UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No:
WCR 2018-9670

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Re: Endangered Species Act Section 7(a)(2) Concurrence Letter and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Dispersant Preauthorization under Section I of the California Dispersant Plan, Appendix XII of the Regional Response Team IX Regional Contingency Plan

Dear Mr. Holmes and Mr. Meer:

On November 21, 2016, NOAA's National Marine Fisheries Service (NMFS) received final amendments to your second version biological assessment (BA) and request for a written concurrence that the U.S. Coast Guard (USCG) 11th District's and U.S. Environmental Protection Agency (EPA) Region IX's Dispersant Preauthorization under Section I of the California Dispersant Plan (CDP), Appendix XII of the Regional Response Team IX Regional Contingency Plan under the Oil Pollution Act of 1990 is not likely to adversely affect (NLAA) species listed as threatened or endangered or critical habitats designated under the Endangered Species Act (ESA). Additional effects determinations for two species listed in January 2018 were received on May 01, 2018. This response to your requests was prepared by NMFS pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402, and agency guidance for preparation of letters of concurrence.

NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The concurrence letter will be available through NMFS' Public Consultation Tracking System (https://pcts.nmfs.noaa.gov/pcts-web/hompage.pcts). A complete record of this consultation is on file at the North-Central Coast Office in Santa Rosa, CA.

Proposed Action and Action Area

The federal action is the preauthorized use of four oil spill dispersants listed on the National Oil and Hazardous Substances Pollution Contingency Product Schedule and licensed for use by the State of California (COREXIT EC9527A, COREXIT EC9500A, NOKOMIS 3-AA, and NOKOMIS 3-FA), as delineated in the CDP Section 1, in Federal waters 3-200 nautical miles (nm) from the California shoreline excluding waters within National Marine Sanctuaries, waters within 3 nm of the California-Mexico border and waters within 3 nm of coastal islands. Any other dispersant chemical would require Area Regional Response Team approval for use and is not part of this consultation. The action area includes all areas directly or indirectly affected by the Federal action and therefore includes all marine waters generally within 200 nm of the California shoreline from the borders with Mexico and the State of Oregon. As dispersant will only be applied in the event of an oil spill, the presence of oil in the water in the preauthorized zone is assumed.

Although four dispersants are authorized for use by the State of California, only two are actually stockpiled and available for use, COREXIT EC9500A and EC9527A. There is approximately 43,000 gallons of COREXIT EC9500A stationed at eight locations from Eureka to Long Beach, California, and it represents the most likely dispersant to be used in a preauthorized response. There is approximately 9,550 gallons of COREXIT EC9527 stockpiled in Carpenteria, California (Holmes, pers. com., 2016). This formulation is believed to be more effective on some of the heavier crude oils produced by several of the offshore platforms in this area and it is stored in the event of an appropriate spill. There are no stockpiles of the NOKOMIS products making their utilization during the 96 hour preauthorization window highly unlikely.

USCG regulations require a seven hour response time to an oil spill and all areas off the California coast are considered accessible by the C-130 aircraft stationed in Chandler, Arizona for this purpose. Additional time may be required for dispersant loading at a staging area near the spill and flying to the spill site and this time lag means some water column and/or inhalation impacts from the oil is likely to occur to those organisms present in the spill zone. This response capability makes the C-130 application of one of the COREXIT products the most likely first response (Holmes, pers. com., 2016).

The CDP provides a decision making framework for the preauthorized use of dispersants and the following restrictions on the use of dispersants in the preauthorized zone are included:

- The Pre-Approval Zone Dispersant Use Checklist in the CDP will be utilized.
- Only spilled oil that can be chemically dispersed with the approved dispersants will be treated. Other response options will be implemented for other types of oil or oil products.
- Diesel spills will not be treated with dispersants.
- Only surface applications from aircraft or boats are allowed. No subsurface applications are preapproved.

- If Special Monitoring of Applied Response Technologies (SMART) indicates that dispersant use is ineffective, dispersant use will be stopped.
- Caution will be taken to avoid spraying of marine mammals and sea turtles.
- Applications will only take place during daylight hours and safe sea and air conditions.

The second BA also clarified that pre-approval only applies to dispersant operations expected to be less than 96-hours in duration in accordance with USCG national policy and that the action agencies will initiate emergency consultation with NMFS for all applications of dispersants in order to account for incident specific variables.

Several modifications to the proposed action and second BA have been made through continued informal consultation in order to address and minimize potential interrelated and interdependent effects of the preapproved use of dispersants in the action area. Interrelated and interdependent effects may arise from the use of aircraft and ships to apply the dispersants on an oil spill and include potential ship strikes on, or disturbance of, listed marine mammals and sea turtles. On November 21, 2016, USCG and EPA detailed the following changes and clarifications to the proposed action in the second BA by letter to NMFS and USFWS:

1. The Federal On-Scene Coordinator (FOSC) will establish a minimum horizontal, no-spray buffer of 100 meters (328 feet) from observed congregations of fish or brown sea nettles, rafting flocks of birds, marine mammals or sea turtles in the water and/or marine mammal haul-out areas to minimize potential contact with dispersant spray drift, and noise and vessel disturbance. Incident specific buffers will be based on dispersant drift spray models. According to a dispersant spray drift model produced for the USCG (AMOG Consulting 2016), this will likely result in larger no-spray buffer zones that vary by incident due to several variables that will be examined in individual consultations.
2. Protected species observers will be present on aircraft and vessels associated with dispersant application or transiting the action area to engage in the response.
3. All vessels will have personnel assigned with wildlife spotting as their primary duty.
4. Wildlife spotters, whether on vessels or aircraft, will function to record data on protected species within the spill area and will advise the dispersant spotter and spray aircraft or vessels of sites within the operational area where wildlife have been spotted. Wildlife spotters can direct a suspension of spraying if animals are within the buffer area.
5. Vessels involved in dispersant spraying operations will not exceed 10 knots (11.5 miles per hour) in speed when marine mammals or sea turtles are observed in the area.
6. At a minimum, tier 1 SMART monitoring will be performed, and tier 2 and 3 monitoring conducted as appropriate. Incident specific emergency Section 7 consultations may require additional monitoring.
7. To lessen the potential for ship strikes, vessels will avoid close approach to whales, pinnipeds and sea turtles by instituting a 100 yard (300 feet) in-water buffer. If a vessel is approached by one of these species, and it is safe to do so, the vessel will disengage its props until the animal(s) has clearly moved more than 100 yards (300 feet) from the response vessel.
8. Vessels involved with dispersant spray operations will maintain a distance of 200 meters (656 feet) from observed killer whales (orcas).
9. Restricted use zones of 400 meters (1312 feet) will be established around high concentrations of marine mammals or sea turtles (e.g. feeding areas, migration pathways,

haul-outs or rookeries) for dispersant planes and vessels, or at distances established as part of an emergency consultation with NMFS.

On November 16, 2016, the action agencies further modified the proposed action in order to protect the marbled murrelet, a bird species managed by the U.S. Fish and Wildlife Service. The action agencies clarified that no dispersant applications will be preauthorized within 3-5 nm from the Oregon border to the southern Monterey County, CA border between March 24th and September 15th of every year.

Action Agency's Effects Determination

The action agencies have determined the potential impacts resulting from the Dispersant Preauthorization under Section I of the CDP, Appendix XII of the Regional Response Team IX Regional Contingency Plan may affect, but are not likely to adversely affect (NLAA) all of the species and their designated critical habitats that may occur in the action area and that are presented below:

Sacramento River winter-run Chinook salmon ESU (*Oncorhynchus tshawytscha*)
endangered (June 28, 2005, 70 FR 37160)
Central Valley spring-run Chinook salmon ESU (*Oncorhynchus tshawytscha*)
threatened (June 28, 2005, 70 FR 37160)
California Coastal Chinook salmon ESU (*Oncorhynchus tshawytscha*)
threatened (June 28, 2005, 70 FR 37160)
Southern California steelhead DPS (*Oncorhynchus mykiss*)
endangered (January 5, 2006, 71 FR 834)
California Central Valley steelhead DPS (*Oncorhynchus mykiss*)
threatened (January 5, 2006, 70 FR 37160)
Northern California Coast steelhead DPS (*Oncorhynchus mykiss*)
threatened (January 5, 2006, 70 FR 37160)
Central California Coast steelhead DPS (*Oncorhynchus mykiss*)
threatened (January 5, 2006, 70 FR 37160)
South-Central California Coast steelhead DPS (*Oncorhynchus mykiss*)
threatened (January 5, 2006, 70 FR 37160)
Southern Oregon/Northern California Coast coho salmon ESU (*Oncorhynchus kisutch*)
threatened (June 28, 2005, 70 FR 37160)
Central California Coast coho salmon ESU (*Oncorhynchus kisutch*)
endangered (June 28, 2005, 70 FR 37160)
Southern DPS of North American green sturgeon (*Acipenser medirostris*)
threatened (April 7, 2006, 71 FR 17757)
critical habitat (October 9, 2009, 74 FR 52300)
Pacific eulachon/smelt southern DPS (*Thaleichthys pacificus*)
threatened (March 18, 2010, 75 FR 13012)
Eastern Pacific Scalloped hammerhead shark DPS (*Sphyrna lewini*)
endangered (July 3, 2014, 79 FR 38213)
Fin whale (*Balaenoptera physalus*)
endangered (December 2, 1970, 35 FR 18319)
Blue whale (*Balaenoptera musculus*)
endangered (December 2, 1970, 35 FR 18319)
Humpback whale Central America DPS (*Megaptera novaengliae*)

