APM BIO-4 To prevent marine mammal entanglement to the extent possible and respond if an entanglement occurs, the applicant has prepared an Entanglement Mitigation Plan included as Appendix 3 to the Project Description (Appendix 1 to this IS/MND). APM BIO-3 commits the applicant to implement this Entanglement Mitigation Plan.

AMP BIO-5 The project's onshore construction should either be initiated and/or completed from August 31 to January 31, outside of the general bird nesting season, or include monitoring by a qualified biologist. If land disturbance activities cannot be completed or initiated outside of the general bird nesting season, a pre-construction nesting bird survey should be performed by a qualified biologist no more than 7 days prior to the initiation of construction. The survey should cover the Project Area and surrounding areas within 500 feet. If active bird nests are found during the survey, a qualified biologist should monitor nesting birds during construction to ensure they are not disturbed by the project activities. If the monitor notices behavioral changes in the birds, an appropriate no-disturbance buffer should be established by the qualified biologist. The no-disturbance buffer will remain in place until it is determined that the young have fledged (left the nest) or the nest otherwise becomes inactive (e.g., due to predation). If more than 14 days of no work occurs during the nesting season, birds may begin nesting; therefore, if more than 14 days of no work occurs during the nesting season and will need to resume to complete the proposed Project, an additional nesting survey is recommended.

AMP CULT-1 Tribal Monitoring is required during earth moving activities, which shall be paid for by the applicant. The Sherwood Valley Band of Pomo Tribal Historic Preservation Office will be contacted at least ten days prior to construction. If cultural resources are encountered during construction, work on-site shall be temporarily halted within 50 feet and the area marked off. Project personnel shall avoid altering the cultural resources encountered and their context until a qualified professional archaeologist and tribal monitor has evaluated the situation and provided appropriate recommendations. Project personnel shall not collect or move cultural resources. No social media posting. If human remains or burial materials are discovered during project construction, work within 50 feet of the discovery location, and within any nearby area reasonably suspected to overlie human remains, will cease (Public Resources Code, Section 7050.5). The Mendocino County Coroner will be contacted. If the coroner determines that the remains are of Native American origin, it is necessary to comply with state laws regarding the disposition of Native American remains (Public Resources Code, Section 5097).

4 REFERENCES

City of Fort Bragg (CFB). 2024. Initial Study/Mitigated Negative Declaration: Wastewater Treatment Facility Bio-Solid Storage and Dryer Buildings & PV Project.

Mendocino Audubon Society. 2019. Citizen science pelagic cormorant monitoring in Mendocino and Northern Sonoma County, California – 2009-2018 seasons. Available at: <https://www.mendocinocoastaudubon.org/news/cormorant-monitoring>.



CITY OF FORT BRAGG

APPENDIX B: Environmental Monitoring Plan



Prepared For

CITY OF FORT BRAGG

Prepared By

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TWB ENVIRONMENTAL RESEARCH & CONSULTING

Date

MARCH 2025

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PROJECT DESCRIPTION AND PURPOSE

This document details the environmental monitoring plan for the City of Fort Bragg's (City's) Oneka Desalination Buoy Pilot Project (Pilot Project). It describes the planned monitoring, sampling, and analysis of the Iceberg's interaction with the area's marine environment. Key marine conditions to be investigated include the following:

1. Construction and decommissioning marine wildlife monitoring,
2. Operational impacts to planktonic life, and
3. Operational impacts to water quality and verification of the brine dilution modeling.

Oneka's desalination Iceberg buoy model is being deployed as a pilot study under Department of Water Resources Agreement (Grant) No. 4600015131 to determine its operational characteristics and to quantify the effect of a single Iceberg on the marine environment. These data generated in the Pilot Project could provide the foundation for a future, utility-scale Iceberg deployment where multiple units are used to augment the City's potable water supply. It is expected that a utility-scale Iceberg deployment will require a new permitting effort. The Pilot Project data will be valuable for understanding how the utility-scale deployment will interact with the environment and will assist California regulators with their project review during the permitting process. The Pilot Project Description is included as Attachment 1 to this document for reference.

1 ENVIRONMENTAL SETTING

The City is located in western Mendocino County on a stretch of the rugged Northern California coastline between the Noyo River and Pudding Creek. It is one of the, comparatively, more urban areas within the mostly rural Mendocino County. Historically, the local economy has been dominated by natural resource-based business enterprises such as timber, fishing, and tourism. The 2002 closure of the Georgia-Pacific Mill reduced the timber industry's stake in the local economy. Fishing and tourism remain significant parts of the coastal economy.

The coastal waters where the buoy for this pilot project will be moored is a mix of sandy plains interspersed among high-rugosity rocky reefs underlying a high-wave-energy environment (Figure 1). In support of the pilot study, a detailed map of the seafloor was created using side-scan sonar imaging followed by remotely-operated vehicle surveys to verify the structures identified during the sonar imaging. This resulted in identifying the mapped soft-bottom habitat displayed in tan in Figure 1. Kelp canopy mapped during three years (1989, 1999, and 2016) is also shown in Figure 1. Two of the three years represent near-maximum canopy area (1989 and 1999) and the third year is the most recent year for which a GIS shapefile is available (2016) from the California Department of Fish and Wildlife's Marine GIS unit (https://filelib.wildlife.ca.gov/Public/R7_MR/). Kelp canopy areas can be used as a proxy for the presence of hard substrate. Canopy forming kelps require hard substrate to attach to in high-energy wave areas to maintain position. Not all hard substrate, however, supports canopy-forming kelp. This can be due to turbidity, high-concentration of suspended solids that scour the substrate and eliminate canopy-forming kelp holdfasts, an abundance of herbivorous predators, and others

(Schiel and Foster 2015). Marine protected areas (MPAs) in the area were also added to the map (Figure 1) to assess the spatial proximity of the proposed project to protected areas.

Recent environmental surveys in compliance with the City’s wastewater treatment plant (AMS 2023) documented a variety of marine resources such as various algal species, sea urchins (including *Strongylocentrotus purpuratus* and *S. franciscanus*), and red abalone (*Haliotis rufescens*). Foliose algal species such as *Desmarestia* and *Nereocystis* were either absent or present in very low densities consistent with the overall trend of declining algal communities along the Northern California coastline (Rodgers-Bennet and Catton 2019). The algal community decline has coincided with an increase in the sea urchin populations, which may be correlated to the algal decline, and an increase in exposed rocky habitat. During the four surveys in the area since 2007, AMS (2023) reported a gradual habitat conversion from sand to rocky substrate throughout the area. This coincides with two significant drought episodes in California.

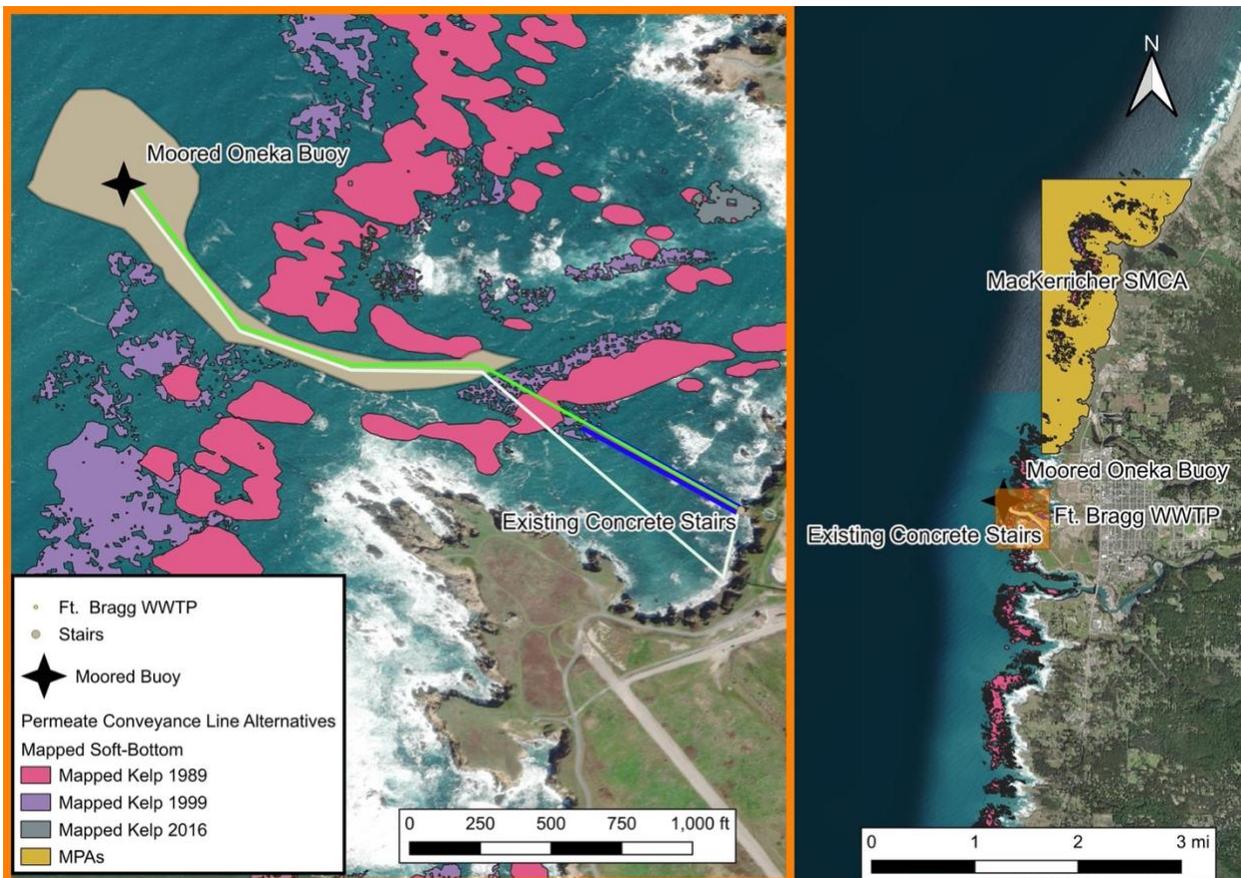


Figure 1. Map of the proposed pilot project and surrounding habitat, existing infrastructure, and location of the nearest Marine Protected Area (MPA). The mapped soft-bottom habitat is represented by the beige area in the map. Mapped kelp areas drawn from the California Department of Fish and Wildlife’s Marine GIS. Green (preferred) and white (alternative) permeate conveyance lines depicted on the map. The existing wastewater treatment plant outfall is shown in blue.

A circular area measuring approximately 6.3 acres of predominantly sandy substrate (the bowl) was identified offshore of the City’s wastewater treatment plant (WWTP) and deemed suitable for the placement of the Iceberg’s mooring system with minimal risk to sensitive habitat. A sand



channel extending from the offshore bowl inshore to near the terminus of the City's WWTP ocean outfall was identified and deemed suitable for the placement of the permeate pipeline. The permeate pipeline will have to cross hard substrate that supported canopy-forming kelp in both the 1989 and 1999 California Department of Fish and Wildlife mapping surveys. No kelp canopy was reported in this area during 2016 mapping effort or during the side-scan sonar and ROV surveys performed for this project as detailed in the Project Description. The proposed permeate pipeline alignment from the offshore bowl to the existing WWTP ocean outfall is the least impactful identified. The channel's minimum width is 71 ft; wide enough for the permeate pipeline and its anchoring system to reach the shoreline.

Using the maps provided in Figure 1, the preferred Iceberg mooring site is approximately 570 ft from the nearest canopy-forming kelp based on the 1989 mapping survey, approximately 300 ft from the nearest canopy-forming kelp based on the 1999 mapping survey, and 0.75 miles from the nearest MPA, MacKerricher State Marine Conservation Area (SMCA).

2 MARINE WILDLIFE MONITORING

The Iceberg installation and decommissioning will require construction work boats and barges. These crafts will primarily be used to deploy and retrieve the Iceberg, the mooring system and the associated large ballast weights and cables. Additional large craft work will be needed to deploy and retrieve the permeate pipeline and its ballast. No pile-driving or similar activities known to produce potentially damaging acoustic signals are planned for the construction or decommissioning. The potential impacts of the construction include harassment of marine mammals and interactions with sea turtles.

2.1 MARINE WILDLIFE IN CALIFORNIA WATERS

A total of fourteen (14) marine animals that are included under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), the Species of Concern (SOC), or a combination of any of these three statues may be present along California's coast. The following subsections include data for each species, including the protected species status, the minimum



Table 1. Species that are expected to be observed in the project area. Species that are listed are those that are included under the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), or are considered (Species of Concern).

Taxonomic Group	Species	Common Name	ESA	MMPA	Minimum Population Estimate	Current Population Trend	Most Likely Period of Occurrence
Cetaceans - Large Whale Species	<i>Balaenoptera musculus</i>	Blue Whale	Endangered	Depleted, Strategic	1,551	Stable	Summer, Fall
	<i>Balaenoptera physalus</i>	Fin Whale	Endangered	Depleted, Strategic	8,127	Stable	Year-round, peaks during Summer and Fall
	<i>Balaenoptera borealis</i>	Sei Whale	Endangered	Depleted, Strategic	374	Data Deficient	Fall, Winter, Spring
	<i>Balaenoptera edeni</i>	Bryde's Whale			Data Deficient	Data Deficient	Summer, Winter
	<i>Balaenoptera acutorostrata</i>	Minke Whale			369	Data Deficient	Spring, Summer, Fall, with peaks during the Spring
	<i>Eschrichtius robustus</i>	Gray Whale			26,960	Increasing	Fall, Winter, Spring, primarily Winter
	<i>Megaptera novaeangliae</i>	Humpback Whale	Endangered	Under Review	2,784	Increasing	Spring, Summer, Fall, with peaks during the Fall
Cetaceans - Dolphins and Porpoises	<i>Delphinus spp.</i>	Common Dolphin					
	<i>Delphinus delphis delphis</i>	Short-Beaked Common Dolphin			839,325	Increase	Year-round, peaks during Summer
	<i>Delphinus capensis capensis</i>	Long-Beaked Common Dolphin			68,432	Potential Increase	Year-round, peaks during Fall
	<i>Tursiops truncatus</i>	Bottlenose Dolphin			346	Stable	Year-round
	<i>Orcinus orca</i>	Killer Whale			276; 77	Stable; Decreasing	Year-round; Summer



Taxonomic Group	Species	Common Name	ESA	MMPA	Minimum Population Estimate	Current Population Trend	Most Likely Period of Occurrence
	<i>Lagenorhynchus obliquidens</i>	Pacific White-Sided Dolphins			21,195	Data Deficient	Cold-water months
	<i>Grampus griseus</i>	Risso's Dolphin			4,817	Data Deficient	Cold-water months
	<i>Pseudorca crassidens</i>	False Killer Whale			No relevant stock	No relevant stock	Rare, but March and April 2018
Pinnipeds	<i>Zalophus californianus</i>	California Sea Lion			233,515	SST dependent	Year-round, peaks in Summer
	<i>Phoca vitulina richardii</i>	Harbor Seal			27,348	Decreasing	Year-round
	<i>Mirounga angustirostris</i>	Northern Elephant Seal			81,368	Increasing	Year-round, peaks in Winter, Spring, and Summer
	<i>Enhydra lutris nereis</i>	Southern Sea Otter	Endangered	Depleted, Strategic	3,272	Increasing	Year-round, peaks in Winter and Spring
	<i>Arctocephalus townsendi</i>	Guadalupe Fur Seal	Threatened	Depleted, Strategic	15,830	Increasing	Rare, but April 2018
	<i>Callorhinus ursinus</i>	Northern Fur Seal			7,524	Increasing, but El Niño Dependent	Year-round
Sea Turtles	<i>Caretta caretta</i>	Loggerhead Turtle	Threatened		1,212	Increasing	Year-round but rare
	<i>Chelonia mydas</i>	Green Turtle	Endangered		20,062	Increasing	
	<i>Dermochelys coriacea</i>	Leatherback Turtle	Endangered		308	Decreasing	Year-round



population estimate, the current population trend, and the most likely periods of occurrence for the species and stocks relevant to the project region.

2.1.1 Cetaceans - Large Whale Species

2.1.1.1 BLUE WHALE

There are two populations of Blue Whales (*Balaenoptera musculus musculus*) in the North Pacific Ocean (Carretta et al. 2019). The population relevant to the project region is the Eastern North Pacific Stock, which ranges from the Gulf of Alaska to the bottom of the Exclusive Economic Zone (EEZ) on the U.S. West Coast (Carretta et al. 2019).

Protection Status – Blue Whales are considered “Endangered” by the ESA, and “Depleted” and “Strategic” under the MMPA (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for this species was calculated from the lower 20th percentile of the mark-recapture estimate (log-normal distribution) for a total of 1,551 whales (Carretta et al. 2019).

Current Population Trend – Using mark-recapture estimates to calculate the current population trend of this species indicates no population increase since the 1990s. It has been suggested that this population reached 97% of its carrying capacity in 2013 (Carretta et al. 2019).

Most Likely Periods of Occurrence – Blue Whales are most likely to occur along the U.S. West Coast in the summer and fall for feeding, but individuals have been found feeding north and south of this region as well (Carretta et al. 2019).

2.1.1.2 FIN WHALE

There are insufficient data to determine precise stocks for Fin Whales (*Balaenoptera physalus physalus*) in the Northern Hemisphere. However, from a conservation standpoint, Fin Whales that are present off the coasts of California, Oregon, and Washington are relevant to the present project area (Carretta et al. 2019).

Protection Status – Fin Whales are considered “Endangered” under the ESA and “Depleted” and “Strategic” under the MMPA (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for this species was calculated as the lower 20th percentile of the posterior distribution of the 2014 abundance estimate for a total of 8,127 whales (Carretta et al. 2019).

Current Population Trend – Fin Whale abundance increased between 1991 and 2008 by an average of 7.5% each year. From 2008 to 2014, the population appeared to stabilize (Carretta et al. 2019).

Most Likely Periods of Occurrence – Fin Whales occur year-round in the Gulf of Alaska, the Gulf of California, California (specifically the Southern California Bight), Oregon, and Washington. Using data derived from CalCOFI surveys between 2004 and 2008, Fin Whales were spotted in California waters across all seasons, with peak abundances observed during the summer and fall (Douglas et al. 2014).

2.1.1.3 SEI WHALE



There is one population of Sei Whales (*Balaenoptera borealis borealis*) in the North Pacific Ocean. The stock that is relevant to the project site is the Eastern North Pacific Stock (Carretta et al. 2019). However, this species tends to use offshore waters and are not associated with coastal features (Carretta et al. 2019).

Protection Status – Sei Whales are considered “Endangered” under the ESA and “Depleted” and “Strategic” under the MMPA (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for this species was calculated as the lower 20th percentile of the log-normal distribution of abundances that were estimated between 2008 and 2014 via vessel line transect surveys for a total of 374 whales (Carretta et al. 2019).

Current Population Trend – There are no data to determine Sei Whale abundance trends (Carretta et al. 2019).

Most Likely Periods of Occurrence – Sei Whales are likely to occur in coastal California waters in all seasons apart from summer (Barlow 1994).

2.1.1.4 BRYDE’S WHALE

There are a total of seven stocks of Bryde’s Whales (*Balaenoptera edeni*) that span the North Pacific Ocean, South Pacific Ocean, and Peruvian coasts. The Eastern Tropical Pacific stock is relevant to this project and spans east of 150°W and includes the Gulf of California and waters off the California Coast (Carretta et al. 2019)

Protection Status – Bryde’s Whales are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – There is no current estimate of minimum population, because the only estimate for this species was in 1993 (Carretta et al. 2019).

Current Population Trend – There are no data to determine Bryde’s Whale abundance trends (Carretta et al. 2019).

Most Likely Periods of Occurrence – A project using passive acoustic telemetry found that Bryde’s Whales are present in the Southern California Bight between summer and early winter seasons (Kerosky et al. 2012).

2.1.1.5 MINKE WHALE

There are three stocks of Minke Whales (*Balaenoptera acutorostrata scammoni*) in the North Pacific Ocean; the stock that spans the waters of California, Oregon, and Washington is relevant to the project region (Carretta et al. 2019).

Protection Status – Minke Whales are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate was calculated as the lower 20th percentile of the log-normal distribution of abundances that were estimated between 2008 and 2014 via ship surveys during the summer and fall seasons for a total of 369 whales (Carretta et al. 2019).



Current Population Trend – There are no data to determine Minke Whale abundance trends (Carretta et al. 2019).

