BEFORE THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

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280 ENVIRONMENTAL, PUBLIC HEALTH, INDIGENOUS, AND COMMUNITY NON-GOVERNMENTAL ORGANIZATIONS,* (full list on pages i-iii)

Petitioners,

vs.

ANDREW WHEELER, ADMINISTRATOR, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY,

Respondent.

PETITION TO REVISE THE CLEAN WATER ACT EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS FOR THE PETRO-PLASTICS INDUSTRY UNDER THE 40 C.F.R. PART 419 PETROLEUM REFINING INDUSTRIAL CATEGORY (CRACKING AND PETROCHEMICALS SUBPARTS) AND PART 414 ORGANIC CHEMICALS, PLASTICS, AND SYNTHETIC FIBERS INDUSTRIAL CATEGORY

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* 100% GREEN SCHOOLS L.A.; 350.ORG; 350 BAY AREA; 350 BUTTE COUNTY; 350 NEW ORLEANS; 350 PITTSBURGH PETROCHEMICAL ACTION TEAM (P-CAT); 350 SANTA CRUZ; 350.ORG; ADVENTURES IN WASTE; ALGALITA; ALTAMAHA RIVERKEEPER; ANACOSTIA RIVERKEEPER; ANIMAL WELFARE INSTITUTE; ANOTHER GULF IS POSSIBLE; APALACHICOLA RIVERKEEPER; ASSATEAGUE COASTAL TRUST; ATA LAW GROUP; ATCHAFALAYA BASINKEEPER; ATHENS COUNTY'S FUTURE ACTION NETWORK, AKA ATHENS COUNTY (OH) FRACKING ACTION NETWORK; AZUL; BAYOU CITY WATERKEEPER; BEAVER COUNTY (PA) MARCELLUS AWARENESS COMMUNITY; BERKS GAS TRUTH; BETTER PATH COALITION; BEYOND PLASTICS; BIG BLACKFOOT RIVERKEEPER, INC.; BLACK WARRIOR RIVERKEEPER; BLUE SPHERE FOUNDATION; BLUE WATER BALTIMORE/BALTIMORE HARBOR WATERKEEPER; BLUECOLOGY; BOULDER WATERKEEPER; BREAM FISHERMEN ASSOCIATION, INC; BREAST CANCER ACTION; BREAST CANCER PREVENTION PARTNERS; BREATHE PROJECT; BUCKEYE ENVIRONMENTAL NETWORK; BUFFALO NIAGARA WATERKEEPER; CA URBAN STREAMS ALLIANCE-THE STREAM TEAM, A WATERKEEPER AFFILIATE; CAFETERIA CULTURE; CAHABA RIVERKEEPER; CALIFORNIA COASTAL PROTECTION NETWORK; CALIFORNIA LEAGUE OF CONSERVATION VOTERS; CALIFORNIANS AGAINST WASTE; CALIFORNIANS FOR WESTERN WILDERNESS; CAPE FEAR RIVER WATCH/ CAPE FEAR RIVERKEEPER; CATAWBA RIVERKEEPER FOUNDATION; CENTER FOR BIOLOGICAL DIVERSITY; CENTER FOR COALFIELD JUSTICE; CENTER FOR ENVIRONMENTAL HEALTH; CENTER FOR FOOD SAFETY; CENTER FOR INTERNATIONAL ENVIRONMENTAL LAW (CIEL); CHANGE BEGINS WITH ME / INDIVISIBLE CD-52; CHARLESTON WATERKEEPER; CHATTAHOOCHEE RIVERKEEPER; CHICOBAG COMPANY / TO-GO WARE; CHISPA - LEAGUE OF CONSERVATION VOTERS; CHOCTAWHATCHEE RIVERKEEPER; CITIZEN COALITION FOR SAFE COMMUNITY; CITIZENS' CLIMATE LOBBY, SANTA CLARITA CHAPTER; CLEAN OCEAN ACTION; COACHELLA VALLEY WATERKEEPER; COASTAL ALLIANCE TO PROTECT OUR ENVIRONMENT (CAPE); COASTAL CAROLINA RIVERWATCH; COLUMBIA RIVERKEEPER; CONGAREE RIVERKEEPER; CONSERVATION LAW FOUNDATION; COOK INLETKEEPER; COOSA RIVERKEEPER; COOSA RIVER BASIN INITIATIVE / UPPER COOSA RIVERKEEPER; COPPER RIVER DELTA SOUND WATERKEEPER; CORALATIONS; COURAGE CAMPAIGN; CREATE; CRYSTAL COAST WATERKEEPER; DELAWARE ECUMENICAL COUNCIL ON CHILDREN AND FAMILIES; EARTH ETHICS, INC.; EARTH ISLAND INSTITUTE; EARTHWORKS; EAST VALLEY INDIVISIBLES; ECOJUSTICE WORKING GROUP, THOMAS MERTON CENTER; ECOLOGICAL RIGHTS FOUNDATION; EMERALD COASTKEEPER; ENDANGERED HABITATS LEAGUE; ENDANGERED SPECIES COALITION; ENVIRONMENT AMERICA; ENVIRONMENT CALIFORNIA; ENVIRONMENTAL ACTION COMMITTEE OF WEST MARIN; ENVIRONMENTAL PROTECTION INFORMATION CENTER; ENVIRONMENTAL YOUTH COUNCIL OF ST. AUGUSTINE FLORIDA; EUREKA RECYCLING; EXTINCTION REBELLION KENTUCKY; EYAK PRESERVATION COUNCIL; FOOD & WATER WATCH; FRACTRACKER ALLIANCE; FRIENDS OF HURRICANE CREEK / HURRICANE CREEKKEEPER; FRIENDS OF PENOBSCOT BAY, A WATERKEEPER ALLIANCE

AFFILIATE; FRIENDS OF THE EARTH; FRIENDS OF THE KAW / KANSAS RIVERKEEPER; FRIENDS OF THE POGONIP; GAS FREE SENECA; GASP; GOOD NEIGHBOR STEERING COMMITTEE; GOOD STEWARDS OF ROCKINGHAM / DAN RIVERKEEPER; GREAT OLD BROADS FOR WILDERNESS; GREATER HELLS CANYON COUNCIL; GREENPEACE; GUNPOWDER RIVERKEEPER; HACKENSACK RIVERKEEPER; HANDS ACROSS THE SAND; HARAMBEE HOUSE, INC.; HAW RIVER ASSEMBLY / HAW RIVERKEEPER; HEAL THE BAY; HEALTHY GULF; HEARTWOOD; HOWLING FOR WOLVES; HUDSON RIVERKEEPER; IDLE NO MORE SF BAY; INDIAN RIVERKEEPER; INDIVISIBLE CA-33; INDIVISIBLE CA-7; INDIVISIBLE MONTEREY HILL; INDIVISIBLE NAPA; INDIVISIBLE OC 48; INDIVISIBLE SACRAMENTO; INDIVISIBLE SAN JOSE; INDIVISIBLE SAUSALITO; INDIVISIBLE SF; INDIVISIBLE VENTURA; INLAND EMPIRE WATERKEEPER; INLAND OCEAN COALITION; INSTITUTE FOR POLICY STUDIES; INTERFAITH CLIMATE ACTION NETWORK OF CONTRA COSTA COUNTY; INTERNATIONAL MARINE MAMMAL PROJECT OF EARTH ISLAND INSTITUTE; JAMPAC (JAMESVILLE POSITIVE ACTION COMMITTEE); KLAMATH FOREST ALLIANCE; LAKE GEORGE WATERKEEPER; LAKE PEND OREILLE WATERKEEPER; LAKE WORTH WATERKEEPER; LEAGUE OF CONSERVATION VOTERS; LITTLE RIVER WATERKEEPER; LIVING RIVERS & COLORADO RIVERKEEPER; LONELY WHALE; LOUISIANA BUCKET BRIGADE; LOWER OHIO RIVER WATERKEEPER; LOWER SUSQUEHANNA RIVERKEEPER ASSOCIATION; MANASOTA-88, INC.; MATANZAS RIVERKEEPER; MIDDLE SUSQUEHANNA RIVERKEEPER ASSOCIATION, INC.; MILWAUKEE RIVERKEEPER; MISSOURI CONFLUENCE WATERKEEPER; MOBILE BAYKEEPER; MONDO BIZARRO; MOUNTAIN WATERSHED ASSOCIATION / YOUGHIOGHENY RIVERKEEPER; MOUNTAINTRUE / BROAD RIVERKEEPER; MOUNTAINTRUE / FRENCH BROAD RIVERKEEPER; MOUNTAINTRUE / GREEN RIVERKEEPER; MOVEMENT FOR A PEOPLE'S PARTY; NATURAL RESOURCES DEFENSE COUNCIL; NO WASTE LOUISIANA; NORTH AMERICAN CLIMATE, CONSERVATION AND ENVIRONMENT(NACCE); NORTHCOAST ENVIRONMENTAL CENTER; NY/NJ BAYKEEPER; NY4WHALES; OCEAN CONSERVATION RESEARCH; OCEAN FIRST INSTITUTE; OCEANA; OCEANIC PRESERVATION SOCIETY (OPS); OGEECHEE RIVERKEEPER; OHIO VALLEY ENVIRONMENTAL COALITION; ONE WORLD ADVENTURE; ORANGE COUNTY COASTKEEPER; PACIFIC ENVIRONMENT; PATUXENT RIVERKEEPER; PAUSE - PEOPLE OF ALBANY UNITED FOR SAFE ENERGY; PEARL RIVERKEEPER; PECONIC BAYKEEPER; PENNENVIRONMENT; PENNFUTURE; PEOPLE CONCERNED ABOUT CHEMICAL SAFETY; PEOPLE OVER PETRO COALITION; PHYSICIANS FOR SOCIAL RESPONSIBILITY FLORIDA; PHYSICIANS FOR SOCIAL RESPONSIBILITY PHILADELPHIA; PLASTIC POLLUTION COALITION; POST-LANDFILL ACTION NETWORK (PLAN); POTOMAC RIVERKEEPER NETWORK / POTOMAC RIVERKEEPER; POTOMAC RIVERKEEPER NETWORK / UPPER POTOMAC RIVERKEEPER; PUGET SOUNDKEEPER ALLIANCE; QUAD CITIES WATERKEEPER INC.; QUICK SERVICE BIKE SHOP; RAINFOREST ACTION NETWORK; RE SOURCES FOR SUSTAINABLE COMMUNITIES / NORTH SOUND BAYKEEPER; RIO GRANDE WATERKEEPER; RISE ST. JAMES; ROGUE RIVERKEEPER; RUSSIAN RIVERKEEPER; SACRED

PLACES INSTITUTE; SAFE ALTERNATIVES FOR OUR FOREST ENVIRONMENT; SAFINA CENTER; SAN ANTONIO BAY ESTUARINE WATERKEEPER; SAN FRANCISCO BAYKEEPER; SAN JUAN CITIZENS ALLIANCE / ANIMAS RIVERKEEPER; SANTA BARBARA CHANNELKEEPER; SANTA CRUZ CLIMATE ACTION NETWORK; SATILLA RIVERKEEPER; SAVANNAH RIVERKEEPER; SAVE OUR SHORES; SAVE THE ALBATROSS COALITION; SAVE THE BAY / NARRAGANSETT BAY RIVERKEEPER; SAVE THE BAY / SOUTH COUNTY COASTKEEPER; SAVE THE COLORADO; SAVE THE RIVER; SAVE THE RIVER / UPPER ST. LAWRENCE RIVERKEEPER; SEALEGACY; SENECA LAKE GUARDIAN, A WATERKEEPER ALLIANCE AFFILIATE; SEVEN CIRCLES FOUNDATION; SEVENTH GENERATION ADVISORS; SHENANDOAH RIVERKEEPER; SHORERIVERS / CHOPTANK RIVERKEEPER; SIERRA CLUB AND ITS LONESTAR, OHIO, AND WEST VIRGINIA CHAPTERS; SNAKE RIVER WATERKEEPER; SOCAL 350 CLIMATE ACTION; SOCIOENERGETICS FOUNDATION; SOLIDARITY COMMITTEE OF THE CAPITAL DISTRICT; SOUND RIVERS / PAMLICO-TAR RIVERKEEPER; SPOKANE RIVERKEEPER; ST. JOHNS RIVERKEEPER; STAND.EARTH; STOP FRACKING LONG BEACH; STUDENT PUBLIC INTEREST RESEARCH GROUPS; SUNCOAST WATERKEEPER; SUNFLOWER ALLIANCE; SUNRISE BAY AREA; SURFRIDER FOUNDATION; SUSTAINUS; SYLVIA EARLE ALLIANCE / MISSION BLUE; TAR SANDS ACTION SOUTHERN CALIFORNIA; TEAM MARINE; TENNESSEE RIVERKEEPER; TEXAS CAMPAIGN FOR THE ENVIRONMENT; THE 5 GYRES INSTITUTE; THE CENTER FOR OCEANIC AWARENESS, RESEARCH, AND EDUCATION (COARE); THE CLIMATE REALITY PROJECT; THE CLIMATE REALITY PROJECT, LOS ANGELES CHAPTER; THE CLIMATE REALITY PROJECT, PITTSBURGH & SWPA; THE ENDOCRINE DISRUPTION EXCHANGE; THE LAST BEACH CLEANUP; THE LAST PLASTIC STRAW; THE RESISTANCE NORTHRIDGE - INDIVISIBLE; THE SHAME FREE ZONE; THE STORY OF STUFF PROJECT; TOPANGA PEACE ALLIANCE AND MLK COALITION OF GREATER LOS ANGELES; TRASH FREE MARYLAND; TRINITY WATERS, A WATERKEEPER ALLIANCE AFFILIATE; TUALATIN RIVERKEEPERS; TURTLE ISLAND RESTORATION NETWORK; TWIN HARBORS WATERKEEPER; U.S. PIRG; UNEXPECTED WILDLIFE REFUGE; UNION OF COMMERCIAL OYSTERMEN OF TEXAS; UPPER ALLEGHENY RIVER PROJECT, A WATERKEEPER ALLIANCE AFFILIATE; VANISHING EARTH; VENICE RESISTANCE; VENTURA COASTKEEPER; WABASH RIVERKEEPER NETWORK/ BANKS OF THE WABASH INC; WATERKEEPER ALLIANCE; WATERKEEPERS CHESAPEAKE; WESTERN NEBRASKA RESOURCES COUNCIL; WHITE OAK-NEW RIVERKEEPER ALLIANCE; WHITE RIVER WATERKEEPER; WILDCOAST; WILDEARTH GUARDIANS; WILLAMETTE RIVERKEEPER; WINYAH RIVERS ALLIANCE; WINYAH RIVERS ALLIANCE / LUMBER RIVERKEEPER; WINYAH RIVERS FOUNDATION / WACCAMAW RIVERKEEPER; WISHTOYO FOUNDATION; WWALS WATERSHED COALITION, INC. / SUWANNEE RIVERKEEPER; YELLOW DOG WATERSHED PRESERVE / YELLOW DOG RIVERKEEPER; YUBA RIVER WATERKEEPER; ZERO WASTE USA; AND ZERO WASTE WASHINGTON

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EXECUTIVE SUMMARY

From bags to bottle caps, plastic garbage is littering coastlines, filling our oceans, and killing whales, seabirds, and fish around the world. And without major changes to how we use, produce, and regulate plastic, the plastic pollution crisis is about to get much worse. As a first and necessary step to ending that crisis, this petition urges the U.S. Environmental Protection Agency (EPA) to update the 26-year-old water pollution rules it uses to approve industrial facilities that create plastic and to eliminate plastic discharges from these plastic plants.

