CENTER for BIOLOGICAL DIVERSITY Because life is good.

Jared Blumenfeld
Regional Administrator, Region IX
Superfund Division
U.S. Environmental Protection Agency
75 Hawthorne Street
San Francisco, CA 94105
(415) 947-8702
blumenfeld.jared@epa.gov

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Re: Petition for Preliminary Assessment of Northwest Hawaiian Islands and the Great Pacific Garbage Patch for Plastic Contamination under Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §§ 9601 et seq.

The reefs and shores of the Northwest Hawaiian Islands are littered with hundreds of thousands of pounds of plastic garbage. Derelict fishing gear and debris entangles innumerable fish, sea birds, and marine mammals, often resulting in injury and death. Plastic pollution harms wildlife via entanglement, ingestion, and toxic contamination, causes substantial economic impacts, and is a principal threat to the quality of the environment.

The Center for Biological Diversity (the "Center") formally requests that pursuant to Section 105 of the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. § 9605, the Environmental Protection Agency ("EPA") conduct a preliminary assessment of the Northwestern Hawaiian Islands in order to evaluate the hazards posed by plastic pollution to public health and the environment. This assessment should extend into the waters of the Great Pacific Garbage Patch within United States jurisdiction in order to fully address the sources and hazards posed by plastic pollution to the marine environment.

CERCLA, which was enacted "in response to the serious environmental and health risks posed by industrial pollution," must be interpreted liberally so as to accomplish its remedial goals. United States v. Bestfoods, 524 U.S. 51, 55 (1998). A "major purpose" of the statue is "to alert the appropriate government officials to releases of hazardous substances that may require rapid response to protect public health and welfare and the environment." 50 Fed. Reg. 13,456 (April 4, 1985). As the nation's premier mechanism for undertaking cleanups in response to the presence of pollutants in our environment, CERCLA requires that EPA conduct a preliminary assessment to evaluate the hazards of plastic pollution in Northwestern Hawaiian Islands.

A preliminary assessment is the first step in the process of including an area on the National Priorities List, and guides EPA in determining which sites warrant further investigation to assess the nature and extent of the risk associated with a release of hazardous substances, pollutants or contaminants. A preliminary assessment will enable the agency to begin the process of remediating the Northwestern Hawaiian Islands from plastic waste and ensure the continued health of our natural resources.

Right to Petition:

The right of an interested party to petition a federal agency is a freedom guaranteed by the first amendment: "Congress shall make no law … abridging the … right of people … to petition the Government for redress of grievances." U.S. Const., Amend I. *See also* United Mine Workers v. Illinois State Bar Ass'n, 389 U.S. 217, 222 (1967) (right to petition for redress of grievances is among most precious of liberties without which the government could erode rights).

CERCLA grants citizens the right to petition for a preliminary assessment if they are "or may be, affected by a release or threatened release of a hazardous substance or pollutant or contaminate." 42 U.S.C. § 9605(d).

> Any person who is, or may be, affected by a release or threatened release of a hazardous substance of pollutant or contaminate, may petition the President to conduct a preliminary assessment of the hazards to public health and the environment which are associated with such release or threatened release.

Id. The Code of Federal Regulations further stipulates that "[a]ny person may petition the lead federal agency [] to perform a PA (preliminary assessment) of a release when such person is, or may be, affected by a release of a hazardous substance, pollutant, or contaminant." 40 CFR § 300.420(b)(5). This petition must be directed to the EPA Regional Administrator covering the location of the site. *Id.* If the EPA has not previously conducted a preliminary assessment of such release, the EPA "**shall**, within 12 months after the receipt of any such petition, complete such assessment or provide an explanation of why the assessment is not appropriate." 42 U.S.C. § 9605(d)(emphasis added).

EPA must respond to this petition. *See* Forest Guardians v. Babbitt, 174 F.3d 1178, 1187 (10th Cir. 1998) ("[W]hen a statute uses the word 'shall,' Congress has imposed a mandatory duty upon the subject of the command"). In addition, the Administrative Procedure Act requires EPA to respond: "Prompt notice shall be given of the denial in whole or in part of a written application, petition, or other request of an interested person made in connection with any agency proceeding." 5 U.S.C. § 555(e).

The APA provides for judicial review of a final agency action, including CERCLA determination. 5 U.S.C. § 704. The scope of review by the courts is determined by section 706 of the APA. 5 U.S.C. § 706. The APA also permits courts to compel

agency action unlawfully withheld or unreasonably delayed. 5 U.S.C. § 706. The provisions of this Petition are severable. If any provision of this Petition is found to be invalid or unenforceable, the invalidity or lack of legal obligation shall not affect other provisions of the Petition.

Petitioner:

The Center for Biological Diversity is a nonprofit environmental organization with over 450,000 members and online activists dedicated to the protection of imperiled species and their habitats through science, education, policy, and environmental law. At the Center, we believe that the welfare of human beings is deeply linked to nature – to the existence in our world of a vast diversity of wild animals and plants. The Center's Oceans Program aims to protect marine life and ocean ecosystems in United States and international waters. The Center submits this petition on its own behalf and on behalf of its members and staff with an interest in protecting the ocean environment.

The Center for Biological Diversity's contact information is:

Emily Jeffers
Staff Attorney, Oceans Program

351 California St, Suite 600
San Francisco, California 94104
Tel: (415) 632-5309
Fax: (415) 436-9683

I. CERCLA Background

Congress passed CERCLA in 1970 in order to ensure "prompt cleanup of hazardous waste sites." General Electric Co. v. Litton Indus. Automation Systems, 920 F.2d 1415 (8th Cir. 1990). CERCLA authorizes the federal government to undertake cleanups in response to any release or substantial threat of release of hazardous substances, pollutants, or contaminants into the environment. 42 U.S.C. § 9604.

> Whenever (A) any hazardous substance is released or . . . (B) there is a release or substantial threat of **release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare**, the President is authorized to act, consistent with the national contingency plan, to remove or arrange for the removal of, and provide for remedial action relating to such hazardous substance, pollutant or contaminant at any time.

42 U.S.C. § 9604(a)(emphasis added).

The primary goal of the CERCLA program is to protect human health and the environment from current and potential threats posed by uncontrolled releases of hazardous substances, pollutants, and contaminants. This is done by identification and remediation of contaminated sites. Contamination at a CERCLA site may originate from releases attributable to the CERCLA site in question, as well as contamination that originated from other sources (EPA 1995).

a. National Priorities List

EPA has broad authority to respond to the release of contaminants into the environment, *see* 42 U.S.C. § 9604(a), but must first identify those sites which need cleanup. In order to prioritize the expenditure of public funds in connection with response actions, EPA maintains a National Contingency Plan which includes criteria for "determining priorities among releases or threatened releases . . . for the purpose of taking remedial action." *Id*. at § 9605(a)(8)(A). Criteria take into account, among other factors, the "potential for destruction of sensitive ecosystems," and "damage to natural resources which may affect the human food chain." *Id*. at § 9605(a)(8)(B).

Based upon the criteria described in Section 105, EPA developed the Hazard Ranking System to evaluate sites for possible inclusion on the National Priorities List. The National Priorities List ranks "national priorities among the known releases or threatened releases throughout the United States." *Id*. at § 9605(a)(8)(B). The list is intended primarily to guide the EPA in determining which sites warrant further investigation, and aid in long term evaluation and response. Once a site is on the National Priorities List, that site is eligible for extensive, long-term cleanup under the Superfund program.

i. *Adding a site to the National Priorities List*

In order to be placed on the National Priorities List, a site must go through a series of assessments. Citizens may begin the process of adding a site to the National Priorities List by petitioning for a Preliminary Assessment.

> Any person who is, or may be, **affected by a release or threatened release of a hazardous substance or pollutant or contaminate**, may petition the President to conduct a preliminary assessment of the hazards to public health and the environment which are associated with such release or threatened release.

42 U.S.C. § 9605(d). In response to such a petition, EPA must conduct a Preliminary Assessment or explain why such an assessment is not appropriate. Id., 40 C.F.R. 300.420(b)(5)(iii)(Preliminary Assessment must be completed within one year of date of receipt of a petition).