Most Likely Periods of Occurrence – Minke Whales occur year-round off the coast of California (Carretta et al. 2019). Using data derived from CalCOFI surveys between 2004 and 2008, Minke Whales were spotted in California waters during the spring, summer, and fall seasons, with peak abundances observed during the spring (Douglas et al. 2014).

2.1.1.6 GRAY WHALE

There are two stocks of Gray Whales (*Eschrichtius robustus*) in the Pacific Ocean; the stock relevant to this project site is the Eastern North Pacific Stock, which includes the coastal waters of Alaska down to the southern region of the Gulf of California (Carretta et al. 2019).

Protection Status – Gray Whales are not currently considered at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate was calculated from the 2015/2016 abundance estimate multiplied by the coefficient of variation for a total of 26,960 whales (Carretta et al. 2019).

Current Population Trend – The population has been increasing over the years, potentially due to an increase in feeding conditions in the arctic as ice begins to melt (Carretta et al. 2019).

Most Likely Periods of Occurrence – Grey Whales occur in the southern region of the North American coast during the fall and in the northern region of the North American coast during the spring seasons. Most individuals pass the California coast in the middle of January to the middle of February (Swartz et al. 2006).

2.1.1.7 HUMPBACK WHALE

The stock structure of Humpback Whales (*Megaptera novaeangliae*) is currently being evaluated by the National Marine Fisheries Service. Historically, several populations of Humpback Whales were identified in the North Pacific Ocean based on breeding areas. The population that is relevant to the project site is the California, Oregon, Washington stock (Carretta et al. 2019).

Protection Status – Humpback Whales are currently considered “Endangered” under the ESA and is under review for the MMPA (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate was calculated as the lower 20th percentile of the log-normal distribution from mark-recapture estimates for a total of 2,784 whales (Carretta et al. 2019).

Current Population Trend – There has been a long-term increase in the population of Humpback Whales (8% per year), but the population did not increase linearly each year (some years showed decreasing population trends) (Carretta et al. 2019).

Most Likely Periods of Occurrence – Using data derived from CalCOFI cruises between 2004 and 2008, Humpback Whales were spotted in California waters during the spring, summer, and fall seasons, with peak abundances observed during the fall (Douglas et al. 2014).



2.1.2 Cetaceans - Dolphins and Porpoises

2.1.2.1 COMMON DOLPHIN

There are two species that comprise the Common Dolphin group – the Short-Beaked Common Dolphin (*Delphinus delphis delphis*) and the Long-Beaked Common Dolphin (*Delphinus capensis capensis*). The Short-Beaked Common Dolphin is widely distributed across the coast of California, and the stock relevant to the project region includes the waters of California, Oregon, and Washington (Carretta et al. 2019). The Long-Beaked Common Dolphin distribution overlaps with the Short-Beaked Common Dolphin Distribution, and the population relevant to the Southern California region is the California Stock (Carretta et al. 2019).

Protection Status – Short-Beaked Common Dolphins and Long-Beaked Common Dolphins are not considered at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for Short-Beaked Common Dolphins is calculated from the log-normal 20th percentile from abundance estimates between 2008 and 2014 for a total of 839,325 dolphins (Carretta et al. 2019). The current minimum population estimate for Long-Beaked Common Dolphins is calculated from the log-normal 20th percentile from abundance estimates between 2008 and 2014 for a total of 68,432 whales (Carretta et al. 2019).

Current Population Trend – There has been an increase in Short-Beaked Common Dolphin population abundances during warm-water periods and likely is the result of the northward movement of this stock from Mexico (Carretta et al. 2019). There have been no formal statistical analyses for the population trend for Long-Beaked Common Dolphins, but vessel-based line-transect surveys have recorded higher abundance estimates in recent years (Carretta et al. 2019).

Most Likely Periods of Occurrence – Short-Beaked Common Dolphins are abundantly distributed along the Californian coast and their periods of occurrence change seasonally and inter-annually (Carretta et al. 2019). Long-Beaked Common Dolphins are more commonly found inshore along the west coast of Baja California and their periods of occurrence change seasonally and inter-annually. Using data derived from CalCOFI cruises between 2004 and 2008, Short-Beaked Common Dolphins and Long-Beaked Common Dolphins were spotted in California waters throughout all seasons, with peak abundances for Short-Beaked Common Dolphins in the summer and Long-Beaked Common Dolphins in the fall (Douglas et al. 2014).

2.1.2.2 COMMON BOTTLENOSE DOLPHIN

Common Bottlenose Dolphins (*Tursiops truncatus*) have a circumglobal distribution in tropical and warm-temperate waters. The population relevant to the project is the California Coastal stock (Carretta et al. 2019).

Protection Status – Common Bottlenose Dolphins are not considered at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for Common Bottlenose Dolphins was collected from the minimum number of individually identified animals



that were documented during surveys between 2009 and 2011 for a total of 346 dolphins (Carretta et al. 2019).

Current Population Trend – The Common Bottlenose Dolphin population appears to be stable, based on data from mark-recapture abundances in 1987 to 1989, 1996 to 1998, and 2004 to 2005 (Carretta et al. 2019). The number of individually identifiable Common Bottlenose Dolphins surveyed in 2009 to 2011 indicates that the population may be growing (Carretta et al. 2019).

Most Likely Periods of Occurrence – Common Bottlenose Dolphins have been known to occur year-round in California and Baja California since 1983 when ocean temperatures began to increase (Carretta et al. 2019).

2.1.2.3 KILLER WHALE (ORCA)

There are eight Killer Whale (*Orcinus orca*) stocks that are recognized within the U.S. EEZ. The stock relevant to this project is the Eastern North Pacific Offshore stock and the Eastern North Pacific Southern Resident stock (Carretta et al. 2019).

Protection Status – Killer Whales in the Eastern North Pacific stock are not considered at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019). However, Killer Whales in the Eastern North Pacific Southern Resident stock were listed as “Endangered” under the ESA in 2005 and are “Strategic” under the MMPA (Carretta et al. 2019). This stock was considered “Depleted” under the MMPA prior to its addition to the ESA in 2005 (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for Killer Whales in the Eastern North Pacific Offshore stock were calculated from the lower 20th percentile of the estimate reported by Ford et al. (2014) for a total of 276 whales (Carretta et al. 2019). The current minimum population estimate for the Eastern North Pacific Southern Resident stock was calculated by counting individually identifiable animals for a total of 77 whales (Carretta et al. 2019).

Current Population Trend – The Eastern North Pacific Offshore Killer Whale stock is considered stable by Ford et al. (2014). This assessment was based on high annual survival rates (0.98) and annual recruitment rates (0.02) (Carretta et al. 2019, Ford et al. 2014). The Eastern North Pacific Southern Resident stock has declined since 1995, but was thought to have increased between 1974 and the 1990’s by 1.8% per year (Carretta et al. 2019).

Most Likely Periods of Occurrence – Killer Whales can occur along the coasts of California year-round (Forney and Barlow 1998), but the Eastern North Pacific Southern Resident stock is most sighted during the summer in the inland waters of Washington and southern British Columbia (Carretta et al. 2019).

2.1.2.4 PACIFIC WHITE-SIDED DOLPHIN

Protection Status – Pacific White-Sided Dolphins (*Lagenorhynchus obliquidens*) are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).



Minimum Population Estimate – The current minimum population estimate for Pacific White-Sided Dolphins was calculated as the log-normal 20th percentile of the average abundance estimates from 2008 to 2014, for a total of 21,195 dolphins (Carretta et al. 2019).

Current Population Trend – No long-term population trends for Pacific White-Sided Dolphins have been identified, as the distribution and abundances of this species are variable across seasons and years (Carretta et al. 2019).

Most Likely Periods of Occurrence – Pacific White-Sided Dolphins are primarily off California during periods of cold water (winter months; Carretta et al. 2019).

2.1.2.5 RISSO'S DOLPHIN

Protection Status – Risso's Dolphins (*Grampus griseus*) are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for Risso's Dolphins was calculated as the log-normal 20th percentile of geometric mean abundance estimates between 2008 and 2014, for a total of 4,817 dolphins (Carretta et al. 2019).

Current Population Trend – No long-term population trends for Risso's Dolphins have been identified, as the distribution and abundances of this species are variable across seasons and years (Carretta et al. 2019).

Most Likely Periods of Occurrence – Risso's Dolphins are found primarily off California during periods of cold water (winter months) (Carretta et al. 2019).

2.1.2.6 FALSE KILLER WHALE

There are several different False Killer Whale (*Pseudorca crassidens*) stocks that are found worldwide in tropical waters (Carretta et al. 2019). However, no stocks are relevant to the project and do not typically occur along southern California.

2.1.3 Pinnipeds

2.1.3.1 CALIFORNIA SEA LION

There are five distinct populations of California Sea Lions (*Zalophus californianus*) that span the United States and Mexico. However, since there is no joint management between countries, the stock relevant to the project area is the U.S. stock (Carretta et al. 2019).

Protection Status – California Sea Lions are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic), as the stock estimate is nearly 40% above the maximum net productivity level (Carretta et al. 2019).

Minimum Population Estimate – According to the most recent Pacific Region Marine Mammal Stock Assessment, the minimum population size in 2014 is 233,515 animals (Laake et al. 2018; Carretta et al. 2019), which appears to be reaching the estimated carrying capacity of this species. The minimum population size represents the lower 95% confidence interval for the 2014 population size estimate (Carretta et al. 2019).



Current Population Trend – Using data from 1975 to 2014, population trends were derived using annual pup counts, annual survivorship estimates using mark-recapture methods, and estimates of human-caused injuries, mortalities and bycatch. Results indicate annual pup survival was higher for females (0.600) compared to males (0.574, Carretta et al. 2019; DeLong et al. 2017). Maximum annual survival rates for animals 5 years of age are 0.952 for females and 0.931 for males, and the survival of pups and yearlings decreased by 50% for each one degree increase in sea surface temperature (Carretta et al. 2019; DeLong et al. 2017). Decreases in sea surface temperature resulted in an increase in pup and yearling survival estimates (Carretta et al. 2019; DeLong et al. 2017).

Most Likely Periods of Occurrence – California Sea Lions can occur along the California coast year-round and show high occurrences south of Point Conception during the breeding season between May and July (Antonelis and Fiscus 1980).

2.1.3.2 HARBOR SEAL

Harbor Seals (*Phoca vitulina richardii*) occur throughout the North Atlantic and North Pacific Oceans. In the North Pacific Ocean, the population relevant to the project site is the California stock (Carretta et al. 2019).

Protection Status – California Harbor Seals are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate was calculated from the estimated number of seals hauled out of the water in 2012 and multiplied by the correction factor for a total of 27,348 seals (Carretta et al. 2019).

Current Population Trend – Since 2004, counts of Harbor Seals in California decreased (Carretta et al. 2019).

Most Likely Periods of Occurrence – Harbor Seals occur off the coasts of California year-round (Bartholomew 1965).

2.1.3.3 NORTHERN ELEPHANT SEAL

Northern Elephant Seals (*Mirounga angustirostris*) have breeding and birthing grounds that span California and Baja California. The stock relevant to the project is the California Breeding stock (Carretta et al. 2019).

Protection Status – Northern Elephant Seals are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate was calculated by doubling the observed pup count in 2010 for a total of 81,368 seals (Carretta et al. 2019).

Current Population Trend – The population has grown annually by 3.8% since 1998 (Lowry et al. 2014).

Most Likely Periods of Occurrence – Between December and March, Northern Elephant seals breed and give birth primarily on offshore islands in California and Baja California. Adults molt on land between March and August and return to their feeding areas in the Gulf of Alaska between seasons (Carretta et al. 2019).



2.1.3.4 SOUTHERN SEA OTTER

Southern Sea Otters (*Enhydra lutris nereis*) occur off the coast of California as far north as San Mateo County and as far south as San Diego County.

Protection Status – Southern Sea Otters are considered “Endangered” under the ESA and as “Strategic” and “Depleted” under the MMPA (FWS 2017).

Minimum Population Estimate – The current minimum population estimate for Southern Sea Otters was calculated from the latest three-year running average of combined counts from the mainland range and San Nicolas Island for a total of 3,272 otters (FWS 2017).

Current Population Trend – The Southern Sea Otter population has grown 3.2% per year over the past five years (FWS 2017).

Most Likely Periods of Occurrence – Southern Sea Otter abundances are highest in the central portion of their range, between Seaside, CA (north) and Cayucos, CA (south) along the Big Sur coast of California. Southern Sea Otters are consistently present in kelp-dominated areas and are seasonally present in sandy, soft-bottom habitats (winter to early spring). Mating and pupping occur year-round, but peak between October through January, and March through April (FWS 2017).

2.1.3.5 GUADALUPE FUR SEAL

Protection Status – Guadalupe Fur Seals (*Arctocephalus townsendi*) are considered “Threatened” under the ESA and “Depleted” and “Strategic” under the MMPA (Carretta et al. 2019).

Minimum Population Estimate – All Guadalupe Fur seals cannot be counted, as different age classes and sexes use the shore at different times of the year. Direct counts from Isla Guadalupe and Isla San Benito in 2010 indicate a minimum overall population size of 15,830 seals (Carretta et al. 2019; Garcia-Capitanchi, 2011).

Current Population Trend – Guadalupe Fur Seal population abundances appear to be increasing 10.3% per year (Carretta et al. 2019).

Most Likely Periods of Occurrence – Guadalupe Fur Seals do not typically inhabit waters near the coast of California, and most sightings of this species are due to stranding events (Carretta et al. 2019).

2.1.3.6 NORTHERN FUR SEAL

Protection Status – Northern Fur Seals (*Callorhinus ursinus*) are not currently listed as at risk under the ESA (endangered or threatened) or under the MMPA (depleted or strategic) (Carretta et al. 2019).

Minimum Population Estimate – The current minimum population estimate for Northern Fur Seals was calculated as the sum of the minimum number of animals at San Miguel Island and the Farallon Islands in 2013 (after accounting for pups and their mothers), for a total of 7,524 seals (Carretta et al. 2019).



Current Population Trend – The Northern Fur Seal population has increased since 1968, but periodically decreases due to El Niño events (Carretta et al. 2019).

Most Likely Periods of Occurrence – Northern Fur Seals may be present year-round, due to different requirements during the reproductive season. Males may appear on shore between June and August, and some individuals may stay as late as November. Females, on the other hand, typically are found ashore between June and November (Carretta et al. 2019).

2.1.4 Sea Turtles

2.1.4.1 LOGGERHEAD TURTLE

There are nine Loggerhead Turtle (*Caretta caretta*) Distinct Population Segments (DPS) that have been identified globally (Conant et al. 2009). The population that is relevant to the project region is the North Pacific Ocean DPS (Conant et al. 2009).

Protection Status – Loggerhead Turtles are considered “Threatened” under the ESA (Conant et al. 2009).

Minimum Population Estimate – The current minimum population estimate was calculated from unpublished data from the Sea Turtle Association of Japan and from Kmezaki et al. (2002). Data in this estimate reflect the number of females at nesting beaches in Japan, as all Loggerhead Turtle nesting for this population occurs in Japan. The most recent available data from 2007 indicates nearly 1,212 turtles (Conant et al. 2009).

Current Population Trend – In the time series data from the sources listed above, it appears that the Loggerhead Turtle population in the North Pacific Ocean decreased between 1990 and 1996/1996 but increased between 1999/2000 and 2004/2005. The population decreased between 2004 and 2005 but appears to be increasing between 2004/2005 and 2007 (Conant et al. 2009).

Most Likely Periods of Occurrence – Loggerhead Turtles can occur within tropical and temperate waters in the Pacific Ocean, but the only documented nesting area for the North Pacific Ocean population of this species is in Japan (Conant et al. 2009).

2.1.4.2 GREEN TURTLE

There are eleven Green Turtle (*Chelonia mydas*) Distinct Population Segments (DPS) that have been identified globally (Seminoff et al. 2015). The population that is relevant to the project is the East Pacific DPS which extends from the California/Oregon border (northern-most region at 42°N) along the coast to central Chile (southern-most region at 40°S). This population includes waters within 143°W to 96°W.

Protection Status – Green Turtle populations along the Pacific Coast of Mexico and in Florida are classified as “Endangered” under the ESA, and all other populations are classified as “Threatened” (Seminoff et al. 2015).

Minimum Population Estimate – The current population estimate for Green Turtles in the East Pacific DPS was calculated from abundance estimates at nesting sites as the total number of females counted divided by the number of years of monitoring and multiplied by the remigration interval. The estimated total nester abundance is 20,062 turtles (Seminoff et al. 2015).



Current Population Trend – The nesting site located in Colola, MX was the only site that had sufficient data to estimate the current population trend (fifteen years of recent nesting data; annual nesting level of > 10 females). Results from this site indicate that the population increased prior to 2015 and is expected to continue increasing over time (Seminoff et al. 2015).

Most Likely Periods of Occurrence – Green Turtles are most likely to occur at known nesting sites during the nesting season. Most nesting sites occur along the coasts of Mexico, Costa Rica, Columbia, and Ecuador with no known nesting sites in California.

2.1.4.3 LEATHERBACK TURTLE

Leatherback Turtles (*Dermochelys coriacea*) have a global distribution that includes regions in the Pacific Ocean that span from British Columbia and the Gulf of Alaska (north) to the coast of Chile and New Zealand (south) (NMFS 2013).

Protection Status – Leatherback Turtles are considered “Endangered” under the ESA (NMFS 2013).

Minimum Population Estimate – The current population estimate for Leatherback Turtles in the eastern Pacific Ocean was derived for several different nesting regions. Approximately 188 female Leatherback Turtles were nesting in 2003-2004 in Costa Rica, and 120 nests were found using aerial surveys along Mexico in 2003-2004 (NMFS 2013).

Current Population Trend – There has been a decline in the population for Leatherback Turtles in the eastern Pacific Ocean since the 1980s (NMFS 2013).

Most Likely Periods of Occurrence – In the Pacific Ocean, Leatherback Turtles nest year-round at nesting beaches in Indonesia, Papua New Guinea and the Solomon Islands and use California waters for foraging. There are both summer and winter nesting Leatherback Turtles, so occurrence off the coast of California may be year-round (NMFS 2013).

2.2 Marine Species Monitoring and Mitigation Plan and BMP Implementation Plan

2.2.1 Marine Wildlife Monitors

A Marine Wildlife Monitor (MWM) will be present during all construction and decommissioning activities. The actual number of MWM(s) present will depend on the equipment used and the spatial area occupied by the working craft. The MWM(s) will have a set of binoculars, a cell phone, a VHF radio set to a pre-determined channel for the project, and a logbook in their possession while they perform their specific duties. If a monitoring vessel is needed during the project, the vessel operator can serve as the MWM as this individual will be surveying the surroundings constantly to ensure safe navigation.

2.2.1.1 MARINE WILDLIFE MONITOR QUALIFICATIONS

Each MWM shall be an experienced marine biologist, with a minimum of a bachelor’s degree in science, who has experience in marine mammal identification and behaviors and have knowledge of marine mammal physiology, behavior, and life-history. These qualifications will assist in being able to determine if observed marine mammals are exhibiting behavioral reactions to the



proposed actions. Each Biological Monitor shall have no other construction-related tasks while conducting monitoring.

2.3 Marine Wildlife Monitoring Guidelines

Minimizing Impacts to Marine Wildlife – The MWM will have the authority to alter vessel operations when marine mammals or reptiles are observed. A 100-m exclusion zone will be observed during construction. If marine wildlife enters the exclusion zone, the MWM will have the authority to stop all work as quickly as can be achieved safely. Construction will only occur when the full exclusion zone can be observed without impairment by nightfall, fog, rain, or other conditions limiting safe observation of the entire safety zone. The conditions effecting observations of the safety zone will be periodically reevaluated during each monitoring day.

When an animal is observed entering or about to enter the exclusion zone, the MWM will issue a stop work order to the construction foreman. All construction will temporarily stop as quickly as can be safely¹ achieved. The animal will be observed continuously. Once the animal has been observed safely outside the exclusion zone or has not been observed for at least 15 minutes, construction will resume.

MWM Station On Board – The MWM(s) will be positioned where a clear view of the surrounding waters can be safely achieved. If stationed on a construction craft, the MWM will be allowed access to the highest point safely achieved on the craft with an unobstructed view of the project area. If the MWM cannot be safely stationed on the construction craft, a dedicated vessel will be used. The vessel will be positioned to see at least 75% of the exclusion zone at any given time. If not possible, additional monitoring vessels and MWMs will be deployed to ensure sufficient coverage to monitor the entire exclusion zone.