The United States already creates more waste per capita than any other country. But in the next 10 years, the petrochemical industry plans to increase plastics production by at least 35 percent, with more than 300 new projects slated for the United States alone. Using fracked natural gas, the new and expanded facilities planned by the industry will produce the essential building blocks for an endless deluge of throwaway plastic. Nearly 50 percent of plastic produced is disposable packaging meant to be discarded within minutes. Much of it will end up in our oceans, smothering corals, traveling through the ocean food web, and polluting our beaches.

But the pollution created by these facilities goes beyond plastic waste. The plastics industry is among the dirtiest and most toxic in the nation, fouling the air and water of some of our poorest communities. The facilities that convert fossil fuels into plastics release a host of toxic pollutants into waterways. They pollute our water with benzene—a known human carcinogen—and dioxins, best known as the toxic contaminant in Agent Orange. Other wastewater pollutants include phthalates, a known cause of developmental and reproductive toxicity in humans, and polycyclic aromatic hydrocarbons, which cause cancer, damage organs, and suppress our immune systems. Plastics facilities also push massive quantities of plastic pellets and other plastic particles into waterways through stormwater discharge—affecting the recreational, aesthetic, biological, cultural, water quality, and economic values and uses of our shorelines and waterways.

In addition to the water quality hazards created during production, irreversible environmental problems stem from the skyrocketing use and disposal of consumer plastics. Threats from increasing plastic production include accumulation of plastic in natural habitats; wildlife and human ingestion of plastics materials; entanglement in discarded plastic products; and the potential for plastics to transfer chemicals to wildlife and humans. The growth of plastic production has far outpaced the ability of waste management to keep up, as demonstrated by the mountains of plastic that choke our waterways and oceans.

Despite plastic production's harms, EPA is allowing this industry to expand its poisoning of our nation's waters. EPA only regulates a subset of wastewater pollutants produced by this industry under its current Clean Water Act regulatory program, using unacceptably old technology-based standards. EPA must start more effectively regulating the plastics industry now.

In light of the Clean Water Act's stated goal of ending the discharge of pollutants into the country's waterways, Petitioners formally request that EPA update the Effluent Limitations Guidelines and Standards applied to facilities that convert fossil fuels into plastics. The Effluent

Limitations Guidelines and Standards for the plastics industry are largely unchanged from their original adoption in the 1970s and 1980s. In the meantime, plastic production and pollution have exploded, and monitoring and treatment technologies have advanced. An update is long overdue and necessary to comply with the Clean Water Act's mandate for effluent limitations, reflect updates in science, and ensure new technologies and treatment methods are used to address emerging pollutants of concern.

Primarily, Petitioners request that EPA take **these four actions**:

1. **Prohibit the discharge of plastic pellets** and other plastic materials in industrial stormwater and wastewater;

2. Update Effluent Limitations Guidelines and Standards for new facilities to **eliminate the discharge of toxic priority pollutants** from wastewater and stormwater streams;

3. For existing facilities, put into effect Effluent Limitations Guidelines and Standards for **pollutants of concern not currently regulated**; and

4. Update current Effluent Limitations Guidelines and Standards for existing facilities to **reflect advances in detection and treatment technologies** since the last revisions decades ago.

EPA has the duty and obligation to ensure that both wastewater and stormwater discharges from petro-plastics facilities do not degrade the health of the country's rivers, oceans, ecosystems, or communities.

I. Notice of Petition

The undersigned organizations hereby petition EPA to promptly review and revise the Effluent Limitations Guidelines and Standards that apply to the facilities that convert natural gas liquids into plastics under the Part 419 Petroleum Refining industrial category (Subpart B Cracking and Subpart C Petrochemical)[1] and Part 414 Organic Chemicals, Plastics, and Synthetic Fibers industrial category pursuant to the Administrative Procedures Act (APA)[2] and the Clean Water Act.[3] The citizen right to petition the government originates in the First Amendment[4] and is codified and applied to federal agency regulations through the APA's requirement that "[e]ach agency shall give an interested person the right to petition for the issuance, amendment, or repeal of a rule."[5] The APA also imposes an affirmative obligation on EPA to respond to this petition in a timely manner, requiring that "[w]ith due regard for the convenience and necessity of the parties or their representatives and within a reasonable time,

[1] To the extent that EPA regulates facilities producing ethylene, propylene, or other monomers for Plastics under 40 C.F.R. Part 419, subpart E (Integrated Subcategory), this Subpart should also be reviewed and updated as proposed below for subparts B and C.
[2] 5 U.S.C. §§ 551 *et seq*.
[3] 33 U.S.C. §§ 1251 *et seq*.
[4] U.S. Const. amend. I ("Congress shall make no law . . . abridging . . . the right of the people . . . to petition the Government for a redress of grievances").
[5] 5 U.S.C. § 553(e).

each agency shall proceed to conclude a matter presented to it."[6] In the event EPA seeks to deny the petition in whole or in part, it must provide "[p]rompt notice" to the petitioners.[7]

Plastic trash on the Island of Kaho'olawe, Hawaii. Source: NOAA Office of Response and Restoration

While mass production of plastic products only began in the 1950s, plastic production and waste have created a global pollution and health crisis today. All along its lifecycle—from fossil fuel extraction, transport, refining, and polymerization to consumer use, waste disposal, and degradation in the environment—plastic is harming the health of people and the planet (CIEL 2019a). Plastic contaminates species, communities, ecosystems, and food chains at a staggering scale.

Despite these harms, according to the American Chemistry Council, the plastics and chemical industry is investing more than $202 billion in the United States for an estimated 333 projects (including new facilities and expansions) designed in large part to convert "plentiful and affordable natural gas" from shale into petrochemical and plastic products (American Chemistry Council 2018a). The industry aims to increase North American plastics production by at least 35 percent by 2025 (CIEL 2017; CIEL 2019). These new plastics will be used to manufacture a variety of products, including water bottles, straws, utensils, food wrappers, packaging, shopping bags, and other single-use items that account for approximately 40 percent of plastic use (Geyer et al. 2017).

Of the approximately 6,300 million metric tons of plastic waste already produced globally as of 2015, only 9 percent has been recycled, with 12 percent incinerated and the remaining 79 percent accumulating in landfills and the natural environment (Geyer et al. 2017).

An additional 8 million tons of plastic pollution enters the water each year. Thousands of seabirds and sea turtles, seals, and other marine mammals are harmed and killed after ingesting plastic or becoming entangled in it. Plastic has been found in our drinking water, seafood, and farthest reaches of the oceans. And more plastic is on the way. If current trends continue, plastics in the ocean could outweigh fish by 2050 (World Economic Forum 2016).

Aside from the legacy of pollution these products create, new and expanded "petro-plastics" facilities emit and discharge a variety of harmful air and water pollutants in the local communities and ecosystems where they are sited. This includes the discharge of plastic resin pellets, flakes, powders, and granules, as well as harmful pollutants including phthalates, dioxin,

[6] *Id*. § 555(b).

[7] *Id*. § 555(e); the APA further grants a right of judicial review to "[a] person suffering legal wrong because of agency action, or adversely affected or aggrieved by agency action" *id.* § 702 which is defined to include the "failure to act." *Id.* § 551(13). In the event EPA fails to timely respond or improperly denies the petition in whole or part, courts "shall compel agency action unlawfully withheld or unreasonably delayed," *id.* § 706(1), and "hold unlawful and set aside agency action, findings, and conclusions found to be arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." *Id*. § 706(2)(A).

and benzene. Many of these pollutants are carcinogens and known to harm human health and the environment.

Petrochemical companies are locating these plastics facilities near existing fossil fuel infrastructure, which means they are targeting Gulf Coast communities in Louisiana and Texas that already shoulder a heavy burden of oil and gas industry pollution. Across the United States, these facilities are often located in and have a disproportionate impact on low-income and minority neighborhoods (Bullard 2000; Collins et al. 2016). Studies dating back to the 1970s have documented a consistent pattern of siting facilities disproportionately where poor people and people of color live (Brown 1995). In the fenceline zones around industrial facilities that use or store hazardous chemicals, the percentage of Latinos is 60 percent greater and percentage of blacks 75 percent greater than for the United States as a whole (Environmental Justice and Health Alliance for Chemical Policy Reform 2014).

Deceased Laysan Albatross. Source: NOAA Office of Response and Restoration

EPA regulates the discharge of pollutants into surface waters under the Clean Water Act's national pollution discharge elimination system (NPDES) program and its Effluent Limitations Guidelines and Standards. This program and standards are intended to ensure that wastewater and stormwater discharges from industrial facilities do not harm public health or the environment. However, EPA has not revised or updated the Effluent Limitation Guidelines and Standards for Petroleum Refining (Cracking and Petrochemical subcategories) *in any way* since 1985 or the Organic Chemicals, Plastics, and Synthetic Fibers ("Plastics") industries *in any way* since 1993. In the decades since, there have been advancements in scientific knowledge and technology as well as changes in the petro-plastics industry and related pollution, all of which warrant a thorough update of these technology-based standards to achieve the goals of the Clean Water Act.[8] EPA has the authority and duty to rigorously review and update these regulations to ensure full compliance with the Clean Water Act and protection of public health and the environment.

On behalf of our millions of supporters and members, the undersigned organizations petition EPA to promptly review and revise the Effluent Limitations Guidelines and Standards for the Part 419 Petroleum Refining industrial category (Subpart B Cracking and Subpart C Petrochemical) and Part 414 Organic Chemicals, Plastics, and Synthetic Fibers industrial category pursuant to the Administrative Procedures Act (APA) and the Clean Water Act.

[8] *See, e.g. Sw. Elec. Power Co. v. U.S. EPA*, 920 F.3d 999, 1003 (5th Cir. 2019) ("By requiring BAT, the Act forces implementation of increasingly stringent pollution control methods" (citation omitted)).

The Petitioners seek the following:

- A zero plastic (in pellet, flake, powder, granule, or other form) discharge standard for all wastewater and stormwater streams;
- A zero detectable discharge requirement for new sources of all pollutants in the wastewater and stormwater streams of new sources;
- For existing sources, the promulgation of Effluent Limitations Guidelines and Standards for wastewater and stormwater pollutants of concern not currently regulated; and
- For existing sources, an update of decades-old Effluent Limitations Guidelines and Standards to ensure they reflect the best available technology.

II. Factual Background

A. Plastic Production Overview

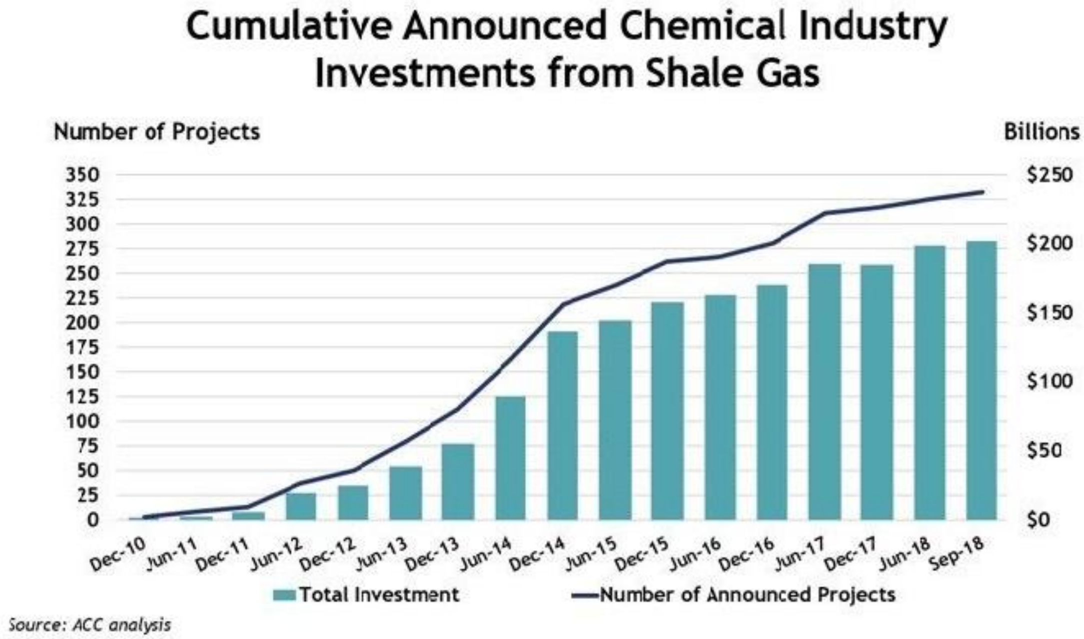
1. The Current Petrochemical Buildout

More than 99 percent of all plastic in the world is produced from fossil fuels. Crude oil and fracked natural gas can be refined to make ethane and propane, which are key feedstocks for plastics (Sadrameli 2015). The petrochemical industry converts ethane and propane into ethylene and propylene (also known as olefins), and from there produces the polyethylene and polypropylene polymers that are the basic building blocks for plastic products (IEA 2018). The process of breaking down fossil fuels into plastics is commonly referred to as "cracking." The current oversupply of fracked natural gas from shale deposits in the United States has created economic incentives for the domestic and international petrochemical industry to invest in the expansion or new construction of petro-plastics plants.

The fossil fuel and petrochemical industries are planning a massive expansion of petro-plastics facilities that would rapidly increase plastic production and its associated pollution. In its 2018 Annual Energy Outlook, the U.S. Energy Information Administration projected that natural gas plant liquids production (including predominately ethane and propane) will double between 2017 and 2050, supported by an increase in global petrochemical industry demand and ethane availability in the United States (U.S. EIA 2018a).

In line with these projections and the oversupply of ethane, the petrochemical industry has been announcing a wave in investments in capacity expansion and new facilities to process ethane since early 2011, with its current tally at $204B and 337 projects (ACC 2019).

Figure 1. **Cumulative Investment in Petchem Buildout.** *Source*: American Chemistry Council, *U.S. Chemical Industry Investment Linked to Shale Gas Reaches $200 Billion* (2018).