endangered (September 8, 2016, 81 FR 62259)
Humpback whale Mexico DPS (*Megaptera novaengliae*)
threatened (September 8, 2016, 81 FR 62259)
Sperm whale (*Physeter macrocephalus*)
endangered (December 2, 1970, 35 FR 18319)
Sei whale *(Balaenoptera borealis)*
endangered (December 2, 1970, 35 FR 18319)
North Pacific right whale *(Eubalaena glacialis)*
endangered (March 6, 2008, 73 FR 12024)
Western North Pacific Gray Whale *(Eschrichtius robustus)*
endangered (December 2, 1970, 35 FR 18319)
Southern Resident killer whale (SRKW, *Orcinus orca*)
endangered (November 18, 2005, 70 FR 69903)
critical habitat (November 29, 2006, 71 FR 69054)
Guadalupe fur seal *(Arctocephalus townsendi)*
Threatened (December 16, 1985, 50 FR 51251)
Leatherback sea turtle (*Dermochelys coriacea*)
endangered (June 2, 1970, 35 FR 8491)
critical habitat (January 26, 2012, 77 FR 4170)
Loggerhead sea turtle (*Caretta caretta*)
threatened (July 28, 1978, 43 FR 32800)
Green sea turtle (*Chelonia mydas*)
threatened (July 28, 1978, 43 FR 32800)
Olive Ridley sea turtle (*Lepidochelys olivacea*)
threatened (July 28, 1978, 43 FR 32800)
Black abalone (*Haliotis cracherodii*)
endangered (January 14, 2009, 74 FR 1937)
critical habitat (October 27, 2011, 76 FR 66806)
White abalone (*Haliotis sorenseni*)
endangered (May 29, 2001, 66 FR 29046)
Giant Manta Ray (*Manta birostris)*
threatened (January 22, 2018, 83 FR 2916)
Oceanic Whitetip Shark (*Carcharhinus longimanus*)
threatened (January 30, 2018, 83 FR 4153)

The action agencies NLAA determination for all listed species is based upon their review of the potential direct and indirect effects of the toxicity and exposure scenarios for oil spill dispersants and for dispersed oil in the action area, as presented in the second BA. In late 2016, modifications to the proposed action to address interrelated and interdependent effects from the use of vessels and aircraft to transport and apply dispersants in accordance with the CDP were made by the action agencies as a result of numerous meetings and conversations with NMFS.

For all of the whale and turtle species, the action agencies determined that the potential direct toxicological impacts from the oil spill dispersants and dispersed oil were insignificant and the indirect effects to their prey bases were insignificant or discountable. The modifications to the proposed action (e.g. assigning wildlife spotters to all vessels and aircraft, mandatory in-water buffers and speed controls, etc.) reduced the potential interrelated and interdependent effects to

discountable. Potential impacts to critical habitat for the Southern Resident Killer Whale (SRKW) and Leatherback sea turtle were also insignificant.

For the salmonid Evolutionarily Significant Units (ESUs) and Distinct Population Segments (DPSs), the Southern DPS of North American green sturgeon (green sturgeon), the Pacific eulachon/smelt Southern DPS (eulachon), and the Eastern Pacific Scalloped hammerhead shark DPS (Scalloped hammerhead shark), the action agencies determined that the wide ranges and variable water column distribution of these species allows these species to avoid exposure and that the potential direct toxicological effects were insignificant. Furthermore, they determined that potential indirect effects to their prey bases were insignificant and there were no potential interrelated or interdependent effects.

For the pelagic Guadalupe fur seal, their solitary and reclusive natures, as well as their rarity in the action area, made the risk of direct exposure to dispersants or dispersed oil insignificant. Potential indirect effects to their prey base were considered insignificant and the modifications to the proposed action reduced potential interrelated and interdependent effects to discountable levels. The giant manta ray and oceanic whitetip shark are also very rare in the action area, and impacts to their prey bases were considered to be insignificant, so that the action agencies considered the potential for adverse effects to be discountable.

Potential effects to white and black abalone were considered discountable because the habitats they occupy are unlikely to be exposed to dispersants or dispersed oil at problematic concentrations. White abalone are found at depths where surface applications of dispersant or dispersed oil are not expected to be detectable while black abalone only occupy intertidal areas outside of the preauthorization zone. The significant distance between the preapproval zone and black abalone habitat (3 nm or 3.45 miles) will allow sufficient dilution of the dispersants or dispersed oil to remove the potential for effects. The action agencies determined there were no potential interrelated or interdependent effects to these species.

Consultation History

Early consultation between NMFS and the action agencies began on this project in April 2012. A draft BA was produced in June 2012. Technical assistance through a series of meetings and conference calls continued until the official submission of a BA on January 29, 2014. NMFS responded to this submission via a letter on March 10, 2014 asking for additional information and analysis and informing the action agencies that there was not yet sufficient information presented to initiate consultation. This triggered a new series of meetings and scheduled calls that culminated in the BA received on August 28, 2015. This BA contained significant amounts of new information and analysis, but questions concerning interrelated and interdependent effects remained. Following another series of scheduled calls, the action agencies amended the project description via letter dated November 21, 2016 to address potential interrelated and interdependent effects. A final, expected report on modeling dispersant spray drift was submitted on December 12, 2016, but was not reviewed by NMFS until January 2017.

During the time between the submission of the second BA and the decision to amend the project description (approximately 14 months), significant scientific information concerning impacts from the Deepwater Horizon (DWH) oil spill (DWH NRDA Trustees 2016) was released that was not analyzed in the second BA. Shortly before the review of the dispersant spray drift modeling report by NMFS, the oceanic whitetip shark was proposed for ESA listing. It was

decided not to address the proposed listing at the time and NMFS agreed to analyze the DWH Natural Resources Damage Assessment (NRDA) Trustees report (2016) and other information released after the second BA as part of its analysis rather than require the action agencies to prepare a third BA. The giant manta ray was then proposed for listing in January 2017.

In late January 2018, both the oceanic whitetip shark and the giant manta ray were listed as threatened under the ESA. NMFS informed the USCG of this development on April 12, 2018 and the action agencies elected to make effects determinations on the two newly species and have them included in this consultation process. The request for concurrence letter was received by NMFS on May 1, 2018.

There is an immense reservoir of scientific journals, books, and gray literature involving oil spills, dispersants and the effects of them, alone and in combination with oil, on a myriad of sea creatures and their habitats. NMFS reviewed many sources as part of this consultation process (see attached bibliography) including four books by the National Research Council (NRC) of the National Academies of Science (NRC 2013, 2003, 2005, 1989), and a recent biological opinion from the Alaska Region (NMFS 2015a) and the BA from that effort (USCG and EPA, 2014). The topic remains an area of active research and interest and the NRC has commissioned another expert committee review effort titled "Evaluation of the Use of Chemical Dispersants in Oil Spill Response" that is expected to conclude sometime in 2019.

ENDANGERED SPECIES ACT

Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

This ESA consultation examines the potential effects of preapproval of four dispersants to oil spills on the surface of the ocean in the action area. Application of any other dispersant or response product, by any means other than ships or aircraft, or outside of the CDP decision making framework discussed earlier are not covered. These types of actions would undergo individual, emergency ESA section 7 consultations.

The baseline for this consultation assumes oil has been spilled in the preapproval zone. A discussion of this altered background condition and the proposed action's effect on it is necessary to present the analysis of the action. Oils are a mixture of thousands of petroleum compounds and other contaminants of varying volatility, water solubility and toxicity (NRC 2005). Most oils spilled on the surface of the action area will spread into a slick, with thickness ranging from several millimeters (mm) to one micrometer (µm) depending on the type of oil and other environmental factors (NRC 1998). Since oil does not spread uniformly, slicks are irregular in shape and thickness. They generally are elongated in the direction of the wind (NRC

2005). Some oils will sink. There is a large variety of crude oils and refined oil products that are transported through the action area off the California coast with some oils identified as readily dispersible and numerous others that are known to not be dispersible.

Wind driven waves will break up an oil slick, producing droplets of various sizes that may be stabilized by natural surfactants, leading to some natural dispersion. Generally, oil droplets are prominent under a slick up to a meter deep in the low parts per million range under natural dispersion scenarios (3-5 ppm up to 1 m depth, 0.03-0.63 ppm 1-2 m deep (NRC 1989)). Smaller droplets are more likely to remain dispersed, while larger droplets are more likely to resurface, but smaller droplets may also coalesce into these larger droplets and reemerge on the surface (NRC 1989).