A petition for a preliminary assessment must be addressed to the EPA Regional Administrator for the region in which the release is located, and should contain a description and location of the release, how the petitioner is affected by the release, and to the extent available, what type of substances may be released, and the nature of activities that have occurred where the release is located. 40 C.F.R. § 300.20(b)(5)(i),(ii).

A Preliminary Assessment is designed to determine whether a site poses a threat to human health and the environment, and whether the threat warrants further investigation. EPA reviews existing information, such as pathways of exposure, exposure targets, sources and nature of releases, and determines whether a site inspection is required. 40 C.F.R. § 300.420(b)(2). A site inspection is then performed to provide the data needed to determine whether a site qualifies for listing on the National Priorities List based upon its score under the Hazard Ranking System. 40 C.F.R. 300.420(c), *see* 40 C.F.R. 300.425(c)(1) (sufficiently high score on Hazard Ranking System qualified for inclusion on National Priorities List). EPA describes the Hazard Ranking System as a "numerically based screening system that uses information from initial, limited investigations – the preliminary assessment and the site inspection – to assess the relative potential of sites to pose a threat to human health or the environment." (EPA 2012).

Once a site has scored sufficiently high in the Hazard Ranking System, it is proposed to the National Priorities List in the Federal Register. EPA accepts public comments on the sites, responds to the comments, and places on the National Priorities List those sites that continue to meet the requirements for listing. Because of the "limited purpose of the National Priorities List (as the mere identification of releases)," a listing neither describes nor fixes the boundaries of the National Priorities List site. *See* 55 Fed Reg. 9689 (1990). The preliminary description of the boundaries of the National Priorities List site will often be represented during the Hazard Ranking System scoring, but the agency may revise this description as it acquires more information about the extent and severity of the contamination. EPA may extend the boundaries as far as "the entire area where hazardous substances have come to be located, even if that area extends beyond the boundary for which the site was named." 54 Fed. Reg. 13298 (March 31, 1989).

Ocean areas have previously been placed on the National Priorities List as a result of toxic contamination. For example, the Palos Verdes Shelf site, off the coast of Los Angeles, consists of a large deposit of DDT and PCB contaminated sediments lying on the continental shelf and ocean floor (EPA 2009). The contamination poses a risk to marine life, as the toxic chemicals enter the food chain through worms and other invertebrates and microorganisms, which are consumed by other marine life. DDT and PCBS accumulate in fish tissue, which can then harm fish-eating birds, marine mammals, and birds of prey. Humans are at increased risk of cancer and other disorders when they consume contaminated fish. *Id.* Sites containing waste from plastics factories have also been placed on the National Priorities List. In Greenpoint, New York, chemical additives that increase the plasticity and fluidity of plastic leached into the soil and groundwater below, necessitating clean-up and placement on the National Priorities List. 74 Fed. Reg. 48511, 48517 (September 23, 2009).

In summary, the first step for inclusion of an area on the National Priorities List, and subsequent remedial action under CERCLA, is the completion of a Preliminary Assessment. This assessment will allow EPA to gather more data and information in order to determine whether plastic pollution offshore the Northwestern Hawaiian Islands poses a threat to human health and the environment.

II. Northwestern Hawaiian Islands are Disposal Sites for Hazardous Plastic Waste

Plastic waste harms the environment by suffocating animals and coral reefs, entangling and damaging ocean vehicles, and concentrating harmful pollutants. The Northwestern Hawaiian Islands and surrounding seas are demonstrably harmed as a result of the release of plastic pollution into our environment.

A. Plastic Pollution Harms the Environment

The environmental problems arising from the indiscriminate disposal of plastics into the global oceans has long been documented in the scientific literature. Threats include accumulation of waste in natural habitats, wildlife entanglement and ingestion, the leaching of chemicals from plastic products, and the potential for plastics to transfer chemicals to wildlife and humans (Thompson et al. 2009; Gregory 2009). To fully understand the threats posed by plastics, it is helpful to understand what they are and where they come from.

Plastics are synthetic organic polymers and are found in a variety of shapes to serve many functions. Plastic resin pellets, also called "nurdles," are small granules, generally cylindrical or disk-shaped, with a diameter of a few millimeters (Mato et al. 2001). These plastic particles are industrial raw material transported to manufacturing sites where "user plastics" are made by re-melting and molding the resin pellets into final products (Mato et al. 2001). Nurdles are often found floating on coastal and ocean waters or embedded in the sand of beaches and are lost during loading and transportation, both on land and at sea, and during their handling at plastic factories (Ashton et al. 2010). Due to their buoyancy and durability, lost pellets may be transported considerable distances in the oceans before becoming temporarily or permanently stranded (Id.).

"User plastics," on the other hand, are materials found in common commercial goods, such as plastic bags, bottle caps, fishing gear, and clothing (Barnes et al. 2009). User plastics are inexpensive, lightweight, strong, durable, and corrosion resistant, making them ideal candidates for a wide range of products. Those same characteristics are also the reasons why plastics pose a serious hazard to the environment (Derraik et al. 2002). As the EPA has noted, "except for the small amount that's been incinerated . . . every bit of plastic ever made still exists" (Casey 2007). Waves and chemical processes eventually break user plastics into smaller pieces, but this serves only to make clean up extremely difficult and ensure they can be consumed by the smallest marine life at the base of the food web (Gordon 2006).

Plastics have been entering the marine environment in quantities roughly paralleling their level of production over the last half century. The production of plastics has increased substantially over the last 60 years from around 1.5 million tons in 1950 to over 230 million tons in 2009 (Hirai et al. 2011). Between 2000 and 2010, there was more plastic produced than in the entire previous century (Thompson et al. 2009). However, in the last two decades of the 20th century, the deposition rate accelerated past the rate of production; from 1960 to 2000, the world production of plastic resins increased 25-fold, while recovery of the material remained below 5% (Moore 2006). Plastics are now one of the most common and persistent pollutants in ocean waters and beaches worldwide (Id.). Between 1970 and 2003, plastics became the fastest growing segment of the US municipal waste stream, increasing nine-fold, and marine litter is now 60–80% plastic, and as much as 90–95% in some areas (Derraik et al. 2002; Barnes et al. 2009). Eighty percent of marine debris originates from land-based sources including urban runoff, combined sewer overflows, beach visitors, inadequate waste disposal and management, industrial activities, construction, and illegal dumping (Gordon 2006). Of these, urban runoff is the primary contributor of marine debris, which is transported by storm drains, wind, or direct dumping (Gordon 2006).

While undoubtedly an eyesore, plastic debris today is having significant harmful effects on marine biota. Plastics turn up in bird nests, are worn by hermit crabs instead of shells, and are present in sea turtle, whale and albatross stomachs (Mrosovsky et al. 2009).Two hundred and sixty seven species of marine organisms worldwide are known to have been affected by plastic debris, a number that will increase as smaller organisms are assessed (Laist 1997). Plastic pollution affects 86% of all sea turtle species, 44% of all seabird species, and 43% of all marine mammal species (Derraik et al. 2002). The impacted taxa include turtles, penguins, albatrosses, petrels and shearwaters, shorebirds, baleen whales, toothed whales and dolphins, seals, sea lions and fur seals, manatees and dugong, sea otters, fish, and crustaceans (Id.). The number of animals that succumb each year to derelict fishing nets and other plastic debris which they ingest and become entangled in cannot be reliably known, but estimates are in the millions (Moore 2008).

Over 100 species of seabirds are known to mistake floating plastics for food, or become entangled in plastic debris (Laist 1997). A study of birds collected off the coast of North Carolina found that 55% of species had plastic particles in their guts (Derraik et al. 2002). Likewise, over ninety percent of northern fulmars found washed up along the Pacific Northwest had plastic in their bellies, with an average of 36.8 pieces of plastic per bird (Avery-Gomm et al. 2012). Ingestion of plastic has many detrimental consequences, including gastrointestinal blockages, ulceration, internal perforation and death (Teuten et al. 2009). Even those animals whose innards remain intact may suffer from false sensations of satiation, or experience reduced reproductive output (Auman et al. 1997).