In 2015, there were 28 ethylene crackers in the United States producing 28.4 million metric tons of ethylene per year (Koottungal 2015). Two years later, there were at least six more new or expanded U.S. crackers: an OxyChem/Mexichem facility in Ingleside, Texas; a Shintech facility in Plaquemine, Louisiana; two LyondellBasell plants in Corpus Christi and Channelview, Texas; and an Indorama (restart) in Lake Charles, Louisiana (Petrochemical Update 2017). A second wave of U.S. petrochemical projects has emerged since that time, which includes expansions into the Appalachian region of the United States (starting with Pennsylvania and Ohio, with indications that West Virginia will soon follow) (ICIS 2017). Nine new ethane crackers alone are in the development pipeline, with plans to open by 2020 and churn out 10.7 million more tons of ethylene each year.

According to the U.S. Department of Energy, more than 95 percent of U.S. ethylene production capacity is located in either Texas or Louisiana (U.S. DOE 2018). While production in the Appalachian region has been slower, it is projected to rapidly grow in the coming years, with other regions to follow (*Id.*). Overall, the U.S. Energy Information Administration projects annual U.S. ethane consumption to grow from an estimated 1.2 million barrels per day in 2017 to 1.6 million in 2019 as new plants and infrastructure ramp up operations (U.S. EIA 2018b).

Table 1. Ten of the Largest New and Expanded Petro-Plastic Projects. *Source*: Center for Biological Diversity compilation.

Company	Location	Phase	Production (mi tonnes/yr)	Feedstock	Type
Exxon Mobil Chemical	Mont Belvieu, TX	One line is operational	2.5	ethane	Expansion
Formosa	St. James, LA	Permit phase	2.4	ethane	New
Exxon Mobil and SABIC	Corpus Christi, TX	Construction	1.8	ethane	New
Sasol	Lake Charles, LA	Online	1.54	ethane	New
NOVA Chemicals	Geismar, LA	Planning	1.5	ethane	Expansion
Chevron Phillips Chemical Co.	Baytown, TX	Online	1.5	ethane	New
Exxon Mobil Chemical	Baytown, TX	Online	1.5	ethane	New
Formosa Chemical	Point Comfort, TX	Expansion in construction phase	1.5	ethane	Expansion
PTT Global Chemical	Shadyside, OH	Permit phase	1.5	ethane	New
Shell Chemical	Monaca, PA	Construction	1.5	ethane	New
TOTAL	*17.24 million tonnes per year*				

2. Wastewater and Stormwater Characteristics of Petro-Plastics Facilities

Production of plastic monomers and polymers occurs at both Petroleum Refining facilities as part of their overall refining processes and at facilities dedicated to processing petrochemicals into plastic resins (together referred to as “petro-plastics facilities”). As described in more detail below, EPA therefore regulates petro-plastics facilities under two Clean Water Act industrial categories: (1) Petroleum Refining; and (2) Organic Chemicals, Plastics, and Synthetic Fibers (“Plastics”). Common waste streams generated by Plastics facilities and Petroleum Refining facilities that perform pyrolysis, fluid catalytic cracking, and propane dehydrogenation include:

- Benzene- and butadiene-containing waste streams associated with cracking (both are naturally occurring chemicals in crude oil and byproducts of cracking that are known human carcinogens);

- Blowdown from cooling towers, boilers, and steam generators;
- Dilution steam blowdown wastewater from quenching and compressing cracked gases;
- Flushing of tank bottoms used for raw material storage;
- Once-through cooling tower water;
- Polymerization wastewater that includes caustic wash and sour water containing amines and mercaptans;
- Sour water from distillation processes;
- Sour water resulting from water being in direct contact with hydrocarbon streams containing sulfides, ammonia, phenols, and other organic chemicals in crude oil;
- Source water treatment systems (e.g. Reverse osmosis wastewater);
- Spent caustic waste used to remove acid gases;
- Sulfur compounds from ethylene processing;
- Wastewater from catalyst regeneration containing metals;
- Wastewater from dehydrogenation reactions; and
- Wastewater from product washing.

(EPA 2004; EPA MACT 2006; EPA Website; U.S. DOL Butadiene; U.S. DOL Benzene).

In 2016, EPA identified, ranked, and prioritized industrial categories with discharges that pose a substantial hazard to human health and the environment. The Petroleum Refining industrial category (which includes fracked gas crackers and petrochemical facilities) ranked 4th and the Plastics industrial category (which includes facilities producing plastic polymers) ranked 5th on its list of the most harmful point source categories of water pollution (EPA 2016). Among EPA's long list of pollutants of concern from these facilities are acrylonitrile, dioxin, polycyclic aromatic hydrocarbons (PAHs), total residual chlorine, hexachlorobenzene, and nitrate compounds. These pollutants are known to harm human health and the environment.

a. Wastewater Characteristics - Petroleum Refining Point Source Category

Wastewater from the Petroleum Refining category (including the Cracking and Petrochemical subcategories) contains many pollutants of concern, several of which have no Effluent Limitations Guidelines or Standards.[9] The makeup of this wastewater is changing with the changing nature of fuel feedstocks. Unconventional oil sources, including "light tight oil," now account for approximately 50 percent of total crude oil production (Kapustin 2018; U.S. EIA FAQ 2018). Though similar to conventional crude oil in hydrocarbon composition, the

[9] 40 C.F.R. Part 419. The cracking subcategory does not apply if a subsequent subpart applies. The petrochemical subcategory includes facilities that produce products from topping, cracking, and petrochemical operations, including olefins (which encompass ethylene and propylene).

impurities in light tight oil differ and can ultimately impact the chemical contaminants found in treated wastewater discharges from Petroleum Refining Facilities. For example, light tight oil and the waste streams associated with its processing contain higher concentrations of inorganic dissolved solids than conventional crude (Olsen 2015; McDaniels et al. 2016; EPA 2017 Study; EPA 2004). This can adversely impact surface water quality in ways EPA has not adequately assessed (McDaniels et al. 2016).

Cracking processes and associated distillation require large volumes of water, resulting in high rates of wastewater production: approximately 41 gallons of sour water per barrel of crude oil processed (EPA 2004). This sour water typically contains hydrogen sulfide, ammonia, suspended solids, chlorides, mercaptans, oil, phenols, cyanides and other pollutants.

EPA's review of the Petroleum Refining Category in its 2004 Effluent Guidelines Program Plan also revealed that several toxic chemicals are discharged from Petroleum Refining facilities. EPA's screening level analysis that found dioxin, polycyclic aromatic compounds (PACs), and metals (specifically selenium, mercury, and vanadium) were the toxic and nonconventional pollutants of greatest concern in discharges from Petroleum Refining facilities (EPA 2004). Dioxin is produced at Petroleum Refining facilities as a byproduct of catalyst regeneration operations used for fluid catalytic cracking and propane dehydrogenation. Dioxin is hydrophobic and readily attaches to solid particles in wastewater streams, including oils. Polycyclic aromatic compounds are present naturally in crude oil and can form during the overall refining process due to incomplete combustion of organic compounds (*Id.*). Crude oil is also the primary source of metals in Petroleum Refining facility wastewater (*Id.*).

Table 2. Petroleum Refining Category Select Wastewater Pollutants of Concern. (40 C.F.R. Part 419)

<table>
<tr><th>Pollutants With Petroleum Refining Effluent Limitation Guidelines and Standards</th><th>Other Pollutants of Concern Without Petroleum Refining Effluent Limitation Guidelines and Standards</th></tr>
<tr><td>Phenolic compounds</td><td>Total dissolved solids (i.e. Chlorides)</td></tr>
<tr><td>Total suspended solids</td><td>Cyanides</td></tr>
<tr><td>Hydrogen sulfide</td><td>Dioxin</td></tr>
<tr><td>Oil</td><td>Fluorides</td></tr>
<tr><td>Metals - Chromium</td><td>Mercaptans</td></tr>
<tr><td rowspan="2">Ammonia</td><td>Metals:
Aluminum
Arsenic
Lead
Mercury
Selenium
Vanadium</td></tr>
<tr><td>Polycyclic aromatic compounds
(including polycyclic aromatic hydrocarbons)</td></tr>
</table>

b. Wastewater and Stormwater Characteristics - Plastics Point Source Category

Stormwater. In addition to wastewater discharges of pollutants, Plastics facilities discharge plastic pellets, powders, granules, and flakes into surface waters during the process of transferring plastic pellets internally and while packaging and preparing plastic pellets for transport to outside facilities (EPA 1993; CalEPA 2014).

As discussed in greater detail below, these plastic pellets can adversely impact the aquatic environment in numerous ways, including from:

- Ingestion by marine animals, including fish, sea turtles, birds, and marine mammals;
- Becoming embedded in sediments and plant matter;
- Introducing toxic plastic additives to the environment, such as bisphenol a and nonylphenol; and,
- Accumulating other toxic chemicals on pellet surfaces, such as PCBs and dioxin, which end up in the aquatic food chain when ingested

  (CalEPA 2014).

The discharge of plastic pellets is the subject of many enforcement efforts, including those that San Antonio Bay Estuarine Waterkeeper and former shrimp boat captain Diane Wilson brought against Formosa Plastics Corporation for illegal stormwater and wastewater discharges of plastics pellets; polypropylene and polyethylene powders; and other floating powders into Cox Creek and Lavaca Bay at Formosa's Point Comfort, Texas plant.

Formosa's Point Comfort facility has 16 production units that produce plastic products, including small pellets. Formosa manufactures caustic soda; ethylene dichloride (EDC); vinyl chloride monomer (VCM); polyvinyl chloride (PVC) suspension resins; specialty polyvinyl chloride (SPVC) dispersion, blending, and copolymer resins; ethylene; ethylene glycol; high density polyethylene (HDPE); liner low density polyethylene (LLDPE); and polypropylene (PP).

Plastic powder in Cox Creek near outfall 6 of Formosa Plastics' Point Comfort, Texas facility (2019). Photo credit: Ronnie Hamrick, Dianne Wilson.

Formosa has had persistent, systemic, and documented problems with containing plastic pellets and floating plastic powders at its Point Comfort facility, which is the subject of ongoing litigation. These discharges violate Formosa's permit, which includes the effluent limitation that "[t]here shall be no discharge of floating solids or visible foam in other than trace amounts and no discharge of visible oil." (TCEQ 2016). Formosa has argued that this non-numeric permit term ("trace amounts") is not specific enough and thus unenforceable.

Plastic pellets from Point Comfort, Texas facility (2019). Photo credit: Steve Jones

Wastewater. The Plastics point source category is large and complex; relies on a variety of feedstock and chemical processes; and produces a wide range of final products and associated pollutants of concern. This petition is focused on those facilities involved with plastic production. Based on Toxic Release Inventory and Permit Compliance System data, wastewater pollutants associated with commonly produced plastics include those listed in Table 3 below.

Table 3. **Common Plastics and Some of Their Associated Pollutants.** *Sources:* EPA 2004; The Essential Chemical Industry 2014; EPA MACT 2006; EPA 1987; EPA 2012.

Common Plastic Type	Wastewater Pollutants
Ethylene, polyethylene and HDPE resin	Polycyclic aromatic compounds (PACs), butadiene, volatile organic compounds (VOCs)
Polyester	Phenols and PACs
Polypropylene	PACs, benzene, VOCs
Styrene	PACs, butadiene, VOCs
Vinyl Chloride	Chlorinated hydrocarbons, chloromethane, dioxin, polychlorinated biphenyls (PCBs), VOCs, semi-volatile organic compounds (SVOCs)
Synthetic organic fiber (e.g. polyester, nylon)	Cadmium, copper, cyanide, iron, manganese, vanadium related compounds, ammonia, nitrates

New Shell ethane cracker and polyethylene plant under construction on the Ohio River in Beaver County, Pennsylvania, with plans to be online in 2021. Photo credit: Ted Auch. 2019. Provided by FracTracker Alliance, fractracker.org. Aerial assistance provided by LightHawk, lighthawk.org.

A December 2018 permit for a proposed petrochemical complex in Belmont County, Ohio, illustrates the pollutants typically present in a Plastics facility's discharge permit. PTT Global Chemical America plans to use the proposed facility to convert fracked natural gas liquids from shale formations in the Appalachian Basin into feedstocks for plastics. The proposed facility includes six ethane cracking furnaces, three natural-gas-fired steam boilers, an ethylene production unit, an HDPE production unit, and an LLDPE/HDPE production unit. It is designed to produce 1,500 kilotons per year (KT/year) of ethylene, 700 KT/year of high-density polyethylene ("HDPE"), and 900 KT/year of linear low-density polyethylene/HDPE ("LLDPE/HDPE"), and will include rail and truck loading facilities, supporting utilities, and other sizeable infrastructure onsite.

Along with conventional pollutants, the facility's discharge permit covers mercury, cadmium, zinc, copper, acenaphthylene, pyrene, acenaphthene, acrylonitrile, anthracene, 3,4-benzofluoranthene, benzo(k)fluoranthene, benzo-a-pyrene, chloroform, carbon tetrachloride, toluene, benzene, chloroethane, chrysene, diethyl phthalate, dimethyl phthalate, ethylbenzene, fluoranthene, fluorene, hexachloroethane, methyl chloride, methylene chloride, nitrobenzene, phenanthrene, tetrachloroethylene, 1,1-dichloroethane, 1,1-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, benzo(a)anthracene, 1,2-dichloroethane, 1,2-dichlorobenzene, 1,2-dichloropropane, 1,2-trans-dichloroethylene, 1,2,4-trichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 2-chlorophenol, 2-nitrophenol, 2,4-dichlorophenol, 2,4-dimethylphenol, 2,4-dinitrotoluene, 2,4-dinitrophenol, 2,6-dinitrotoluene, 4-nitrophenol, 4,6-dinitro-o-cresol, phenol, naphthalene, bis(2-ethylhexyl) phthalate, di-n-butylphthalate, vinyl chloride, trichloroethylene, hexachlorobenzene, hexachlorobutadiene, chlorobenzene, and 1,3-dichloropropylene (Ohio EPA 2019).

B. Plastic Production Endangers Public Health and the Environment

As with other forms of petroleum refining, producing plastic from ethane crackers, dehydrogenation plants, and polymerization plants discharges pollutants that are detrimental to water quality, air quality, and public health.

1. Stormwater and User Plastic Pollution

Plastic production results in the loss of millions of plastic pellets to the environment. These plastic pellets are often spilled in outdoor areas, picked up in stormwater runoff, and discharged to surface waters. Once in the environment, plastic pellets are persistent and can be transported long distances from their source in flowing surface waters such as streams, rivers, and oceans. Similarly, user plastic accumulating on shorelines and in the oceans has become a staggering pollution problem.

Trillions of pieces of plastic float in the world's oceans (Eriksen et al. 2014; van Sebille et al. 2015; Derraik et al. 2002; Barnes et al. 2009; Rodrigues et al. 2019). The vast majority of marine debris—including plastic—originates from land-based sources like urban runoff; inadequate waste disposal and management; and industrial activity (Gordon 2006).