Movement of the surface slick is generally dictated by the wind in both direction and speed. Lighter molecular weight fractions of the oil (*e.g*. short-chained alkanes, benzene, toluene, ethylbenzene, xylenes and some other two and three ringed Polycyclic Aromatic Hydrocarbons (PAHs) are soluble and they can diffuse away from the surface slick into the waters below the surface layer although many volatilize rapidly as discussed below. They will not coalesce and resurface and these compounds can cause toxic effects (e.g. narcosis) in the water column to exposed biota (NRC 2005). During conditions that slow evaporation rates (*e.g*. night time, cold temperatures) a greater percentage of these more acutely toxic compounds dissolve into the water column where they may impact zooplankton and other near surface life. As oil weathers, the concentration of higher molecular weight PAHs remaining in the slick increase because of the loss of the lighter fraction of hydrocarbons (NRC 2005).

Movement of water below the surface layer may proceed in a different direction based upon the direction of local currents (Zeinstra-Helfrich, *et. al.*, 2015, George-Ares and Clark 2000, Fingas 2014, Mearns *et. al.*, 2001). In the action area, the California current generally moves water from the north to the south, while prevailing winds push the surface waters to the east towards the mainland shore. There are counter currents and gyres in the Southern California area that influence local transport processes as well (Howard, *et. al.*, 2014). Therefore, an oil spill can actually spread in multiple directions and result in a larger contaminated volume of water than is readily evident from just surface observations. A surface slick can serve as a reservoir of oil droplets that undergo natural dispersion as the slick spreads resulting in a prolonged oil exposure event (Carls *et. al.*, 2008).

Evaporation is the most important and rapid of all weathering processes and it can account for the loss of 20-50% of many crude oils and 75% or more of refined petroleum products (NRC 2005). This often leads to a significant loss of the lighter weight, soluble and acutely toxic components of oil and they will not be present to affect organisms in the water column when dispersant applications actually take place. While this may benefit water column organisms, inhalation or aspiration of these compounds by air breathing organisms is also possible during this time and this may cause toxic effects.

Following spreading, evaporation/volatilization and natural dispersion of the spilled oil, wave action may cause some oils to emulsify, forming what is commonly referred to as a mousse. The oil absorbs water and this causes the volume of the spill that must be dealt with to increase dramatically. Mousses are difficult to remove from the ocean by mechanical means or the use of dispersants although some crude oil mousses have been successfully dispersed (NRC 2005).

Ultimately, oil that is introduced into the ocean undergoes some level and form of microbial biodegradation. Biodegradation rates are highly variable based upon the properties of the oil, environmental conditions and the microbes present. In warmer waters, and in waters with natural oil seeps and microbes evolved to take advantage of this carbon source, this process tends to be more rapid than in cooler waters and waters where oil is rare. Microbial growth on open ocean oil slicks is likely to be limited by nutrient availability and may be a slow process relative to the formation of emulsions, which are often very difficult to biodegrade (NRC 2005). Incomplete biodegradation may result in the formation of high molecular weight residues such as "tar balls" or asphaltenes that may sink in open waters and later wash up on shorelines.

Dispersants do not reduce the amount of oil in a spill, but reduce the mass of oil at the surface of the water by forcing the oil into smaller droplets that can be suspended in the water column (NRC 2005). Dispersants also tend to prevent coalescence of oil droplets into sizes that resurface more rapidly (NRC 1989). The goal of dispersant use is to enhance dilution, get the oil off the surface and away from animals susceptible to physical oiling (of skin, fur or feathers) and inhalation impacts from the oil, and prevent its stranding on shore where it may cause chronic exposures to aquatic resources there and in the intertidal zone (Bue *et al.* 1998, Heintz *et al.* 1999, Rice *et al.* 2001, Carls *et al.* 1999). The use of a dispersant is a calculated trade-off of impacts to surface and shoreline resources versus those in the water column (NRC 2005, 1989).

The dispersant effectively encapsulates the oil in a micelle similar in nature to detergents. The nonpolar (hydrophobic) portion of the dispersant attaches to the oil while the polar (hydrophilic) portion remains in the water column (Tjeerdema *et. al.* 2010, Lin *et al.* 2009). Generally, chemically dispersed oil is considered to be confined to the upper 10 meters of the water column due to temperature and density gradients (NRC 2005, 1989, BenKinney *et. al.*, 2011), but this depth is somewhat variable based on environmental conditions. For example, many research and monitoring cruises during the DWH oil spill response found the upper mixed layer there to be ~20m deep based on the conductivity and temperature measurements with a range of 16-29m at times (Grennan *et. al.*, 2015, DWH NRDA Trustees, 2016.) Application of dispersant results in a rapid increase in the mass of oil already in the water column due to natural dispersion, but this also results in rapid dilution of the oil into a greater volume (NRC 2005). This greater dilution rapidly offsets the greater mass in the water column, resulting in concentrations that are lower than those under natural dispersion as the dispersed oil pushes deeper into the water column and becomes subject to subsurface currents influencing transport direction and speeds.

Bejarano *et. al*. (2014b) conducted a recent review of oil spill literature and noted that field trials showed initial high oil concentrations within the top few meters rapidly declining within minutes to hours (≤ 4 hours) to concentrations of 1 ppm or less following dispersant application. This is also evident from monitoring during the DWH response that showed a maximum total petroleum hydrocarbon concentration of 2 ppm at 1m depth approximately 30 minutes after chemical dispersion of a weathered oil slick at the surface (Bejarano *et. al.*, 2013). BenKinney *et. al.* (2011) noted that dispersed oil concentrations at 10m depth were consistent with background concentrations while monitoring aerial dispersant applications during the DWH response. The second BA (USCG and EPA 2015) cites several additional older studies showing similar patterns.

The amount of oil that may reach sensitive shoreline habitats is also reduced by dispersant application and this may mitigate longer term impacts and exposures to some species found there

(Bejarano *et. al.*, 2014b, NRC 2005, 1989, Bue *et al.* 1998, Heintz *et al.* 1999, Rice *et al.* 2001, Carls *et al.* 1999). The mass of oil components in the water column increases and this increases the exposure potential for pelagic and benthic organisms, but not necessarily the toxicity to them. The potential toxicological impacts of dispersant application varies at each spill and depends on the type of oil product spilled, the amount of weathering (evaporation, natural diffusion into the water, ultraviolet (UV) light degradation, etc.) that takes place before dispersant application, the type and life stage of biotic resources present at the site, and natural variables such as temperature, current speeds, UV light intensity, etc.

The toxicity of oil comes from the bioavailability and toxicity of individual hydrocarbons that make up the oil and relates to their solubility in water. Dissolved hydrocarbons, whether chemically or naturally dispersed, may diffuse across gills, skin and other membranes of organisms (NRC 2005). The sensitivity of individual species and life stages is highly variable, but embryonic and larval life stages are usually more sensitive than adults (NRC 2005, DWH NRDA Trustees 2016, Barron *et al.*, 2013, Bejarano *et al.*, 2014, NMFS 2015). Narcosis is a typical form of impact from these exposures and can result from both PAHs and monaromatic or heterocyclic aromatic hydrocarbons (NRC 2005). Other work has shown cardiac toxicity to developing fish embryos (Incardona *et. al.*, 2014, Carls *et. al.*, 1999) resulting in mortality.

Many studies also identified photoenhanced toxicity of PAHs as a potential means of impacting surface and near surface resources exposed to an oil spill (NRC 2005). The DWH NRDA Trustees report (2016) found DWH oil to be ~10-100 times more toxic to invertebrates and larval fish species such as red snapper, mahi-mahi, and bay anchovies. These impacts are most likely to occur to translucent or semi-transparent pelagic larvae and organisms living in shallow water areas that ingest or otherwise absorb some PAHs and where ultraviolet light exposure is greatest. This may include oiled shorelines. This type of impact may not be prominent among opaque organisms (e.g. adult fish, invertebrates, mammals, etc.) or organisms that migrate into the photic zone during the night and retreat to depths during the day (NRC 2005). The effects will occur in the shallow ocean waters whether the oil is naturally or chemically dispersed, but dispersion of an oil slick may reduce the surface area of oil impacting the photic zone and the time it is there.

The NRC (1989) concluded, as shown in the second BA (USCG and EPA 2015), that the acute lethality of dispersed oil is primarily associated with the dissolved oil constituents, and very little with the dispersant itself. The NRC (2005) presented data from many studies to further illustrate that COREXIT 9500 and 9527 are significantly less toxic to multiple species compared to oil and dispersed oil. EPA (2010a, Hemmer *et. al.*, 2011) tested several dispersant formulations during the DWH oil spill response due to the concerns of the public about the volume of COREXIT dispersants being applied. These tests included COREXIT 9500 and the two NOKOMIS products subject to this consultation. The EPA reconfirmed that COREXIT 9500 and the NOKOMIS dispersants were much less toxic than the test oil (Louisiana sweet crude) and the dispersed oil. Numerous other studies have also found that dispersants alone were less toxic than the oils they were tested with (Almeda *et. al.*, 2014, Adams *et. al.*, 2014, Barron *et. al.*, 2013, Coelho *et. al.*, 2011, McFarlin *et. al.*, 2011, Fuller *et. al.*, 2004, DWH NRDA Trustees 2016).