Threatened and endangered sea turtles mistake plastic bags, fishing line and other items for jellyfish and other prey items. One study examined the digestive tracts of endangered green sea turtle carcasses and found ingested debris in 24 of 43 animals (Bjorndal et al. 1994). Ingested debris included plastic, monofilament line, fishhooks,

rubber, aluminum foil, and tar (Bjorndal, K., Bolten, A., & Lagueux 1994). Studies on loggerheads, leatherbacks, and green turtles have all documented high levels of plastic debris in the intestinal tracts of these animals (Mrosovsky et al. 2009; Bugoni et al. 2001; Schuyler et al. 2012), and loggerhead and green turtles actively target and consume plastics (Lutz 1990). In addition to ingestion, entanglement has been reported for all species of sea turtles that inhabit U.S. waters. Entangling debris may cause drowning, lacerations, infection, strangulation, increased energy expenditure, reduced feeding, and starvation (Derraik et al. 2002). Entanglement and ingestions may be highly underestimated; most victims are likely to go undiscovered, as they either sink or are eaten by predators (Id.).

Other marine animals are either drawn to or accidentally entangled in netting, rope and monofilament lines that are discarded from commercial fishing activities. For those species entangled in discarded fishing equipment, many are unable to escape and are doomed to drawn or die from injury, starvation, and general debilitation (Gregory 2009). Entanglement has been documented in 58% of all pinniped populations (Boland & Donohue 2003). Packing loops, for example, attract the interest of curious seals and sea lions, and once looped around the animal's head they create "lethal necklaces' which result in strangulation (Boland & Donohue 2003). Even the largest creatures are not immune; recent sightings include endangered humpback whales travelling northward with a mass of tangled rose in tow (Gregory 2009).

Aside from entanglement and ingestion, plastic pollution raises toxicity concerns. Marine plastics contain two types of chemicals; those added during the manufacturing process and those adsorbed from surrounding seawater (Ogata et al. 2009). Chemical additives and plasticizers, such as phthalates and bisphenol A, have adverse impacts in terms of reproductive and developmental toxicity, and as animals ingest plastic particles these toxins bioaccumulate to higher trophic levels (Teuten et al. 2009). Plastic litter also acts as a transport vector of marine pollutants. For example, persistent organic pollutants (POPs) that are distributed globally via atmospheric and ocean circulations adsorb onto plastic particles from ambient seawater due to the hydrophobic nature of plastic surfaces (Heskett et al. 2012). POPs are considered among the most persistent anthropogenic organic compounds introduced into the environment (Rios et al. 2007). Some of these are highly toxic and have a wide range of chronic effects, including endocrine disruption, mutagenicy and carcinogenicity (Id.).

Studies of polychlorinated biphenyls (PCBs, a type of POP) in nurdles found that the concentration of these toxic chemicals was 100,000 to 1,000,000 times that of surrounding waters, suggesting that plastics serve as a potential source for toxic chemicals in the marine environment (Mato et al. 2001). PCBs are mixtures of synthetic organic chemicals that are highly toxic and dangerous to human health: in a 1996 report, prepared at the direction of Congress, the EPA found that PCBs cause cancer in animals and are probable carcinogens for humans. Other known significant ecological and human health effects of PCBs include neurotoxicity, reproductive and developmental toxicity, immune system suppression, liver damage, skin irritation, and endocrine disruption (EPA 1996). PCBs are non-flammable and chemically stable, so after they are released into the

environment they persist for many years (Id.). The manufacture of PCBs has been banned in the United States due to their highly toxic effects and persistence in the environment once released. *See* 15 U.S.C. § 2605(e). PCBs are also a persistent organic pollutant targeted for global phase-out and action under the Stockholm Convention.

The persistency of both POPs and chemical additives are of great concern due to their high bioaccumulative nature and adverse effects on wildlife and humans (Teuten et al. 2009). Both plasticizers and organic contaminants that concentrate on plastics at levels far superior to the surrounding marine environment have been show to affect both development and reproduction in a wide range of marine organisms (Rios et al. 2010). Some of the chemicals have estrogenic activity and may disrupt the endocrine system when ingested (Hirai et al. 2011). Mollusks and crustaceans appear to be particularly sensitive to these compounds (Oehlmann et al. 2009). Being an important food item for many species, plastics ingested by invertebrates have greater potential to bioaccumulate and transfer toxic substances up the food web (Teuten et al. 2009).

Higher trophic level organisms such as fish-eating birds, omnivorous birds, and marine mammals are exposed to toxic compounds via their consumption of prey. Even baleen whales, amongst the largest animals on earth, are exposed to micro-litter ingestion as a result of their filter-feeding activity; a recent study of stranded fin whales documented phthalates traced to microplastic pollution (Fossi et al. 2012). Generally, the typical PCB levels increase by a factor of 10- to 100-fold when ascending major consumption levels in a food chain (Gobas et al. 1995). Specifically, Wasserman et al. (1979) reported that for marine food webs, zooplankton range from < 0.003 μg/g to 1 μg/g, whereas top consumers, such as seals and fish, had ranges of PCB from 0.03 to 212 μg/g. Therefore, if PCBs and other contaminants are abundant in lower trophic levels, they will be amplified through the food chain to levels that can adversely affect higher trophic level organisms. As a result, people who ingest fish may be exposed to dangerous levels of PCBs (EPA 2006). Due to the toxin's accumulation properties, many scientists believe there is no safe level of exposure to PCBs (EPA).

Finally, because plastics do not readily degrade and are long-lived they provide an effective invasive species dispersal mechanism (Barnes et al. 2009; Gregory 2009). Pelagic plastic items are commonly colonized by a diversity of encrusting and fouling epibionts, including barnacles, tube worms, foraminifera, coralline algae, and bivalve mollusks (Gregory 2009). The environmental importance of this process is widely recognized, as pelagic plastic may be vectors in the dispersal of aggressive and invasive marine organisms that could endanger endemic biota (Barnes et al. 2009). Plastics are already implicated in the northward range extension of some barnacles (Moore 2008)

The scientific community has conclusively demonstrated that plastic pollution has resulted in an ocean emergency. Our seas are a giant refuse bin for all manner of plastic items, and marine species are forced to endure a constant barrage of plastic bags, monofilament, and toxic chemicals. But the pollution is not equally distributed; the Northwest Hawaiian Islands are particularly hard hit by marine debris and must be evaluated for their potential to be included on the National Priorities List.

B. Plastics in the Northwestern Hawaiian Islands

Marine debris, and plastic in particular, presents a significant and persistent threat to the wildlife and coral reef ecosystems of the remote Northwestern Hawaiian Islands (Henderson 2001). The Northwestern Hawaiian Islands, established as Papahanaumokeakea Marine National Monument in 2006, are a chain of scattered Hawaiian Islands home to more than 7,000 marine species, a quarter of which are found nowhere else on Earth (NOAA 2012). In 2010, the monument was inscribed as a natural and cultural World Heritage site by UNESCO. The Northwestern Hawaiian Islands span more than 1,200 miles of the North Pacific Ocean, encompass almost 150,000 square miles, and comprise one of the largest marine conservation areas in the world. The Islands are breeding grounds for millions of seabirds and endangered animals, including the Hawaiian monk seal—one of the world's rarest marine mammals—and the green sea turtle.