Data Collection and Reporting for Marine Wildlife Monitors – The MWM will record all encounters with marine mammals and sea turtles. Relevant information such as the species, group size, age (juvenile or adult, if can be determined), size (if can be determined), and sex (if can be determined) of individuals will be recorded. Other information that will be recorded includes the behavior of the animals, the distance the group of animals was from the vessel, and the outcome of such encounters.

Marine Mammal and Reptile Collision Response and Reporting – If a collision with a marine mammal or a sea turtle occurs at any time, the MWM will document the conditions under which the accident occurred, including:

- 1) the exact location at the time of collision
- 2) the date and time of the collision
- 3) any environmental conditions such as wind speed and direction, swell height, visibility in meters or kilometers, and the presence of rain or fog present at the time of the collision
- 4) the species of marine wildlife that was involved in the collision, and
- 5) the name of the vessel and the vessel operator at the time the collision occurred.

¹ Safe applies to minimizing the potential to harm staff, damage equipment, or negatively impact the environment.



The project's Marine Mammal Entanglement Plan (included in the Project Description) will be used to guide the reporting of any injured, stranded, or entangled animal.

Recording and Reporting Procedures – At the completion of each phase (construction and decommissioning), a Marine Wildlife Monitoring Report (Report) will be prepared and submitted to all permitting agencies. The Report will include copies of the MWM logbooks and will address the effectiveness of the current monitoring protocols and procedures, as well as a report on all marine mammal and sea turtle sightings. Such sightings will include species names and counts. If, over the course of the survey, the MWM notices a behavioral change in any wildlife species that may be attributed to the survey's actions, such information will be included in the Report. Any alterations to the survey in response to MWM observations of altered marine mammal behavior will also be included in the Final Report.

3 MARINE WATER QUALITY MONITORING

3.1 Continuous Brine Discharge Monitoring

The brine discharge is expected to rapidly dilute within a one foot (horizontally) and nine feet (vertically) from the discharge point. To effectively monitor and validate the modeled dilution, a string of temperature and conductivity data-logging sensors, from which salinity is derived, will be deployed from and near the Iceberg (Table 2). The sensors will be spaced at increasing intervals from the Iceberg to the seafloor to match the discharge dilution modeling. From the Iceberg, data-logging sensors will be placed on a vertical mooring line spaced at 1, 3, 9, and 12 ft depth from the Rotoflush intake/discharge screen. This spacing encapsulates, and exceeds, the model-predicted depth (nine ft vertically) of the brine plume before it dilutes to no more than 2 ppt over ambient salinity. A second mooring with four data-logging sensors will be placed approximately one foot (horizontally) away from the Rotoflush screen. The sensors will again be placed at the 1, 3, 9, and 12 ft depths in reference to the Rotoflush screen and not the sea surface. This second string of data-logging sensors will capture the outer boundary of the brine mixing zone (BMZ) predicted by the discharge modeling, or one foot (horizontally) away from the discharge point (Rotoflush screen). The loggers will be serviced as needed, but no less than quarterly, to download the accumulated data, clean the logger and its housing of any biofouling, and redeploy. Monitoring will continue for the duration of the pilot study while the Iceberg is deployed.

3.2 Monthly Water Quality Monitoring

Each month, water quality profiles from the sea surface to the sea floor will be collected using a calibrated, multiparameter sonde. Water temperature, pH, salinity, and dissolved oxygen will be measured throughout the water column at each of five stations at 1-ft depth intervals between the surface and the sea floor (Table 2). One station will be located as close to the Iceberg's Rotoflush screen as can be safely achieved and an additional four stations will each be located 100 ft away from each corner of the Iceberg in a cross-formation to monitor upcoast, downcoast, offshore, and inshore of the Iceberg (Figure 2). The four stations located 100 ft away will serve as spatial reference stations capturing water quality in each possible direction of the ocean currents that



could transport the brine plume. Monthly monitoring will continue for the duration of the pilot study while the Iceberg is deployed.

3.3 Water Chemistry Monitoring

Each quarter during the Iceberg's deployment and once before the deployment, seawater samples will be collected using a discrete-depth sampler (e.g., Van Dorn bottle) as close to the Iceberg discharge point as possible and at Station WQ2, a reference station (Table 2). These samples will be transported to Alpha Analytical Laboratories for chemical analysis. This is the same analytical laboratory the City has used for testing in compliance with the WWTP's NPDES permit. The water samples will be tested for the same set of Ocean Plan Table 1 Priority Pollutants as were analyzed in the Project Description.

3.4 Marine Water Quality Monitoring Reporting

A brief synopsis of the data collected each month will be shared with the regulatory group via email. These data should be considered draft and subject to change as the project progresses. A final report compiling all accumulated data and its analysis after a rigorous QA/QC review will be prepared and submitted to the funding and permitting agencies within 6 months of the Iceberg's decommissioning at the end of the pilot study's year-long deployment.

4 PLANKTON ENTRAINMENT ASSESSMENT

One of the key concerns raised regarding seawater desalination is the potential impact to marine plankton. The Iceberg is designed to minimize entrainment to the extent possible by using an ultra-fine mesh (60 μm) screen over the intake. The mesh size and a corresponding intake velocity of less than 0.5 feet per second are expected to exclude all but the smallest plankton, e.g., phytoplankton. This expectation will be assessed with the following plankton sampling plan. The application of the results from this study will be germane to future Iceberg permitting efforts if this investigation can empirically demonstrate that the Iceberg's intake system results in significantly reduced entrainment in comparison to an unscreened open intake.

4.1 Plankton Sampling Plan

Plankton in the immediate vicinity and at a reasonable distance away from the Iceberg will be sampled quarterly. For the pilot study, a quarterly sampling frequency was selected in recognition of the often-dangerous conditions that exist on the water offshore of Fort Bragg. A quarterly frequency should allow sufficient scheduling latitude to safely conduct the field sampling during daylight and nighttime hours during the same 24-hr period.

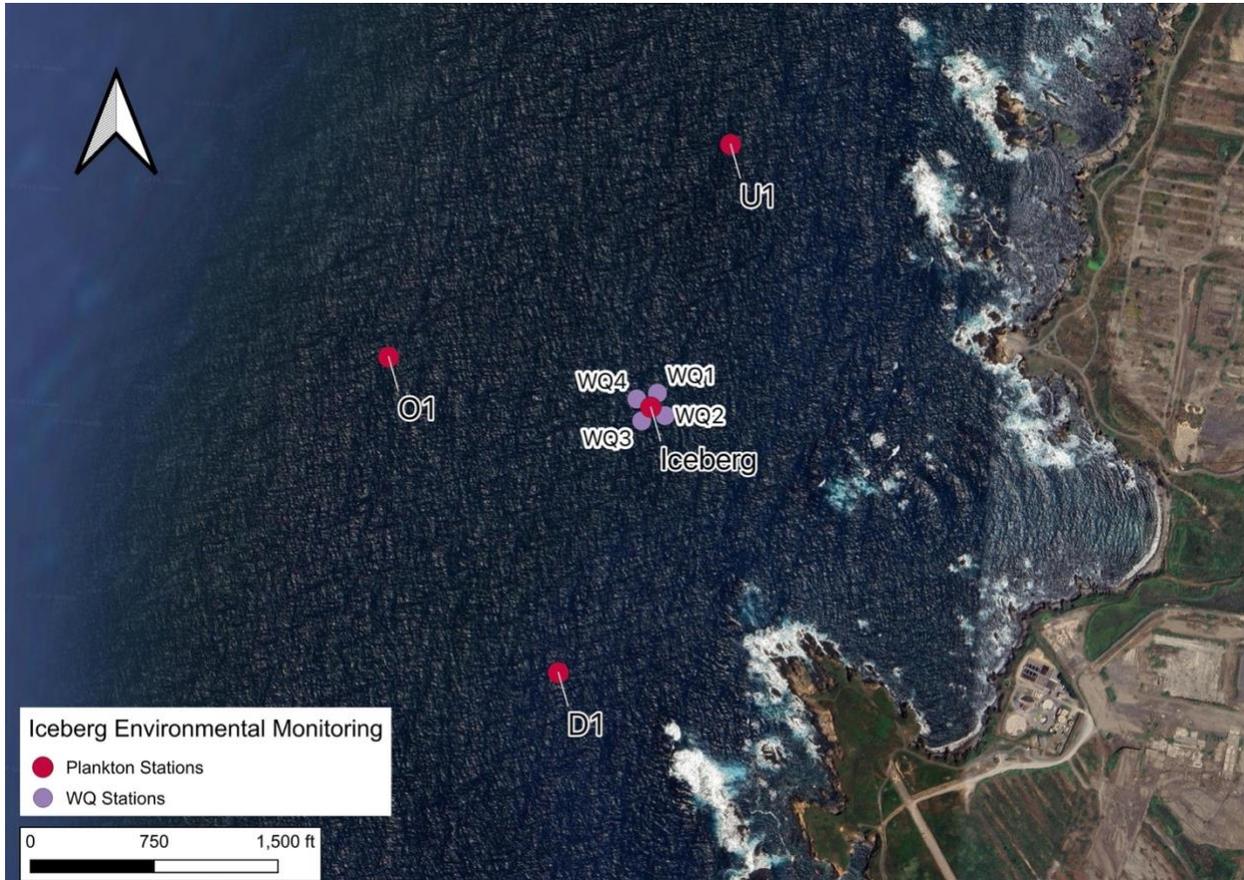


Figure 2. The water quality and plankton sampling stations. The Iceberg is indicated as both its relative position and its presence as both a water quality and plankton station as close to the Iceberg buoy as possible. The continuous salinity monitoring stations are not shown.



Table 2. Parameters monitored, survey type (frequency and equipment type), Station Identification, Sampling Depth (ft), and Narrative Description of the Station's Location.

Parameter Monitored	Survey Type	Station ID	Depth (ft)	Location Description
Salinity	Continuous Data Logger	Dis-1	1	Vertical string of salinity data loggers hanging from Iceberg as close to Rotoflush intake/discharge screen as possible. Depth is in reference to Rotoflush screen not sea surface.
		Dis-3	3	
		Dis-9	9	
		Dis-12	12	
		BMZ-1	1	Vertical string of salinity data loggers hanging from a buoy moored approximately 1-ft away from the Iceberg's Rotoflush screen. Depth is in reference to Rotoflush screen not sea surface.
		BMZ-3	3	
		BMZ-9	9	
		BMZ-12	12	
Temp, Sal, pH, DO	Monthly Multiprobe	WQ-Iceberg	1-ft increments from Surface to Seafloor	Approximately 100-ft away from each corner of the Iceberg
		WQ1		
		WQ2		
		WQ3		
		WQ4		
OP Table 1 PP	Quarterly Van Dorn	Dis-3 and WQ2	3-5 ft	As close to the Iceberg Rotoflush screen and at Station WQ2 (Ref)
Plankton	Quarterly Pumped	Iceberg	Approx 5 ft	At the Iceberg with pump intake as close to the Rotoflush screen as can be safely achieved.
		U1	Approx 5 ft	1,600 ft upcoast of the Iceberg
		O1	Approx 5 ft	1,600 ft offshore of the Iceberg
		D1	Approx 5 ft	1,600 ft downcoast of the Iceberg



4.1.1 Sampling Stations

Four stations including the Iceberg (Table 2 and Figure 2) will be sampled during each quarterly event. The Iceberg will be the entrainment point while each of the three remaining stations will sample the ambient plankton communities in the area. The ambient plankton sampling stations are located approximately 1,600 ft upcoast, offshore, and downcoast from the Iceberg to sample plankton that may be passively transported to the Iceberg by prevailing currents. The coordinates of all four sampling sites (Iceberg and ambient) will be determined during the first survey after the Iceberg has been commissioned. On the first survey, the Iceberg station will be recorded based on the final position of the Iceberg after it is moored. Each of the ambient station coordinates will be recorded after maneuvering the sampling vessel to a position that matches the narrative description of the station, e.g., 1,600 ft upcoast of the Iceberg plankton sampling station. The coordinates for each sampling station occupied during the first survey will be recorded. Each subsequent survey will reoccupy the same coordinates assuming it is safe to do so.

The prevailing currents can change their alongshore direction while the dominant inshore-offshore flow is inshore. Therefore, ambient plankton stations are positioned at the three points where plankton can be transported towards the Iceberg and be safely sampled. Inshore of the Iceberg is considered a less likely source for ocean currents to carry plankton to the Iceberg and, due to its shallower depths and rocky substrate, is considered a more dangerous sampling location.

No ocean current monitoring is proposed for this study. None of the ocean current models presently available for the region have spatial resolution relevant to the study or coverage of the cove where the Iceberg will be placed (Figure 3). To derive at least a proxy estimate of ocean currents, the Regional Ocean Modeling System (ROMS) estimated ocean currents published by the California Ocean Observing Systems Data Portal (https://data.caloos.org/?new_session=true#map) will be recorded and used. Each day of sampling, the ROMS estimates nearest the cove will be averaged to derive the proxy ocean current for the sampling period to be used in any further analyses.

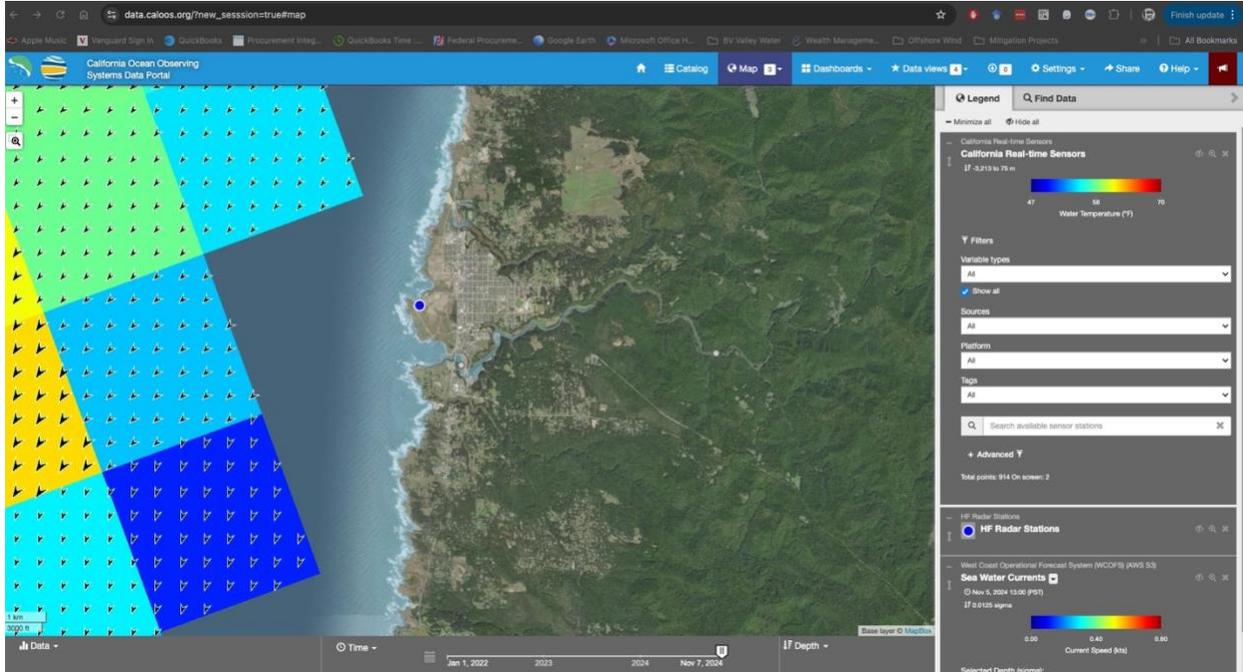


Figure 3. Screen shot of the ROMS output indicating the available cells with estimated ocean currents (represented by the individual arrow heads) in proximity to the Mill Bay location for the Iceberg deployment (blue dot).

4.1.2 Sampling Methods

Sampling from behind the operating Iceberg’s intake screen would require disassembly and reassembly of the system. Furthermore, the Iceberg’s seawater intake is near the sea surface, extending less than 6 ft below the water’s surface. These two factors were considered in the sampling plan design.

The proposed plankton sampling will focus on the upper, approximately, 5 ft of the water column near the surface. This will mimic the depth of the Iceberg intake. To avoid the disassembly/reassembly concerns, the intake will be replicated using a pumped sampling system with the intake hose fitted with a 60- μ m mesh screen. A similar sampling program was completed by MMSC for TWB Environmental Research and Consulting, Inc. for Poseidon Resources (Appendix A in TWB 2022). A gas-powered water pump will be used to pump seawater through an intake set at a fixed depth of approximately 5 ft and discharge the seawater through a 50- μ m mesh plankton net on the opposite side of the boat from the intake (Figure 4). This will capture all plankton that has passed through both intakes regardless of intake screen mesh. Organisms smaller than 50 μ m will mostly pass through the plankton net although some are expected to be retained. Intake size and pump flow rate will be set to create an intake velocity of approximately 0.22 ft/sec, or the same as the Iceberg’s calculated intake velocity.

The intake velocity will be calculated based on the intake size and pumping rate. The pumping rate will preferably be determined at full throttle on the pump. If the pump needs to operate at less than full throttle to achieve a pumping rate suitable to create the approximately 0.22 ft/sec through screen velocity, the throttle position associated with this pumping rate will be permanently marked on the pump. The derivation of all these parameters will be made when the final pump and hoses

are selected. While not available at this point, the calculations and parameters will be included in the final report.

At the Iceberg, two sampling configurations will be used in recognition of the ultra-fine mesh screening. The screened intake will incorporate a 60- μm mesh Rotoflush screen identical to the one used on the Iceberg to replicate the Iceberg’s ultra-fine mesh intake screen. The second sample will be an “open intake” where the Rotoflush screen is removed and replaced with a large funnel that has a 6-mm mesh netting stretched over it as an intake pump protection screen². Six-millimeter mesh is large enough to allow all but some gelatinous zooplankton through the intake while excluding most juvenile and adult fish and other larger debris that could impact the sample and the sampling pump.

Collecting near-simultaneous samples through the screened (Rotoflush) and unscreened intakes will allow quantification of the ultra-fine mesh screen’s exclusion efficiency. The paired sampling design, screened and unscreened, will be used at each of the four sampling stations. This will both increase the sampling size and statistical power as well eliminating any unknown site effects that could influence the screened versus unscreened comparison. These data will support a robust assessment of the screening efficiency of the Rotoflush that can be applied to future deployment efforts.

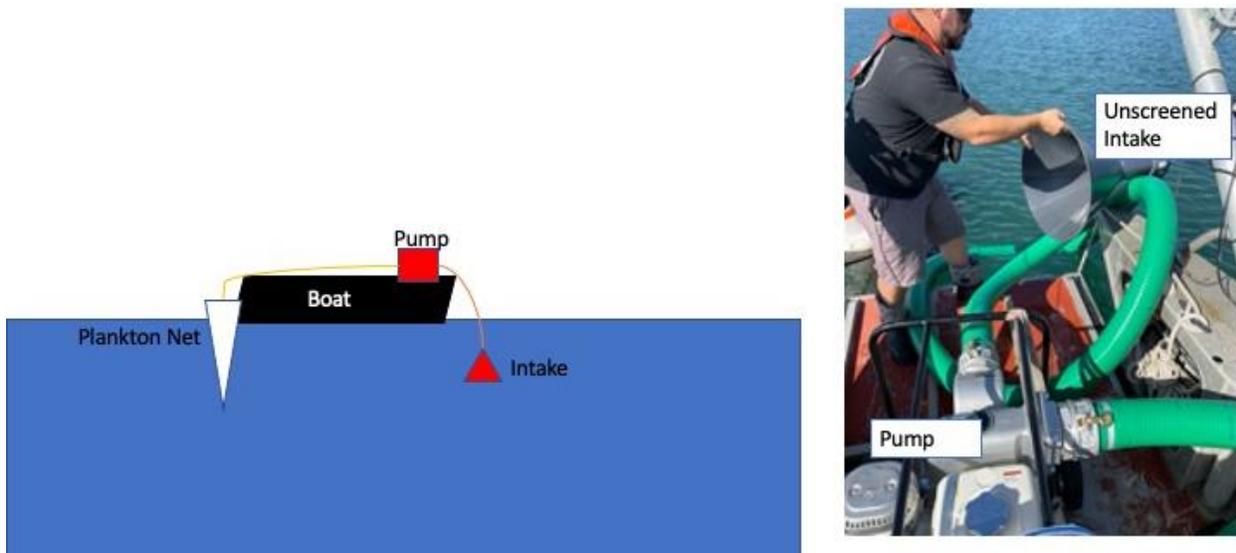


Figure 4. Left: Cartoon representation of pump sampling arrangement indicating the approximate location of the intake point, pump on the boat, and plankton net away from the intake to avoid disturbing the intake’s zone of influence. Right: Example of unscreened intake funnel, green sampling hose, and the gas-powered sampling pump.