The NRC (2005) further concluded that there was no compelling evidence that chemically dispersed oil is more toxic than physically dispersed oil when the comparisons of toxicity are based upon the measured concentrations of petroleum hydrocarbons in the water column rather than the nominal concentration of oil in water. The NRC (1989) noted that dispersant toxicity

thresholds were often reported as nominal concentrations (the total amount of dispersant or oil divided by the total volume of water in the experiment's design) rather than measured concentration of the compounds to which organisms were actually exposed. They (NRC 1989) noted that 2/3 of the literature published prior to 1987 presented nominal concentration data rather than measured concentrations and they concluded that a substantial number of these early studies misinterpreted the toxicity data because of this experimental technique. This is because the bioavailability of the oil components in the dissolved, colloidal and particulate phases may vary (Fuller 1999, Lin *et al.*, 2009) and the nominal concentration method does not allow for differentiation of which forms are bioavailable to the test organism. The encapsulation of the hydrocarbon molecules in a dispersant micelle reduces the toxicity of the oil by making the hydrocarbon generally incapable of diffusing across cell membranes, greatly reducing its bioavailability (Tjeerdema *et. al.*, 2010, Fuller *et. al.* 2004, Lin *et. al.*, 2009). The NRC (2005) determined that the nominal concentration method was no longer generally acceptable for toxicity evaluations involving oil and that standardized protocols (Aurand and Coehlo 2005) were necessary for future work.

To provide further analysis of this point following a number of papers published post-DWH that used the nominal concentration method, Bejarano *et. al.* (2014b) compiled a large number of paired data sets from studies conducting water accommodated fractions (WAF or naturally dispersed) and chemically enhanced water accommodated fractions (CEWAF or chemically dispersed) exposure experiments. It differentiated between the data by experimental design (nominal v. measured concentrations of oil loading) and found that the acute toxicity of CEWAF can be grossly over predicted when using the outdated nominal concentration methods. For the COREXIT products, there were 329 measured WAF-CEWAF paired data points for individual species from 36 independent studies. 89% of this paired data for COREXIT 9527 (n=67) had CEWAF ≤ WAF in toxicity. When CEWAF was determined to be more toxic, it was only between 1.62 and 1.76 fold more toxic, which is within the degree of repeatability for standard acute toxicity testing. However, when nominal concentrations were used, CEWAF was more toxic than WAF in 80% of the paired-data set by 1.1 to >1000 fold.

There are 262 paired records available for COREXIT 9500 in this examination and 78% of measured data points showed CEWAF ≤ WAF in toxicity with most (76%) within threefold of the WAF value. However for the nominal concentration information, 93% of the data had CEWAF as more toxic than WAF by 1.2 to > 1000 fold. The critical review (Bejarano *et al.* 2014b) determined that the nominal concentration method is not a reliable metric of toxicity.

Dispersants also mitigate the toxic effects of oil exposure to water column resources by reducing the duration and concentration of exposure through increased, rapid dilution (NMFS 2015, NRC 2005, 2003, 1998, USCG and EPA 2015, 2014, Bejarano *et al.*, 2014b). This results in another conflict with large portions of the scientific literature (especially older studies but also many recent studies following DWH) regarding the time of exposure and determinations of toxicity based upon experiments with unrealistic exposure scenarios. The environmentally realistic scenario for the use of oil spill dispersants under consideration in the preapproval zone of the CDP will result in an exposure to dispersed oil that will rapidly spike and then dilute as the treated oil disperses deeper into the water column and is advected away from the surface slick (Aurand and Coelho, 2005). As discussed previously, the concentrations to which an organism may be exposed in the water column rapidly dilutes within minutes to hours (≤ 4 hours) to low (≤ 1 ppm) or background levels (Bejarano *et. al.*, 2014b, NRC 2005, 1998, BenKinney *et. al.*,

2011). However, a very large proportion of the studies generate information using traditional toxicological experiment designs, i.e. continuous 24 to 96-hour exposures of organisms to dispersants and dispersed oil, despite these time periods being considered invalid. Longer than realistic exposures lead to overestimates of toxicity.

Clark *et. al.*, (2001) found that spiked exposure conditions were up to 36 times less toxic than constant exposure conditions for COREXIT 9500 and 9527 when tested with three types of oil on five different species. Fuller *et. al.* (2004) found declining exposures of dispersed oil to be clearly less toxic than constant exposures by a factor of nine while, in a paper that compared the results of numerous published data sets, George-Ares and Clark (2000) found that the LC50 values for the most sensitive species in the spiked exposure experiments exceeded the maximum measured COREXIT 9500 and 9527 concentrations in field trials in most cases. Greer *et. al.* (2012) found that pulse exposures of Arabic light crude with COREXIT 9500 were not toxic to Atlantic herring while COREXIT 9500 and Alaska north slope crude resulted in toxicity at concentrations 15 minutes post mixing, but not at 30 or 60 minutes.

Dispersants may also aid in the biodegradation process by greatly increasing the surface area of the spilled oil available to bacteria although the observed rates vary among studies with some even showing the rate of biodegradation initially slows (Abbriano *et al.* 2011, Kleindienst *et al.* 2015, Prince 2015, NRC 2005, Fingas 2014). The COREXIT dispersants themselves are biodegradable (George-Ares and Clark 2000, NRC 2005, Fingas 2014), but no information was found regarding the NOKOMIS products. In general, biodegradation will take place over a matter of weeks to years and may never be complete based upon the type of oil spilled, the microbial community present and a number of environmental factors (Fingas 2014, NRC 2005). The application of dispersants may affect the biodegradation rate, but removing the oil from the surface of the ocean and causing the rapid dilution of the resultant oil droplets in suspension is their intended purpose. Although the information about biodegradation rates are interesting, it does not address a potential impact to ESA listed species under NMFS jurisdiction at this time.

Effects on Listed Species

Cetaceans

There are nine cetacean species and distinct population segments (DPS) analyzed by the action agencies in this consultation. Two are toothed whales (Sperm whale and SRKW) while the seven remaining are baleen whales. Although several of these species are very uncommon off the California coast (e.g. Western North Pacific Gray whales, Carretta *et al*., 2016a), at least one of these species or DPSs may be found in the action area during the entire year, and the second BA (USCG and EPA 2015) presents useful information on locations and timing. We present our analysis of the cetaceans as a group because the exposure scenarios and potential impacts are similar, before analyzing some specific indirect effects.

The action agencies determined that these species may overlap in time and space with pre-approved dispersant applications. We analyzed the potential impacts from dermal exposure, ingestion, baleen contact and inhalation and aspiration as well as impacts to the cetaceans' prey base and from vessel and aircraft operations.

There is little new information available regarding the effects of dispersants or dispersed oil on cetaceans. The majority of available information has been properly analyzed by the action agencies (USCG and EPA 2015). Direct effects to whales from dispersant or dispersed oil are expected to be insignificant or discountable because there is a low probability of dispersants being sprayed onto the whales with the incorporation of the protections detailed earlier (e.g. no spray buffer, protected species observers on aircraft and vessels), their thick epidermis is thought to protect against absorption (DWH NRDA Trustees 2016), the behavior of the cetaceans (i.e. frequent swimming and diving especially during daylight hours when applications take place), as well as the nature of the proposed dispersants themselves.

The dispersants proposed in the CDP are water soluble. Therefore, in the unlikely event that a whale is sprayed, the dispersants are not likely to remain on a listed cetacean except for a very short time. They are likely to make any oil encountered less sticky to the cetaceans (Lessard and DeMarco 2000, Claireaux *et al.* 2013) and may help to minimize observed impacts such as oil sticking to dolphins during the DWH spill (Dias 2017, DWH NRDA Trustees 2016). The potential genotoxic and cytotoxic effects following the 24 hour exposure scenario of skin fibroblast cells to the COREXIT dispersants and dispersed oil presented in a newer study by Wise (2014) are unlikely to occur in a field scenario, and cytotoxic impacts are noted by Judson *et al.* (2010) as a typical response of cells to xenobiotics. The most likely scenario is that of a cetacean surfacing in an oil slick that has been sprayed with dispersant and that the dispersant/dispersed oil mixture would be washed off the whale as it swam through the area or dived again.

Dispersed oil may be less sticky than undispersed oil (Lessard and DeMarco 2000, Claireaux *et al.* 2013) because of the micelle structure of dispersed oil droplets and, for the baleen whales, any oil taken into the whale's mouths during feeding may be less likely to foul their baleen. Just as uncontaminated water is ejected during feeding, water with dispersed oil would be rapidly ejected compared to the observed time for clearing oil fouled baleen with running water (70% within 30 minutes and 95% within 24 hours – Geraci 1990 in USCG and EPA 2015). This should reduce the ingestion of oil and lower the time whales are exposed to oil. Geraci (1990 in USCG and EPA 2015) calculated that 150 gallons of oil would need to be ingested by an adult whale to cause deleterious effects. As presented in the second BA (USCG and EPA 2015), Goldbogen et al. (2007) calculated the potential oil intake by a fin whale feeding in a spill zone still contaminated with 1 ppm hydrocarbons (Bejarano *et al.*, 2013) to be approximately 18 gallons per day. Therefore reducing oil concentrations to this level or lower and preventing prolonged exposure times would help prevent potential ingestion impacts to baleen whales.