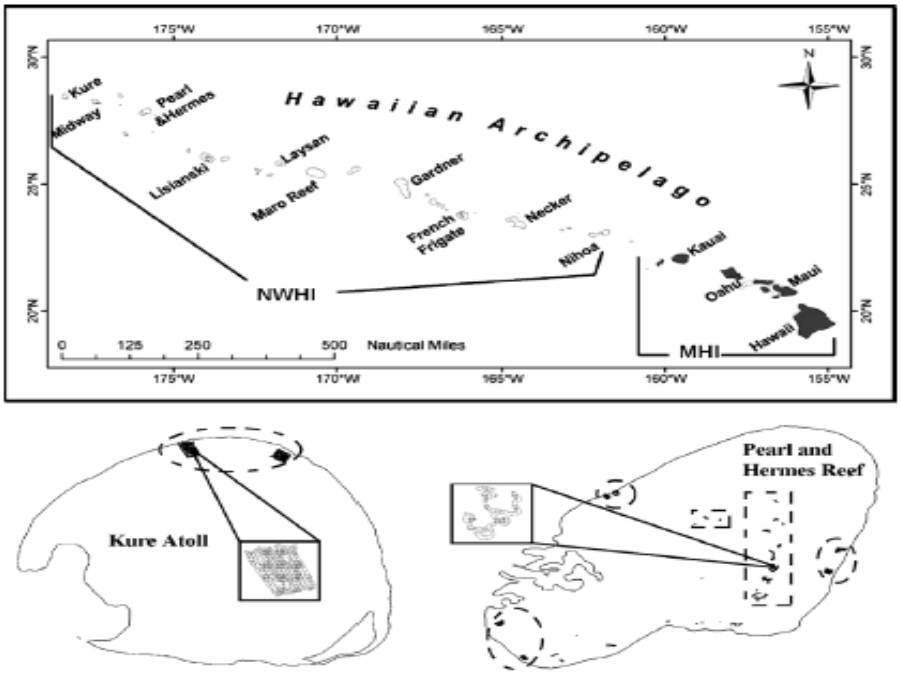

Figure 1: Northwestern Hawaiian Islands. From Dameron et al. 2007.

i. *Ocean Currents Accumulate Plastic Debris in the Northwestern Hawaiian Islands*

It is the location of the Northwestern Hawaiian Islands, between 18° and 28° N latitude, which makes it prone to the accumulation of marine debris (NOAA 2011). One of the reasons marine debris accumulates in these islands is the movement of debris within the North Pacific Subtropical Convergence Zone. The Subtropical Convergence Zone concentrates debris and moves seasonally between 23° and 37° N latitude, dipping farther south during periods of El Niño. This accumulation due to the Subtropical

Convergence Zone is evidenced by an increase in the quantity of floating marine debris deposited on beaches during El Niño periods (Morishige et al., 2007). Additionally, a correlation has been noted between increased entanglements of endangered Hawaiian monk seals in marine debris and periods of El Niño (Donohue and Foley, 2007).

The Northwestern Hawaiian Islands also accumulate marine debris from the North Pacific Subtropical Gyre, an area of the ocean that contains a particularly high density of floating marine debris that has accumulated as a result of the complex ocean circulation system in the North Pacific (Howell et al. 2012). The North Pacific Subtropical Gyre is one of five major gyres on earth and stretches over 100 million square miles; faster current outside of this area push debris in a slowly swirling mass, where it becomes trapped. The result is two enormous masses of trash; one, the Western Garbage Patch, is located between Japan and Hawaii; the other, known as the Eastern Garbage Patch, is located between California and Hawaii. The patches (collectively known as the "Great Pacific Garbage Patch") are estimated to contain approximately 100 million tons of garbage; most of the debris is found just below the water surface and extending down to depths of 100 feet or more (Dautel 2010). The Eastern and Western Garbage Patches are connected by the North Pacific Subtropical Convergence Zone, seasonally migrating between these extremes. The islands and atolls of Northwestern Hawaiian Islands stretch from 18° to 28° N latitudue and act as a filter, gathering marine debris from passing currents.

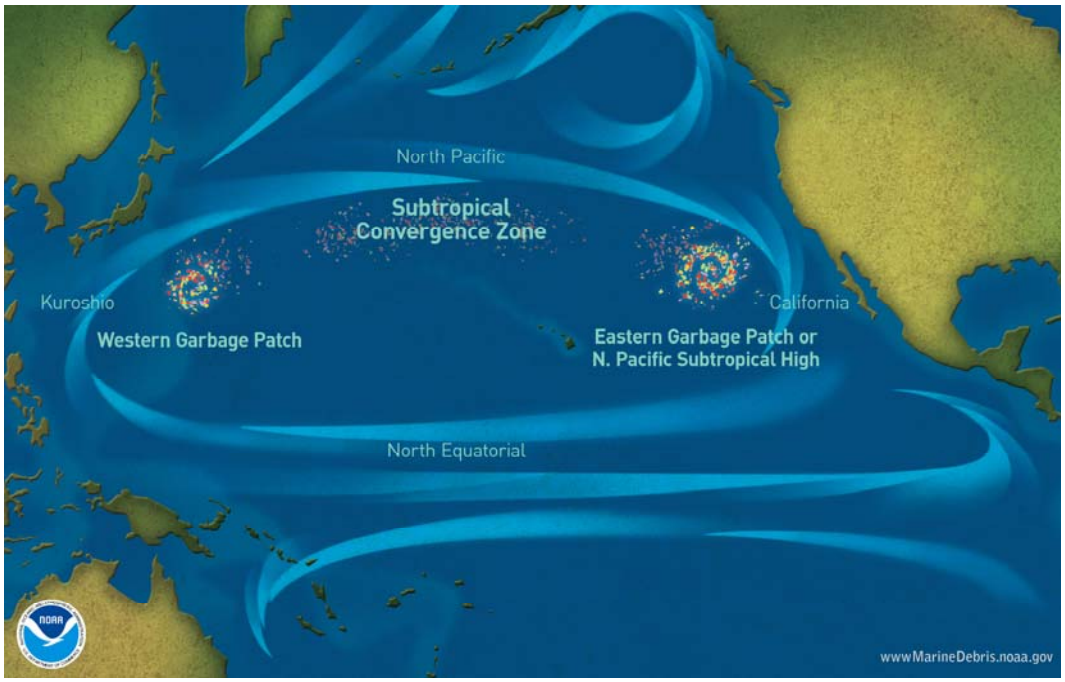

Figure 2: Simplified diagram of the currents and Garbage Patches in the North Pacific, and their relationship to Hawaiian archipelago. From marinedebris.noaa.gov.

The extremely high concentration of marine debris, such as derelict fishing nets and plastic particles, which have accumulated in the North Pacific Subtropical Gyre have long been recognized to have negative effects on organisms in the North Pacific (Morishige et al. 2007). In 1997, Captain Charles Moore, ocean researcher and founder of the Algalita Marine Research Foundation, sailed through the Eastern Garbage Patch and saw "bottle caps floating by, toothbrushes, and pieces of plastic" (Moore 2007). In 1999, the Algalita Marine Research Foundation discovered that in the Eastern Garbage Patch plastics outweighed zooplankton by a ration of six to one and averaged over 300,000 pieces per square kilometers (S L Moore et al. 2001). The fragmentation of plastic particles and their resulting density in the Garbage Patch results in a "plastic soup," where fish and other animals cannot distinguish between plastic and their natural food (Id.).