The California Ocean Plan requires plankton sampling to use a net mesh of no greater than 335 μm . A 50- μm mesh 0.5-m (or larger), single-ring plankton net will be used to better quantify the Iceberg’s entrainment. This fine mesh plankton net will be used at all stations for consistency with the Iceberg entrainment station.

² A screen to exclude large debris that may damage the pump but not exclude any plankton.



To account for diel periodicity in the entrainable plankton, sampling will occur during the daylight and nighttime hours. Daylight sampling will occur at least 2 hrs before (after) sunset (sunrise). Night sampling will occur at least 2 hrs after (before) sunset (sunrise). Sampling will preferably occur centered on sunset but some sampling events may be centered on sunrise if weather conditions require. The decision on sunset vs. sunrise sampling will be made for each sampling event based on the weather forecast at the time.

To maximize the data collected during each sampling event the following sampling program is proposed. Four samples per diel period will be collected at each station, Iceberg and ambient. This will include two samples per diel period, each, of the screened and unscreened intake sampling at the entrainment station. This will result in 32 total samples annually at each station, 16 screened and 16 unscreened. The pumped volume will be calculated based on the pump's flow rate and the pumping time. A target of 30 m³ pumped per sample will be used at all stations.

With each sample, a 0.5 L water sample will be collected from the pump discharge stream and analyzed in the field using a calibrated sonde to collect water temperature, salinity, turbidity, pH, dissolved oxygen, and chlorophyll-a concentration. The value of this sample is to assess changes in these parameters potentially due to the use of the screened intake, especially on chlorophyll-a concentrations. Differences in chlorophyll-a concentrations could represent a differing concentration of phytoplankton in the water that has passed through the intake. Phytoplankton are expected to pass through the 50- μ m mesh plankton net. The additional parameters will highlight any oceanographic differences between the samples and sampling stations that may influence the plankton community susceptible to the sampling effort.

4.1.3 Sample Processing

All samples will be fixed in pre-labeled, plastic 0.5 L jars in the field using a 5% buffered formalin seawater solution. The plastic jars with fixed samples will be sealed with parafilm and the lids taped closed with electrical tape in preparation for shipping to MMSC's lab. The sealed jars will be shipped, via ground shipping, with a documented chain of custody after all quarterly sampling is complete. Once received, MMSC will catalog all samples and complete the shipping chain of custody.

Samples will be transferred to 99% isopropyl alcohol after at least 72 hrs in the formalin solution. Following California EPA standards, the formalin will be treated appropriately in Scigen NEUTRALEX® Formalin Neutralizer. Once transferred, each sample will be decanted into a graduated cylinder and allowed to settle. The volume, termed the volumetric biomass, will be read and recorded once the plankton sample has settled to the bottom. The significantly lower density of isopropyl alcohol (0.79 g/ml) versus seawater (1.02 g/ml) accelerates settling. The time to settlement can vary seasonally based on the plankton species present. Therefore, the uniform settlement time will be determined each season based on when the first unscreened sample is collected for the quarter near the Iceberg to settle. The volumetric biomass will be read off the graduated cylinder and recorded. This measurement will indicate the cumulative volume of plankton caught in the sample. Volumetric biomass is a standard plankton measure used in programs such as the California Cooperative Oceanic Fisheries Investigations (CalCOFI) to assess total biological productivity or biological biomass regardless of taxon-specific composition.



This metric has supported some landmark research assessing community changes such as Roemmich and McGowan (1995).

After the volumetric biomass is collected, each sample will be sorted using a stereomicroscope to remove all fish larvae, fish eggs, megalops-stage crab larvae, and squid paralarvae. All fish and crab larvae will be identified to the lowest, practicable taxonomic level and counted. Fish larvae will also be measured using image analysis software and micrographs. Fish eggs will not be identified but will be counted. Fish eggs are largely unidentifiable and are included in this assessment to evaluate the intake mesh exclusion efficiency. The standard practice for calculating the Empirical Transport Model-Area of Production Forgone (ETM-APF) analysis required in the California Ocean Plan includes adding the estimated pelagic egg stage length to the estimated age of the larvae without attempting to identify the eggs. Squid paralarvae will also be counted. California spiny lobster larvae (any stage) are highly unlikely at this location but will be sorted for identification and enumeration if observed.

4.1.4 Data Analysis and Reporting

The resulting data will be compiled into a project-specific database. All plankton data will be standardized to the water volume filtered. The data will be cataloged, and an entrainment estimate calculated for the screened and unscreened intake for each quarter. The entrainment estimate will represent the mean plankton concentration multiplied by the pilot study's targeted daily intake volume of 13,200 gal/day. These estimates will be calculated for the total plankton volumetric biomass and by each subcategory, e.g., total fish eggs, total fish larvae, by fish larvae taxon, etc.

Detailed analyses will focus on assessing the intake screen exclusion efficiency based on both the plankton volumetric biomass and the community composition of identified and enumerated entrained larvae. The size distribution of identified and entrained larvae will be compared with those collected in the ambient plankton community sampling. Additional analyses will assess seasonality in the entrained plankton in addition to any detectable effect of water quality at each sampling station.

The core assessment is expected to examine the volumetric biomass/m³ of water sampled. This measure will be uniformly collected and will best represent all forms of marine life caught in the 50- μ m mesh net. All of the more refined metrics such as taxonomic composition and abundance suffer from the practicable taxonomic limitations and sorting efficiencies. If the hypothesis is correct that the ultra-fine mesh Rotoflush screen excludes a significant fraction of the plankton, especially the larger organisms, a clear difference in volumetric biomass/m³ is expected between the screened and unscreened intake samples.

Collecting water quality data on water after it has passed through a screen is a new approach to plankton monitoring. Its goal in this effort is to provide some insight into the phytoplankton fraction that may pass through the screen to determine if any effect of the Rotoflush on phytoplankton concentrations can be derived. Phytoplankton are presumed to pass through the 50- μ m mesh plankton net. The measured chlorophyll-a concentrations will serve as a proxy for phytoplankton in this analysis. The additional water quality parameters collected will provide ancillary data should a marked difference marine life parameters between the sampling sites be detected. Plankton are



highly sensitive to variations in water, especially density. Seawater density can be derived from temperature, salinity, and depth.

Plankton data rarely meets parametric statistic assumptions. Therefore, where applicable, non-parametric statistics will be used to compare the screened and unscreened intake samples. Analyses will be completed for the complete data set of screened versus unscreened intake samples without regard to sampling location. The analyses will be progressively refined to determine if any site effects are present in the data that could be applicable to a future, utility-scale deployment.

After each quarter, the resulting data will be reviewed to determine if additional analyses, such as the ETM/APF, can be applied. The lack of project-specific ocean current data will inhibit a detailed EMT/APF. If sufficient plankton information is recorded in the screened net samples to support an ETM/APF, the estimated ocean current information recorded from ROMS will be used to calculate the applicable model parameters. An ETM/APF will only be calculated if sufficient information is available in the screened samples as they are the experimental treatment in this analysis while the unscreened is the control. The unscreened sample is expected to contain sufficient fish larvae and crabs to calculate an ETM/APF, but this data is of no importance without a corresponding screened intake sample ETM/APF result.

After each quarter, a brief, draft summary will be submitted to the regulatory agencies. These data should be considered draft and subject to change as more data becomes available and analyses potentially evolve. All information and methods will be documented in a final report to be submitted to the funding and permitting agencies within 6 months of the Iceberg's decommissioning at the end of the pilot study's year-long deployment.

5 QUALITY ASSURANCE PROJECT PLAN

Data quality is a cornerstone of science in support of regulatory decision making. Therefore, a Quality Assurance Project Plan (QAPP) is developed and will be used to ensure the final data products meet the highest scientific standards and the goals to support the regulatory decisions that will follow.

5.1 QAPP Purpose

The Environmental Monitoring Plan element's purposes are detailed above. The QAPP is to ensure the workplans described in the preceding pages are followed. Should the need arise to adjust the plans after implementation, the necessary adjustments will be documented and reported to the regulatory agencies during the monthly sampling summaries.

5.2 QAPP Execution

To ensure all phases of both studies are achieved to the highest quality possible, a Miller Marine Science & Consulting, Inc. scientist (MMSC) will be on site in the field to train local staff in the City of Fort Bragg during the data logger deployment and retrieval as well as the first monthly water quality survey and the first plankton sampling event. All field data will be transmitted to



MMSC after the survey is complete. This will include all digital files and legible scans of any paper data sheets. The MMSC sorting laboratory will process the plankton samples.

In the field, a checklist of operational events related to each sampling effort will be maintained. Prior to the first survey, principal field staff local to the City of Fort Bragg will be trained in the execution of the workplan described above. If staff turnover occurs where trained staff are no longer available, MMSC staff will be dispatched to join the survey. A Scientific Collecting Permit issued by the California Department of Fish and Wildlife for the project's plankton sampling will always be with the sampling party. The lead scientist on each plankton sampling event will be listed on the Scientific Collecting Permit.

Operational efforts will include:

- Water Quality Monitoring
 - A calibrated multiparameter sonde will be available during all water quality surveys
 - The sonde will be calibrated per manufacturer's specifications prior to the survey using commercially available standards for each parameter
 - The sonde is needed to collect baseline information at the deployment and retrieval of the data-logging sensors to calibrate the sensors, if needed
 - Either a second set of data-logging sensors or a computer with downloading shuttle and all needed cleaning supplies will be taken out each time the data-logging sensors are serviced. Clean, downloaded, and relaunched data-logging sensors will be redeployed each time.
 - The Van Dorn bottle will be cleaned with Alconox detergent prior to the survey and rinsed with site water at each site before collecting a water sample
 - Sample bottles from the analytical laboratory will be on hand in the field to transfer the sample directly from the Van Dorn to the sample bottle with no intermediary
 - Samplers will wear rubber gloves for sampling at each site. A new pair of clean gloves will be used at each site.
- Plankton Sampling
 - All materials are present before sampling begins.
 - Plankton net frame, plankton net of mesh no larger than 50 μm free of any tears or holes, codends of mesh no larger than 50 μm free of any tears or holes for each net, labeled sample jars, buffered formalin, list of stations with coordinates, GPS, datasheets, washdown hose or bucket to rinse the net from the outside, gas-powered pump with sufficient gas to complete the sampling, sampling hose, Rotoflush with all equipment to attach it to the hose, unscreened intake funnel with 6-mm mesh netting stretched over the opening, calibrated multiparameter sonde to measure chlorophyll-a in water discharged into the plankton net to measure phytoplankton proxy collected during each sampling event.



- Sampling is conducted in accordance with the workplan.
- Post-sampling sample handling is done to eliminate the potential introduction of plankton, including rinsing the net from the outside to condense the plankton in the codend.
- Post-sampling preservation is completed for each sample with an appropriate volume of formalin added to achieve a 4-5%-formalin solution.
- Plankton Laboratory Processing
 - Only trained sorters and taxonomists will process the samples
 - New sorters will have their first five samples resorted
 - Each sorter must remove at least 90% of the target organisms in each of the five samples to be considered trained
 - Failure on one sample will result in another five samples sorted by the trainee being resorted by a trained sorter
 - If pass on the second set of five samples then sorter is considered trained
 - If not passing, then sorter is removed from the sorting lab
 - Failure on more than one sample eliminates the sorter from continuing in the sorting lab
- Data Management and Analysis
 - All data will be transcribed into a digital database.
 - Data entry will be checked by someone other than the original data entry staffer for accuracy. Errors will be corrected immediately and documented.
 - Laboratory data manager will conduct a final review of all data. Taxonomic questions will be followed up with the taxonomist performing the identification.
 - MMSC project management will review the data submitted by the laboratory data manager and any questions will be addressed with the laboratory manager.
 - Data digitally recorded by the instruments will be reviewed for errors in the system
 - Calibration failures, data logging failures, sensor/probe malfunctions
 - Analyses
 - All analyses will be reviewed by a TWB Environmental Research and Consulting, Inc. scientist to ensure no calculation errors are made.
 - Reporting



- The report will be reviewed internally by MMSC, then by TWB, with a draft final submitted for review to the City of Fort Bragg and Oneka. A final report incorporating comments and edits by the City and Oneka will be provided to the City for submittal to the regulatory agencies, or submitted on the City's behalf by MMSC.



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APPENDIX C: Iceberg Brine Discharge Modeling Report

ICEBERG BRINE DISCHARGE MODELING: FORT BRAGG PILOT PROJECT

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APPENDIX 1: VISUAL PLUMES RESULTS

1. INTRODUCTION

The goal of this document is to explain the initial dilution modeling of the brine discharge from Oneka Technologies' desalination buoy within the context of its compliance to the Water Quality Control Plan for Ocean Waters of California. The proposed pilot project by the City of Fort Bragg aims to locate an Iceberg class desalination buoy in Mill Bay, off the coast of Fort Bragg, California.

Due to its higher salinity, the Iceberg's brine discharge is denser than the ambient seawater, causing the discharge to sink. The highest dilution of the brine discharge is achieved during the initial dilution process, when the turbulent brine discharge gets mixed with the receiving body. A detailed explanation of the brine discharge's dilution is provided in the following sections.

2. MODEL DESCRIPTION

Visual Plumes (VP) was used for the near field simulation of the Iceberg's brine discharge, following the recommendations given by Roberts, 2018.

VP is a widely recognized Windows-based computer application that supersedes the DOS PLUMES (Baumgartner et al., 1994) mixing zone modeling system. VP simulates single and merging submerged plumes in arbitrarily stratified ambient flow and buoyant surface discharges. Predictions include dilution, rise, diameter, and other plume variables. Among its features are graphics, time-series input files, user-specified units, a conservative tidal background-pollutant build-up capability, and a sensitivity analysis capability.

VP addresses the issue of model consistency in a unique way by including a suite of models within its model. In doing this, it promotes future modeling consistency and encourages continued improvement of plume models. VP includes the DKHW model based on UDKHDEN (Muellenhoff et al., 1985), the surface discharge model PDS (Davis, 1999), the three-dimensional UM3 model based on UM, and the NRFIELD model based on RSB.

For the Iceberg Pilot Project, the UM3 sub-model was used to model the brine's discharge. UM3 is an acronym for the three-dimensional Updated Merge (UM) model used to simulate single and multi-port submerged discharges. UM3 is coded in Delphi Pascal, the language of Visual Plumes, and is a Lagrangian model that uses the projected-area-entrainment (PAE) hypothesis (Winiarski and Frick, 1976; Frick, 1984). This established hypothesis (Rawn et al., 1960) quantifies forced entrainment, representing the rate at which mass is incorporated into the plume in the presence of current. UM3 assumes that the plume is in a steady state; in the Lagrangian formulation this implies that successive elements follow

the same trajectory (Baumgartner et al., 1994). Therefore, the plume envelope remains invariant while elements moving through it change their shape and position with time. However, ambient and discharge conditions can change over time scales which are long compared to the time in which a discharged element reaches the end of the initial dilution phase, usually at maximum rise.

To make UM three-dimensional, the PAE forced entrainment hypothesis has been generalized to include an entrainment term corresponding to the third-dimension: a cross-current term. As a result, single-port plumes are simulated as truly three-dimensional entities.

3. INPUT DATA

The following parameters were adopted for the brine diffuser simulation.

3.1. DIFFUSER SET-UP

The brine diffuser consists of a 60-micron strainer cylindrical screening mesh that also serves as the seawater intake (see Figure 1). Discharge from this strainer occurs at a depth of 40 inches (3.33 feet) below sea level.



Figure 1: Seawater intake and brine discharge system with 60-micron mesh screening.

3.2. DIFFUSER LOCATION

The following location of the Iceberg pilot project was used to calculate brine dilution. The diffuser location is identified by point P in Figure 2.

POINT	X COORDINATE (ft)	Y COORDINATE (ft)	Z COORDINATE (ft)
P	6,046,707.00	2,292,710.00	-80.00

Table 1: Coordinates of point P

Note that the coordinate system used is the following:

- Horizontal datum: California State Plane, Zone 2 (NAD 83).
- Vertical datum: Water depth below the mean lower low water (MLLW).

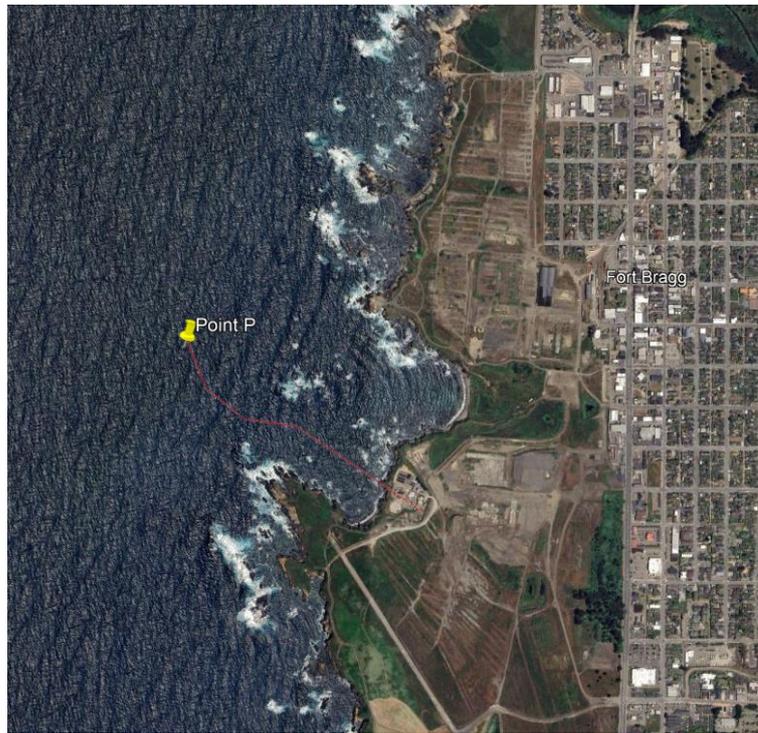


Figure 2: Point P location in Mill Bay, off the coast of Fort Bragg, California

3.3. AMBIENT CONDITIONS

Baseline data for ambient seawater conditions shown in Table 2 were taken into consideration for dilution calculations.

AMBIENT SEAWATER CONDITIONS	
Salinity (ppt)	Temperature (°C)
33.10	11.50

Table 2: Ambient conditions for the project.

3.4. BRINE EFFLUENT CHARACTERISTICS

For modeling purposes, the Ice Ocean outfalls I: submerged wastefield formation berg's highest salinity discharge was used. At 35% recovery, the iceberg discharges 24,500 gallons/day (17 gallons/minute) of brine. The maximum brine discharge velocity is 0.23 feet/second. Additional brine discharge data is shown in Table 3.

BRINE DISCHARGE CONDITIONS	
Salinity (ppt)	Temperature (°C)
50.92	11.50

Table 3: Effluent conditions for the pilot project.

3.5. ENVIRONMENTAL REGULATIONS

The environmental regulation taken into consideration for this study is the Water Quality Control Plan for Ocean Waters of California (Ocean Plan), which provides the maximum increment of salinity as well as the extent of the Brine Mixing Zone (BMZ) for best designs.

The Ocean Plan states the BMZ is a region where salinity increments over natural background can be greater than 2 ppt¹ [chapter III.M.2.e.(1).(b)]. According to the Ocean Plan, increments should be minimised up to a maximum allowable distance of 328 feet.

Consequently, the initial dilution required can be calculated by the following expression:

¹ ppt is equivalent to g/l.

$$S_{final} = S_{inic} + \frac{(S_{efl} - S_{inic})}{D_i}$$

Where:

- S_{inic} = Initial salinity (33.10 ppt).
- S_{efl} = Brine salinity (50.92 ppt).
- S_{final} = Maximum salinity at the end of the near field (33.10 ppt + 2.00 ppt = 35.10 ppt).