Unfortunately, the plastic pollution problem continues to grow. Global trends reveal increasing plastic accumulations in aquatic habitats, consistent with the increasing trend in plastic production: a 560-fold increase in just over 60 years (Thompson et al. 2004; Goldstein et al. 2013). Tragically, under a business-as-usual scenario, the ocean is expected to contain one ton of plastic for every three tons of fish by 2025, and more plastics than fish (by weight) by 2050 (World Economic Forum 2016). We must find ways to stem the tide of plastic pollution, including pollution with the microplastic pellets that petro-plastics facilities produce.

<u>Microplastic Impacts - Local</u>

Of the 51 trillion plastic particles currently floating in the world's oceans (van Sebille et al. 2015), 92 percent are microplastics (Eriksen et al. 2014). Microplastics, generally defined as plastic particles less than five millimeters in length or diameter, constitute a major threat to marine wildlife and water quality. While some microplastics are the result of larger pieces breaking down, up to 30 percent of the ocean's microplastics originate as plastic pellets, or nurdles, that are used as a raw material to make plastic products (Boucher & Friot 2017; Karkarnorachaki et al. 2018). Microplastics are ubiquitous to coastal and marine environments, found at sites worldwide from the poles to the equator and from the ocean

Microplastic Pollution, Source: NOAA Office of Response and Restoration surface to the sea floor (Barnes et al. 2009; Bergmann et al. 2015; Browne et al. 2011; Ferreira et al. 2019; Ivar do Sul & Costa 2014; Obbard et al. 2014; O'Donovan et al. 2018; Woodall et al. 2014). One California survey reported 118,705,732 plastic pellets on the state's beaches, and in the Los Angeles area alone, 20 tons of microplastics are carried into the Pacific Ocean every day (Moore et al. 2011).

Plastic pellets—also known as primary microplastics—have caused documented damage to freshwater, coastal, and marine ecosystems. They also represent one of the most common types of plastic pollution in these environments (Moore et al. 2011; Anbumani & Kakkar 2018; Karkarnorachaki et al. 2018; O'Donovan et al. 2018; Rodrigues et al. 2019). Pellets frequently spill during handling at plastic factories as well as during loading and transportation both on land and at sea (Ashton et al. 2010). Road runoff and wind transfer also lead to pellet pollution (Rodrigues et al. 2019).

Extant protective measures, including U.S. federal regulations, appear insufficient to curb the flow of pellet pollution. Formosa Plastic's Point Comfort, Texas, plastics manufacturing facility continues to release plastic pollution in violation of its discharge permit (Sneath 2016). The company explained that plastic can escape in loading areas, which "unavoidably happens when billions of tiny polyethylene pellets are produced and are transferred from one materials handling unit to another." (Sneath 2016). In a recent federal court decision holding Formosa liable for its plastic pollution discharges, the court noted that the company and the Texas Commission on Environmental Quality had repeatedly failed to prevent discharges of plastics. Absent updated and more stringent regulations monitoring that reflect best available technology, plastic pollution from these facilities will continue.

Microplastic Impacts - Global

a. The scale and expanse of microplastic pollution

A rapidly growing body of research suggests there is not one square mile of ocean surface anywhere on earth not polluted with microplastics (Eriksen et al. 2013). Microplastics comprise the majority of plastic pollution in the global ocean.[10] (Boucher & Friot 2017). Ocean currents rapidly disperse microplastic particles, and scientists have found microplastics accumulating in remote locations far from population centers, including Arctic and Antarctic waters (Isobe et al. 2016; Cózar et al. 2017; O'Donovan et al. 2018; Chen et al. 2019). Given the alarming amount of plastic polluting coastal and marine ecosystems worldwide, we must seek ways to reduce the flow of primary microplastics into our oceans. Existing regulatory schemes have proven insufficient to prevent this pollution, and continuing to permit new petro-plastics facilities under these schemes will only exacerbate the ongoing plastic pollution catastrophe.

[10] To illustrate, a recent study on plastic particles flowing from two rivers into coastal areas in southern California found that microplastic particles were 16 times more abundant and had a cumulative weight three times greater than larger particles (Moore et al. 2011).

b. Microplastic impacts on aquatic wildlife

1. In General

Plastics harm fish and wildlife both through physical effects of ingestion (e.g. intestinal blockage) and by acting as a transfer agent for toxic chemicals (Hammer et al. 2012; CIEL 2019b). Many plastics—including pellets—adsorb persistent environmental chemicals,[11] such as polychlorinated biphenyls (PCBs), pesticides like dichlorodiphenyltrichloroethane (DDT), polycyclic aromatic hydrocarbons ("PAHs"), heavy metals, and dioxins (Teuten et al. 2009; Hammer et al. 2012; Van et al. 2012; Rochman et al. 2013; Wright et al. 2013; O'Donovan et al. 2018; Chen et al. 2019). Scientists began acknowledging plastic's role as a toxin vector as early as 1973 (CIEL 2019b). Because of their large surface-area-to-volume ratio and their tendency to attract contaminants more readily than natural sediments, plastic fragments concentrate organic pollutants; these concentrations can be up to 1,000,000 times higher than that of the surrounding seawater (Rios et al. 2007; Bakir et al. 2014; Anbumani & Kakkar 2018; Guzzetti et al. 2018; Karkarnorachaki et al. 2018). The two types of plastic that the petro-plastics facilities discussed in this petition will primarily produce—polyethylene and polypropylene—show a particularly strong adsorption capacity for harmful chemicals, including PAHs and DDT (O'Donovan et al. 2018).

Aquatic species may ingest these pollutant-laden plastic particles, resulting in lethal and sublethal harms. The absorbed toxins—as well as plastic additives such as bisphenol A ("BPA"), phthalate plasticizers, and flame retardants—can leach from ingested plastics into animal tissues,[12] inducing adverse effects such as endocrine disruption (that is, the disruption of hormone systems), neurotoxicity, and carcinogenesis (Teuten at al. 2009; Hammer et al. 2012; Rochman et al. 2013; Anbumani & Kakkar 2018; O'Donovan et al. 2018).

Scientists have documented over 2200 species impacted by ocean plastic pollution and at least 690 that have ingested microplastics (Gall & Thompson 2015; CIEL 2019b; Litterbase 2019).[13] Because of their small size and environmental persistence, microplastics remain readily available to ingestion by a wide variety of marine organisms for an extended period of time (Nelms et al. 2019). Plankton, invertebrates, fish, sea birds, sea turtles, and marine mammals all are known to adsorb, ingest, or otherwise uptake microplastics (Anbumani & Kakkar 2018; Gall & Thompson 2015; Guzzetti et al. 2018; O'Donovan et al. 2018; Duncan et al. 2019; Herrera et al. 2019). Trophic transfer of microplastics (*i.e.*, transfer up the food chain) also occurs, with the potential transfer of microplastics to humans when they eat shrimp, bivalves, fish, or other marine organisms containing these pollutants (O'Donovan et al. 2018; CIEL 2019b; Donohue et al. 2019; Ferreira et al. 2019; Herrera et al. 2019).

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[11] Adsorbed toxins are toxins that are "stuck" to plastic particles. Interestingly, toxin adsorption to plastic surfaces may reduce contaminant biodegradation—meaning the contaminants do not break down and persist for an even longer time in the environment than they would were they not adsorbed to plastic (Hammer et al. 2012).

[12] These contaminants can be released into animal digestive tracts up to 30 times faster than to seawater (CIEL 2019b).

[13] *See also* Table 2, "Observed Ecotoxicity of Microplastics in Different Model Systems," *in* Anbumani & Kakkar 2018.

Smaller and larger microplastic particles harm wildlife in different ways. Larger particles may have longer residence time in the digestive tract, in turn leading to increased toxicant release (O'Donovan et al. 2018). Smaller micro- and nanoplastics may move into an organism's cells, causing a variety of harms discussed in more detail below (O'Donovan et al. 2018). Smaller particles may also carry more of a toxicant load, as their increased surface area to volume ratio allows them to adsorb more contaminants (Anbumani & Kakkar 2018; O'Donovan et al. 2018). Documented harms from ingestion of microplastics and adsorbed contaminants include but are not limited to decreased feeding and growth; increased stress; behavioral modifications; reproductive harms; immunotoxicity; neurological harms; alteration of gene expression; cancer; and increased mortality (O'Donovan et al. 2018).

2. Plankton

Microplastics inhibit growth of planktonic marine microalgae; they also decrease growth, fertility, and fecundity, and increase mortality of copepods, an important zooplankton species (Anbumani & Kakkar 2018; Guzzetti et al. 2018). Scientists observed a similar reproductive response, as well as reduced feeding, growth, and survival rates, in freshwater *Daphnia* species (Anbumani & Kakkar 2018; Guzzetti et al. 2018). These impacts not only affect the planktonic organisms themselves, but also higher trophic level organisms that rely on plankton as a primary food source (Anbumani & Kakkar 2018; Guzzetti et al. 2018). Finally, impacts to plankton species that uptake CO_2 from the atmosphere may significantly reduce the ocean's ability to absorb and store greenhouse gases, with serious implications for atmospheric warming (CIEL 2019b).

3. Marine Invertebrates

Scientists report microplastic ingestion in a variety of marine invertebrate species, including molluscs, sea worms, and crabs (Graham & Thompson 2009; Gall & Thompson 2015; Guzzetti et al. 2018; CIEL 2019b; Duncan et al. 2019). Effects include inflammation; reduced feeding activity; suppressed immune system function; reproductive harms; damage to gills and digestive tract; increased mortality; and possible DNA damage (Browne et al. 2008; Mearns et al. 2013; Anbumani & Kakkar 2018; Duncan et al. 2019; Guzzetti et al. 2018; Herrera et al. 2019; O'Donovan et al. 2018; Wright et al. 2013). Microplastics also harm corals by reducing calcification and inducing bleaching and tissue death (Gall & Thompson 2015; Chapron et al. 2018; Reichert et al. 2018; Donohue et al. 2019).

4. Fish

Freshwater, estuarine, and marine fish ingest microplastics and their adsorbed pollutants either directly or through contaminated prey (Anbumani & Kakkar 2018; Duncan et al. 2019; Herrera et al. 2019). Such ingestion induces physiological effects and harm, including liver toxicity, endocrine disruption, behavioral changes, and intestinal effects (Anbumani & Kakkar 2018; CIEL 2019b; Guzzetti et al. 2018).

5. Seabirds

Seabirds are among the most sensitive wildlife species to microplastics pollution due to high frequency of ingestion, impacts on body condition, and transmission of toxic chemicals

(Wilcox et al. 2015; CIEL 2019b). Ingested plastic may stay in seabirds' stomachs for months, potentially interfering with feeding behavior and increasing leached contaminant loads (Gall & Thompson 2015). Laboratory studies show that contaminants (including PCBs and DDT) from microplastics ingested by shearwater chicks are released once inside the bird's body (Ryan et al. 1988; Teuten et al. 2009; Hammer et al. 2012; Gall & Thompson 2015; O'Donovan et al. 2018). Plastic contaminants like endocrine-disrupting phthalates affect seabirds across the globe, even in remote environments like the Arctic (Sample 2019). Scientists estimate that by 2050, the percentage of seabird species ingesting plastic will reach 99.8 percent, resulting in increased mortality and decreased reproduction (Wilcox et al. 2015).

6. Sea Turtles

Plastic pollution also poses a serious risk to sea turtles (*See* CIEL 2019b). Scientists have documented ingestion of microplastic particles in all seven species of sea turtles (Guzzetti et al. 2018; Duncan et al. 2019; Garrison et al. 2019). This microplastic consumption exposes sea turtles to dangerous toxins and pathogens that affect reproduction and survival (Schuyler et al. 2012; Duncan et al. 2019; Garrison et al. 2019; Guzzetti et al. 2018).

7. Marine Mammals

Marine mammals, including whales and seals, likewise ingest and may be harmed by microplastics and adsorbed contaminants. Such ingestion occurs directly as a consequence of feeding activity or through predation on contaminated prey (Zhu et al. 2019). There also exists the possibility that whales inhale microplastics when they surface to breathe (Nelms et al. 2019). In addition to leaching contaminants, microplastics can clog baleen, which impedes feeding behavior, reduces body condition, and suppresses immune response (Guzzetti et al. 2018). Nelms et al. (2019) found evidence of a possible relationship between a cetacean's body burden of microplastics and cause of death—specifically that animals dying from infectious disease contained a higher number of plastic particles than those dying from other causes. *See also* Donohue et al. 2019; Gall & Thompson 2015) (discussing microplastics' effects on seals and sea lions).

c. Human health risks associated with marine microplastic pollution

Marine species from plankton to invertebrates to large pelagic fishes have been shown to ingest microplastics (or prey that contain them) (Romeo et al. 2015). Thus, people who ingest aquatic plants or seafood may be exposed to dangerous levels of contaminants (U.S. EPA 2006). Scientists have yet to fully investigate the human health implications of microplastic ingestion from fishes and other seafood, but it stands to be serious, especially given the prevalence of microplastics in fish caught and sold for human consumption both nationally and internationally (*See*, e.g., Van Cauwenberghe & Janssen 2014; Bergmann et al. 2015; Rochman et al. 2015; Herrera et al. 2019).

Robust medical evidence links various persistent organic pollutants commonly found on microplastics with a host of human illnesses, including cancers (e.g., breast cancer, pancreatic cancer, non-Hodgkin's lymphoma, adult-onset leukemia, and soft tissue sarcomas), neurological disorders (e.g., attention deficit disorder, impaired memory, learning disabilities, and behavioral problems), and reproductive disorders (e.g., menstrual disorders, abnormal sperm, miscarriages, pre-term delivery, low birth weight, altered sex ratios, and shortened lactation periods) (CIEL 2019a). Many of these persistent organic pollutants bioaccumulate and biomagnify up the food chain, posing a risk of harm for higher trophic-level organisms, including humans (Wasserman et al. 1979; Gobas et al. 1995; Rochman et al. 2013).

An additional human health concern from microplastic pollution relates to plastics' ability to harbor infectious agents (Wright et al. 2013; Donohue et al. 2019; Mearns et al. 2013; CIEL 2019a; Rodrigues et al. 2019). Both viruses and bacteria, including *Escherichia coli* and *Vibrio* (which cause gastrointestinal illness in humans), find refuge on pellets. The potential for microbial contamination-related impacts grows as coastal regions warm from climate change; such warming increases both the range of pathogenic microbes and the likelihood that storm surges and other events bring contaminated pellets into contact with humans (Rodrigues et al. 2019).