While it is speculated that the direct application of dispersants onto a cetacean would cause inflammation of sensitive membranes such as on the eyes or mouth, it is known that volatile hydrocarbons cause this impact to marine mammals (Geraci and St. Aubin 1988, Geraci 1990 in USCG and EPA 2015). By mitigating exposure to volatile hydrocarbons, dispersant use could minimize this impact. No spray buffers reduce the likelihood of direct effects from dispersants to a discountable level.

The purpose of dispersant use is to minimize exposure time to animals on the water's surface such as the listed cetaceans (NRC 2013, 2005, 1998). Benefits may occur from the use of dispersants on an oil slick by reducing the inhalation of oil fumes and ingestion of oil because of the rapidly declining concentrations of oil following dispersion (NRC 2013, 2005, Curd 2011).

Bottlenose dolphins experienced lung damage due to oil vapors as a result of the DWH spill (Smith *et al.* 2017, Kellar *et al*. 2017) as did Killer Whales from the Exxon Valdez oil spill (Matkin et al., 2008). Inhalation of oil fumes or aspiration of aerosols containing oil molecules is a particular threat to cetaceans because they lack the physical structures that filter air taken into the lungs, they exchange 80-90% of their lung volume at a time, and they may hold their breath for extended periods while they dive, allowing for elevated absorption of hydrocarbons onto the lung tissue and into the blood (Takeshita *et. al*., 2017, DWH NRDA Trustees 2016). This type of damage is likely responsible for the increased incidence of lung disease, bacterial pneumonia and reproductive failures found in stranded dolphins during and following the DWH spill (Venn-Watson *et al*. 2015, Colegrove *et al*. 2016, Schwacke *et al*. 2014, DWH NRDA Trustees 2016). COREXIT 9500 was found to cause damage to human and mice lung cells before the body compensated with anti-inflammatory reactions via anti-oxidant production (Lin et al. 2015), but studies specific to marine mammals were not located. This further illustrates the importance of the exposure prevention actions (e.g. wildlife spotters, no spray policies and buffers) agreed to by the action agencies that make the likelihood of a whale being directly sprayed discountable.

As touched upon earlier in discussing dispersants, some zooplankton as well as the larval life stages of some fish species are expected to be impacted by chemically dispersed oil at an increased level compared to physically dispersed oil in the treated footprint of an oil slick, although environmentally realistic exposure times are an important factor not properly considered in some of the experimental designs (Adams *et al.* 2014, Almeda *et al.* 2014, 2013b, Fern *et al.* 2015, Fingas 2014, Incardona *et al.* 2013, Lee *et al.* 2011, Mearns *et al.* 2001, Ortman *et al.* 2012, Prince 2105, Rico-Martinez *et al.* 2013, NRC 2005, Bejarano *et al.* 2014b, Clark *et al.* 2001, Frantzen *et al.* 2015, Georges-Ares and Clark 2000). This impact occurs because the dispersants rapidly force greater amounts of soluble aromatics and PAHs into the water column and oil droplets at sizes that may be consumed by the zooplankton and larval species (NRC 2005, Fingas 2014, Carls *et al.* 2008, Fuller *et al.* 2004). While some invertebrates may bioaccumulate PAHs or hydrocarbons through direct consumption of the droplets, trophic transfer of dispersed oil was not found in experiments by Wolfe *et al*. (2001, 1999, 1998) and vertebrate organisms such as fish and marine mammals have the ability to metabolize and depurate (i.e. eliminate) them (Wolfe *et al.* 2001, 1999, Stein 2010, Varanashi *et al*., 1989).

This increased impact to some species in the water column, targeted or incidentally consumed by feeding cetaceans, is expected to be brief and only in the immediate vicinity of the dispersant application (Varela 2006, Bejarano *et al.*, 2014b, BenKinney *et al.*, 2011). This is minor in comparison to the distribution of the prey and whales, and may potentially be a smaller area than that impacted by a large volume, untreated spill (Carls *et al.*, 2008). Many of the prey species of cetaceans occupy portions of the water column much deeper than will be impacted by dispersant applications and therefore are not expected to be significantly affected. Studies have shown that zooplankton will rapidly recolonize an impacted area (Varela *et al.* 2006, Abbriano *et al.* 2011, Symons and Arnott 2013, NRC 2005). The DWH NRDA Trustees (2016) noted there was not any apparent system-wide population crashes to monitored fish or water column invertebrate species, despite the substantial short-term loss to the water column food web, from the oil spill and dispersant application. Based upon these factors, impacts to zooplankton for actions covered under the CDP are insignificant to baleen whales.

As noted previously, dispersant application will increase the mass of PAHs and other hydrocarbons in the water column up to approximately 10-20m deep for a few hours (Bejarano *et al.* 2014b, 2013, BenKinney *et al.* 2011, DWH NRDA Trustees 2016) to levels that could be a concern for adult fish which do not leave the impacted area (Mearns *et al.* 2001). However, fish species that are prey for the baleen whales such as the Humpback whale DPS's are highly mobile and distributed deeper in the water column than just the top 10-20 meters. It is unlikely that mobile schools of prey fish such as Pacific herring, Northern anchovy, or mackerel will be exposed for prolonged periods of time to dispersants or dispersed oil. As discussed previously in the latter paragraphs of the Effects of the Action section, the toxicity of the dispersed oil to exposed adult fish is likely to be no worse than that of naturally dispersed oil found in the upper water column. Additionally, dispersing a surface slick that can serve as a reservoir of oil droplets that undergo natural dispersion as the slick expands should prevent a prolonged oil exposure event that results in potentially problematic oil concentrations over a longer time and greater surface area and/or volume of water (Carls *et. al.*, 2008). Therefore, the potential effects to baleen whales from impacting their forage fish species is insignificant.

Western North Pacific Gray whales feed on benthic amphipods, often at depths of 50 to 60 m along the continental shelf (Weller 2010). Benthic species at these depths will not be exposed to dispersants or dispersed oil in problematic concentrations. Sperm whales feed on deep dwelling species of cephalopods and fish (NMFS 2010b) often several hundred meters deep. Dispersants and resulting dispersed oil from preapproved applications in the CDP will not be present at these depths to affect these prey species. SRKWs, observed in the action area generally from January to March, feed almost exclusively on salmonids, preferably full grown Chinook salmon, but also take some other species such as quillback rockfish (NMFS 2008). As discussed in a later section, salmonids present in the action area off of California are not expected to be impacted by the action. The other fish species occasionally taken by SRKWs are either at depths not expected to be impacted by preapproved dispersant applications (i.e. rockfish species from 3 – 200 nm from shore) or are mobile, widespread and numerous enough to not be impacted as discussed earlier. Therefore the impacts to prey species on these whale species are discountable and/or insignificant.

The action agencies determined that vessel and aircraft operations may affect but were not likely to adversely affect the ESA listed whale species. Vessel strikes on whales have been documented in the action area (Carretta *et. al*., 2017). In order to mitigate for this effect, the action agencies altered their project description to incorporate several protective practices as described under the Proposed Action section of this letter (e.g. protected species observers with wildlife spotting as their primary duty, minimum 100 yard in-water buffer, maximum speed of 10 knots when marine mammals are observed in the area, etc.). The proposed actions are expected to reduce the likelihood of vessel strikes to a discountable level.

Noise from vessels or aircraft in the response also presents a potential concern for cetacean species but the threat is difficult to quantify. Potential impacts include altering important behavioral patterns, physiological effects such as hearing impairment or stress, and masking critical acoustic cues, and the results of these range from no effect to potentially significant effects on the fitness of marine mammals and their habitat, depending on the context and scale of the noise exposures (Southall et al. 2007, NOAA 2016). Most observations of marine mammal responses to anthropogenic sounds have been limited to short periods, and included the cessation of feeding, resting, or social interactions. Given the many variables involved and complex

interaction with sources and animals (i.e., overlap that varies over time, space, and frequency), it has been difficult to link specific behavioral responses to specific sound sources (Southall et al. 2007). More recent controlled exposure studies have illustrated these connections and discerned the importance of more nuanced contextual factors such as the distance of the sound source or the behavioral state of the animal (Southall et al. 2016, Dunlop et al. 2017). Although ship noise may result in negative behavioral, physiological, or auditory effects to cetaceans, it is uncertain whether there are consequences at either individual or population levels. More serious effects are more likely in areas of high whale use or important habitat overlaps with areas of heavy ship traffic and large vessels, such as shipping lanes.

There are only two vessels in California outfitted to spray dispersants and they are limited to use on small spills within short transit distances from their ports (CDP 2008). The largest ship is 65' long (Holmes, pers. com., 2018) and the payloads of the vessels are only 1,000 and 20,000 gallons respectively, limiting their usefulness over the 96 hour preapproval window. There may be a second vessel serving as a spotting platform, or this may be done through air support. The open ocean environment of the action area, the transient nature of dispersant applications and the limited potential use of vessels for dispersant application over the 96 hour preapproval window makes the likelihood of noise impacts from the proposed action discountable.