Therefore, the minimum initial dilution to be achieved at the end of the near field (<328 feet) is 1:8.91.

4. METHODOLOGY FOLLOWED

The model simulates a submerged horizontal discharge into a stagnant and homogeneous environment. The simulation of calm conditions (low wind and neap tide, *i.e.* in absence of currents) is the worst-case scenario and means the dilution will be higher for the rest of the potential events.

The variables shown below are required as input data for the simulation (all of them have already been defined in previous sections):

- Depth at the discharge point.
- Distance from the surface to the discharge point.
- Discharge angle (relative to the bottom): it has considered a horizontal discharge (0°).
- Number of discharge ports (per device).
- Port diameter of the discharge: Given the existing limitations of the modeling software, the strainer diffuser mesh has been modeled as a single discharge point assuming discharge at 24,500 gallons/day and brine discharge velocity at 0.23 feet/second. Therefore, the equivalent diameter for the brine discharge is 5.51 inches (0.14 meters).
- Discharge flow.
- Effluent salinity.
- Seawater salinity.
- Effluent temperature.
- Seawater temperature.
- Horizontal distance to the end of the BMZ.

Figures 3 and 4 show the diffuser and ambient inputs to the model.

Project **C:\Visual_Plumes\FLOTADE3**

Project "C:\Visual_Plumes\FLOTADE3" memo

Ambient file list
Filename Cases
C:\Visual_Plumes\FLOTADE3.001.db 1 1

After run go to tab
 Diffuser
 Ambient
 Special
 Text
 Graphics

Units Conversion
 Convert data
 Label only

Model Configuration
 Brooks far-field solution
 Graph effective dilution
 Isoleth plume boundary
 Amb. current vector averaging
 Tidal pollution buildup

Case selection
 Base or selected case
 Sequential, all ambient list
 Sequential, parse ambient
 All combinations

UM3

Diffuser, Flow, Mixing Zone Inputs

Port diameter	n/r	Port elevation	Vertical angle	Hor angle	Num of ports	n/r	n/r	n/r	n/r	Acute mix zone	Chronic mix zone	Port depth	Effluent flow	Effluent salinity(*)	Effluent temp	Effluent conc
m	m	m	deg	deg		m	s	s	s	ft	m	ft	MGD	psu	C	kg/kg
0.14	0	0	0	0	1					328	0	3.3333	0.024422	50.92	11.5	17.82

Figure 3: Diffuser inputs in Visual Plumes.

Ambient Inputs

Measurement depth or height	Near-field current speed	Near-field current dir.	Ambient salinity(*)	Ambient temperature	Background concentration	Pollutant decay rate(*)	n/r	n/r	Far-field diffusion coeff
Depth or Height	depth	depth	depth	depth	depth	depth	depth	depth	depth
Extrapolation (sfc)	constant	constant	constant	constant	constant	constant	constant	constant	constant
Extrapolation (btm)	constant	constant	constant	constant	constant	constant	constant	constant	constant
Measurement unit	m/s	deg	psu	C	kg/kg	>-1	m/s	deg	m0.67/s2
	0	0	0	33.1	11.5	0	0		0
	80	0	0	33.1	11.5	0	0		0

UM3

Ambient file list
Filename
FLOTADE3.001.db 1 1

Figure 4: Seawater inputs in Visual Plumes.

5. RESULTS OF THE SIMULATION

The main results of the model are summarized below. The entire output of the model can be consulted in Appendix 1.

Results show seawater salinity lower than 2.0 ppt (including the centreline jet) at a depth of 8.697 feet and a horizontal distance of 0.798 feet from the discharge point (reaching a centreline dilution of 1:9.273).

Figure 5 shows an elevation and plan view of the brine plume. Figure 6 shows the brine discharge's dilution over distance.

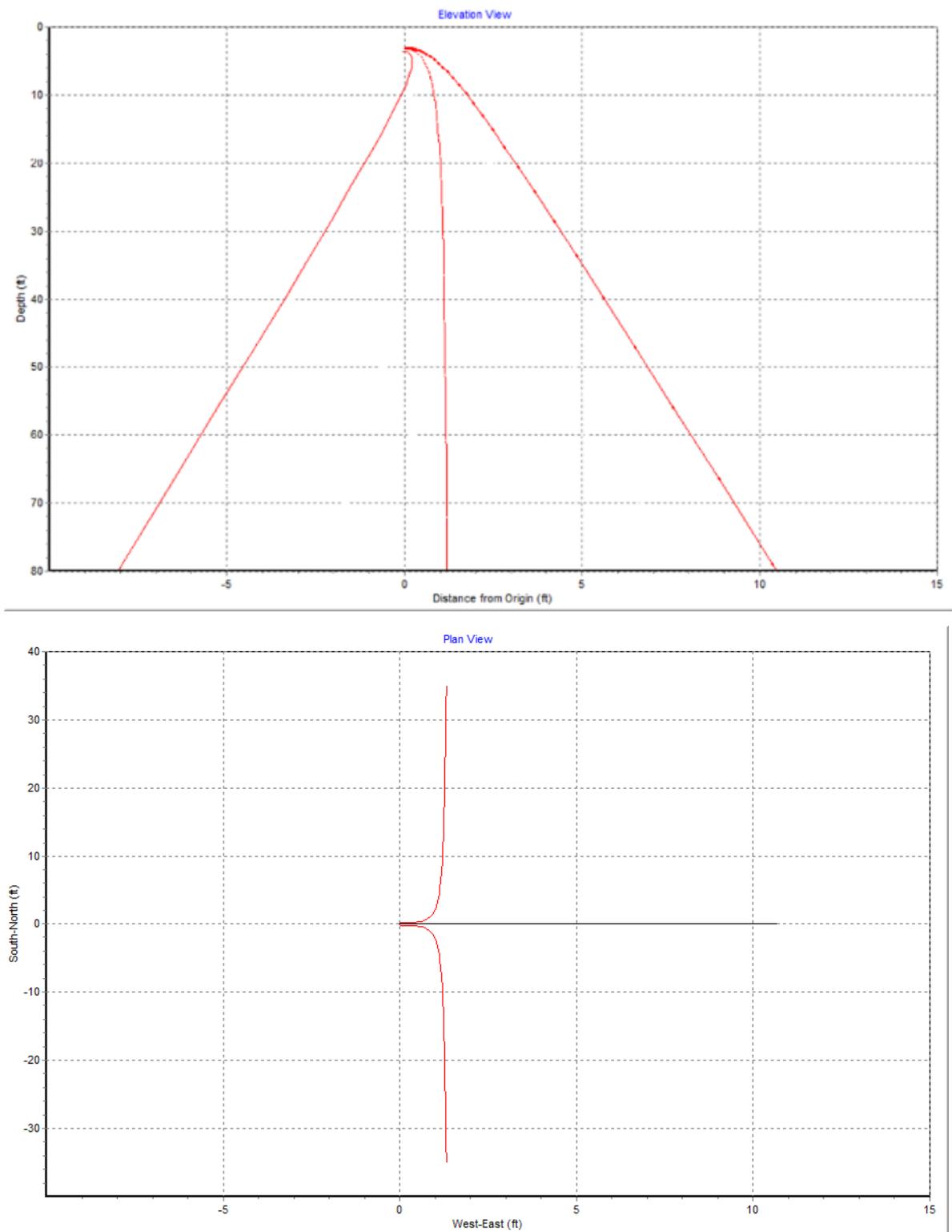


Figure 5: Elevation (Upper) and plan (Lower) view of the plume discharge.

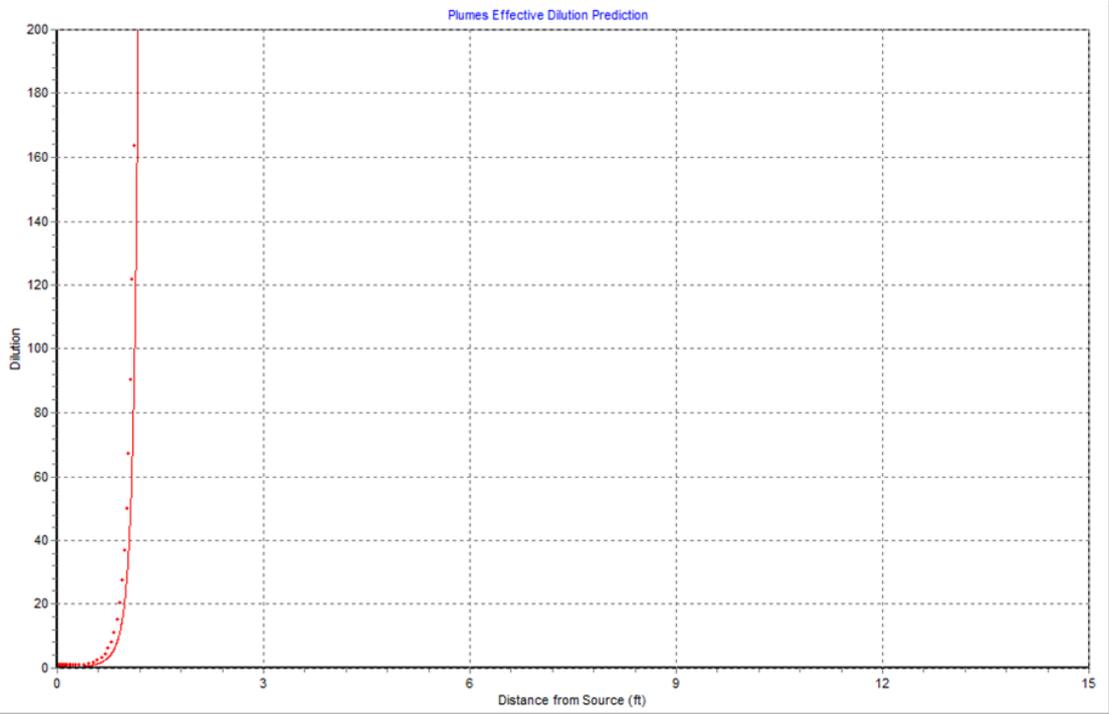


Figure 6: Dilution of the centreline of the plume from the source.

6. CONCLUSIONS

Visual Plumes was used as the model to simulate the initial dilution of the Iceberg's brine discharge. The model considered the characteristics of the Iceberg's brine diffuser as well as the characteristics of the proposed Iceberg location in Mill Bay, off the coast of Fort Bragg, California. Once modelled, the results were compared to the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) to evaluate compliance. The model shows compliance to the Ocean Plan by achieving a dilution below 2.0 ppt compared to ambient salinity at 8.967 feet vertically (depth) and 0.798 feet horizontally from the brine discharge point (reaching a centreline dilution of 1:9.273).

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**APPENDIX 1:
VISUAL PLUMES RESULTS**

Contents of the memo box (may not be current and must be updated manually)

Project "C:\Visual_Plumes\FLOTADE3" memo

Model configuration items checked:

Channel width (m) 100

Start case for graphs 1

Max detailed graphs 10 (limits plots that can overflow memory)

Elevation Projection Plane (deg) 0

Shore vector (m,deg) not checked

Bacteria model : Mancini (1978) coliform model

PDS sfc. model heat transfer : Medium

Equation of State : S, T

Similarity Profile : Default profile (k=2.0, ...)

Diffuser port contraction coefficient 1

Light absorption coefficient 0.16

Farfield increment (m) 200

UM3 aspiration coefficient 0.1

Output file: text output tab

Output each ?? steps 20

Maximum dilution reported 1000

Text output format : Standard

Max vertical reversals : to max rise or fall

/ UM3. 30/04/2024 12:57:47

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Case 1; ambient file C:\Visual_Plumes\FLOTADE3.001.db; Diffuser table record 1: -----

Ambient Table:

Depth	Amb-cur	Amb-dir	Amb-sal	Amb-tem	Amb-pol	Decay	Far-spd	Far-dir	Disprsn	Density
m	m/s	deg	psu	C	kg/kg	s-1	m/s	deg	m0.67/s2	sigma-T
0.0	0.0	0.0	33.10	11.50	0.0	0.0	-	-	0.0	25.23097
24.38	0.0	0.0	33.10	11.50	0.0	0.0	-	-	0.0	25.23097

Diffuser table:

P-diaVer	angl	H-Angle	SourceX	SourceY	Ports	MZ-dis	Isoplth	P-depth	Ttl-flo	Eff-sal	Temp	Polutnt
(m)	(deg)	(deg)	(m)	(m)	()	(ft)	(concent)	(ft)	(MGD)	(psu)	(C)	(kg/kg)
0.1400	0.0	0.0	0.0	0.0	1.0000	328.00	0.0	3.3333	0.02442	50.920	11.500	17.820

Simulation:

Froude No: -0.512; Strat No: 0.0000; Spcg No: 1.53E+9; k: 6950.8; eff den (sigmaT) 39.17227; eff vel 0.0695(m/s);

Current is very small, flow regime may be transient.

Absolute value Froude No. < 1, possible intrusion and/or plume diameter reduction

step	Depth (ft)	Amb-cur (m/s)	P-dia (m)	Polutnt (kg/kg)	Dilutn ()	CL-diln ()	x-posn (ft)	y-posn (ft)	Iso dia (m)
0	3.333	1.000E-5	0.140	17.82	1.000	1.000	0.0	0.0	0.1400;
2	3.333	0.0	0.140	17.81	1.001	1.000	0.00129	0.0	0.1401;
begin overlap;									
20	3.334	0.0	0.140	17.76	1.003	1.000	0.0121	0.0	0.1401;
40	3.336	0.0	0.139	17.71	1.006	1.000	0.0244	0.0	0.1395;
60	3.339	0.0	0.138	17.65	1.010	1.000	0.0371	0.0	0.1382;

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**ICEBERG BRINE DISCHARGE MODELING:
FORT BRAGG PILOT PROJECT**

APPENDIX 03

80	3.344	0.0	0.136	17.58	1.014	1.000	0.0506	0.0	0.1363;
100	3.351	0.0	0.134	17.49	1.019	1.000	0.0652	0.0	0.1338;
120	3.361	0.0	0.131	17.35	1.027	1.000	0.0813	0.0	0.1308;
140	3.375	0.0	0.128	17.15	1.039	1.000	0.0995	0.0	0.1275;
160	3.395	0.0	0.124	16.81	1.060	1.000	0.121	0.0	0.1242;
176	3.417	0.0	0.122	16.36	1.089	1.000	0.141	0.0	0.1221;
end overlap;									
180	3.424	0.0	0.122	16.22	1.098	1.000	0.146	0.0	0.1217;
200	3.467	0.0	0.120	15.38	1.159	1.000	0.177	0.0	0.1199;
220	3.535	0.0	0.119	14.19	1.256	1.000	0.216	0.0	0.1193;
240	3.650	0.0	0.122	12.49	1.426	1.000	0.268	0.0	0.1216;
260	3.862	0.0	0.131	10.06	1.771	1.000	0.339	0.0	0.1307;
280	4.277	0.0	0.155	6.993	2.548	1.274	0.436	0.0	0.1550;
300	4.836	0.0	0.192	4.698	3.793	1.896	0.525	0.0	0.1924;
320	5.538	0.0	0.242	3.158	5.643	2.821	0.603	0.0	0.2416;
340	6.425	0.0	0.305	2.124	8.392	4.196	0.674	0.0	0.3051;
360	7.546	0.0	0.386	1.428	12.48	6.238	0.739	0.0	0.3862;
380	8.967	0.0	0.489	0.961	18.55	9.273	0.798	0.0	0.4893;
400	10.77	0.0	0.620	0.646	27.56	13.78	0.853	0.0	0.6203;
420	13.05	0.0	0.787	0.435	40.97	20.48	0.904	0.0	0.7865;
440	15.95	0.0	0.997	0.293	60.88	30.44	0.951	0.0	0.9974;
460	19.62	0.0	1.265	0.197	90.47	45.23	0.994	0.0	1.2649;
480	24.28	0.0	1.604	0.133	134.4	67.22	1.034	0.0	1.6042;
500	30.18	0.0	2.035	0.0892	199.8	99.89	1.071	0.0	2.0345;
merging;									

REPORTS

520	37.67	0.0	2.580	0.060	296.9	148.4	1.105	0.0	2.5803;
540	47.17	0.0	3.272	0.0404	441.1	220.6	1.137	0.0	3.2725;
560	59.22	0.0	4.150	0.0272	655.5	327.8	1.166	0.0	4.1503;
580	74.50	0.0	5.264	0.0183	974.1	487.0	1.193	0.0	5.2636;
587	80.77	0.0	5.720	0.0159	1118.9	559.4	1.201	0.0	5.7201;
bottom hit;									
600	93.88	0.0	6.675	0.0123	1447.4	723.7	1.217	0.0	6.6755;
620	118.5	0.0	8.466	0.00829	2150.8	1075.4	1.240	0.0	8.4661;
640	149.6	0.0	10.74	0.00558	3195.9	1598.0	1.261	0.0	10.737;
660	189.2	0.0	13.62	0.00375	4749.0	2374.5	1.281	0.0	13.617;
680	239.3	0.0	17.27	0.00253	7056.7	3528.4	1.299	0.0	17.270;
698	295.8	0.0	21.39	0.00177	10078.8	5039.4	1.314	0.0	21.388;
stop dilution reached;									

Horiz plane projections in effluent direction: radius(m): 0.0; CL(m): 0.4006

Lmz(m): 0.4006

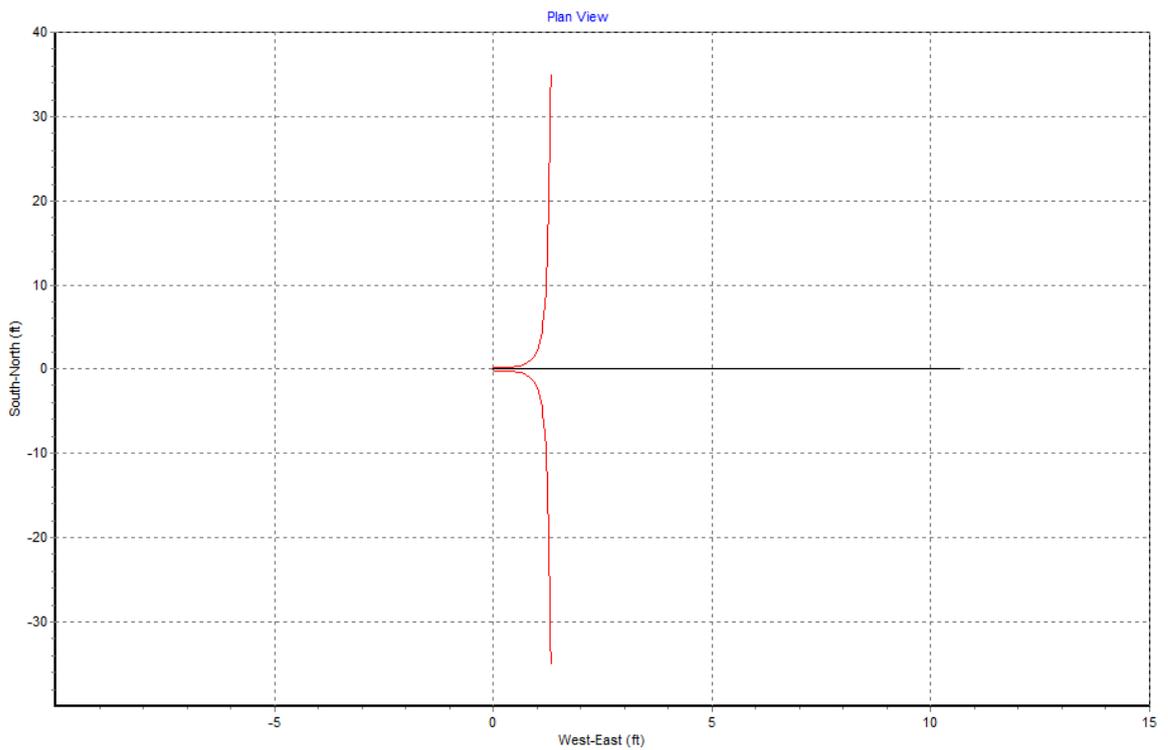
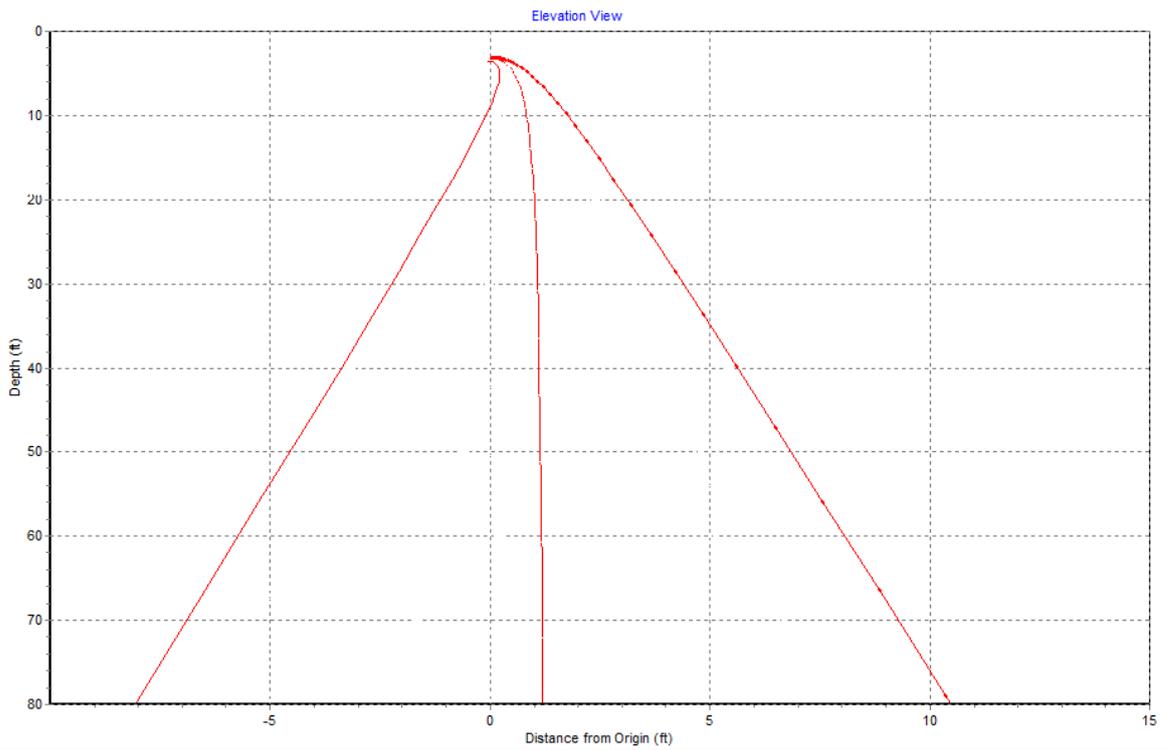
forced entrain 1 0.0 -89.15 21.39 2.38E-4