Another concerning development is the discovery that microplastic is contaminating drinking water supplies. Scientists have only recently studied plastic pollution in freshwater, but it is now documented in groundwater (Panno et al. 2019), and it is at least as ubiquitous in rivers and streams as it is in marine environments (Koelmans et al. 2019; McCormick et al. 2016). For example, a scientist recently swam the length of the Tennessee River—the drinking water source for 4.7 million people—and found one of the highest concentrations of microplastics in the world (Tennessee Aquarium 2018). Samples showed 18,000 particles per cubic meter of water, which is 8,000 percent higher than measurements in the Rhine and 80 percent higher than measurements in the Yangtze River—the source of 55 percent of all river-born microplastic entering the ocean (*Id*.).

Recent studies have also found microplastics at the outflows of drinking water treatment facilities, and in tap water, bottled water, and even domestic beer (Eerkes-Medrano et al. 2019; Koelmans et al. 2019; Kosuth et al. 2018; Pivokonsky et al. 2018; Novotna et al. 2019). The first study that looked at microplastics in bottled water found concentrations as high as 10,000 plastic pieces per litre of water, with only 17 of 259 bottles testing free of microplastics (Kosuth et al. 2018).

d. Ecological impacts from microplastics

In addition to the wildlife and human health impacts just described, microplastic pollution impacts ecosystem structure and function (Guzzetti et al. 2018; CIEL 2019b). For example, microplastics affect seafloor and open ocean habitats by altering biogeochemical cycles, including carbon storage (with implications for climate change) (Guzzetti et al. 2018; CIEL 2019b).

Microplastics affect nearshore and inshore environments—such as sandy beaches—through sediment contamination (Rios et al. 2007; Oehlmann et al. 2009; Gall & Thompson 2015). The presence of microplastics also alters physical properties of beaches, including heat transfer and water movement (Carson et al. 2011; Gall & Thompson 2015). These changes may have broad ecological implications for a wide variety of beach dwelling organisms and their eggs—including crustaceans, molluscs, fish, and sea turtles—and climate change may exacerbate these impacts (Carson et al. 2011; Valenzuela et al. 2019). These concerns are not merely theoretical: researchers recently found anthropogenic marine debris, including plastics, at 10 loggerhead sea turtle nesting beaches—including protected areas (Garrison et al. 2019).

In addition, because plastics do not readily degrade, they become vehicles for invasive species dispersal—effectively serving as a raft for exotic species transport and as a colonizing surface in areas otherwise lacking one (Barnes et al. 2009; Gregory 2009; Hammer et al. 2012; Mearns et al. 2013; Wright et al. 2013; Gall & Thompson 2015; Guzzetti et al. 2018). These invasive organisms can prove devastating when they move into a new area, wiping out native species, and also harming human health and local economies (*see* discussion on viruses and bacteria, *supra*) (Barnes et al. 2009).

Environmental plastic pollution also directly contributes to climate change (CIEL 2019b). When plastic particles are exposed to the elements, they slowly break down. *Id.* Photodegradation (*i.e.*, degradation caused by exposure to sunlight) of plastic triggers the production of greenhouse gases; this off-gassing increases as the plastic particles become smaller. *Id.* The breakdown of low-density polyethylene, in particular, releases methane, ethylene (C_2H_4), ethane, and propylene at a high rate. *Id.* As more plastic accumulates in the environment, so too will greenhouse gas emissions from this source increase. *Id.*

Finally, plastic pollution litters our beaches, harming the aesthetic, recreational, tourism, and economic values of our waterways and seashores.

2. Wastewater Pollution

Along with creating the global plastics pollution problem, petro-plastics facilities pollute the water; harm sensitive aquatic environments and wildlife; and jeopardize human health in the areas where they are sited. The processes that turn fossil fuels into plastic produce numerous chemical byproducts, many of which are toxic to humans and wildlife, and some of which cause cancer (Siemens 2007; Environmental Law Institute 2018). A number of these chemicals are so hazardous that they never should be released into the environment. Yet the permits issued to petro-plastics operations allow just that—the discharge of liquid waste streams laden with myriad hazardous chemical compounds into our rivers, streams, and oceans.

In humans, these compounds are known to cause various cancers; damage DNA; increase inflammation; induce reproductive harms, including fatal embryonic malformations; disrupt hormone systems; and/or damage key organs, including the brain, liver, and kidneys. In non-human animals—including invertebrates, fish, amphibians, reptiles, birds, and mammals—chemical exposure leads to many of the same problems: impaired reproduction, DNA damage, liver disorders, altered blood chemistry, immune deficiency, cancers, and death.

The discussion that follows highlights some of the extremely toxic chemicals that petro-plastics facilities are permitted to discharge into the environment. However, these are only a handful of more than 150 compounds listed across a representative sample of NDPES permits for petro-plastics plants. The permitted discharges include substances ranging from oil and grease to potent carcinogens. Here, we review a small subset of these contaminants and their known or suspected effects on living organisms—*polycyclic aromatic hydrocarbons (PAHs); benzene;*

phthalates; acrylonitrile; trichloroethylene; hexachlorobenzene; carbon tetrachloride; methyl chloride; 1,2,4-trichlorobenzene; 1,3-butadiene; lead; and dioxin—most of which EPA already considers Priority Pollutants (a subset of known toxic pollutants for which EPA has published analytical test methods).

a. Polycyclic Aromatic Hydrocarbons (PAHs)

Many polycyclic aromatic hydrocarbons (PAHs)[14] are carcinogenic, cause organ damage, and/or suppress the immune system. They also comprise one of the most ubiquitous classes of compounds that industrial facilities discharge into the air[15] and water (CWQG PAHs 1999). EPA lists 17 PAHs as Priority Pollutants, including a number of chemicals commonly found in NPDES permits associated with petro-plastics facilities: acenaphthene, anthracene, benz(*a*)anthracene, benzo(*k*)fluoranthene, chrysene, fluoranthene, fluorene, naphthalene,[16] phenanthrene, and pyrene (EPA 2014; Collier et al. 2014; Eisler 1987; Kannan & Perrotta 2008).

The toxicity of PAHs has long been known. The scientific community first identified the carcinogenic nature of benzo(*a*)pyrene in 1918. Albers 2003 and a 1987 U.S. Fish and Wildlife Service Biological Report called PAHs "among the most potent carcinogens known to exist, producing tumors in some organisms through single exposures to microgram quantities." (Eisler 1987, at 4). When metabolized, PAHs byproducts can cause a host of problems in humans and animals, including inflammation, suppressed immune system function, endocrine (hormone) system disruption, genotoxicity, embryotoxicity, mutation, developmental malformations, tumors, and cancer (specifically, lung, skin, gastrointestinal, and bladder cancers) (Abdel-Shafy et al. 2016; Albers 2003; Albers & Loughlin 2003; Collier et al. 2014; Kabir et al. 2015; Kannan & Perrotta 2008; Rengarajan et al. 2015; Troisi et al. 2016).

As in humans, PAHs induce a wide variety of detrimental effects in aquatic organisms, including reproductive harm, compromised immune system function, cancer, and death (Eisler 1987; Albers 2003). These harms impact species across taxa, from bacteria to invertebrates, fish to reptiles, birds to mammals. Aquatic organisms exposed to PAHs may exhibit reduced growth; deformities; endocrine disruption; inhibited reproduction and reduced survival of young; toxicity to embryos; suppressed immune systems; liver and kidney toxicity; cancers; and mortality (Albers 2003; Albers & Loughlin 2003; Bell et al. 2006, at 463-64; Eisler 1987; Collier et al. 2014; Cousin & Cachot 2014; CWQG PAHs 1999; Goodale 2013; Malcolm & Shore 2003; Meador et al. 1995; Payne et al. 2003; Reynolds & Wetzel; Troisi et al. 2016; Zychowski et al. 2017). The most striking evidence for the effect of PAHs on marine mammals comes from an eight-year study on St. Lawrence Estuary beluga whales (*Delphinapterus leucas*). A quarter of

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[14] PAHs "are aromatic hydrocarbons with two or more fused carbon rings that have hydrogen or an alkyl . . . group attached to each carbon." Albers 2002, at 343.

[15] Even PAHs discharged into the air may ultimately contaminate water via deposition. "Polycyclic aromatic hydrocarbons released into the atmosphere have a strong affinity for airborne organic particles and can be moved great distances by air currents. The molecules are eventually transported to earth as wet or dry particulate deposition." Albers 2002, at 347.

[16] Naphthalene contains two coplanar six-member rings that share an edge. Technically, it is a "bicyclic aromatic hydrocarbon" (Abdel-Shafy et al. 2016; Rengarajan et al. 2015), but it is often analyzed as a PAH. (Collier et al. 2014).

adult St. Lawrence Estuary belugas—which are exposed to PAHs through the ingestion of contaminated worms—die from cancer. (Albers & Loughlin 2003; Martineau 2012).

b. Benzene

Benzene (C6H6) is a monocyclic aromatic compound that is a known—and notorious—carcinogen for all routes of exposure (CSQG Benzene 2004; PHS Benzene; NIH Benzene). Nonetheless, EPA and state agencies often permit petro-plastics facilities to discharge benzene pursuant to their NPDES permits.

Benzene exposure from petro-plastics pollution can cause cancer (including lymphoma) and other harmful effects in humans, fish, and wildlife. Effects of short-term exposure to benzene through inhalation are dose-dependent—ranging from drowsiness, dizziness, rapid heart rate, headaches, tremors, and confusion to unconsciousness and death (PHS Benzene; NIH Benzene). Longer term exposure can lead to hematologic neoplasm; blood disorders, including cytopenia, preleukemia, aplastic anemia, myelodysplastic syndrome, and excessive bleeding; as well as cancer (specifically, Hodgkin's lymphoma and other types of lymphatic and hematopoietic cancers; acute myelogenous leukemia; and chronic lymphocytic leukemia) (CSQG Benzene 2004; PHS Benzene; NIH Benzene).

Animal studies suggest that benzene also increases the risks for other forms of cancers, including oral and nasal, forestomach, liver, preputial gland, ovary, lung, and mammary gland (NIH Benzene). Reproductive organ harm may also occur with prolonged exposure, and laboratory studies on animals show benzene exposure can cause fetal harm resulting in low birth weight, delayed bone formation, and bone marrow damage (PHS Benzene; NIH Benzene). Both benzene and its metabolites are genotoxic, inducing effects such as chromosomal aberrations in peripheral lymphocytes and bone marrow (PHS Benzene). They also serve as immunosuppressants (*Id.*).

Benzene is toxic to a number of aquatic organisms. For example, benzene has been shown to be toxic to juvenile striped bass (*Morone saxatilis*)—inducing respiratory effects and potentially causing death by narcosis, acute anemia, or ventricular fibrillation (Meyerhoff 1975; Norton et al. 1985). Benzene sensitivity sharply increases during embryonic development in pink salmon and coho salmon (*Oncorhynchus kisutch*), with the egg stage being least sensitive, alevin stage moderately sensitive, and emergent stage most sensitive (Moles 1979). This is attributed to benzene sequestration in and then liberation from the yolk sac as it is absorbed. *Id.* Outmigrants of pink salmon, sockeye salmon (*O. nerka*), and Dolly Varden (*Salvelinus malma*) (i.e., those transitioning to seawater) are twice as sensitive to benzene as those residing in freshwater (Moles 1979).

Struhsaker (1977) found that spawning females are extremely sensitive to low levels of benzene. She also found that benzene, which is highly lipid-soluble, accumulates to high levels in ovarian eggs. This, in turn, leads to reduced fecundity and possible significant long-term population-level effects (Struhsaker 1977). Benzene also leads to behavioral effects in both males and females (*Id.*).

Exposure of herring and anchovy larvae to benzene resulted in delayed egg development and abnormalities in larvae; delayed larvae development; decreased feeding and growth; and increased respiration (NIH Benzene).

Benzene also harms shellfish. For example, blue crab juveniles exposed to sublethal concentrations of benzene needed substantially more time to complete a molt cycle, had a slower rate of growth of regenerating limb buds, and exhibited depressed ATPase activity in mitochondria. Exposure also decreased the crabs' oxygen consumption (NIH Benzene).

c. Phthalates

Petro-plastics plants also commonly discharge phthalates, a term encompassing a wide variety of compounds that are best known as endocrine disruptors (Barse et al. 2007; Kabir et al. 2015). These compounds can cause reproductive and developmental toxicity (NIH DEP).

Di(2-ethylhexyl)phthalate (DEHP) is one of the most commonly employed chemicals used to make plastics more flexible. (ATSDR DEHP; Rowdhwal & Chen 2018). Annual global production of DEHP is approximately 2 million tons. (Rowdhwal & Chen 2018). As a class, phthalates have come under scrutiny for their role as endocrine disruptors. Di(2-ethylhexyl phthalate) is known to disrupt the endocrine system as well as the immune system, and is classified as a probable human carcinogen. (ATSDR DEHP; Rowdhwal & Chen 2018). DEHP has been linked to cardiac irregularities; it also induces brain, kidney, and liver toxicity in rodents. (Rowdhwal & Chen 2018). In aquatic ecosystems, DEHP adsorbs to sediments and may persist in this state or be taken up by aquatic biota. It is "biodegraded very slowly in algae, *Daphnia*, mosquito larvae, snails, and clams" and "rapidly biomagnified by a variety of plants and animals" in lipid tissue (Metcalf et al. 1973). Some researchers have likened its behavior to DDT and cautioned that further study and regulations governing its use are warranted. (*Id.*)

Barse et al (2007) evaluated physiological effects of diethyl phthalate (DEP) on the common carp (*Cyprinus carpio*). The researchers found myriad effects of DEP on carp, including increased liver size, decreased testis size, and increased levels of muscle vitellogenin in males (vitellogenin is normally synthesized in the liver of adult, female egg-laying vertebrates) (Barse et al. 2007). These findings corroborate those of other researchers that DEP imitates estrogen and acts as a potent endocrine disruptor (*Id.*). DEP also acts as an immunosuppressant (*Id.*). Studies in bluegill sunfish (*Lepomis macrochirus*) suggest a high potential for DEP to bioconcentrate in aquatic organisms (NIH DEP).

d. Acrylonitrile

Many petro-plastics facilities discharge acrylonitrile, a highly toxic and carcinogenic compound that has been linked to brain damage in rodents and fish (EPA Acrylonitrile; NIH Acrylonitrile; Lin et al. 2018). Acrylonitrile is a confirmed carcinogen (NIH Acrylonitrile). Human workers exposed to acrylonitrile showed a statistically significant increase in lung and colon cancers (NIH Acrylonitrile; NTP Acrylonitrile). Rats exposed to the compound developed malignant tumors of the brain and spinal cord (EPA Acrylonitrile; NIH Acrylonitrile). Malignant tumors of the stomach, tongue, eye, lung, ear canal, and small intestine also have been observed, as well as the mammary gland and ovary in females, and Zymbal gland and liver in males (EPA Acrylonitrile; NTP Acrylonitrile).