Harassment of cetaceans by aircraft and vessels is expected to be discountable due to the protective practices adopted by the action agencies and the open ocean environment of the action area which allows cetaceans to move as they please. Should vessels be applying dispersant to a surface slick and listed cetaceans surface or otherwise appear in the immediate area, any accidental harassment they experience would be beneficial by minimizing contact with the oil slick and its associated vapors.

Guadalupe Fur Seals

Relatively little is known about Guadalupe fur seals compared to other fur seal species because they were assumed to be extinct by the late 19th century due to hunting. It is difficult to reconstruct their former range because hunters did not distinguish between Northern and Guadalupe fur seals in their harvest records (Aurioles-Gamboa 2015) but satellite-tagged and stranded Guadalupe fur seals have been found along the entire U.S. west coast and as far as 700 nmi west of California, although most of the population occurs outside of U.S. waters (Carretta *et al*. 2017). During the nonbreeding season from September to May, they are largely at sea foraging. Pups are born between June and August, mostly at Guadalupe Island in Mexico, but there is also a small breeding colony on the easternmost part of the San Benito Islands (also in Mexico). Additionally, since 2008, individual adult females, subadult males and between one and three pups have been observed annually on San Miguel Island at the northern end of the Channel Islands in U.S. waters (NMFS-AFSC, unpublished data). The second B.A. (USCG and EPA 2015) correctly notes that they may be found throughout the preapproval zone although they are expected to be in the southern part of the action are more frequently.

A population estimate of approximately 20,000 individuals was made from direct counts between 2008-2010 in Mexico (Carretta *et al.*, 2017, Aurioles-Gamboa, D. 2015). When at sea, Guadalupe fur seals are presumed to be mostly solitary. Preferred hunting grounds have not been identified.

Guadalupe fur seals depend upon their thick pelage for thermoregulation (Aurioles-Gamboa, D. 2015), but they need to take swims during the heat of the day to protect themselves from heat exhaustion when they are on shore in tropical habitats (NMFS AFSC, undated). As a pinniped with thick pelage, it is expected that exposure to an oil spill could result in impacts to their thermoregulatory performance. When in cooler waters, this compromise could be a threat to their survival.

Dispersants such as those proposed for preapproval were designed to remove oil from the surface waters quickly, thus limiting the exposure of Guadalupe fur seals and other vulnerable animals (e.g. birds, sea otters) to the effects of an oil spill through dermal, inhalation, or ingestion (via grooming) impacts (NRC 2013, 2005). In this capacity the application of a dispersant in the preapproval zone is expected to be a benefit to the Guadalupe fur seal by preventing exposure of their fur, respiratory system and irritable membranes (e.g. eyes) to the oil and fumes, or by rendering the oil less sticky to the Guadalupe fur seals' pelage.

However, it is unknown if accidental overspray of a Guadalupe fur seal with dispersant could result in compromised thermoregulatory performance of their pelage or impacts to their respiratory systems and membranes. Only one study (Duerr *et al.* 2011) was located examining the effects of oil and dispersed oil on marine mammal fur and it is inconclusive. Although the physical structure of sea otter fur did not appear to be altered by the exposures in the experiment, the extractable hydrocarbons results were labeled as preliminary and further analysis has not appeared in the literature. However the preliminary results between oil and dispersed oil were similar and may indicate that dispersed oil is no worse than undispersed oil regarding this impact. Dispersant alone was not tested.

The protective practices detailed earlier in this analysis (wildlife spotters on all vessels and aircraft, no spray zones, etc.) as well as the rarity of the Guadalupe fur seal in the preapproval zone, especially in the cooler waters north of Point Conception, make this possibility extremely unlikely to occur and thus discountable. Operational impacts to the Guadalupe fur seal (i.e. vessel strikes) are also discountable due to the protective measures adopted by the action agencies and the small size and quickness of the species.

Guadalupe fur seals feed mostly on squid species and schooling fish such as mackerel species, anchovies and sardines (Aurioles-Gamboa, D. 2015). Similar to the analysis presented for cetaceans, these species are widely distributed and often found at depths significantly deeper than dispersed oil is expected to penetrate. The impact to these prey species from dispersed oil or dispersant alone will be insignificant.

<u>Sea Turtles</u>

Four species of sea turtles may be found in the preapproval zone and action area for the CDP consultation (leatherback, loggerhead, green, olive ridley sea turtles). Only the leatherback sea turtle has designated critical habitat. The second BA correctly notes that at least one of the four species of sea turtle may be found in the action area during the entire year, although they are more frequent in the warmer waters off Southern California and, in the case of the leatherback sea turtle, the central California coast. All four species are found in Federal waters, but the green sea turtles generally tend to stay closer to shore in state waters.

Like the previously discussed cetaceans and the Guadalupe fur seals, the four species of sea turtles breathe air. Therefore, exposure scenarios for dispersant applications and dispersed oil are similar. The listed sea turtles may be exposed through dermal contact, inhalation, and ingestion and could experience other impacts through effects to their prey base and from vessel and aircraft operations.

There is limited data available regarding the impact of dispersants or dispersed oil to sea turtles. Similar to the analysis for cetaceans and the Guadalupe fur seal in the previous sections, the application of dispersants to an oil slick is expected to benefit sea turtles by reducing the amount of oil on the surface that could stick to them or irritate sensitive membranes such as their eyes, reducing the amount of oil that could be ingested by them, and reducing oil fumes that may be inhaled by them. Average turtle dives last 5-30 minutes and longer dives may last for more than an hour for leatherback sea turtles (Hochscheid 2014) allowing for oil compounds in their lungs time to be absorbed into their blood streams. Recent information generated for the NRDA process for the DWH oil spill clearly shows oiled turtles absorbed PAHs from oil via ingestion and inhalation based on gastrointestinal and lung data (Ylitalo *et al.*, 2017) including a Kemp's ridley sea turtle with an esophagus full of oil. Sea turtles are known to ingest petroleum, perhaps due to mistaking oiled detritus as prey or indiscriminate feeding (Camacho *et al*. 2013), and even very lightly oiled sea turtles recovered during DWH had ~50% occurrence of ingestion (DWH NRDA Trustees 2016). Ylitano *et al.* (2017) examined 492 sea turtles, but found limited data on exposure to dispersants. DOSS (dioctyl sodium sulfosuccinate – a dispersant component) levels were below quantification except in the oil in the esophagus of the aforementioned heavily oiled sea turtle. This indicates that dispersants were either not used in the vicinity of these oiled turtles before they died, or that the dispersant and or dispersed oil was not bioavailable or bioaccumulated by the turtles. This latter hypothesis is in agreement with the research of Wolfe *et al.* (2001, 1999, 1998) which found negligible trophic transfer of petroleum hydrocarbons from invertebrates to vertebrates and that depuration of petroleum hydrocarbons form both vertebrates and invertebrates increased when dispersant was used. This is likely due to the micelle structure of the dispersed oil molecule being absorbed to/by the dispersants and not bioavailable. When this information is considered in conjunction with the rarity of the four sea turtle species in the preapproved application area, the likelihood of direct adverse impacts from dispersants is insignificant.

Impacts to the forage resources of the four sea turtle species is discountable. Green sea turtles are primarily herbivorous but also consume sessile and mobile invertebrates (Lemons et al., 2011). They primarily use resources in shallow, nearshore waters outside of the preapproval zone where any dispersed oil is expected to be diluted to the point it is not detectable or problematic. Olive Ridley sea turtles are pelagic and omnivorous. They are known to dive up to 150m deep to forage on benthic invertebrates. Loggerhead sea turtles found in the action area are typically pelagic juveniles and they are rare off the coast of California except during certain warm water oceanographic conditions. Loggerheads mostly prey on benthic invertebrates, although they also consume some fish and plants. Pelagic red crabs are a favorite prey species. They forage between 0-100m in depth.

Dispersants and dispersed oil from preapproved surface applications in the preapproval zones are not likely to be transported below 10-20 m deep in significant concentrations (NRC 2005, 1998, Bejarano *et al.*, 2014b, BenKinney *et al.*, 2011, DWH NRDA Trustees 2016) leaving much of the forage zones unexposed. Applications in the preapproval zones are unlikely to enter state

waters at concentrations that may impact sea turtles or their forage species. Therefore effects to the prey resources of green, loggerhead and Olive Ridley sea turtles are insignificant.

Leatherback sea turtles are the species most likely to be found in the cooler waters north of Southern California. They prey upon scyphomedusae species and their critical habitat designation is based upon eddies and oceanic front areas that produce aggregations of brown sea nettles such as along the central California coast. Little is known about the potential impact of dispersants or dispersed oil to jellyfish species, or to brown sea nettles in particular. One study was conducted following the DWH oil spill examining the impact of Louisiana sweet crude oil on two related scyphozoan species, but this study was unfortunately conducted with exposure durations that are unrealistic to a surface application dispersed oil scenario (16 hour and 6 day exposures) and only the nominal concentration of the whole oil was calculated. Nonetheless, it is interesting to note that the two scyphozoan species showed different tolerances to oil pollution. This means that it cannot be assumed that jellyfish in the same species class will react similarly to dispersed oil or dispersant. In general, jellyfish species seem to be very tolerant of marine conditions with compromised water quality conditions and are found in many urbanized nearshore areas, in increasing numbers, where some petroleum contamination is very likely (Purcell 2012).