Rate sec-1 0.0 dy-1 0.0 kt: 0.0 Amb Sal 33.1000

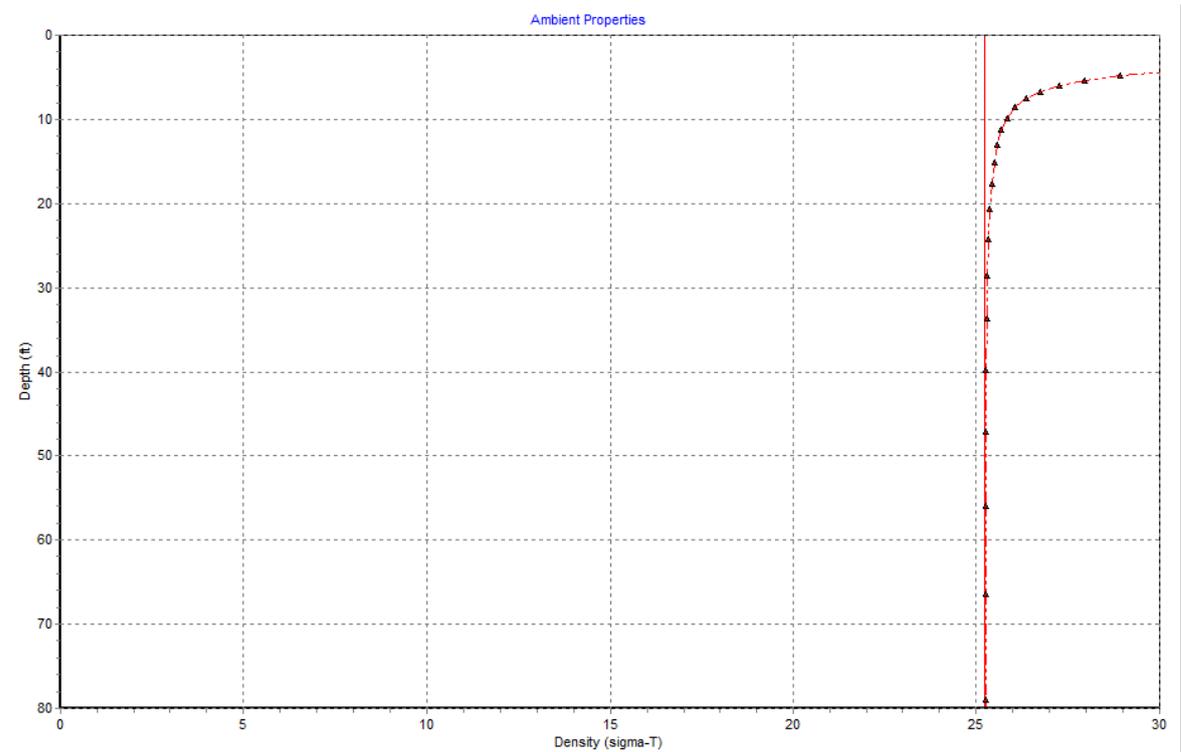
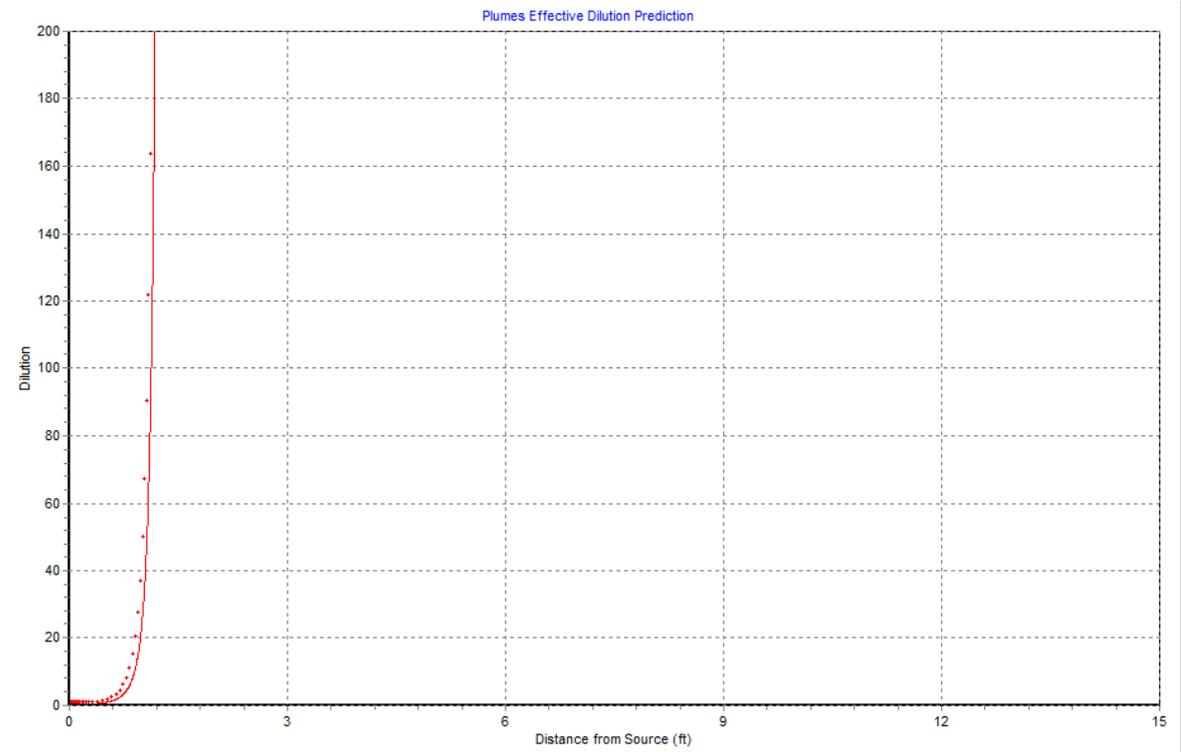
;

12:57:47. amb fills: 4

REPORTS



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Appendix D: Entanglement Plan

APPENDIX 4: ICEBERG DESALINATION BUOY ENTANGLEMENT MITIGATION PLAN (Fort Bragg, CA USA)

The following outlines the entanglement mitigation plan for the Iceberg wave-powered desalination buoy pilot project for Fort Bragg, CA. The plan's goal is to outline the plans to mitigate entanglement of marine animals on the Iceberg mooring system and anchor lines. The Iceberg mooring system is displayed below in Figure 1. Oneka will continue to seek advisement and input from NOAA Fisheries' Office of Protected Resources (NMFS OPR) and their Marine Mammal Health and Stranding Response Program (MMHSRP), built upon these initial regional efforts of partnering with state and federal agencies, non-governmental organizations (NGOs) to continuously improve our entanglement prevention efforts.

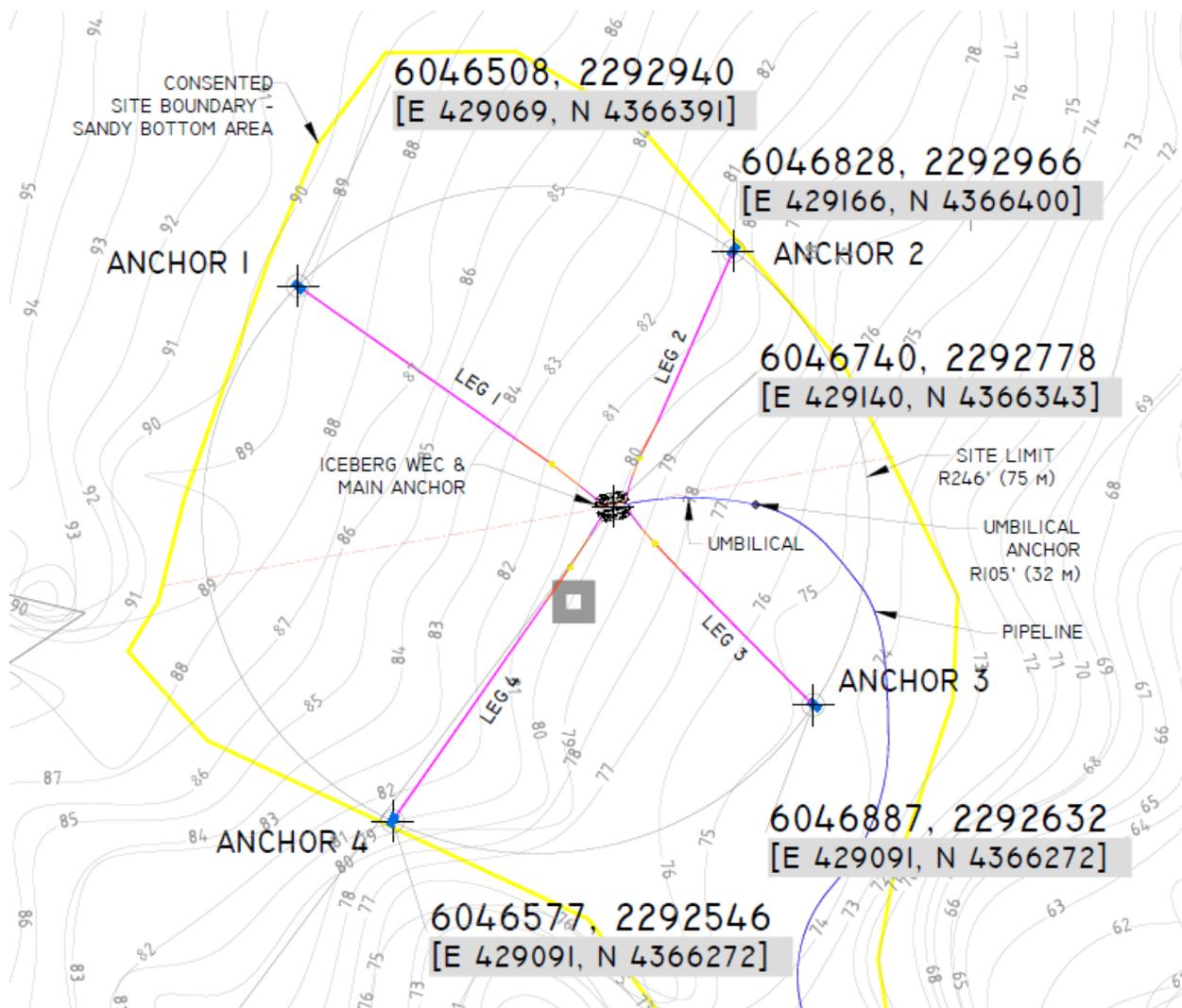


Figure 1. Iceberg Desalination Buoy mooring plan during its 12-month pilot study deployment offshore of the City of Fort Bragg, CA.

PRIMARY ENTANGLEMENT MITIGATION (DESIGN)

The mooring lines holding the Iceberg will be set under high-tension so no loops are able to form in the lines that could ensnare marine life. All additional lines needed for accessory equipment, such as backup emergency anchors, will be run through semi-rigid piping to prevent any loops developing in the water column that could ensnare marine life. The line would be able to move vertically within the piping as needed to fluctuate with the tide and waves. Exposed lines outside of the piping will occur only on the last few feet of line near the seafloor and near the surface. Only the minimal necessary length of the exposed line will be used.

SECONDARY ENTANGLEMENT MITIGATION (REGULAR MONITORING)

During each regular maintenance visit, a visual inspection of the lines from the sea surface will be made to look for evidence of nets or other marine debris getting caught on the lines that could result in secondary entanglement. A video inspection will be made quarterly of the lines using a drop camera, divers, or an ROV to ensure no materials that could cause a secondary entanglement to have become attached to the desalination buoy or its mooring system from the surface to the seafloor.

Similar Oneka desalination buoys operating since 2017 in multiple western hemisphere locations have never experienced an entanglement event. The Iceberg's position will be monitored in real-time by the maintenance team via electronic telemetry and independent satellite coordinates. Available real-time data transmitted from the buoy confirm that the units are securely moored. The GPS sensors mounted on the buoy effectively creates an electric fence and would immediately alert the monitoring system if significant or erratic movement of the buoy is occurring such as that expected if the buoy breaks free from its mooring system or is being dragged by an entangled marine mammal. Units are also equipped with a wireless camera (4G LTE) for enhanced security via periodic transmissions of the field of view. Oneka will also be evaluating acoustic monitoring devices to determine if any could detect marine mammal vocalizations/sounds near the buoys so that a visual exam could be followed upon.

ENTANGLEMENT ACTION PLAN

Following is a list of the Federal policies, guidance, and regulations used to administer the Marine Mammal Protection Act (Table 1) we have consulted to develop the following action plan in the unlikely case of marine mammal entrapment during the Iceberg Pilot Study.

Table 1. Federal policies and best practices for marine mammal entanglement response that were reviewed in preparation of this action plan.

Title	Date	Document
Large Whale Entanglement Response Best Practices	2022	PDF, 332 pages
Small Cetacean Entanglement Response Best Practices	2022	PDF, 115 pages
Pinniped Entanglement Response Best Practices	2022	PDF, 183 pages

Large Whale Entanglement

Oneka is aware of the NOAA Fisheries' Office of Protected Resources (NMFS OPR) and their Marine Mammal Health and Stranding Response Program (MMHSRP), built upon these initial regional efforts of partnering with state and federal agencies, non-governmental organizations (NGOs), researchers, the fishing industry, members of the community and many others, to establish a network of trained, experienced, well-equipped responders throughout the United States.

The principal resource of large whale entanglement response is the network of authorized responders. Human safety is paramount. The Network follows protocols and techniques that have been proven over time and can mitigate the risks posed by the response to an entangled large whale. It is for risk reduction - to humans and animals - that all large whale entanglement response efforts involving close approach are authorized, overseen, and permitted, under NMFS OPR and their MMHSRP. As such Oneka is actively engaging the Northern California NOAA offices, the Noyo Harbor Coast Guard and the Noyo Harbor Harbormaster in ongoing dialogue regarding the Pilot project, mitigation and monitoring efforts and maintaining a list of primary emergency contacts (listed below) in the unlikely event an entanglement event occurs.

Emergency Contacts

- Entanglement Hotline - 1-877-SOS-WHAlE (1-877-767-9425)
- United States Coast Guard – VHF Channel #16

Procedure while awaiting response

- Stay in the boat—**never get in the water** to attempt to help an entangled large whale.
- Note the GPS coordinates of the location of the entangled large whale, the direction and speed of travel, and whether it is solitary or with other whales.
- Call the entanglement hotline and US Coast Guard using at the Emergency Contacts listed above.
- Wait for trained, authorized personnel—do not attempt to free a large whale on your own.
- Monitor the situation—if a response is possible, authorities may ask that you stand by and watch the animal from a safe and legal distance (e.g., greater than 100 yards and not directly behind the animal).
- Document the entanglement—if possible take photos and video of the animal from a safe, and again, legal distance (high-quality camera preferred). Note behavior of the whale, approximate size, presence, color and markings on any buoys or other gear on the large whale.

Small Cetacean and Pinniped Entanglement

Entanglement in, hooking by, and ingestion of, fishing gear and marine debris is a global problem affecting hundreds of marine species. Small cetaceans (i.e., porpoises, dolphins, and toothed species of whales, excluding sperm whales), pinnipeds (seals and sea lions), fissipeds (sea otters), and sea turtles can become entangled in active and derelict fishing gear and marine debris (e.g., plastic packing bands, large rubber bands, garbage, etc.), as well as ingest fishing gear and

marine debris, causing injury and death. Responding to entangled animals is often difficult or impossible due to the inaccessibility of the animal, inability to relocate the animal, inclement weather, lack of experienced and trained personnel, human safety concerns, and more.

NMFS and the MMHSRP have developed Best Practices for responding to live small cetaceans observed with life-threatening entanglements, or more rarely, that have ingested fishing gear, to ensure the health, welfare, and safety of human responders and the impacted animals. These Best Practices balance the need for standardized procedures while allowing flexibility to address specific needs of different situations for diverse species and habitats, as well as unforeseen circumstances.

Report a Stranded or Injured Marine Animal

Reporting a sick, injured, entangled, stranded, or dead animal is the best way to make sure professional responders and scientists know about it and can take appropriate action. All maintenance staff will have access to the [Dolphin and Whale 911 app](#). If a sick, injured, stranded, or dead marine mammal or sea turtle, the maintenance staff will immediately report the observation through the app and contact the local stranding network response centers listed below.

- [The Marine Mammal Center](#) - (415) 289-7325
- NOAA Stranding Hotline, West Coast Region – (866) 767-6114

While waiting for responders, maintenance staff will:

- Maintain a safe observing distance (at least 150 ft)
- Record and update the animal's location
 - Address/landmarks on land
 - GPS position in the water
- Observe physical characteristics for approximate size, general identification (whale, dolphin, seal/sea lion, sea otter, or turtle), condition, visible wounds, ID tags or markings, clearly visible reason for distress (entanglement, injured, unknown)

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PHOTO CREDITS: J. WILLIAMS, VRG



PURPOSE

Miller Marine Science & Consulting, Inc. (MMSC) has prepared this oil spill prevention plan to highlight our methods to minimize any negative effect of the Iceberg Pilot Study on California's marine environment. During all operations where hydrocarbons will be at risk of being spilled, a spill kit will be on hand to contain and clean up the spill. At a minimum, the spill kit will include:

- (20) 15 x 19" Absorbent Pads
- (12) 3" x 12' Absorbent Socks
- (4) Pairs of Nitrile Gloves
- (10) Disposable Bags

For larger operations where potential hydrocarbon fluid spills may happen, the spill kit will be augmented as needed to ensure complete containment, capture, and clean-up of any spilled fluids. The spill kit will be held to respond to spills. As a preventative measure, absorbent pads such as Pig Stat-Mat (Pad), that are manufactured to absorb flammable liquids will be used each time hydrocarbon fluids are being dispensed as described below.