Rats exposed to acrylonitrile by inhalation gave birth to pups with fetal malformations, including missing or incompletely-formed vertebrae, a hole in the belly button through which abdominal organs (e.g., intestines) protrude, short tail, and short trunk (NIH Acrylonitrile). Reproductive harms were observed in mice exposed to acrylonitrile, including degenerative changes in testicular tubules and decreased sperm count (*Id.*).

Acrylonitrile is harmful to aquatic organisms and has a moderate potential for bioaccumulation (NIH Acrylonitrile). In a recent study, Lin et al (2018) observed the effects of acrylonitrile on juvenile flounder (*Paralichthys olivaceus*). Exposure reduced juvenile growth rates and led to tail deformation and, more alarmingly, DNA damage in the brain (Lin et al. 2018). This study highlights the potential of acrylonitrile to cause significant ecotoxicological effects.

e. Trichloroethylene

Trichloroethylene is another toxic and carcinogenic compound that petro-plastics facilities discharge. It is a chlorinated hydrocarbon that contaminates up to a third of U.S. drinking water supplies (NIH Trichloroethylene). Chronic exposure can lead to sleepiness, dizziness, headache, and nausea. Scientists also suspect that trichloroethylene is an immune system toxicant and causes genetic defects (NIH Trichloroethylene; PHS Trichloroethylene). Residential proximity to industrial emissions of chlorinated solvents, including trichloroethylene, may be associated with miscarriage and birth defects, including heart defects, central nervous system defects, and low birth weight (NIH Trichloroethylene).

Human exposure to trichloroethylene is linked to neurological impairment; liver damage and cancer; kidney damage and cancer; cervical cancer; cardiotoxicity; non-Hodgkin lymphoma, and—at very high concentrations—death (EPA Trichloroethylene; NIH Trichloroethylene). Rodents exposed to trichloroethylene show an increased incidence of leukemia and tumors of blood-producing organs, lungs, liver, kidney, mammary glands, testes, and pituitary gland (EPA Trichloroethylene; NIH Trichloroethylene). Long-term exposure in rodents also results in increased liver weight, increased kidney weight, and renal dysfunction (NIH Trichloroethylene).

Trichloroethylene exposure produces long-lasting, harmful effects on aquatic life (NIH Trichloroethylene). Many aquatic species suffer harm upon trichloroethylene exposure. For example, aquatic invertebrates exposed to trichloroethylene experienced genetic effects that impaired metabolism, reproduction, and growth (NIH Trichloroethylene). Goldfish (*Carassius auratus*) exposed to trichloroethylene showed significantly reduced body weight and disease-associated tissue changes, while exposed fathead minnows displayed hemorrhaging and behavioral changes, including lost schooling behavior, swimming in a corkscrew/spiral pattern near the water's surface, and hyperactivity (NIH Trichloroethylene).

f. Hexachlorobenzene

Hexachlorobenzene is a dioxin-like chlorinated hydrocarbon, toxic to humans and aquatic life (NIH Hexachlorobenzene). It is one of the most persistent environmental pollutants both on land and in water due to its stability and resistance to degradation (PHS Hexachlorobenzene). EPA classifies hexachlorobenzene as a probable human carcinogen based on animal testing showing an association between oral exposure and thyroid, liver, and kidney cancers (NIH Hexachlorobenzene). Breast cancer models indicate that hexachlorobenzene exposure leads to metastasis (Chiappini et al. 2019).

Reproductive harms also are associated with exposure, as is liver disease (NIH Hexachlorobenzene). Hexachlorobenzene crosses the placenta and accumulates in fetal tissue, causing harm to developing embryos (including neurological, immune system, and liver damage, as well as physical malformations). It poses a risk to children exposed via breastmilk and to young children exposed via contaminated food (NIH Hexachlorobenzene).

When released into water, hexachlorobenzene adsorbs, or sticks, to suspended sediments and solids, increasing its persistence in the aquatic environment (NIH Hexachlorobenzene). Once in the aquatic environment, hexachlorobenzene readily bioaccumulates (and may also biomagnify) in aquatic organisms, including plants, fish, shellfish, birds, and mammals (PHS Hexachlorobenzene; NIH Hexachlorobenzene). Its bioaccumulative properties made hexachlorobenzene a candidate for monitoring in the U.S. Fish and Wildlife Service's National Pesticide Monitoring Program and in the National Study of Chemical Residues in Fish (PHS Hexachlorobenzene). This study revealed that the highest body burdens of hexachlorobenzene in fish were found near industrial facilities (PHS Hexachlorobenzene).

Bays feeding into the Gulf of Mexico—a region targeted as sites for a number of new and expanded petro-plastics facilities—already harbor concentrations of hexachlorobenzene sufficient to cause bioaccumulation in fish and shellfish. Scientists have measured such contamination in flounder (species unspecified), longnose killifish (*Fundulus similis*), brown shrimp (*Penaeus aztecus*), blue crab (*Callinectes sapidus*), and dwarf squid (*Lollingnucula brevis*) collected near San Luis Pass of Galveston Bay, Texas, and in oysters (*Crassotrea virginica*) collected in the Houston Ship Channel (PHS Hexachlorobenzene).

Across animal species, hexachlorobenzene acts as a reproductive toxicant and endocrine disruptor, affecting the production of steroid and sex hormones, including thyroid hormone, progesterone, testosterone, and estradiol (Chiappini et al. 2019; Sun et al. 2019). Effects of such disruption in laboratory animals (rats and quail) include reduced egg production and endometriosis (Chiappini et al. 2019; Sun et al. 2019).

g. Carbon Tetrachloride

Carbon tetrachloride is a toxic compound that depresses central nervous system activity, causes liver and kidney damage, and is a probable human carcinogen (NIH Carbon Tetrachloride; PHS Carbon Tetrachloride). Studies in laboratory animals show a relationship between carbon tetrachloride exposure and tumors of the liver and adrenal gland; there also exists evidence to suggest a relationship between humans exposed to carbon tetrachloride and liver cancer, lymphosarcoma, lymphatic leukemia, non-Hodgkin's lymphoma, and multiple myeloma (NIH Carbon Tetrachloride; PHS Carbon Tetrachloride). Reproductive harms, including decreased fertility and testes degeneration, also have been observed in animals exposed to carbon tetrachloride, and in-utero exposure through drinking water may lead to low birth weight, cleft palate, and other adverse birth outcomes (NIH Carbon Tetrachloride; PHS Carbon Tetrachloride).

While it tends to evaporate quickly, carbon tetrachloride can be found in surface waters and groundwater, posing a hazard to aquatic life (NIH Carbon Tetrachloride). While bioaccumulation is not common, it is possible where exposure is constant (e.g., near discharge sites) (PHS Carbon Tetrachloride). Carbon tetrachloride appears to be more hazardous to embryo-larval stages of fish and amphibians than to adults; this is of particular concern near areas of industrial discharge (NIH Carbon Tetrachloride). Carbon tetrachloride causes liver damage in fish, including the common carp (*Cyprinus carpio*) and rainbow trout (*Oncorhynchus mykiss*) (Krasnov et al. 2005; Jia et al. 2014).

h. Methyl Chloride

Methyl chloride (chloromethane) produces a wide variety of wildlife and human health harms. High-concentration, acute exposure in humans causes severe neurological effects, as well as effects on heart rate, blood pressure, liver, and kidneys (NIH Methyl Chloride). Chronic exposure in animals induces liver, kidney (including tumors), spleen, and central nervous system effects (NIH Methyl Chloride). Rainbow trout and common carp also develop liver damage after exposure to methyl chloride (Yin et al. 2011; Jia et al. 2012). Studies done on rats reveal reproductive harms, including testicular lesions and decreased sperm production (NIH Methyl Chloride).

A growing body evidence indicates a potential role of methyl chloride as a carcinogen. Exposure preceded development of liver and adrenal tumors and abnormal tissue masses in mice and rats (Yin et al. 2011). One additional study on male mice reported kidney tumors (NIH Methyl Chloride). In vitro studies suggest that atmospheric concentrations of 1 percent methyl chloride induce DNA damage and mutations to human lymphoid cells (NIH Methyl Chloride). An increased occurrence of salivary gland tumors also has been observed in humans after exposure to methyl chloride (NIH Methyl Chloride).

i. 1,2,4-Trichlorobenzene

1,2,4-trichlorobenzene is a colorless, manmade liquid. (NIH 1,2,4-Trichlorobenzene). Acute exposure to 1,2,4-trichlorobenzene results in shortness of breath and lung irritation in animals. (NIH 1,2,4-Trichlorobenzene). Rats subjected to long-term exposure to 1,2,4-trichlorobenzene developed liver problems and enlarged adrenal glands. (NIH 1,2,4-Trichlorobenzene). Mice exposed on their skin developed tumors. (EPA 1,2,4-Trichlorobenzene).

1,2,4-trichlorobenzene has been deemed very toxic to aquatic life. (NIH 1,2,4-Trichlorobenzene). Once released into water, some of the compound will volatilize and some will adsorb to sediments. (NIH 1,2,4-Trichlorobenzene; PHS 1,2,4-Trichlorobenzene). It easily bioaccumulates in fish and other aquatic life, posing a risk to humans that ingest contaminated freshwater or marine organisms. (NIH 1,2,4-Trichlorobenzene; PHS 1,2,4-Trichlorobenzene).

j. 1,3-Butadiene

Ninety-five percent of global butadiene production comes from steam cracking of hydrocarbons to produce ethylene. (IARC 1,3-Butadiene). This substance—the 36th highest volume chemical produced in the U.S.—then can be used to make, *inter alia*, polymers, plastics and resins. (*Id.*; NCI 1,3-Butadiene; NIH 1,3-Butadiene).

Short-term human exposure to 1,3-butadiene causes irritation to the eyes and respiratory tract and, depending on the dose, central nervous system depression. (NIH 1,3-Butadiene). Long-term exposure may damage bone marrow and cause heritable genetic damage to eggs and sperm. (*Id.*). 1,3-butadiene is a known human carcinogen (specifically with respect to leukemias) and causes a host of neoplasms in animals including heart, lung, forestomach, liver, Harderian gland, preputial gland, pancreas, thyroid gland, Zymbal gland, kidney, testis, ovary, uterus, and mammary gland. (*Id.*; IARC 1,3-Butadiene; NCI 1,3-Butadiene).

k. Lead

Lead poses well-known dangers to humans and wildlife. These harms are associated with even low levels of lead exposure. (NIH Lead). Such effects include neurotoxicity; gastrointestinal, kidney and bone marrow toxicity; and neurodevelopmental defects. (NIH Lead). The EPA classifies lead as a probable human carcinogen. (NIH Lead).

Heavy metals including lead are some of the most widespread, toxic, and persistent contaminants in aquatic ecosystems. (Jackson, Baird & Els 2005). Some of the main sources of heavy metal pollution include industrial effluents and industrial sewage. (Jackson, Baird & Els 2005). Once released, these metals do not biodegrade into inert substances; they remain in the aquatic environment and pose an ongoing exposure concern to aquatic biota. (Jackson, Baird & Els 2005). Aquatic flora and fauna (including crustaceans, molluscs, and fish) bioaccumulate lead. (Jackson, Baird & Els 2005; Carocci et al. 2015). Adverse effects occur at concentrations as low as 0.2 mg/l. (Jackson, Baird & Els 2005).

l. Dioxins

EPA has neglected to set effluent limitations for dioxins, a highly toxic group of persistent environmental pollutants. This omission is unconscionable given dioxins' known toxicity to humans and wildlife (WHO Dioxins).

Dioxin is perhaps best known as a contaminant of Agent Orange—an herbicide the United States broadly used during the Vietnam War that caused myriad health impacts on exposed veterans and Vietnamese. "Dioxins are highly toxic and can cause cancer, reproductive and developmental problems, damage to the immune system, and can interfere with hormones." (EPA Dioxin Facts). These compounds break down extremely slowly in the environment, underscoring the importance of preventing additional releases (EPA Dioxin Facts).

According to the National Institutes of Health, "[e]xposure to dioxins has widespread effects in nearly every vertebrate species, at nearly every stage of development, including in the womb." (NIH Dioxins). Short-term human exposure to dioxins may result in skin lesions and liver problems (WHO Dioxins). Long-term exposure impairs immune system function; nervous system development in fetuses and children; the endocrine system; and reproduction (NIH Dioxins; WHO Dioxins). The World Health Organization classifies dioxins as a "known human carcinogen" based on animal studies (WHO Dioxins). Exposure also is linked to other diseases, including type 2 diabetes and ischemic heart disease (NIH Dioxins).

Table 4. Summary of Subset of Plastics Facility Pollutants With Known Toxic Effects

Chemical Name	Known Toxic Effects to Animal and/or Human Life
1,2,4-Trichlorobenzene	Shortness of breath; lung irritation; liver effects and enlargement of adrenal glands; tumors; bioaccumulation in fish and other aquatic life
1,3-Butadiene	Cancer; depression of nervous system activity; reproductive harms
Acrylonitrile	Cancer; brain damage; reproductive harm
Benzene	Human and animal carcinogen; acute toxicity (mortality); blood disorders; reproductive harm; compromised immune system functions
Carbon Tetrachloride	Depression of nervous system activity; liver and kidney damage; tumors; probable human carcinogen; decreased fertility and testes degeneration; birth effects/defects
Di (2-ethylhexyl) phthalate	Endocrine and immune system disruption; brain, kidney, and liver toxicity; probably human carcinogen
Dioxins	Immunotoxicity; thyroid and adrenal gland enlargement; mammary and ovarian disease; reproductive harms; birth defects and malformations; growth inhibition
Hexachlorobenzene	Reproductive harms; endocrine disruption
Lead	Neurotoxicity; gastrointestinal, kidney and bone marrow toxicity; and neurodevelopmental defects
Methyl chloride	Neurological harm; effects on heart rate, blood pressure, liver, spleen, and kidneys; testicular lesions and decreased sperm production; evidence of carcinogenic effects
Polycyclic Aromatic Hydrocarbons (PAHs)	Acute toxicity (mortality); reproductive harm; compromised immune system function; cancer
Trichloroethylene	Altered metabolism, reproduction and growth; genetic effects; reduced body weight; tissue damage; behavioral effects; hemorrhaging

Dioxins bioaccumulate in fatty tissues, and these concentrations biomagnify up the food chain (WHO Dioxins). Human exposure largely occurs through ingestion of contaminated food, including fish and shellfish (WHO Dioxins). Dioxins from chemical factory discharges also contaminate drinking water sources (EPA Dioxin Facts). EPA must act, setting effluent limitations for this highly toxic pollutant to prevent additional discharges into our environment.

While dioxin discharges from each factory ostensibly are capped by the facility's NPDES permit, sampling is infrequent (sometimes only once per year) so it is hard to know whether overall effluent limits are being exceeded. Further, with the significant projected increase in petro-plastics facilities in the United States, the total volume of chemical discharges will increase proportionally. The health and ecological risks of these chemicals outweigh our nation's need for more plastics facilities. And the risks of the plastics facilities do not stop with their production. The plastic pellets themselves present a host of environmental problems.