In order to add an additional level of protection to leatherback sea turtles and their designated critical habitat, the action agencies agreed to add a minimal horizontal no-spray buffer of 100m to observed aggregations of brown sea nettles even without direct observation of a leatherback sea turtle. As discussed earlier, spill specific variables are likely to increase the size of the buffer. The application of this no spray buffer makes the likelihood of adversely affecting the leatherback sea turtle's prey availability or its designated critical habitat discountable.

The action agencies also determined that operational impacts of oil spill response (i.e. vessel and aircraft operations) could affect the four sea turtle species, but that this was unlikely to result in an adverse effect. No information was found to indicate that aircraft operations affect sea turtles. The use of dedicated wildlife spotters on vessels (and in the aircraft for aerial applications), a minimum 100-yard buffer to be maintained between any vessel operations and sea turtles, and a maximum vessel speed of 10 knots if a sea turtle is observed in the area, reduces the likelihood of colliding with or otherwise impacting the animals to a discountable level.

<u>Abalone</u>

Two species of ESA listed abalone may be found in the action area, black and white abalone, but only the white abalone are found within the preapproval zone. The second BA (USCG and EPA 2015) correctly notes that black abalone only live and spawn in the intertidal and shallow subtidal zones at depths of 6m of less. There is nearly three nautical miles between black abalone and their designated critical habitat and the preapproval zone. Any application of dispersant in the preapproval zone and subsequent dispersed oil is expected rapidly dilute and be nondetectable in black abalone habitat. Potential impacts to black abalone and their designated critical habitat are therefore discountable.

The second BA (USCG and EPA 2015) correctly states that white abalone may be found along the coast of California from Point Conception south to Punta Abreojos, Baja California. They are found at depths between 5-60m, but their habitat (open low relief rocky reefs and boulders) is

patchy and therefore so is their distribution. Overharvesting has resulted in their remnant populations being found between 30-60m deep with the highest densities at depths of 40-50m (Butler *et al.*, 2006, Steinhoff *et al.*, 2012).

Generally, surface applications of dispersant to an oil slick and resultant dispersed oil stay in the upper 10-20 m of the water column due to temperature and density gradients (NRC 2005, 1998, DWR NRDA Trustees 2016) and aerial application monitoring during DWH showed concentration at 10m depth were consistent with background concentrations (BenKinney *et al.*, 2011). The same temperature and density gradients are expected to keep viable abalone larvae below this depth during their 3-10 day larval stage. Given the depths of known white abalone habitat and the physical restrictions on potential exposure, adverse effects to white abalone from this action are discountable.

Fish Species

Fifteen fish species are listed under the ESA and found within the action area. A significant amount of information regarding the toxicity of oil, dispersed oil, and the preapproved dispersants alone to fish has already been presented in this document. As noted earlier, dispersant applications to surface oil slicks (the proposed action in the preapproval zone) may increase the toxicity of the upper water column to many invertebrates and larval life stages of fish. This is due to increased dissolved hydrocarbons and the production of more small oil droplets that could be consumed by these species. The level of potential impact is highly variable based upon the substance being dispersed, the presence/absence of vulnerable species and life stages, and the amount of weathering that the spilled oil has already experienced. It is important to remember that many of the oil components that cause acute impacts in the water column (soluble, low molecular weight hydrocarbons and some PAHs) will have already entered the water or volatilized by the time the first dispersant applications occur. Thus the impacts to water column resources will already be occurring. The DWH NRDA Trustees (2016) found that even thin sheens of undispersed oil were extremely toxic to early life stage fish and invertebrates. They also noted potential impacts to several juvenile fish species from DWH oil exposure for reduced growth, immunosuppression and swim performance. In each case, the experiments looked at longer term exposures (1-2 weeks, 4 days and 24 hours respectively) of the juveniles that may be prevented through dispersion of the spilled oil.

During and after DWH, federal and impacted state agencies analyzed more than 8,000 seafood samples including fish, shrimp, oysters, and crabs (Ylitalo *et al*. 2012, Fitzgerald and Gohlke 2014). The samples were tested for seafood safety concerns (*i.e.* edible tissues only), but the results are informative because this large data set found PAHs and dispersant analogs (DOSS) only at low levels or the contaminants, if present, were below detection limits. Multiple fish species from difference trophic levels were tested including red snapper, grouper, and tilefish. The results indicate that the significant oiling and persistence of oiling during DWH, which was much longer than a spill that may be addressed through the preapproval authorities of the proposed action, did not result in the bioaccumulation of PAHs into the fish. This is not surprising because fish are known to metabolize and depurate PAHS (Stein 2010, Varanasi *et al*. 1998).

The ESA listed fish species evaluated do not occur in the preapproval zone as larval species and thus are not particularly vulnerable. The Scalloped hammerhead shark gives live birth to

between 1-41 pups in nearshore areas (Miller *et al.*, 2014). Oceanic whitetip sharks have litters of 1-14 live pups (Miller and Klimovich 2016) while giant manta rays give birth to only one pup every two to three years (Young *et. al.*, 2018). Eulachon spawn in fresh water, often in tidal portions of rivers, and the juveniles inhabit estuaries and near shore areas until large enough to swim offshore (NMFS 2017). Green sturgeon spawn in freshwater tributaries of San Francisco Bay (i.e. the Sacramento River) and the juveniles rear in the San Francisco Bay and Delta for several years until moving into the marine environment (NMFS 2002). ESA listed salmonids (three Chinook and two Coho salmon ESUs and five steelhead DPSs) enter the Pacific ocean as juveniles from freshwater spawning streams and rivers in all six area contingency planning areas along the California coast. Given the reproductive strategies of the listed fish species, the chances of adversely affecting their larvae or juvenile lifestages via dispersant applications in preapproval zone is discountable.

Juveniles and adults of these species typically utilize water column depths or locations that are also unlikely to encounter dispersants or dispersed oil at problematic concentrations in addition to being highly mobile so that they may easily leave an impacted area. Scalloped hammerhead sharks may be found in waters south of Point Conception, but they are seldom found in waters cooler than 22^0 C. They are infrequent in California state waters and are more prevalent during El Niño events when ocean temperatures rise (Miller *et al*. 2014). Although known for schooling behavior, this has not been reported in the action area and any Scalloped hammerhead sharks will likely be solitary or in pairs. They are known to occur over continental and insular shelves, and adjacent deep waters at depths of 450 m or more where they frequently prey of benthic organisms such as rays (Miller *et al.* 2014). They have been observed pursuing yellowtail and tuna at shallower depths (LA Times, 2015). Concentrations of dispersant or dispersed oil will be virtually nondetectable at depths in the preapproval zone where Scalloped hammerhead sharks may be found. In nearshore areas, any dispersed oil will be sufficiently diluted from the action area and below 10-20 m so that their preferred prey is not expected to be impacted by the proposed action. Given their mobility, infrequent presence in the action area and tendency to be deep in the water column, the chances of adversely affecting Scalloped hammerhead sharks via dispersant application is discountable.

Miller and Klimovich (2016) presents data on giant manta rays. Southern California waters represent the northern most range of giant manta ray habitat and drift gillnet fishery bycatch data indicates they are only found in low numbers during El Niño events. They utilize large portions of the water column, from feeding in shallow waters (< 10m) to descents of 200-450m in depth in association with the thermocline and prey location. Giant manta rays are filter feeders. Their diet consists of mostly zooplankton although some studies state they also consume small and medium sized fish. Concentrations of dispersant or dispersed oil will be virtually nondetectable at most depths in the preapproval zone where giant manta rays may be found (Bejarano *et al.*, 2014b, 2013, BenKinney *et al.* 2011). In nearshore shallow areas, any dispersed oil will be sufficiently diluted from the application site so that they and their preferred prey is not expected to be impacted by the proposed action. Given their mobility, infrequent presence in the action area, ability of prey resources to avoid or recover from potential impacts and use of a large range of the water column, the chances of adversely affecting giant manta rays via dispersant application is discountable.

Young *et. al.* (2018) presents data on oceanic whitetip sharks. This species is a highly mobile, pelagic species that generally remains offshore in the open ocean. They generally occupy

warmer waters near the surface at the outer continental shelf, preferring to be over waters greater than 600 feet deep. They have also been noted to dive to nearly 500 foot depths. While their range may extend to southern California waters, distribution of the species appears to be concentrated in more tropical waters further south. West coast based U.S. drift gillnet fisheries did not record oceanic whitetip sharks in the observed catches from 1990-2015. They are subject to bycatch in other fisheries outside of the action area. This shark feeds primarily on bony fishes and cephalopods but has been known to consume sea birds, other sharks, rays, marine mammals (including scavenging) and garbage. As analyzed earlier, populations of these prey species are not expected to be significantly affected by the use of oil spill dispersants and minimum horizontal, no-spray buffer of 100 meters (328 feet) from observed congregations of fish and rafting flocks of birds, as proposed in the second BA (USCG and EPA 2015) should add further protection. Given their mobility, infrequent presence in the action area, ability of prey resources to avoid potential impacts and use of a large range of the water column, the chances of adversely affecting oceanic whitetip sharks via dispersant application is discountable.