OIL SPILL PREVENTION PLAN

Spill Prevention

All marine crew involved with the pilot project install, field operations, and decommissioning will be trained on the safe handling of the hydrocarbons used as highlighted in the following sections. When a contracted vessel or land-based personnel are involved during the project, these will be required to provide an Oil Spill Prevention Plan that comply with California State Oil Spill Contingency Plan (Office of Spill Prevention and Response 2019).

Training for personnel involved in field operations will include reviewing this plan with the team prior to any operations begin, always maintain a copy of this plan with the field crew, location and use of the spill kit (listed above), posting the names, phone numbers, and location of all relevant entities such as oil spill response regulators, emergency medical facilities, wildlife care centers, etc. The primary contacts are listed in Table 1. The entities in Table 1 will be contacted immediately when a spill occurs.

The vessels and equipment used by field staff during the project may vary. These may include trailered vessels, larger docked vessels, and other land-based equipment. Regardless of what is being fueled, all open flames and other heat sources will be extinguished in the area surrounding the item being fueled. No smoking, including vaping, will be allowed within a 100 ft radius of the fueling operation. Any spill on land will be reported to the fueling facility (gas station or fuel dock) immediately and field staff will provide any and all assistance with the clean-up the facility needs. The City of Fort Bragg and Oneka Technologies project managers will be immediately notified of any on-the-water spills. The Oneka Technologies project manager will communicate with those listed in Table 1 and coordinate the clean-up effort if hydrocarbons reach the water. Spills



contained within the confines of the vessel will be cleaned up immediately by the field staff using the hydrocarbon spill kit.

Table 1. Contact information for emergency response entities to be notified if oil spill occurs.

Entity	Contact Information
California Office of Oil Spill Prevention and Response	800-852-7550 or 916-845-8911
United States Coast Guard District 11	VHF Ch. 16 or 310-521-3801 (LA/LB) or 619-683-6470 (SD)
Oiled Wildlife Care Network (if spill expands to impact wildlife)	877-823-6926
California Coastal Commission – Jonathan Bishop	Jonathan.Bishop@coastal.ca.gov

Trailerred Vessels – All trailerred vessels will be fueled while on the trailer and on dry land. Absorbent pads will be placed on the ground and on the deck under the fuel fill port to capture any spills. After fueling, the area will be wiped with the mat to clean up any spills that did not land on the mat. Only EPA-approved fuel cans will be used when fueling away from a commercially operated gas station. Whenever possible, trailerred vessels will be fueled at a gas station. If the trailerred vessel must be fueled while in the water, the spill kit shall be set nearby and ready for deployment if needed. A Pad will be wrapped around the fill port while an EPA-approved fuel can is used to add fuel to the fuel tank. A second pad will be held near the fuel pressure release port to catch any gas that may be expelled as the tank is filled. Absorbent socks will be set in the water below the overflow spout to catch any fuel released to the environment. If the two-cycle oil reservoir must be filled on the water, a Pad will be placed surrounding the fill hole. All Pads will be retained and disposed of at approved facilities at the earliest opportunity.

Non-Trailerred Vessels – Larger, chartered vessels that remain in the water will be fueled only at commercial fuel docks. Absorbent pads will be used to surround the fuel port on the vessel to capture any spilled fuel.

Equipment described in Table 2 below will be fully fueled on land. The land-based fueling will be done away from the water or any storm drains and similar conveyance that could quickly carry a spill to the water. Fueling will be done in a watertight collapsible berm with absorbent pads under the piece of equipment itself. A fire extinguisher will be present at all times while fueling. Only EPA-approved gas cans will be used to dispense gas into the equipment’s gas tank. All spills will be cleaned immediately using absorbent pads. The soiled absorbent pads will be disposed of as flammable waste at an approved facility. While at sea, the equipment may require refueling. Due to space limitations, no collapsible berm is available. Absorbent pads will be placed under and surrounding the equipment. A handheld transfer pump will be used to transfer gas from the EPA-approved gas can, while it is on the deck sitting on an absorbent pad, to the equipment’s fuel tank. This process will occur as far from any scuppers as possible on the boat. If safe, the



scuppers will be covered during fueling with absorbent pads to prevent any spill from leaking off the deck into the water. Any and all spills will be cleaned up with absorbent pads. All soiled pads will be deposited in a secure trash bag or trash can on the deck away from any ignition source until it can be offloaded at the dock. Once offloaded, the soiled pads will be disposed of as flammable waste at an approved facility.

Other Hydrocarbon Spill/Leak Prevention, Detection and Containment

Hydraulic Fluids – All hydraulic and greased systems, whether on the Iceberg, on a vessel, or on land, will have all hoses, fittings, and surfaces inspected either weekly (Iceberg or on land) or prior to departure (vessel). Any loose, worn, or damaged equipment will be replaced by trained technicians. For the Iceberg, any repairs or hydrocarbon dispensing made at sea will be done so with a spill kit at hands distance. An absorbent sock will be deployed to encircle the Iceberg and absorbent pads will be placed under all parts where hydrocarbons may leak or drip.

Vessels and equipment will be regularly inspected for leaks before startup and during operation. Operators will inspect equipment or engine rooms for raw hydrocarbon fluid around fittings, filters, hoses and other components. After shutdown, a last verification will be made to ensure the engine room or equipment did not leak. If a leak is detected, the equipment or vessel will be shut down as safely as possible, and any isolating valves will be shut. Operators will then use the spill kit on hand to capture and contain the fluid. Scuppers will be blocked to prevent any spill from leaking off the deck into the water. The City of Fort Bragg and Oneka Technologies project managers will be immediately notified of any on-the-water spills. For all vessels and equipment, other than emergency repairs, the repair will be made at a land-based facility or at the dock where vessel motion can be minimized. Absorbent pads will be used to surround the work site to catch any fluid that may spill. All absorbent pads will be properly disposed of at the nearest designated hydrocarbon disposal facility.

Table 2. Inventory of anticipated equipment using hydrocarbon fluids anticipated during the Iceberg Pilot Study.

Equipment Identification	Purpose	Expected Fluid and Volume
Gas Cans	Extra Gas for Plankton Sampling Pumps, water pumps, or winches	Up to 10 gal. Exact need will vary based on conditions.
Honda WT20 Trash Pump	Plankton sampling	Gas = 0.82 gal, 10W-30 Oil = 1.5 pint
Honda GX90 High pressure water pump	Priming buoy hydraulics	Gas = 1.6 gal, 10W-30 Oil = 1.5 pint
RuggedMade HP9-05 Hydraulic power pack	Winching in main mooring line	Gas = 1.6 gal, Hydraulic fluid = 3.6 gal, 10W-30 Oil = 1.5 pint



Gas winch: Honda GXH50	Winching in secondary mooring lines	Gas = 0.2 gal, 10W-30 Oil = 0.2 pint
Iceberg onboard capstan	Assisting main mooring line winching	Grease = 0.4 pint
Fasteners	Preventing corrosion and seizing	Anti-seize = 0.3 pint

Vessels

During the installation, operation, and decommissioning of the Iceberg buoy, the following vessels may be used:

Table 3. Inventory of anticipated vessels during the Iceberg Pilot Project.

Vessel type	Purpose	Expected Fluid and Volume
Tugboat: Length = 76', Beam = 22'	Install moorings and pipeline	Fuel = 44,000 gal, Hydraulic fluid = 850 gal, Lube oil = 850 gal
Diver support vessel: Length = 25', Beam = 12'	Assist mooring/pipeline inspections and conduct inspections	Fuel: 100 gal
Operations support vessel: Length = 32', Beam = 10.5'	Ferry site staff to the Iceberg buoy for inspections, maintenance, and environmental monitoring activities	Fuel: 300 gal



North Coast Regional Water Quality Control Board

Appendix F: NPDES Permit

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
NORTH COAST REGION
MONITORING AND REPORTING PROGRAM
ORDER No. R1-2025-0041**

**FOR THE
CITY OF FORT BRAGG
ONEKA DESALINATION BUOY PILOT PROJECT
WDID NO. 1B25030RMEN
MENDOCINO COUNTY**

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ATTACHMENTS

ATTACHMENT A - MONITORING LOCATION MAPA-1

MONITORING AND REPORTING PROGRAM (MRP)
Order No. R1-2025-0041

The City of Fort Bragg (The City or Permittee) shall be subject to the following monitoring and reporting requirements unless such requirements are further modified by the Executive Officer. The Code of Federal Regulations (40 C.F.R. § 122.48) requires that all National Pollutant Discharge Elimination System (NPDES) permits specify monitoring and reporting requirements. California Water Code section 13267 and 13383 also authorizes the Regional Water Quality Control Board (Regional Water Board) to require technical and monitoring reports. This MRP establishes monitoring and reporting requirements that implement federal and California regulations. Any person failing to furnish technical or monitoring reports or falsifying any information therein is guilty of a misdemeanor and may be subject to civil liability. (California Water Code section 13268).

The City is enrolled for coverage under Order No. R1-2020-0006, General NPDES Permit for Low Threat Discharges to Surface Waters of the North Coast Region (General Order). The use authorized under the General Order is the City of Fort Bragg's Oneka Desalination Buoy Project's (Project) brine discharge to the Pacific Ocean. This Project is proposed to withdraw less than 0.10 million gallons per day of seawater and will operate for a period not greater than one year.

The General Order allows the Regional Water Board Executive Officer to modify the monitoring and reporting program for a specific permittee to reduce monitoring frequency and/or eliminate a monitoring parameter if it can be demonstrated that any reduction in monitoring requirements will not compromise water quality. The Executive Officer may also stipulate conditions and requirements in addition to those established by the MRP for all authorized discharges, including monitoring and reporting requirements, for each specific discharge to assess compliance with requirements of the General Order and/or characterize the discharge and/or receiving water quality. This monitoring and reporting program (MRP) replaces the MRP contained within the General Order.

1. General Monitoring Provisions

1.1. Representative Monitoring Provision

Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring locations specified in Table E-1, below, and further described in the Permittee's Notice of Intent (NOI) and Executive Officer's Notice of Applicability (NOA), and, unless otherwise specified, before the monitored flow joins or is diluted by any other waste stream, body of water, or substance. Monitoring locations shall not be changed without notification to and the approval of the Regional Water Board.

Effluent samples shall be taken downstream of the last addition of wastes to the treatment or discharge works where a representative sample may be obtained prior to mixing with the receiving waters. Samples shall be collected at such point and in such manner to assure representative samples of the discharge.

1.2. Supplemental Monitoring Provision

If the Permittee monitors any pollutant more frequently than required by this MRP, using test procedures approved by 40 C.F.R. part 136 or as specified in this MRP or the General Order, the results of such monitoring shall be included in the calculation and reporting of the data submitted in the annual self-monitoring report.

1.3. Data Quality Assurance Provision

Laboratories analyzing monitoring samples shall be certified by the State Water Resources Control Board (State Water Board) in accordance with the provisions of Water Code section 13176 and must include quality assurance/quality control data with their analytical reports. The Permittee may analyze pollutants with short hold times (e.g., pH, chlorine residual, etc.) with field equipment or an on-site laboratory provided that the Permittee has standard operating procedures (SOPs) that identify quality assurance/quality control procedures to be followed to ensure accurate results.

The Permittee shall keep a manual onsite containing the steps followed in this program and must demonstrate sufficient capability to adequately perform these field tests (e.g., qualified, and trained employees, properly calibrated and maintained field instruments). The program shall conform to U.S. EPA guidelines or other approved procedures.

1.4. Instrumental and Calibration Provision

All monitoring instruments and devices used by the Permittee to fulfill the prescribed monitoring program shall be properly maintained and calibrated as necessary to ensure their continued accuracy. All flow measurement devices shall be calibrated no less than the manufacturer's recommended intervals or one-year intervals (whichever comes first) to ensure continued accuracy of the devices.

1.5. Field Test Instruments

Field test instruments (such as those used to test pH, dissolved oxygen, electrical conductivity, and turbidity) may be used provided that the samples are analyzed by a State Water Board certified laboratory, or:

1.5.1. The user is trained in proper use and maintenance of the instruments;

1.5.2. All readings are properly recorded and records maintained;

- 1.5.3. The instruments are field calibrated prior to monitoring events at the frequency recommended by the manufacturer;
- 1.5.4. Instruments are serviced by the manufacturer or authorized representative at the recommended frequency; and
- 1.5.5. Field calibration reports are maintained and available for at least three years.

1.6. **Minimum Levels (ML) and Analytical Method Selection**

- 1.6.1. U.S. EPA published regulations for the Sufficiently Sensitive Methods Rule (SSM Rule) which became effective September 18, 2015. Unless otherwise specified by this MRP, all monitoring shall be conducted according to test procedures established at 40 C.F.R. 136, Guidelines Establishing Test Procedures for Analysis of Pollutants. All analyses shall be conducted using the lowest practical quantitation limit achievable using U.S. EPA approved methods. For the purposes of the NPDES program, when more than one test procedure is approved under 40 C.F.R., part 136 for the analysis of a pollutant or pollutant parameter, the test procedure must be sufficiently sensitive as defined at 40 C.F.R. 122.21(e)(3) and 122.44(i)(1)(iv). A U.S. EPA-approved analytical method is sufficiently sensitive where:
 - 1.6.1.1. The Minimum Level (ML) is at or below both the level of the applicable water quality criterion/objective and the permit limitation for the measured pollutant or pollutant parameter; or
 - 1.6.1.2. In permit applications, the ML is above the applicable water quality criterion/objective, but the amount of the pollutant or pollutant parameter in a facility's discharge is high enough that the method detects and quantifies the level of the pollutant or pollutant parameter in the discharge; or
 - 1.6.1.3. The method has the lowest ML of the U.S. EPA-approved analytical methods where none of the U.S. EPA-approved analytical methods for a pollutant can achieve the MLs necessary to assess the need for effluent limitations or to monitor compliance with a permit limitation.
- 1.6.2. Where effluent limitations are set below the lowest achievable quantitation limits, pollutants not detected at the lowest practical quantitation limits will be considered in compliance with effluent limitations. Analysis for toxics listed by the California Toxics Rule (CTR) shall also adhere to guidance and requirements contained in the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (2005) (SIP). However, there may be situations when analytical methods are published with MLs that are more sensitive than the MLs for analytical methods listed in the SIP. For instance, U.S. EPA Method 1631E for mercury is not currently listed in SIP Appendix 4, but it is published with an ML of 0.5 ng/L that makes it a

sufficiently sensitive analytical method. Similarly, U.S. EPA Method 245.7 for mercury is published with a ML of 5 ng/L.

2. Environmental Monitoring Plan

- 2.1. The Permittee shall perform Marine Water Quality Monitoring as proposed in the Permittee’s March 2025 monitoring plan titled City of Fort Bragg, Oneka Desalination Buoy Pilot Environmental Monitoring Plan (Environmental Monitoring Plan). Sections 4 through 6 and 7.1 of this MRP are intended to summarize key requirements of the Environmental Monitoring Plan. The Environmental Monitoring Plan is required to be completed in its entirety, and the omission of any specifics within this MRP shall not be interpreted as authorization for the permittee to reduce the monitoring proposed.
- 2.2. At the request of the Permittee, the Regional Water Board may, at its Executive Officer’s discretion, choose to reduce, and/or eliminate, and/or modify monitoring requirements as proposed within the Environmental Monitoring Plan. Any request for modification to the Environmental Monitoring Plan shall be made at least 30 days prior to the subject monitoring.

3. Monitoring Locations

- 3.1. The following monitoring locations have been established within the Permittee’s Environmental Monitoring Plan. These monitoring locations shall be maintained to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements in the General Order.

TABLE E-1. MONITORING STATION LOCATIONS

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
001	EFF-001	Brine discharged from the Oneka desalination buoy.
---	DIS-X	Receiving water monitoring location collected at multiple depth intervals below the brine discharge point and within the Pacific Ocean. The proposed depth intervals of 1-foot, 3-foot, 9-foot, and 12-foot below the discharge point shall be designated DIS-1, DIS-3, DIS-9, and DIS-12, respectively, with continuous data collection. Water Chemistry Monitoring at DIS-3 will be conducted on a quarterly basis.
---	BMZ-X	Receiving water monitoring location collected at multiple depth intervals from a point approximately 1 foot horizontally from the discharge point and within the Pacific Ocean. The proposed depth intervals of 1-foot, 3-foot, 9-foot, and 12-foot below the discharge point shall be designated BMZ -1, BMZ -3, BMZ -9, and BMZ -12, respectively, with continuous data collection.

Discharge Point Name	Monitoring Location Name	Monitoring Location Description
---	WQ-Iceberg	Receiving water quality monitoring location located at the desalination buoy, with monthly data collection.
---	WQ1	Receiving water quality monitoring location located approximately 100-feet northeast of the desalination buoy, with monthly data collection.
---	WQ2	Receiving water quality monitoring location located approximately 100-feet southeast of the desalination buoy, with monthly data collection. Water Chemistry Monitoring at WQ2 will be conducted on a quarterly basis.
---	WQ3	Receiving water quality monitoring location located approximately 100-feet southwest of the desalination buoy, with monthly data collection.
---	WQ4	Receiving water quality monitoring location located approximately 100-feet northwest of the desalination buoy, with monthly data collection.
---	Iceberg	Plankton water monitoring location collected at a location as close as can be achieved to the desalination buoy discharge point. Sampled quarterly at approximately 5 feet depth.
---	U1	Plankton water monitoring location collected at a location approximately 1,600 feet upcoast (north) of the desalination buoy. Sampled quarterly at approximately 5 feet depth.
---	O1	Plankton monitoring location collected at a location approximately 1,600 feet offshore (west) of the desalination buoy. Sampled quarterly at approximately 5 feet depth.
---	D1	Plankton water monitoring location collected at a location approximately 1,600 feet downcoast (south) of the desalination buoy. Sampled quarterly at approximately 5 feet depth.

4. Brine Discharge Monitoring Requirements

4.1. The Permittee shall monitor the Pacific Ocean at Monitoring Locations DIS-X and BMZ-X as follows:

4.1.1. Continuous temperature and conductivity monitoring shall be conducted using data loggers during operation of the desalination buoy, as described in Section 3.1 of the Environmental Monitoring Plan. This data will be used to derive salinity at each monitoring location and to verify the Permittee's brine dilution modeling.

5. Monthly Water Quality Monitoring Requirements

5.1. The Permittee shall monitor the Pacific Ocean at Monitoring Locations WQ-Iceberg, WQ1, WQ2, WQ3, and WQ4 as follows:

5.1.1. Monthly temperature, pH, salinity, and dissolved oxygen monitoring shall be conducted using multiparameter sondes during operation of the desalination buoy, as described in Section 3.2 of the Environmental Monitoring Plan. Monitoring at each Monitoring Location shall occur at 1-foot intervals between the Ocean's surface to the sea floor.

6. Water Chemistry Monitoring Requirements

6.1. The Permittee shall monitor the Pacific Ocean at Monitoring Locations DIS-3 and WQ2 as follows:

6.1.1. Quarterly monitoring for Ocean Plan Table 3 Priority Pollutants shall be conducted as described in Section 3.3 of the Environmental Monitoring Plan. Section 3.3 of the Environmental Monitoring Plan identifies these parameters as the Ocean Plan Table 1 Priority Pollutants; however, this table designation referred to a previous version of the Ocean Plan. The Permittee shall conduct monitoring for Table 3 Priority Pollutants in accordance with the 2019 California Ocean Plan.

7. Other Monitoring Requirements

7.1. Plankton Entrainment Assessment Monitoring

7.1.1. Plankton entrainment assessment monitoring shall be conducted quarterly at Monitoring Location Iceberg, U1, O1, and D1. Monitoring shall be performed as described in section 4 of the Permittee's Environmental Monitoring Plan.

7.2. Visual Monitoring

7.2.1. Visual observations of the discharge point (Monitoring Location WQ-Iceberg) shall be recorded during each monthly water quality monitoring event. Visual monitoring of the receiving waters immediately adjacent to the desalination buoy shall include, but not be limited to, observations for color, turbidity, floating or suspended matter or debris, unusual aquatic growth, etc. Visual observations shall be recorded and included in the Permittee's monitoring reports submitted to the Regional Board.

7.2.2. The Permittee shall take photographs of the discharge point (Monitoring Location WQ-Iceberg) during each monthly water quality monitoring event. The photographs shall be labeled with a date and time and shall be included with monitoring reports submitted to the Regional Water Board.