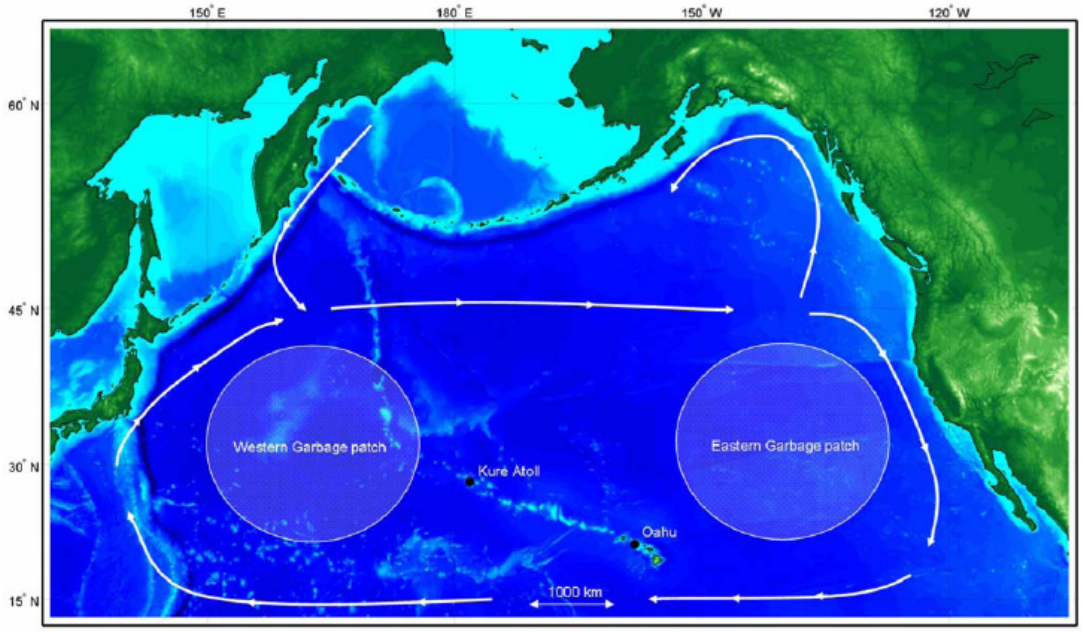

Figure 1. Study sites relative to major current systems and 'garbage patches' in the North Pacific Ocean. Arrows indicate direction of currents and shaded areas denote the locations of the putative garbage patches.
doi:10.1371/journal.pone.0007623.g001

Figure 3: Map showing position of Northwestern Hawaiian Islands relative to Eastern and Western Garbage Patches. From Young et al. 2009.

The coral reefs in the Northwestern Hawaiian Islands have been reported to contain extraordinarily high densities of derelict fishing gear and other marine debris (Dameron et al. 2007). Lost and abandoned fishing gear, primarily large trawl and drift nets, float into the region and come to rest within the more protected, shallow water environments inside barrier reefs of the Northwestern Hawaiian Islands (Id.). The key physical forcing mechanism for this phenomenon is the convergence of surface waters in the subtropical convergence zone, resulting from westerly winds in mid-latitudes and easterly winds in the tropics (Id.). From 1996 to 2005, the National Marine Fisheries Service removed 492 metric tons of derelict fishing gear from various sites within the

Northwestern Hawaiian Islands (Id.). As of 2007, annual Northwestern Hawaiian Islands debris accumulation is estimated to be 52.0 metric tons (Id.).

A study quantifying the types of derelict fishing gear in several of the islands determined that trawl netting (88%) was the most frequent debris type encountered (Donohue et al. 2001). Fourteen tons of derelict fishing gear were identified and trawl netting also represented the greatest component recovered by weight (35%), followed by monofilament gillnet (34%), and maritime line (23%) (Id.). Once derelict fishing gear is caught on Northwest Hawaiian Islands coral reefs, it begins cycle of destructive activity. When fishing gear snags on reefs, wave action acting on the debris breaks coral heads on which the debris is held, freeing the debris to subsequently snag and damage additional corals. Derelict gear damages so much coral that some recovered nets have 20% of their weight attributable to broken coral fragments (Id.). Degradation of coral reefs undermines the survival of a diverse array of invertebrates, fish, and vertebrates that depend on this limited resource.

ii. *Plastic Pollution Results in Ingestion by and Entanglement of Marine Life*

Plastic pollution directly harms marine animals though ingestion and entanglement. In the Northwestern Hawaiian Islands, aside from damaging and destroying the coral reef itself, derelict gear devastates benthic reef flora and fauna and entangles macrofauna, including threatened and endangered species. All sea turtle species occurring in Hawaiian waters, including endangered hawksbill, olive ridley, and leatherback turtles, as well as the threatened green sea turtle have documented entanglement records (Donohue et al. 2001). Most of these published accounts document turtles that died due to entanglement or would have died without human intervention. However, published entanglements represent a very conservative estimate of animals lost to derelict fishing gear, as documented entanglements are almost exclusively generated from animals able to swim ashore or washed ashore dead (Id.).

Marine debris is arguably the largest documented anthropogenic impact to the recovery of the endangered Hawaiian monk seal (Boland & Donohue 2003). Hawaiian monk seals are one of the world's most endangered marine mammals and are endemic to Hawaii. Breeding colonies are limited to six small islands and atolls in the Northwestern Hawaiian Islands, and the population is extremely small, estimated at approximately 1100 individuals (NOAA 2012). Since 2001, the total abundance at the six main Northwestern Hawaiian Islands sites has been declining at an average annual rate of about 4.5% (Id.). Entanglement of derelict fishing gear, in particular, is a threat to the recovery of this species (Henderson 2001).

Entanglements of Hawaiian monk seals in the Northwestern Hawaiian Islands have been observed for over 30 years. From 1982 to 1998, researchers documented 173 entanglements, with pups and juvenile seals more likely to become entangled than older seals (Henderson 2001). Pups and juvenile seals are more likely to become entangled in nets, possibly because recently weaned pups remain relatively close to the islands where large amounts of plastic marine debris, primarily trawl nets, are present in shallow reefs

adjacent to beach haulouts (Boland & Donohue 2003). Entanglements of subadults and adults are more likely to involve line (Henderson 2001). The subpopulation of seals at Lisianski Island experienced the most entanglements during this period. While Lisianski does not accumulate the most debris, the windward location of pupping areas exposes young seals to more debris than their counterparts at other islands (Id.).

During a study of three sites in the Northwestern Hawaiian Islands from 1999-2001, a survey of marine debris in nursery zones of the Hawaiian monk seal documented 10.8 tons of derelict fishing gear (Boland & Donohue 2003). Scientists determined that debris was large enough to cause a decline in the population. Not only are does direct mortality resulting in drowning or injury from lacerations and infection, fitness costs have been associated with pinniped marine debris entanglement. Such costs have been documented in Northern fur seals, showing lower reproductive success, represented by reduced preweaning pup growth. Other studies have demonstrated that entangled pinnipeds must increase metabolism to compensate for increased drag during swimming caused by entangling debris. One hypothesis for the lack of recovery of the Hawaiian monk seal is prey limitation, which may be exacerbated by entanglement in marine debris (Id.). However, unlike prey limitation and other ecological factors that may inhibit the recovery of the Hawaiian monk seal, marine debris is a tangible factor that can be addressed and mitigated.

Plastic debris has become an inadvertent source of food for marine wildlife in the Northwestern Hawaiian Islands. The concentration of plastic found in sea bird stomachs has increased with the passage of time, corresponding to the increase in plastic production (Ribic et al. 2012). Seabirds ingest floating plastic while feeding on the surface of the ocean, and adult birds feed their chicks plastic particles mistaken for food (Auman et al. 1997).

Laysan albatrosses are reported to have a greater incidence, a wider variety, and larger volume of ingested plastic than any other seabird; at Midway Atoll, Laysan albatross chicks die by the thousands from starvation and dehydration due to a build up of plastics in their stomachs (Auman et al. 1997). In 1966, 74 percent of Laysan albatross chicks sampled at Pearl and Hermes Reefs, located in the Northwestern Hawaiian Islands, contained an average of 1.87 grams of plastic (Auman et al., 1997). Thirty years later, 98% of chicks had plastic in their stomachs, with over 18 grams on average (Id.). Other studies of plastic ingestion in albatross chicks suggest that the amount of plastics in the Great Pacific Garbage Patch is increasing (Auman et al., 1997, Teuten et al., 2009).

This startling increase in plastic consumption by seabirds in the Northwestern Hawaiian Islands is not experienced by seabirds in other parts of the Pacific. A recent study of Laysan Albatross concluded that the foraging area of adult albatross originating from Kure Atoll overlapped with the reported range of the Western Garbage Patch, resulting in the transfer of marine plastics from this area by adult albatross to their chicks (L. C. Young et al. 2009). Laysan albatross chicks from Kure Atoll whose parents foraged for food in the Western Garbage Patch had 10 times more plastic in their bodies compared to chicks from Oahu, whose parents foraged in other areas of the North Pacific

(Id.). Despite adults from both colonies having access to similar amounts of natural food, because the range of adults from Kure atoll overlapped with the Western Garbage Patch, the birds ingested a greater percentage of plastic debris.