As noted in the second BA (USCG and EPA 2015), green sturgeon adults and subadults reside primarily in coastal marine waters at depths of 100m or less with the majority of time spent between 20-70 m in nearshore waters, bays and estuaries, particularly Willapa Bay, Grays Harbor and the Columbia River Estuary, all far removed from the action area (NMFS 2015b). They are typically found from Monterey Bay northward. Green sturgeon are primarily benthic feeders consuming mostly invertebrates and some small fish and recent data indicates they may make rapid ascents primarily at night (Erichson and Hightower 2007 in NMFS 2015b), presumably following the diel vertical migrations of some prey species.

Designated critical habitat for the green sturgeon within the action area consists of coastal U.S. marine waters within 110 m depth (60 fathoms or 360 feet) from Monterey Bay to the California/Oregon border. Specific primary constituent elements include maintaining migratory corridors, water quality with adequate dissolved oxygen levels and low contaminant concentrations and sufficient food resources such as shrimp, clams, crabs, anchovies, etc. The action agencies determined that approximately 9% of designated critical habitat occurs within the preapproval zone from San Francisco Bay north to the Oregon border.

Approximately 91% of the habitat expected to be routinely occupied by the green sturgeon is outside of the preapproval zone. Within this area and the area that does overlap, green sturgeon are expected to be found primarily along the benthos. As discussed previously, that means that the preapproved surface applications are unlikely to mix to the depths where green sturgeon are found due to temperature and salinity gradients commonly found in marine waters (NRS 2005, 1998). Although green sturgeon may ascend to shallower depths, typically at night, dispersant applications are limited to daylight hours and monitoring shows that dispersed oil rapidly dilutes to low or background concentrations within hours of application (Bejarano *et al.*, 2014b, 2013, BenKinney *et al.* 2011). Areas that are as shallow as potential mixing depths (10-20m) are found close to shore, several nautical miles away from the preapproval zone. Therefore green sturgeon are unlikely to be exposed to dispersants or dispersed oil in problematic concentrations.

Prey resources of the green sturgeon share the same potential exposure scenario and are therefore unlikely to be significantly exposed. In the event of some exposure in the water column that leads to impacts, research and monitoring has shown that invertebrate populations are expected to rapidly recover from impacts (Varela *et al.* 2006, Abbriano *et al*. 2011, Symons and Arnott

2013, NRC 2005). Therefore impacts to the prey resources of green sturgeon are not expected and the overall potential for adverse effects to the species is insignificant.

Only 9% of the designated critical habitat for green sturgeon falls within the preapproval zone and any application of dispersants will only result in temporary water quality impacts on the scale of minutes to hours (Bejarano *et al*. 2014b, 2015, BenKinney *et al*. 2011). Access to migratory corridors will not be affected and impacts to prey resources will be minor and transient and not expected to result in take of green sturgeon. Therefore potential adverse effects to designated critical habitat are discountable.

Eulachon consume plankton in their marine life stage. Although information from specifically studying eulachon is scarce, fisheries bycatch data indicates that they have a large vertical distribution between 10-500 m with most taken around 100 m in depth. They are frequently taken in groundfish and ocean shrimp fisheries at near-benthic depths (NMFS 2017). Like many planktivorous species, their movements are likely part of a diel vertical migration pattern as they follow their prey up in the water column at night.

Similar to the analysis presented for green sturgeon, adverse effects to eulachon from the proposed action are expected to be discountable because the fish themselves are expected to be deep in the water column when preauthorized dispersant applications take place. Their prey resources are unlikely to be significantly impacted because they are mostly found below the mixing layer and footprint for dispersed oil and monitoring shows populations of planktonic organisms have rapidly recovered from typical oil spill situations as noted previously. Therefore adverse effects to eulachon from the proposed action are discountable.

The second BA (USCG and EPA 2015) correctly identifies that the range of steelhead encompasses the entire California coast while Chinook and Coho salmon are generally found from of Monterey Bay northward. Once in the ocean, salmonids may be widely distributed in the action area and throughout the water column depending on temperature, prey availability and the presence of predators. Salmonids smolt in estuaries, entering the ocean as juveniles, and largely stay in coastal waters feeding on zooplankton and larval fish. As they grow into subadults and adults, their range and depth utilization greatly expands (Groot and Margolis 1991, Welch *et al*. 2003) as does the variety of their prey resources (e.g. anchovies, herring, etc.).

An ambient sea water study on Chinook smolts (Lin *et al*. 2009) found that the application of COREXIT 9500 to Prudhoe Bay crude oil significantly reduced the oil's lethal potency by 20 times. A subsequent freshwater study on Chinook pre-smolts found similar results (Van Scoy *et al*. 2010). These studies indicate that ESA listed salmonids in the action area may benefit from dispersant applications because the spilled oil becomes less bioavailable to these lifestages.

Similar to the other ESA listed fish species for which data has already been presented, the preapproved use of dispersants in federal waters is unlikely to result in significant impacts due to the short duration of exposure to dispersants and dispersed oil, the high mobility of salmonids in the action area, the range of depths used by salmonids, and the wide distribution and abundance of their prey species (NMFS 2015). Juvenile salmonids occupying near shore waters during the first months or years at sea are unlikely to be exposed to problematic concentrations of dispersant or dispersed oil 2-3 nmi from the application site due to dilution in the water column and advection in ocean currents. This contrasts with impacts to early life stages of pink salmon

in nearshore areas from undispersed crude oil spilled there by the *Exxon Valdez* in Alaska which are well documented (Bue *et al*. 1998, Heintz *et al*. 1999, Rice *et al*. 2001).

There have been several studies conducted specific to salmonids due to their commercial and ecological importance. Exposing adult Chinook salmon to whole and dispersed crude oil in a freshwater experiment did not reduce their homing success or affect the number of days needed for migration (Brannon *et al*. 1986). Similar work conducted on coho salmon in marine waters had the same result (Nakatani and Nevissi, 1991). Earlier work exposed immigrating adult salmon (99% were coho salmon) to a mixture of petroleum hydrocarbons and found that the salmon did not avoid hydrocarbon concentration less than 3.2 ppm (Weber *et al*. 1981). When considered together, these three studies indicate that salmonids migrating from the ocean are unlikely to be deterred by dispersants or dispersed oil, or perhaps even undispersed oil unless it is at higher concentrations than typically found post dispersion in the ocean.

Conclusion

Based on this analysis, NMFS concurs with the USCG and EPA that the proposed action is not likely to adversely affect the subject listed species and designated critical habitats.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the USCG and EPA, or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (2) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this concurrence letter; or if (3) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16).

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Under the MSA, this consultation is intended to promote the protection, conservation and enhancement of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10), and "adverse effect" means any impact which reduces either the quality or quantity of EFH (50 CFR 600.910(a)). Adverse effects may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.

NMFS determined the proposed action would adversely affect EFH by temporarily increasing the concentration of total petroleum hydrocarbons and PAHs in the upper water column, potentially leading to increased toxicity to some zooplankton and larval lifestages of fish (NRC 2005, DWH NRDA Trustees 2016, Barron *et al.,* 2013, Bejarano *et al.,* 2014, NMFS 2015, Incardona *et. al.*, 2014, Carls *et. al.*, 1999) that are a component of EFH. However, these impacts are expected to be brief due to rapid dilution (NMFS 2015, NRC 2005, 2003, 1998, USCG and EPA 2015, 2014, Bejarano *et al.,* 2014b, BenKinney *et. al.*, 2011) and confined to the upper 10-20m of the water column (NRC 2005, 1998, BenKinney *et. al.*, 2011) leaving a large portion of the photic zone unaffected. Studies of areas impacted by oil spills have shown that zooplankton will rapidly recolonize an impacted area (Varela *et al.* 2006, Abbriano *et al.* 2011,

DWH NRDA Trustees 2016). Toxicity may also be lessened due to a decrease in bioavailability to some EFH prey resources (Tjeerdema *et. al.*, 2010, Fuller *et. al.* 2004, Lin *et. al.*, 2009, Bejarano *et. al.*, 2014b) and dispersion may prevent longer term impacts both from surface water exposures and migration of a surface slick into shallow or intertidal waters and the shoreline (Bejarano *et. al.*, 2014b, NRC 2005, 1989, Bue *et al.* 1998, Heintz *et al.* 1999, Rice *et al.* 2001, Carls *et al.* 1999). EFH Habitats of Particular Concern, such as estuaries, submerged aquatic vegetation and shallow rocky reefs, are often found in these nearshore and intertidal areas. Given that the potential adverse effects to EFH from the application of the four dispersants authorized under the CDP are expected to be temporary in nature and that the applications may result in prevention of longer term and more widespread impacts, NMFS is not providing EFH recommendations at this time. The USCG 11th District and U.S. EPA Region IX must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600. 920(l)). This concludes the MSA portion of this consultation.

Please direct questions regarding this letter to Joe Dillon in our Santa Rosa office at (707) 575-6093 or Joseph.J.Dillon@noaa.gov.

Sincerely,

Barry A. Thom
Regional Administrator

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