7.3. Other Monitoring

- 7.3.1. When granting authorization to discharge under the General Order, the Executive Officer may stipulate conditions in addition to the requirements described by the General Order for all authorized discharges, including monitoring requirements, for a specific discharge. Such monitoring requirements shall become enforceable requirements of the General Order and may include effluent and/or receiving water monitoring requirements.

Low threat discharges that continue for more than one year may be required to monitor for any toxic pollutants for which water quality criteria or objectives have been established for the receiving stream. For example, this additional monitoring requirement may be applied to any discharge for which pre-project sampling revealed levels of any toxic pollutant that was below the applicable water quality criteria. This additional monitoring requirement may be stipulated in the authorization letter or may be requested at a later date if Regional Water Board staff determines that this requirement is necessary to assure water quality protection. Monitoring for the toxic pollutants will provide on-going characterization of authorized discharges and assurance that toxic pollutants are not present in the concentrations that exceed applicable water quality criteria and objectives.

8. Reporting Requirements

8.1. General Monitoring and Reporting Requirements

- 8.1.1. The Permittee shall comply with all Standard Provisions (Attachment D) of the General Order related to monitoring, reporting, and recordkeeping.

8.2. Self-Monitoring Reports

- 8.2.1. The Permittee shall electronically submit Self-Monitoring Reports (eSMRs) using the State Water Board's [California Integrated Water Quality System \(CIWQS\) Program Web site](http://www.waterboards.ca.gov/ciwqs/index.html) (<http://www.waterboards.ca.gov/ciwqs/index.html>). The CIWQS Web site will provide additional directions for SMR submittal in the event there will be service interruption for electronic submittal. The Permittee shall maintain sufficient staffing and resources to ensure it submits eSMRs that are complete and timely. This includes provision of training and supervision of individuals (e.g., Permittee personnel or consultant) on how to prepare and submit eSMRs.
- 8.2.2. The Permittee shall report in the SMRs the results for all monitoring specified in this MRP under sections 3 through 7. The Permittee shall submit quarterly draft data summary reports and a Final SMR including the results of all required monitoring using U.S. EPA approved test methods or other test methods specified in this Order. If the Permittee monitors any pollutant or parameter

more frequently than required by this Order, the results of this monitoring shall be included in the calculations and reporting of the data submitted in the SMR.

8.2.3. Draft Data Summary Reports

8.2.3.1. The Permittee shall prepare quarterly draft data summary reports that include all available data collected for each quarter for the desalination pilot project. The data will be submitted to all interested regulatory agencies in a timely fashion (approximately 30 days) and will be considered draft. The draft data summary reports will allow the Permittee and interested regulatory agencies to determine if additional or alternative monitoring would be appropriate for the project.

8.2.4. Final SMR

8.2.4.1. The Final SMR shall include all monitoring completed for the duration of the pilot project.

8.2.4.2. The Final SMR shall be submitted within 6 months of completion of the pilot project.

8.2.4.3. The Final SMR shall include the results of the post-construction surveys performed after demobilization of the desalination buoy and associated equipment, as described in Section 7.5 of the Environmental Monitoring Plan.

8.2.5. Monitoring Results

8.2.5.1. All monitoring results reported shall be supported by the inclusion of the complete analytical report, including all quality assurance and quality control data and chain of custody records from the laboratory that conducted the analyses.

8.2.5.2. The Permittee shall report with each sample result the applicable ML, the Reporting Level (RL), and the current Minimum Detection Level (MDL), as determined by the procedure in 40 C.F.R. part 136.

8.2.5.3. The Permittee shall report the results of analytical determinations for the presence of chemical constituents in a sample using the following reporting protocols:

8.2.5.3.1. Sample results greater than or equal to the reported ML shall be reported as measured by the laboratory (i.e., the measured chemical concentration in the sample).

8.2.5.3.2. Sample results less than the reported ML, but greater than or equal to the laboratory's MDL, shall be reported as "Detected, but Not Quantified," or

DNQ. The estimated chemical concentration of the sample shall also be reported.

- 8.2.5.3.3. For the purposes of data collection, the laboratory shall write the estimated chemical concentration next to DNQ as well as the words "Estimated Concentration" (may be shortened to "Est. Conc."). The laboratory may, if such information is available, include numerical estimates of the data quality for the reported result. Numerical estimates of data quality may be percent accuracy (\pm a percentage of the reported value), numerical ranges (low to high), or any other means considered appropriate by the laboratory.
 - 8.2.5.3.4. Sample results less than the laboratory's MDL shall be reported as "Not Detected," or ND.
 - 8.2.5.3.5. The Permittee is to instruct laboratories to establish calibration standards so that the ML value (or its equivalent if there is differential treatment of samples relative to calibration standards) is the lowest calibration standard. At no time is the Permittee to use analytical data derived from extrapolation beyond the lowest point of the calibration curve
- 8.2.6. The Permittee shall submit all eSMRs in accordance with the following requirements:
- 8.2.6.1. The Permittee shall arrange all reported data in a tabular format. The data shall be summarized to clearly illustrate whether the Facility is operating in compliance with interim and/or final effluent limitations. The reported data shall include calculations of all effluent limitations that require averaging, taking of a median, or other computation. The Permittee is not required to duplicate the submittal of data that is entered in a tabular format within CIWQS. When electronic submittal of data is required and CIWQS does not provide for entry into a tabular format within the system, the Permittee shall electronically submit the data in a tabular format as an attachment.
 - 8.2.6.2. The Permittee shall attach a cover letter to the SMR. The information contained in the cover letter shall clearly identify:
 - 8.2.6.2.1. Facility name and address;
 - 8.2.6.2.2. WDID number;
 - 8.2.6.2.3. Applicable period of monitoring and reporting;
 - 8.2.6.2.4. Any variations from the Notice of Intent (NOI);
 - 8.2.6.2.5. A brief evaluation of the effectiveness of all treatment methods and/or management measures implemented;

8.2.6.2.6. Identification and explanation of any complaints caused by the discharge;

8.2.6.2.7. Violations of the General Order (identified violations must include a description of the requirement that was violated and a description of the violation);

8.2.6.2.8. Corrective actions taken or planned; and

8.2.6.2.9. The proposed time schedule for corrective actions.

8.2.6.3. eSMRs must be submitted to the Regional Water Board, signed, and certified as required by the Standard Provisions (Attachment D) of the General Order, to the CIWQS Program [Website](#).

8.2.6.4. In the event that an alternate method for submittal of electronic self-monitoring reports is required, the Permittee shall submit electronically via email to NorthCoast@waterboards.ca.gov or on disk (CD or DVD) in Portable Document Format (PDF) file in lieu of paper-sourced documents. The guidelines for electronic submittal of documents can be found on the Regional Water Board website at <http://waterboards.ca.gov/northcoast>.

8.3. Other Reports

8.3.1. Notice of Discharge Event

The Permittee shall provide the appropriate Regional Water Board staff person written notification by email at least three (14) days before initiating an authorized discharge, unless a shorter notification period is authorized by the Executive Officer.

8.3.2. Notice of Termination

8.3.2.1. Within 30 days following permanent termination of the authorized discharge covered under the General Order, the Permittee shall provide notice that the authorized discharge has been discontinued using the Notice of Termination (NOT) form provided as Attachment G of the General Order.

8.4. Spills Notification

8.4.1. Spills and Unauthorized Discharges

Information regarding all spills and unauthorized discharges that may endanger health, or the environment shall be provided orally and by email to the Regional Water Board as soon as possible, but no later than 24 hours from the time the Permittee becomes aware of the circumstances and a written report shall also be provided within five (5) days of the time the Permittee becomes aware of the

circumstances, in accordance with section V.E of Attachment D of the General Order.

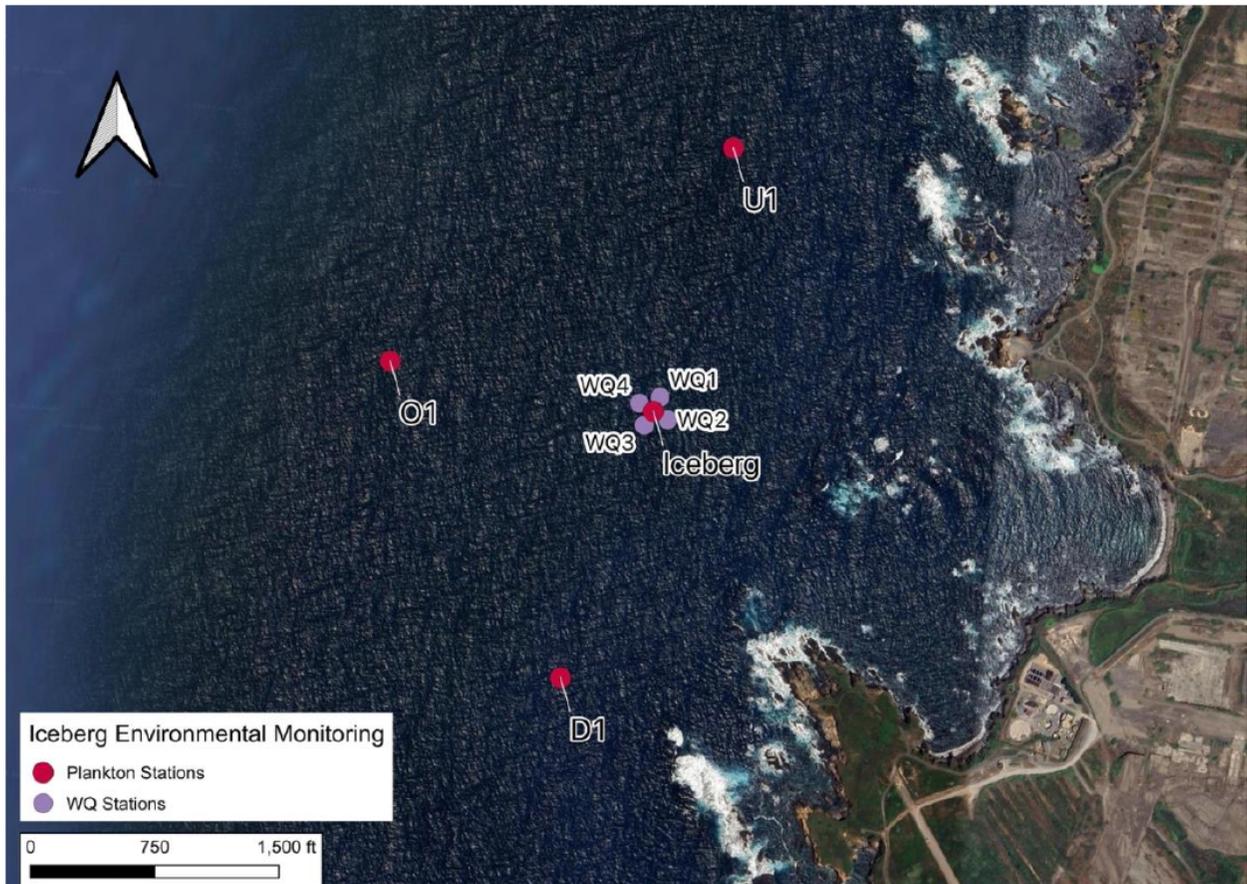
- 8.4.1.1. Information to be provided verbally and by email to the Regional Water Board includes:
 - 8.4.1.1.1. Name and contact information of caller;
 - 8.4.1.1.2. Date, time, and location of spill or unauthorized discharge occurrence;
 - 8.4.1.1.3. Estimates of spill or unauthorized discharge volume, rate of flow, and spill duration, if available and reasonably accurate;
 - 8.4.1.1.4. Surface water bodies impacted, if any;
 - 8.4.1.1.5. Cause of spill or unauthorized discharge, if known at the time of notification;
 - 8.4.1.1.6. Cleanup actions taken or repairs made at the time of the notification; and
 - 8.4.1.1.7. Responding agencies.
- 8.4.1.2. The written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

Ordered By: _____

Valerie Quinto
Executive Officer

25_0041_FortBraggDesal_MRP

ATTACHMENT A - MONITORING LOCATION MAP





North Coast Regional Water Quality Control Board

August 29, 2025

Mr. John Smith
Director of Public Works
City of Fort Bragg
416 N. Franklin Street
Fort Bragg, CA 95437
jsmith@fortbragg.com

Dear Mr. Smith:

Subject: Water Code Section 13142.5(b) Determination Letter

File: City of Fort Bragg, Oneka Desalination Buoy Project,
WDID No. 1B25030RMEN, Place ID CW-900269

The City of Fort Bragg (City) submitted a request for a California Water Code (Water Code) section 13142.5(b) determination for the Oneka Desalination Buoy Pilot Project (Project) in a letter dated June 20, 2024. Based on the information provided within the City's Project Description dated October 8, 2024, and their application for enrollment under General Order No. R1-2020-0006, Low Threat Dischargers to Surface Waters in the North Coast Region, received on October 11, 2024, the Regional Water Board, in consultation with the State Water Board, has determined that the Project complies with Water Code section 13142.5(b).

In response to drought conditions and water reliability concerns experienced by the City in recent years, the City has sought new, reliable alternatives to supplement their potable water supply. Oneka Technologies (Oneka) wave-powered desalination buoy system, capable of converting seawater into freshwater through reverse osmosis using only the power of ocean waves, may be well suited to the coastal elements of the City. The Project deployment will determine the effectiveness of this technology along the coast of Northern California and refine operational parameters to inform a future utility-scale development. The Project comprises a single Oneka "Iceberg" class desalination buoy that can produce 13,200 gallons per day of fresh water for a period of twelve months. The Iceberg's general operation and environmental impacts will be monitored during this period to support future utility-scale permitting.

Water Code section 13142.5(b) requires that each new or expanded coastal powerplant or other industrial installation using seawater for cooling, heating, or industrial processing use the best available site, design, technology, and mitigation measures

HECTOR BEDOLLA, CHAIR | VALERIE QUINTO, EXECUTIVE OFFICER

feasible to minimize the intake and mortality of all forms of marine life. The Project is, however, exempt from the Implementation Provisions for Desalination Facilities contained within Chapter III.M.2, M.3, and M.4 of the Water Quality Control Plan for Ocean Waters of California (Ocean Plan) because it has been identified as a portable desalination facility operated by a government agency that withdraws less than 0.10 million gallons per day of seawater.

This Water Code section 13142.5(b) determination is applicable only to the Project, which is a 12-month, temporary pilot study. The site, design, technology, and mitigation measures that the Regional Water Board has considered in this determination, as described further below, are derived from the information submitted by Oneka Technologies and the City. Any future pilot projects testing similar technologies or located at different sites will require separate permitting processes and evaluations. Further, any future utility-scale projects will require separate permitting processes.

The City must apply for a new Water Code section 13142.5(b) determination, in accordance with any applicable Ocean Plan or other legal requirements, if any potential future expansion of the installation occurs, including any of the following: 1) increases in the amount of seawater used either exclusively by the facility or used by the facility in conjunction with other facilities or uses, or 2) design or operational changes to the Project that could increase the intake and mortality of all forms of marine life beyond that which is approved under this Order.

Site:

“Site” is the general onshore and/or offshore location of a new or expanded facility. The City analyzed the general area of the Fort Bragg coastline to identify suitable locations to place the mooring system for the pilot desalination buoy. Since this type of technology has not been tested in California, the best available site feasible for this Project is one that can accommodate the following parameters: shoreside facilities to receive and test the permeate delivered from the buoy; access to supporting infrastructure for the disposal of the permeate; and a position in the Pacific Ocean that considers pumping efficiency, ambient wave energy, water depth for brine dispersion, and minimization of visual impacts.

The site proposed for the desalination buoy is northwest of the Fort Bragg Wastewater Treatment Facility, approximately 0.5 miles offshore. This location allows for efficient pumping of permeate from the desalination buoy to land without the need for supplemental pumps and minimizes visual impacts from the buoy. Additionally, the Fort Bragg Wastewater Treatment Facility has space to accept permeate for testing and disposal. Furthermore, the chosen location allows for the mooring system to be placed in an area dominated by soft-bottom habitat and allows the permeate pipeline to be placed along the previously disturbed habitat created by the wastewater treatment plant’s ocean outfall. The site is not located within a Marine Protected Area (MPA) or State Water Quality Protection Area (SWQPA).

The City concluded that the proposed location for the desalination buoy, adjacent to the Fort Bragg Wastewater Treatment Facility, was the best available site feasible because there were no other feasible locations that could accommodate the permeate piping without disrupting marine navigation near Noyo Harbor or encroaching on areas of hard bottom that support sensitive kelp beds. The Regional Water Board finds that the Project's location is consistent with section 13142.5(b).

Design:

"Design" is the layout, form, and function of a facility, including the configuration and type of infrastructure, including intake and outfall structures. The key design features of the Iceberg desalination buoy are the 60-micron mesh intake screen, low through-screen velocity intake, and low intake volume.

The desalination buoy's intake screen is made from a 60-micron stainless steel mesh to prevent the entrainment of larger marine organisms. This screen size is expected to minimize intake and mortality of all forms of marine life. The proposed screen size is anticipated to limit marine life entrainment to phytoplankton, nanoplankton, and microplankton and its efficacy will be further studied over the course of the Project as described in the Environmental Monitoring Plan.

The desalination buoy has also been designed for a maximum intake velocity of 0.22 feet per second (ft/sec), less than the 0.5 ft/sec required by the Ocean Plan. This low intake velocity protects marine life by significantly limiting the potential for impingement. Furthermore, since the intake structure also serves as the discharge for the brine, the backflushing during each pumping cycle is expected to release any marine life that is trapped against the screened (impinged). It is recommended that backflushing be verified under field conditions to confirm its effectiveness at removing impinged organisms.

The low seawater intake (up to 66,000 gal/day) and brine discharge volumes (up to 52,800 gal/day) used by the desalination buoy further protect marine life by allowing a passive diffusion of brine to mix with ambient seawater as it falls vertically from the near surface intake location. Salinity is estimated to increase from an ambient ocean salinity of 30.1 parts per thousand (ppt), to a maximum of 50.92 ppt in the discharge when the pump is operated at a 35% recovery rate. Design modeling indicates that the brine discharge is expected to be diluted to near-ambient salinity within 1-foot horizontally and 9-feet vertically of the discharge, well above the sea floor at the Project location. Salinity monitoring is proposed during the 12-month pilot period to provide detailed data on the characteristics and extent of the brine mixing zone.

Additional design criteria are being employed to reduce risks to marine life and the environment including minimizing the use of chemicals on the Iceberg desalination buoy, and reducing the number of mooring/anchoring lines to reduce the risk of entanglement. All mooring and anchoring lines shall be tensioned to prevent loops that

may ensnare marine life. The Regional Water Board finds that the Project's design is consistent with section 13142.5(b).

Technology:

"Technology" is the type of equipment, materials, and methods that are used to construct and operate the design components of the Project. The Iceberg desalination buoy makes use of ambient waves to generate energy used for the desalination process and to pump permeate to the shore-side receiving facility. This approach to desalination allows the production of fresh water without using the local power grid and reduces the normally heavy carbon footprint of traditional desalination technology. Ancillary systems on the desalination buoy can be powered by solar panels if necessary, although these systems are not required for the desalination process.

Other aspects of the Project's technology have been discussed in the design section above, and include the intake mesh size, low velocity intake velocity, passive discharge of the brine through the intake structure, and low volume discharge of brine. The Regional Water Board finds that the Project's technology is consistent with section 13142.5(b).

Mitigation:

"Mitigation" is the replacement of all forms of marine life or habitat that is lost due to the construction and operation of a desalination facility after minimizing intake and mortality of all forms of marine life through best available site, design, and technology (Ocean Plan, 2019). The Ocean Plan allows the payment of a mitigation value to an approved mitigation program in lieu of completing an independent mitigation project. The Regional Water Board has approved the use of a fee-based mitigation approach for this project because of the pilot nature of the Project, including its short operational timeframe, and the low intake and discharge volumes.

The City has estimated an approximate mitigation value of not less than \$372; based on the State Water Board's interim mitigation calculations framework adopted by State Water Board Resolution No. 2024-0014. This mitigation approach is based on a default payment calculated per volume of water circulated over the course of 12 months, with an additional monitoring and maintenance payment. The final mitigation value will be determined upon completion of the Project and will be donated to a conservatory group conducting marine mitigation near the City of Fort Bragg. Final selection of the mitigation recipient and project shall be subject to Regional Water Board approval.

If you have any questions, please contact Matthew Herman of my staff, at matthew.herman@waterboards.ca.gov or (707) 576-2683.

Sincerely,

Valerie Quinto
Executive Officer

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