3. Environmental Justice Concerns

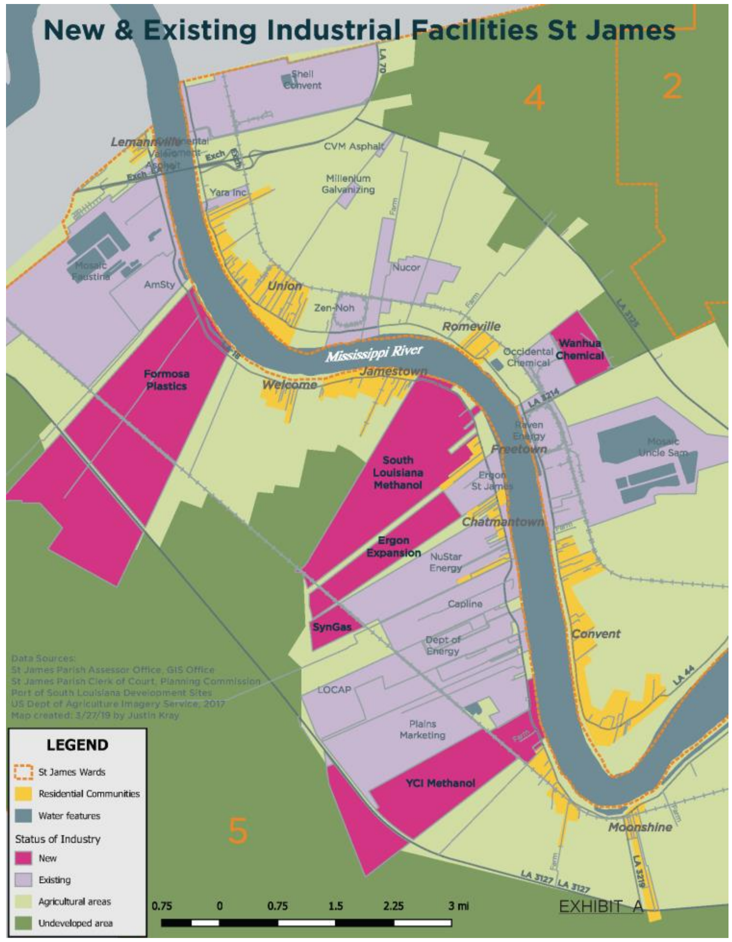
As noted above, many of the new and expanded petro-plastics facilities are being built in minority and low-income communities already suffering from high pollution levels; incidences of cancer, illness, and other health and environmental impacts; depreciating property values; and declining public services due to existing industrial facilities, terminals, and pipelines clustered in the same areas. A recent EPA report concluded that African-Americans and individuals living below the poverty level are more likely than others to live near pollution-emitting facilities, and that the racial correlation was stronger than the poverty-based one (Mikati 2018). One community in Texas illustrates this reality all too well. The historic African-American community of West Port Arthur is surrounded by oil refineries—including the largest one in the country—several petrochemical facilities, and an incinerator complex that handles up to 150,000 tons of hazardous and toxic waste per year. Total and Novealis Holdings Chemicals launched construction of a one million ton/year ethane cracker in Port Arthur in 2018 (Stickney 2018). Saudi Aramco's Motiva is in the planning stages of a multi-billion dollar expansion of its Port Arthur refinery to add a steam cracker to produce ethylene, with construction to begin in 2020 and operations in 2022 (pending regulatory approvals) (Luck 2018).

Port Arthur also happens to be the end-of-the-line for the Keystone XL tar sands pipeline and the target for more industrial development, including a Port Arthur LNG liquification and export terminal and approximately 170 miles of pipeline (FERC 2019). Even with the heavy presence of industry, the community has a high unemployment rate. It also has a depressed economy; higher than average pollution and illness rates; and vulnerability to the impacts of climate change and extreme weather events (Stephenson 2014). For example, recent hurricanes devastated Port Arthur , and one petro-plastics facility run by BASF TOTAL Petrochemicals was responsible for the single biggest post-Harvey wastewater spill, with over 100 million gallons released into neighboring communities and waterways connecting to the Gulf (Stuckey 2017).

St. James Parish, Louisiana, is another community that has seen its surrounding agricultural lands increasingly occupied by petrochemical and other industrial facilities. Among the many new industrial projects targeting this community is the Formosa Plastics project, which is in the permitting stage for its new St. James Parish, Louisiana, location on the banks of the Mississippi River. This new Formosa plant will crack ethane, dehydrogenate propane, and produce the following end products:

- Ethylene
- Propylene
- Ethylene glycol
- Polypropylene
- Various types of polyethylene (e.g., high density polyethylene (HDPE), low density polyethylene (LPDE), and linear low-density polyethylene (LLDPE).

(FG LA LLC 2018).



There are a dozen other significant sources of air and water pollution clustered around the predominately African-American community of St. James' 5th district.[17] The region is so overburdened by industrial pollution that it has been nicknamed "Cancer Alley." As a result of the concentration of petrochemical facilities around their communities, residents—primarily minority and low-income individuals—are more vulnerable to cancer, autoimmune issues, and respiratory illnesses; decreasing property values; and disappearing public services (Rolfes 2018).

EPA estimates that residents within a five-mile radius of the proposed Formosa Plastics facility are in the 99th percentile for the risk of cancer from air pollution when compared to the state, the rest of EPA Region 5, and the country (EJ Screen). EJScreen shows that 442 people live within a mile radius of the Project site and 100 percent of them are black, with an average

[17] Petro-plastics facilities discharge dozens of criteria, hazardous, and toxic air pollutants that are known to cause cancer and a host of other respiratory, neurological, dermatological, reproductive, and developmental illnesses. They also result in the atmospheric deposition of pollutants, exacerbate climate change, and reduce the ability of coastal areas to withstand future floods and severe weather (ATSFR 2018; Belli et al. 2004; Chen et al. 2018; Clean Air Council 2014; de Moraes et al. 2010; U.S. Global Change Research Program 2018; IPCC 2014; Iyer et al. 2009; Jia 2010; Leusch et al. 2010; Liu et al. 2008; Marinaccio et al. 2011; Pasetto et al. 2012; RTI International 2015; Rovira et al. 2014; Salerno et al. 2013; Shrum 2018; Suh 2000; Tsai et al. 2009; White et al. 2009; Wichmann et al. 2009;Yang et al. 2000; Yang et al. 2004; Yu et al. 2006).

per capita income of $20,876. The EJ Indexes for Diesel PM, Air Toxics Cancer Risk, Lead Paint Indicator, and Wastewater Discharge Indicator for the people who live within one mile of the project are all above 90 percent for the state. In other words, 90 percent of Louisiana residents have less exposure to these pollutants than the residents who live near the proposed Formosa facility. If this Formosa Plastics project is approved, low-income and minority populations would again bear the brunt of the air pollution, wastewater pollution, chemical spill risks, traffic, lighting, noise, odor, and aesthetic impacts of another industrial project.

III. EPA's Duty to Regulate Petro-plastics Facilities under the Clean Water Act

The goal of the Clean Water Act is to *eliminate* the discharge of pollutants into waterways and "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters."[18] The Act seeks to guarantee "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation . . . ."[19] To achieve these goals of eliminating water pollution and restoring water quality, the Clean Water Act prohibits "the discharge of any pollutant by any person."[20] It focuses on two types of controls for point source discharges of pollutants: (1) water quality-based controls that are established through state water quality standards, including numeric and narrative criteria; and (2) technology-based controls, implemented through Effluent Limitations Guidelines and Standards that EPA establishes for industrial categories and subcategories regardless of their location across the country. Effluent Limitations Guidelines and Standards for petro-plastics facilities are the focus of this petition.

A. EPA's Duty to Establish Effluent Limitations Guidelines and Standards for Stormwater

EPA has the authority and obligation to ensure that our nation's waterways, wildlife, and communities are not polluted by stormwater runoff from industrial facilities. Industrial stormwater results when rain and runoff comes in contact with industrial manufacturing, processing, or storage and then runs offsite and enters drainage systems or receiving waters. In light of the Act's expressed goal of eliminating the discharge of pollutants into the nation's waters,[21] EPA must ensure that plastic (including but not limited to pellets, resins, flakes, granules, and powders) produced by petro-plastics facilities do not enter into the nation's waterways via stormwater runoff.

In 1987, Congress amended the Clean Water Act to significantly expand the NPDES program to include industrial stormwater runoff conveyed directly through outfalls to receiving waters or indirectly through municipal separate storm sewer systems. In those areas under EPA's permitting authority, permitting is currently available under the agency's Multi-Sector General Permit for industrial stormwater discharges.[22] The Multi-Sector General Permit covers over 4,000 facilities nationwide and includes industrial stormwater discharges associated with

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[18] 33 U.S.C. § 1251(a).
[19] *Id*. § 1251(a)(2).
[20] *Id*. § 1311(a).
[21] 33 U.S.C. § 1251(a).
[22] *See* EPA website, Stormwater Discharges from Industrial Activities, https://www.epa.gov/npdes/stormwater-discharges-industrial-activities#msgpdocuments (last visited July 15, 2019.

"Chemical Manufacturing and Refining," which encompasses the production of plastics, synthetic resins, and other synthetics (SIC 2821-2824) (EPA 2006).[23] It serves as a model for states with delegated permitting authority (NAS 2019).

Obtaining coverage under either EPA's Multi-Sector General Permit or a state industrial stormwater permit requires the applicant to develop a Stormwater Pollution Prevention Plan, a written assessment of potential sources of pollutants in stormwater runoff, and effluent limitations and/or Best Management Practices to minimize the discharge of pollutants in runoff from the site.[24]

B. EPA's Duty to Establish Effluent Limitations Guidelines and Standards for Industrial Wastewater

Pursuant to the Clean Water Act, EPA is required to establish Effluent Limitations Guidelines and Standards that are national in scope and based on pollutant reductions that can be achieved by using available pollution treatment and prevention technologies. The Act defines effluent limitations as "any restriction established by a State or the Administrator on quantities, rates, and concentrations of chemical, physical, biological, and other constituents which are discharged from point sources into navigable waters . . . ."[25] In general, EPA establishes technology-based Effluent Limitations Guidelines and Standards for pollutants by evaluating (1) industry practices, (2) the characteristics of the discharges, and (3) the effectiveness and costs of demonstrated wastewater pollution control and treatment technologies.[26] These technologies can include in-plant process and procedure changes, operating methods, end-of-pipe technologies, and other alternatives.

Effluent Limitations Guidelines and Standards apply to industrial facilities that discharge pollutants directly to surface water and discharge pollutants indirectly to surface waters through publicly owned treatment works. For direct dischargers, EPA or states authorized to administer the NPDES program must incorporate the Effluent Limitations Guidelines and Standards into NPDES permits.[27] The Clean Water Act limits the duration of NPDES permits to five years.

Clean Water Act regulations establish technology-based numeric limitations for specific pollutants at the following levels of control for each industrial category:[28]

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[23] *See also* National Pollutant Discharge Elimination System Permit Application Regulations for Storm Water Discharges, 55 Fed. Reg. 47,990 (Nov. 16, 1990) (codified at 40 C.F.R. § 122.26).
[24] EPA Office of Water, EPA-833-F-06-018, December 2006, Industrial Stormwater Fact Sheet Series, Sector C: Chemical and Allied Products Manufacturing and Refining, https://www.epa.gov/sites/production/files/2015-10/documents/sector_c_chemical.pdf.
[25] *Id*. § 1362(11).
[26] *Id*. §§ 1311, 1314(b).
[27] *Id*. § 1342. EPA has authorized most states to administer all or part of the NPDES permitting program, leaving EPA the permitting authority for industrial facilities in only a few states (Massachusetts, New Hampshire, New Mexico), the District of Columbia, as well as most territories.
[28] *Id*. § 1314.

- Best Conventional Pollutant Control Technology (BCT) for conventional pollutants: Technology-based standard for discharges from existing industrial point sources of conventional pollutants, including Biological Oxygen Demand, Total Suspended Solids, fecal coliform, pH, oil, and grease. The BCT is established in light of a two-part cost reasonableness test, which compares the cost for an industry to reduce its pollutant discharge with the cost to a publicly owned treatment facility for similar levels of reduction of a pollutant loading. The second test examines the cost-effectiveness of additional industrial treatment beyond BPT. EPA must find limits that are reasonable under both tests before establishing them as BCT.

- Best Practicable Control Technology Currently Available (BPT) for all pollutants: The first level of technology standards established under the Clean Water Act to control pollutants discharged to waters of the United States. BPT limitations are generally based on the average of the best existing performance by plants within an industrial category or subcategory. EPA looks at a number of factors when defining BPT, including the total cost of applying the control technology in relation to the effluent reduction benefits; the age of the equipment and facilities; processes employed by the industry and any required process change; engineering aspects of the control technologies; non-water quality environmental impacts, including energy requirements; and other factors as EPA deems appropriate.

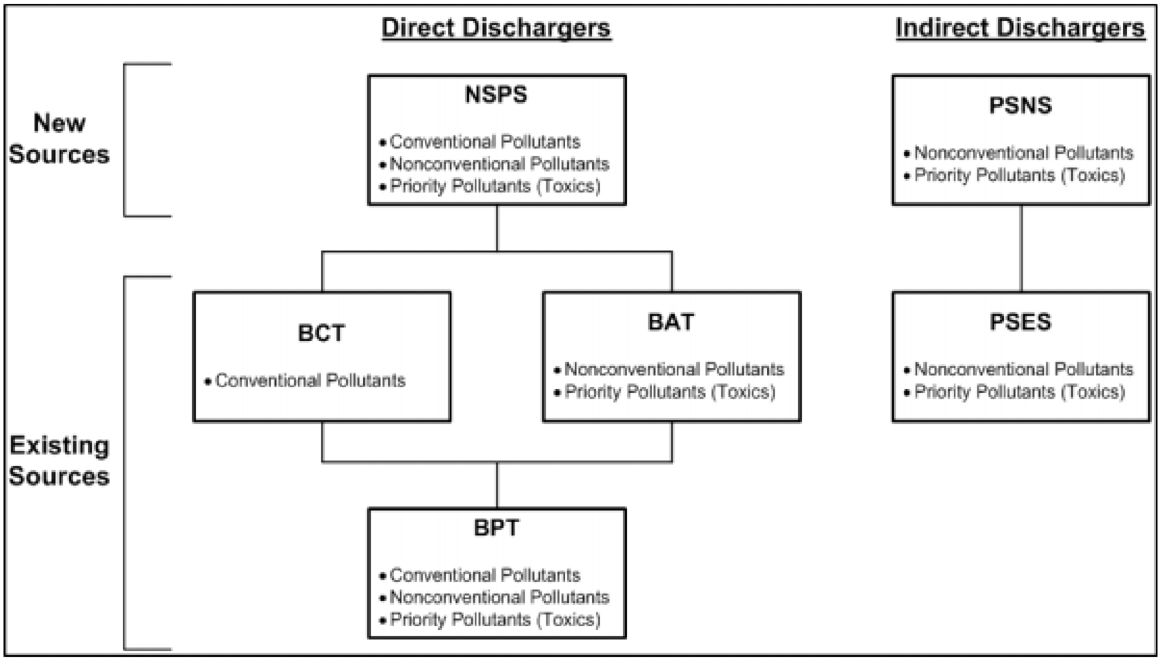
- Best Available Technology Economically Available (BAT) for priority (toxic) and nonconventional pollutants: Technology standards established under the Clean Water Act as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. BAT limitations in effluent guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.