Fish also ingest plastic debris in the North Pacific. In 2008, scientists conducted a study of plastic ingestion by planktivorious fishes in the North Pacific Central Gyre, finding that approximately 35% of the fish studied had ingested plastic, averaging 2.1 pieces per fish (Boerger et al. 2010). The average number of plastic pieces ingested increased as the size of the fish increased, reaching a maximum average of seven pieces per fish for the 7 cm size class (Id.). Some fish contained as many as 83 pieces of plastic.

Unfortunately, the ocean currents described above similarly influence the transport of both marine debris and planktonic organisms, and satellite-derived measurements have observed a significant correlation of marine debris with sea surface temperature, chlorophyll-*a*, and the chlorophyll-*a* gradient in the Subtropical Convergence Zone. The co-occurrence of marine debris with phytoplankton, zooplankton and other drifters within these areas increases the potential impacts of marine debris on higher trophic level species, such as loggerhead turtles and albacore tuna, which have been shown to preferentially forage within the transitional zone chlorophyll front (Polovina et al. 2007). Therefore, the location of the Northwestern Hawaiian Islands within the Subtropical Convergence Zone positions the wildlife in a perfect location to ingest and bioaccumulate debris that coexist alongside their natural food.

iii. *Plastic Pollution is a Toxic Hazard*

Animals that inhabit the waters off the coast of the Northwestern Hawaiian Islands include fish and sea birds with documented evidence of toxic chemicals originating from plastic ingestion. As discussed above, the transport of marine debris, specifically plastics, is itself a mechanism for transport of persistent organic pollutants. Plastics may also contain other organic pollutants such as phthalates, organotins, and phenols, including bisphenol A (BPA) (Teuten et al. 2009, Rios et al. 2010). In addition, plastics tend to have high affinity for the sorption of hydrophobic compounds such as polycyclic aromatic hydrocarbons, PCBs, and chlorinated pesticides. (Teuten et al. 2007, Teuten et al. 2009, Frias et al. 2010). The chemicals found in animals from the Northwestern Hawaiian Islands include PCBs, dioxins and other POPs that cause great concern due to their highly bioaccumulative nature and adverse effects on wildlife and humans (Ueno et al. 2012). Frias et al. (2010) suggest that the entire food chain may be impacted due to the pervasive nature of plastics and their widely accepted use.

A recent analysis of samples of plastic debris collected from the Northwestern Hawaiian Islands found high concentrations of PCBs and DDT (Rios et al. 2007). The toxicity of these plastic particles affects not only the initial organism that ingests the plastic, but also the organisms within its food web. Many marine organisms, including the endangered Hawaiian monk seal, are vulnerable to toxins originating from plastic pollution. One study analyzed blubber and blood samples for organochlorines (OCs) from 158 Hawaiian monk seals at four of their six primary breeding colonies in the

Northwestern Hawaiian Islands (Ylitalo et al. 2008). This study found that levels of OCs in blubber were lower in adult females compared to juvenile or adult males, as a result of the transfer of these compounds to pups by pregnant or lactating females (Id.). Concentrations of PCBs in blubber increased with age until seals were sexually mature and then continued to increase with age in males after puberty. Average levels of PCBs in blubber were significantly higher in adult male and juvenile seals at Midway Atoll than the same age class of seals at the other colonies. According to researchers, these concentrations were high enough to affect their health (Id.).

Polychlorinated biphenyls (PCBs) were analyzed in sediment, coral, fish, crab, lobster, and eel samples collected from Tern Island and Disappearing Island, part of the French Frigate Shoals in the Northwestern Hawaiian Islands. In general, high trophic species such as eels were found to bioaccumulate PCBs at high levels (Miao et al. 2000). Another study analyzed the concentrations of PCBs and their toxic potential in the subcutaneous fat of eight albatross and one petrel species collected from the North Pacific and the Southern Oceans. Among all the species analyzed, high PCB levels were found in adult male black-footed albatross from the North Pacific. The calculated hazard indices indicated that black-footed and Laysan albatrosses inhabiting in the North Pacific had similar threshold levels which were known to cause toxic effects in some populations of fish-eating birds (Guruge et al. 2001).

Tuna are especially prone to bioaccumulate and biomagnify contaminants from its environment, because it is long-lived and at the top of marine food webs. Hawaii is home to several species of tuna, such as the yellowtail and the bigeye, which have been documented with plastics in their guts (Hoss & Settle 1990). The majority of scientific studies of contaminants and tuna have focused on investigations of nutrition for consumers rather than the effects of the pollutants on the tunas themselves (Lowenstein et al. 2010, Vizzini et al. 2010). However, scientists have sounded a warning of potential alterations in tuna populations as a result of the bioaccumulation of endocrine disrupting chemicals (Storelli et al. 2008, Fossi et al. 2002). A wide variety of substances, including pharmaceuticals, dioxins, polychlorinated biphenyls, DDT and other pesticides, and plasticizers such as bisphenol can cause endocrine disruption. Storelli et al. (2008) concluded that the exposure of Atlantic bluefin tuna in the Mediterranean to endocrine disrupting chemicals over their long lifetimes might "create the prerequisite for the development of pathological conditions." While studies have not been conducted on Pacific tuna populations, similar bioaccumulation and biomagnifications through the food chain is likely occurring.

Humans who consume seafood from the North Pacific are also threatened by the toxic effect of chemicals surrounding the Northwestern Hawaiian Islands. Studies have shown that edible marine species, such as fish, cephalopods, molluscs and crustaceans can transport hazardous toxins to humans who ingest them (Storelli 2008). More studies must be performed in order to evaluate the levels of toxicity that exist within the ecosystems of the Northwest Hawaiian Islands, and the potential for toxic transfer to humans.

iv. *Navigation and Economic Impacts*

Marine debris also results in economic losses and jeopardizes vessels navigating in the Northwestern Hawaiian Islands. Marine debris can be difficult to see in the ocean and can also be quite large. Large debris, such as derelict fishing nets and lines that float at or just below the surface, pose the greatest threat to vessel navigation. Lines and nets can become wrapped around propellers and entrained in intakes of motors, and vessels may strike large items, damaging hulls and propellers. In a tragic example, derelict fishing gear contributed to the sinking of a Korean passenger ferry in 1993 that resulted in the deaths of 292 passengers. (NOAA 2011). Vessel entanglement of fishing vessels results in the loss of opportunities to fish and the increased cost of repairing vessels. Additionally, ghost fishing by lost nets and pots can compete with active fishing for limited resources, undermining economic opportunities while also decreasing the reproductive capacities and viabilities of fish and invertebrate stocks (Id.). The economic loss of commercial fish caught in ghostnets, the time and expense of rescue operations for entangled or damaged vessels, and the costs of cutting nets by hand from reefs can be measured in the millions of dollars (Pichel et al. 2007).

Plastic marine debris is a severe and chronic threat to wildlife and marine habitats of the Northwestern Hawaiian Islands. Ocean currents carry a wide array of marine debris, including derelict fishing nets and other gear, household plastics, and hazardous material. Currents concentrate the materials and deposit them on the reefs and beaches of the island chain, where debris hinders the recovery of the endangered Hawaiian monk seal and threatens sea turtles and other marine life through entanglement, drowning, and suffocation hazards.

III. EPA Must Conduct Preliminary Assessment of Northwestern Hawaiian Islands

The first step in remediating the areas polluted by plastic debris in the Northwestern Hawaiian Islands is to conduct a preliminary assessment of the hazards posed to the environment. This analysis will inform the nature and extent of the site contamination, and a baseline risk assessment will assess the current and potential future risks to human health and the environment posted by that contamination. The scientific literature is clear that the Northwestern Hawaiian Islands contain an amount of plastic debris that is hazardous to the health of sea turtles, sea birds, marine mammals and fish. Remediation of this contamination falls within the purview of the CERCLA, and EPA must take the first steps to ensuring a healthy future for our wildlife and environment.

A. EPA Has Authority to Conduct Preliminary Assessment of Northwestern Hawaiian Islands

A Preliminary Assessment is the first step in the process of evaluating a site potentially contaminated with hazardous substances or pollutants pursuant to CERCLA, the National Contingency Plan, and the Hazard Ranking System. As detailed above, the purpose of the Preliminary Assessment is to differentiate sites that pose no potential

threat to human health and the environment from sites that warrant further investigation under CERCLA (EPA 1993). CERLA requires the petitioner proposing a preliminary assessment to demonstrate the release or threatened release of a pollutant in the affected area. Here, the Northwestern Hawaiian Islands meet the statutory criteria required for a preliminary assessment, and EPA must respond by collecting information in order to evaluate pollutant migration and exposure pathways.

Section 105 of CERCLA provides that

> Any person who is, or may be, **affected by a release or threatened release of a hazardous substance or pollutant or contaminate**, may petition the President to conduct a preliminary assessment of the hazards to public health and the environment which are associated with such release or threatened release.

42 U.S.C. § 9605(d)(emphasis added). The Northwestern Hawaiian Islands and surrounding waters fit the criteria defined by CERCLA.

First, the Center's interests are undoubtedly "affected" by plastic pollution in the Northwestern Hawaiian Islands. The Center advocates on behalf of all wild species, and as detailed above, innumerable animals, big and small, have been entangled or ingested marine plastic debris. From Laysan albatross, mollusks, and green sea turtles, these creatures have endured the ill effects of plastic pollution in their environment. Discarded fishing gear entangles endangered Hawaiian monk seals while chemicals leach into ocean waters and into the bodies of many species who suffer their toxic effects (Henderson 2001, Teuten et al. 2009). The toxic chemicals ingested via plastic pollution by zooplankton and fish may eventually end up affecting health as these chemicals bioaccumulate up the food web (Thompson et al. 2009). The Center's Oceans Program defends marine species and habitat from a host of threats, and the demonstrable injuries sustained by marine species have also injured the interests of the Center.

Second, there has been a "release" of plastic pollution onto waters offshore the Northwestern Hawaiian Islands. A "release" is defined in the statutory language of CERCLA as any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment. 42 U.S.C. § 9601(22). This definition has been construed broadly. *See* Missouri v. Independent Petrochemical Corp., 610 F. Supp. 4, 22 E.R.C. 1167 (E.D. Mo. Jan. 8, 1985). A "release" occurs, for example, when asbestos fibers are blown from a site by the wind, United States v. Metate Asbestos Corp., 584 F. Supp. 1148, 1149 (D. Ariz. 1984), or when hazardous substances leach into soil and groundwater. Here, a release has occurred; millions of plastic fragments pollute the once pristine waters of our nation's largest marine monument and the expanse of ocean we identify as the Garbage Patch. As a result of the accumulation of plastics in the Eastern and Western Pacific Garbage Patches, and due to the currents and properties of the Suptropical Convergence zone, the Northwestern Hawaiian Islands are surrounded by thousands of tons of plastic pollution (Howell et al. 2012, Donohue et al. 2001). Without a release of plastic debris, there would not be the

widespread contamination we see today. For example, a 2012 study found the Pacific Ocean has 100 times more small plastic particles now than it did in the 1970s (Goldstein et al. 2012). Plastic particles are so numerous as to outweigh zooplankton in some areas (Moore et al. 2001). While the precise route by which plastic fragments arrive in these areas is still under investigation, recent studies suggest that most of these items originate from land based sources (Gregory 2009).

Finally, according to CERCLA, the term "pollutant or contaminant" encompasses a broad array of substances, including

> any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, **either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations, in such organisms or their offspring;** except that the term "pollutant or contaminant" shall not include petroleum.

42 U.S.C. § 9601(33)(emphasis added). Courts have interpreted CERCLA's "hazardous substance" requirement liberally. *See* B.F. Goodrich v. Betkoski, 99 F.3d 505 (2d Cir. 1996) ("Pens or plastic containers might include a hazardous substance in their chemical makeup. . . . CERCLA's 'hazardous substance' definition includes even miniscule or nominal amounts.").

The statutory definition of "pollutant or contaminant" speaks directly to the various ways that plastic pollution harms the marine environment in the Northwestern Hawaiian Islands. Ingestion of plastic particles has been widely documented to injure sea birds such as Laysan albatross, leading to starvation and reduced reproductive output (Auman et al. 1997). Sea turtles mistake plastic items for their main prey item, jellyfish, and suffer entanglements in trawl netting (Mrosovsky et al. 2009). Plastic marine debris is one of the leading factors in the decline of the endangered Hawaiian monk seals; thirty years of documented monk seal entanglements support the proposition that plastic debris causes "death, disease, [and] behavioral abnormalities" (Boland & Donohue 2003). The presence of plastic marine debris in the Northwestern Hawaiian Islands is also a mechanism for transport of persistent organic chemicals, which can result in a myriad of deleterious effects (Teuten et al. 2009). In sum, plastic pollution both directly and indirectly harms wildlife and qualifies for inclusion as a "pollutant or contaminant" pursuant to CERCLA.

The requirements for an initial PA are not onerous, nor are they intended to bar petitioners from asserting harms accrued as a result of the release of toxic chemicals (EPA 2002). Here, all the requirements for a PA have been met, and EPA should proceed by examining the offshore habitat of the Northwestern Hawaiian Islands in order to evaluate the hazards of plastic pollution.

B. Garbage Patch and Northwestern Hawaiian Islands Fit Within CERCLA's Purview

CERCLA was enacted to ensure cleanup of polluting materials causing damage to the environment and human health. 42 U.S.C. § 9604. The plastic pollution surrounding the Northwestern Hawaiian Islands is within the bounds of CERCLA's envisioned purview; like other sites on the National Priorities List, the contaminating substances in these areas are harming innumerable wildlife species. And while CERCLA imposes requirements beyond those required for a Preliminary Assessment, the plastic contamination surrounding the Northwestern Hawaiian Islands equally satisfies those conditions.

As laid out above, CERLCA authorizes action, consistent with the National Contingency Plan, whenever "any hazardous substance is released . . . into the environment," or "there is a release or substantial threat of release into the environment of any pollutant or contaminant which may present an imminent and substantial danger to the public health or welfare." 42 U.S.C. § 9604(a). The National Contingency Plan, in turn, bases its listing criteria on relative "risk or danger to public health or welfare or the environment" in order to "set priorities among releases or threatened releases throughout the United States" for purposes of taking cleanup actions. 42 U.S.C. § 9605(a)(8)(A). In preparing the resulting National Priorities List, EPA is to apply the criteria thus established (Hazard Ranking System) and then "list as part of the [National Contingency] plan national priorities among the known releases or threatened releases throughout the United States." Id. § 9605(a)(8)(B). In addition, Section 106 authorizes the United States to seek a mandatory injunction against responsible parties "when the President determines that there may be an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance. . ." 42 U.S.C. § 9606. Use of the disjunctive "or" mandates the conclusion that a possible endangerment to the public welfare alone, or a possible endangerment of the environment alone, will warrant relief.

Because we have already determined that there has been a release of a pollutant or contaminant which affects the wildlife of the Northwestern Hawaiian Islands, the issue becomes whether that release is a) an imminent and substantial danger to the public health or welfare, and b) whether the release has occurred within the environment of the United States. Both questions can be answered affirmatively.

Once plastic debris enters the marine environment it poses an immediate danger to wildlife and satisfies the "immediate and substantial danger" criteria of Section 104. Plastic pollution in the Garbage Patch and Northwestern Hawaiian Islands tangles animals, damages corals, and has lethal and sublethal effects on sea turtles, marine mammals, sea birds, and fish. In addition, the absorption of toxic chemicals from surrounding seawater begins immediately upon contact. Although an animal may not be immediately killed or injured upon release of the plastic item into the ocean, the danger

for entanglement or ingestion exists the moment that item enters the marine environment. As described in B.F. Goodrich Co. v. Murtha, 697 F. Supp. 89, 96 (D. Conn. 1988),

> [w]ith respect to section of CERCLA authorizing relief necessary to abate "an imminent and substantial endangerment because of an actual or threatened release of a hazardous substance from a facility," an endangerment is "imminent" if conditions which give rise to it are present, even though the actual harm may not be realized for years; moreover, the fact that implementation may take a protracted time does not justify a finding that threat to public health is any less imminent nor that commencement of the correction process should be delayed.

Plastic pollution's dangers, whether they be from entangling debris or toxic contamination, pose an imminent threat to the marine ecosystem even though actual harm may not be realized for years. Once a fishing net is discarded, it is only a matter of time before it ensnares a reef or entangles a Hawaiian monk seal, or breaks down into particles that adsorb toxic chemicals and are ultimately ingested by a sea turtle or fish.

The term "public welfare" is exceptionally broad, and encompasses "health and safety, recreational, aesthetic, environmental and economic interests." City of El Paso v. Reynolds, 597 F. Supp. 694, 700 (D. N.M. 1984). "Public health and welfare" is not confined to human health effects, and therefore injury to wildlife suffices to ensure a site is added to the National Priorities List. See 42 U.S.C. 9606(a) (relief authorized when there may be an endangerment to "the public health or welfare **or the environment**")(emphasis added). However, even though CERCLA does not require harm to human health in order to satisfy this requirement, toxic chemicals that accumulate through the food chain as a result of plastic ingestion by lower trophic levels have the potential to cause injury to humans consuming seafood (Thompson et al. 2009). *See also* (EPA 2009)(describing injury to humans as a result of consumption of contaminated seafood in Palos Verdes Superfund site).

Lastly, in order for EPA to take action under CERCLA, the release of pollutants must occur in the "environment," defined by statute as the "navigable waters, the waters of the continuous zone, and the ocean waters of which the natural resources are under the exclusive management authority of the United States under the Magnuson-Stevens Fishery Conservation and Management Act." 42 U.S.C. 9601(8). The Magnuson-Stevens Act, 16 U.S.C. §§ 1801-1884, provides for the conservation and management of fishery resources within the United States' exclusive economic zone. The exclusive economic zone extends from the seaward boundary of each of the coastal states to 200 nautical miles from shore. Courts have found releases of pollutants thirty miles off the coast to be liable for clean-up under CERCLA, United States v. M/V Santa Clara I, 887 F. Supp. 825 (D.S.C. 1995), as well as marine areas along the continental shelf. 62 Fed. Reg. 44430-44434 (August 21, 1997).

The Center's request for an investigation of plastic pollution off the coast of the Northwestern Hawaiian Islands falls within CERCLA's jurisdiction to investigate

releases into the "environment," and EPA should exercise its full authority to investigate plastic pollution as far off the coast as CERCLA's influence allows. Extending the Preliminary Assessment to waters up to 200 miles offshore, potentially encompassing parts of the Great Pacific Garbage Patch, will allow EPA to examine the extent to which the Garbage Patch is responsible for contributing plastic debris to the shores of the Northwestern Hawaiian Islands and will lead to a more complete understanding of the ways in which we can begin to remediate the polluted areas.

The expansive scope of the terms "imminent and substantial endangerment," "public welfare" and "environment" mandates the conclusion that Congress intended relief to issue whenever any aspect of the nation's interest in a clean environment may be endangered imminently and substantially by a release. As Senator Stafford, one of CERCLA's sponsors, stated, "The purpose of this bill . . . is to protect the public health and welfare in its broadest sense." 126 Cong. Rec. S 16427 (Dec. 12, 1980).

C. CERLCA's Response Authority

If the Northwestern Hawaiian Islands are ultimately placed on the National Priorities List, there are two types of responses available: removal actions and remedial actions. Generally, "'removal' actions are primarily those intended for the short-term abatement of toxic waste hazards, while 'remedial' actions are typically those intended to restore long term environmental quality." *See* City of New York v. Exxon Corp., 633 F. Supp. 609, 614 (S.D.N.Y. 1986) (*citing* New York v. Shore Realty Corp., 759 F.2d 1032, 1040 (2d Cir. 1985). Because plastic pollution is both an immediate and recurring threat, both actions would be necessary to ensure a clean and healthy environment. However, placement on the National Priorities List does not designate a primary responsibility to any party for the cleanup. It would be up to EPA to take an enforcement action for the cleanup against potentially responsibly parties, and if unsuccessful, EPA could clean up the sites using the CERCLA Trust Fund (Superfund). 42 U.S.C. § 9607(a)(1)-(4).

Removal actions are short term actions taken to clean up or remove contaminants, mitigate a threat of release, dispose of removed material, and prevent damage to public welfare or the environment. Federal regulations list removal actions that address specific situations. 40 C.F.R. 300.415(e). Removal actions can include, but are not limited to, activities such as movement, treatment, disposal or incineration of contaminants, evacuation or removal of highly contaminated soils, and fences, waning signs, or other site control precautions. The National Contingency Plan categorized removal actions in three ways: 1) emergency removal actions, 2) time-critical removal actions, and 3) non-time-critical removal actions. In the Northwestern Hawaiian Islands, even though threats to wildlife from plastic pollution are imminent, these sites most closely fit the rubric for non-time-critical removal actions because a six month planning period is available before on-site activities begin. The planning process would necessitate a plan to remove not only large, readily-visible plastic debris, but small microplastics that are ingested by fish, birds, and other species. Unlike other Superfund sites, removal actions would need to occur repeatedly to account for the constant circulation and deposition of plastic pollution in the North Pacific.

Remedial activities would require a more comprehensive strategy than the initial removal action. Remedial actions, the major part of a CERCLA response program, include the discovery, selection, study, design, and construction of longer-term actions aimed at a permanent remedy. Once a site has gone through the Hazard Ranking System and is placed on the National Priorities List, a remedial investigation would determine the nature and extent of the problem. A feasibility study follows, to develop and evaluate options for remedial action. In the case of plastic pollution, determining the source of the plastic would inform the remedial action. Abating the flow of land based plastic debris into the marine environment, combined with a cessation of fishing equipment dumping, would be the most effective remedial strategy, but there are a multitude of ways that would be done to achieve this goal.

Sixty to eighty percent of marine debris originates from land based sources (Derraik et al. 2002). Marine debris could be addressed by setting water quality criteria for plastic pollution under the Clean Water Act, which would then lead to water quality standards supporting the designated uses of our oceans. 33 U.S.C. §1314(a)(1). Plastic pollution water quality criteria would improve management and prevention of marine debris, and leave a legacy of clean water and healthy ecosystems to future generations. A criterion could take multiple forms, either mandating that ocean and coastal waters be free of all visible plastic waste, or setting a standard of zero plastic debris discharge from stormwater outfalls. Best Management Practices would then complement the water quality criteria to ensure that programs and ordinances are implemented to promote recycling and reduce the tide of plastic drifting into the ocean. In addition, to deal with the discarded fishing nets and line which ensnare reefs and entangle wildlife, fishing regulations could fine vessels that lose nets in the open ocean, or mandate a particular technology that prevents the loss of gear. Regulations particular to certain fisheries could also be implemented, in order to target the worst offenders.

In short, removal and remedial actions undertaken in the Northwestern Hawaiian Islands would give those areas a chance to recover from the harms to wildlife and the environment from plastic pollution. Performing a Preliminary Assessment and subsequently adding these waters to the National Priorities List is the first step in the long road towards recovery.

IV. Conclusion

CERCLA, the country's strongest law concerning the remediation of toxic waste, allows citizens to petition for a preliminary assessment of areas that are affected by the release of pollutants. Because a considerable body of scientific evidence demonstrates the harms suffered by the wildlife and ecosystems around the Northwestern Hawaiian Islands as a result of plastic pollution, the Center believes these areas should be assessed for their suitability for inclusion on the National Priorities List. The lethal and sub-lethal effects on species, in the form of entanglement, ingestion, and toxic contamination have dire consequences for the marine ecosystems of these areas and EPA must exercise its authority to begin the process of restoring their once pristine waters.

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