- New Source Performance Standards (NSPS) for new sources and all pollutants: Based on the best available demonstrated control technology (BADT) for conventional, toxic, and nonconventional pollutants. NSPS represents the most stringent controls attainable through the application BADT and may prohibit the discharge of pollutants.

- Pretreatment Standards for New Sources (PSNS) and Existing Sources (PSES): Apply to indirect discharges of nonconventional and priority pollutants to publicly owned treatment works.

(EPA 2010).

Figure 2. Regulations for Direct and Indirect Wastewater Discharges. *Source*: EPA 2016 Effluent Limitations Guidelines Review, Figure 2.5, at 2-12.



Along with numerical effluent limitations, NPDES permits contain monitoring, reporting, and other requirements necessary to comply with the Clean Water Act. In terms of monitoring, all NPDES permits must specify the (1) requirements for use, maintenance, and installation of monitoring equipment and methods; (2) required monitoring, including type, intervals, and frequency; and (3) "[a]pplicable reporting requirements based on the impact of the regulated activity."[29] Compliance monitoring for NPDES permits largely takes place at the state level, with states reporting their data to EPA.

EPA can also define and include "Best Management Practices" as permit conditions in place of or with effluent limitations to prevent or control the discharge of pollutants. They may be included, for example, where numeric limitations are deemed infeasible. Best Management Practices are defined as schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the United States. They can include treatment requirements; operating procedures; and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.[30]

[29] 40 C.F.R. § 122.48.
[30] 40 C.F.R. § 122.2, 40 C.F.R. § 122.44(k), 40 C.F.R. § 403.3(e) (indirect dischargers).

C. Current Effluent Limitations Guidelines and Standards for Plastic Production

Petroleum Refining. EPA developed Effluent Limitations Guidelines and Standards for the Petroleum Refining Point Source category in 1974 and last updated them in 1985.[31] The Petroleum Refining category covers wastewater discharges at over 140 refineries across the country, according to EPA. Subpart B of the Petroleum Refining category applies to facilities involved in cracking, one of the many processes performed at Petroleum Refining facilities. Subpart C, the Petrochemical Subcategory, also applies to facilities that perform cracking, but adds specific requirements as a result of the particular refined products included in that subcategory. EPA defines "petrochemical operations" as the production of second-generation petrochemicals (i.e. alcohols, ketones, cumene, styrene, etc.) or first-generation petrochemicals and isomerization products (i.e. olefins) when 15 percent or more of refinery production consists of first-generation petrochemicals and isomerization products.[32] These refineries therefore can produce the monomers essential to making plastic, including ethylene and propylene.

EPA currently regulates a surprisingly small number of wastewater pollutants under the Petroleum Refining category given the other pollutants these facilities discharge, the changing nature of these facilities and their feedstocks, and emerging pollutants of concern. The first column of Table 5 below lists the pollutants the EPA regulates for the Petroleum Refining category subpart for Cracking and the pollutants currently regulated under the Organic Chemicals, Plastics, and Synthetic Fibers industrial category subpart for Thermoplastic Resins, discussed in more detail *infra*.

Table 5. Regulated Pollutants under Part 419 Petroleum Refining (Cracking Subpart) and 414 Plastics (Thermoplastic Resins Subpart)

	Petroleum Refining Subpart B Cracking (40 C.F.R. Part 419)	**Plastics Subpart D Thermoplastic Resins (40 C.F.R. Part 414, direct dischargers)**
Wastewater Pollutants Regulated to BPT	- Biological Oxygen Demand (5-Day) - Total Suspended Solids - Chemical Oxygen Demand - Oil and grease - Phenolic compounds - Ammonia as Nitrogen (N) - Sulfide - Total chromium - Hexavalent chromium - pH	- Biological Oxygen Demand (5-Day) - Total Suspended Solids - pH

[31] 40 C.F.R. Part 419.
[32] 40 C.F.R. § 419.31.

Wastewater Pollutants Regulated to BCT	- Biological Oxygen Demand (5-Day) - Total Suspended Solids - Oil and grease - pH	- Reserved[33]
Wastewater Pollutants Regulated to BAT	- Chemical Oxygen Demand - Ammonia as N - Sulfide - Phenolic compounds - Total chromium - Hexavalent chromium	<u>If 5 million pounds of Plastics products/year or less</u>: BAT is set to BPT <u>If greater than 5 million lbs/year, then BAT is set for</u>: - § 414.91 pollutant limits for end-of-pipe biological treatment[34] and - § 414.101 pollutant limits for sources that do not use end-of-pipe biological treatment[35]
Wastewater Pollutants Regulated to NSPS	<u>Same as BPT</u> - Biological Oxygen Demand (5-Day) - Total Suspended Solids - Chemical Oxygen Demand - Oil and grease - Phenolic compounds - Ammonia as Nitrogen (N) - Sulfide - Total chromium - Hexavalent chromium - pH[36]	New sources with end-of-pipe biological treatment, NSPS is set for: - Biological Oxygen Demand (5-Day) - Total Suspended Solids - pH - § 414.91 toxic pollutant limits New sources that do not use end-of-pipe biological treatment, NSPS is set for: - Biological Oxygen Demand (5-Day) - Total Suspended Solids - pH - § 414.101 toxic pollutant limits[37]

33 40 C.F.R. § 414.42.

34 40 C.F.R. § 414.91 includes limits for the following pollutants: Acenaphthene, Acenaphthylene, Acrylonitrile, Anthracene, Benzene, Benzo(a)anthracene, 3,4-Benzofluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Bis(2-ethylhexyl) phthalate, Carbon Tetrachloride, Chlorobenzene, Chloroethane, Chloroform, 2-Chlorophenol, Chrysene, Di-n-butyl phthalate, 1,2-Dichlorobenzene, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 1,1-Dichloroethane, 1,2-Dichloroethane, 1,1-Dichloroethylene, 1,2-trans-Dichloroethylene, 2,4-Dichlorophenol, 1,2-Dichloropropane, 1,3-Dichloropropylene, Diethyl phthalate, 2,4-Dimethylphenol, Dimethyl phthalate, 4,6-Dinitro-o-cresol, 2,4-Dinitrophenol, 2,4-Dinitrotoluene, 2,6-Dinitrotoluene, Ethylbenzene, Fluoranthene, Fluorene, Hexachlorobenzene, Hexachlorobutadiene, Hexachloroethane, Methyl Chloride, Methylene Chloride, Naphthalene, Nitrobenzene, 2-Nitrophenol, 4-Nitrophenol, Phenanthrene, Phenol, Pyrene, Tetrachloroethylene, Toluene, Total Chromium, Total Copper, Total Cyanide, Total Lead, Total Nickel, Total Zinc, 1,2,4-Trichlorobenzene, 1,1,1-Trichloroethane, 1,1,2-Trichloroethane, Trichloroethylene, and Vinyl Chloride.

35 40 C.F.R. § 414.101 includes the same list of pollutants as those regulated for sources using end-of-pipe treatment (with different limits), plus 2,4-Dinitrotoluene and 2,6-Dinitrotoluene.

36 40 C.F.R. §§ 419.12(a), 419.22(a), 419.32(a), 419.42(a), 419.52(a).

37 40 C.F.R. § 414.101 includes the same list of pollutants as those regulated for sources using end-of-pipe treatment (with different limits), plus 2,4-Dinitrotoluene and 2,6-Dinitrotoluene.

Stormwater Pollutants Regulated to BPT	Solely contaminated runoff: - Oil and Grease - Total Organic Carbon (TOC) Commingled or treated with process wastewater or exceeding oil & grease and TOC limits: - Biological Oxygen Demand (5-Day) - Total Suspended Solids - Chemical Oxygen Demand - Oil and Grease - Phenolic compounds - Total chromium - Hexavalent chromium - pH [38]	Not included in Part 414
Stormwater Pollutants Regulated to BAT	Solely contaminated runoff: - Total Organic Carbon Commingled or treated with process wastewater or exceeding TOC limit: - Phenolic compounds - Total chromium - Hexavalent chromium - Chemical Oxygen Demand [39]	Not included in Part 414
Stormwater Pollutants Regulated to BCT	Solely contaminated runoff: - Oil and grease Commingled or treated with process wastewater or exceeding oil and grease limit: - Biological Oxygen Demand (5-Day) - Total Suspended Solids - Chemical Oxygen Demand - Oil and Grease - pH[40]	Not included in Part 414

[38] 40 C.F.R. §§ 419.12(e), 419.22(e), 419.32(e), 419.42(e), 419.52(e).
[39] 40 C.F.R. §§ 419.13(f), 419.23(f), 419.33(f), 419.43(f), 419.53(f).
[40] 40 C.F.R. §§ 419.14(e), 419.24(e), 419.34(e), 419.44(e), 419.54(e)

EPA based its development of BAT Effluent Limitations Guidelines and NSPS for Petroleum Refining in 1974 and its subsequent revisions in 1982 and 1985[41] on two different groups of technologies to treat production wastewater (EPA 1974; EPA 1985). End-of-pipe treatment consists of treatment of process wastewaters directly prior to final discharge to receiving waters. In-plant technologies are considered part of the overall refining process and consist of treatment technologies employed before discharging to the end-of-pipe treatment facility.

Table 6. Part 419 Petroleum Refinery In-Plant and End-of Pipe BAT

Part 419 In-Plant BAT	Part 419 End-of-Pipe BAT
- Steam strippers (for sulfide, ammonia, and VOC removal from sour waters) - Elimination of once-through barometric condenser water through use of surface condensers or recycle streams - Storm sewer and once-through cooling water segregation from process wastewater streams to avoid unnecessary treatment of unpolluted waters - Elimination of polluted once-through cooling water, by monitoring and repair of surface condensers or use of wet and dry recycle systems	- Flow Equalization - Additional oil separation through use of dissolved air flotation (DAF) - Biological treatment (Biochemical Oxygen Demand, Chemical Oxygen Demand and Total Organic Carbon removal) - Effluent polishing (e.g. sand filters, polishing ponds)

Effluent limitations for the Petroleum Refining category were established for "contaminated stormwater runoff" in 1985 due to a settlement between the Natural Resources Defense Council (NRDC) and EPA.[42] The rule established BPT, BCT, and BAT effluent limitations guidelines for contaminated runoff.[43] "Runoff" is defined in the Petroleum Refining category as "the flow of storm water resulting from precipitation coming into contact with petroleum refinery property."[44] "Contaminated runoff" is runoff that comes into contact with any raw material, intermediate product, by-product, or waste product located on petroleum refinery property.[45] NSPS for runoff in the Petroleum Refining category have not been established to date.[46]

Plastics. EPA developed the Organic Chemicals, Plastics, and Synthetic Fibers ("Plastics") Effluent Limitations Guidelines and Standards in 1987, with the last amendment in

[41] Petroleum Refining Point Source Category Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards, 47 Fed. Reg. 46,434 (Oct. 18, 1982); Petroleum Refining Point Source Category; Effluent Limitations Guidelines, 50 Fed. Reg. 28,516 (July 12, 1985).
[42] 50 Fed. Reg. at 28,516.
[43] *Id*.
[44] 40 C.F.R. § 419.11(a).
[45] 40 C.F.R. § 419.11(g).
[46] 40 C.F.R.§ 419.36 (e)(Effluent Limitation for Runoff--[Reserved]).

1993, twenty-six years ago.[47] This category applies to wastewater discharges from a large and diverse set of facilities (or portions thereof) that manufacture plastic materials or product groups, including a petroleum refining facility where plastics are also synthesized (EPA OCSFP 2005). The Plastics category covers a wide range of products, raw materials, and chemical processes; large volume producers and smaller producers of "specialty" chemicals; and facilities producing a variety of products with product mixes that can change frequently. Part 414 applies to plastics molding and forming processes, such as forming plastic pellets, when it occurs at plastics facilities only for shipment off-site. However, facilities that mold or form plastic independent of producing the raw plastic materials are regulated under Part 463, the Plastics Molding and Forming Point Source Category (Part 463) (EPA 1987).

According to EPA, the Plastics category includes more than 1,000 chemical facilities producing over 25,000 end products, such as benzene, toluene, polypropylene, polyvinyl chloride, chlorinated solvents, rubber precursors, rayon, nylon, and polyester (EPA Overview). Subcategories regulated under the Plastics category are rayon fibers, other fibers, thermoplastic resins, thermosetting resins, commodity organic chemicals, bulk organic chemicals, and specialty organic chemicals. The resulting wastewater streams from these facilities contain a wide variety of pollutants requiring different in-plant and end-of-pipe treatment approaches specific to each individual plastics facility (EPA 1987).

As noted in Table 5, *supra*, EPA currently regulates the discharge of certain pollutants under the Plastics industrial category, but this list has not been substantially revised since its original creation, fails to adequately regulate the pollutants it does include, and omits others altogether.

The BAT analysis used to determine Effluent Limitations Guidelines and Standards under Part 414 was completed in 1987, over 30 years ago, identifying the following in-plant and end-of-pipe treatment technologies:

Table 7. Part 414 Plastics In-Plant and End-of Pipe BAT

Part 414 In-Plant BAT (for facilities that do not use biological treatment)	Part 414 End-of-Pipe BAT (for facilities that use biological treatment)
- Alkaline chlorination for cyanide removal - Carbon adsorption for base-neutral compound removal - Chemical substitution using fewer toxic chemicals or chemicals that are more easily treated - Coagulation/flocculation - Dissolved air flotation (DAF) - Distillation	- Preliminary treatment typically consisting of flow equalization - Neutralization - Biological treatment for Biochemical Oxygen Demand, Chemical Oxygen Demand, and Total Organic Carbon removal. - Effluent polishing through use of sand filters, polishing ponds, clarifiers, and/or carbon adsorption to remove remaining Total

[47] 40 C.F.R. Part 414; amendments summarized by EPA on the agency's website, https://www.epa.gov/eg/organic-chemicals-plastics-and-synthetic-fibers-effluent-guidelines.

- Equalization - Hydroxide precipitation for metals removal - Biological treatment - Neutralization - Oil/water separation for oily waste removal - Process modification to reduce water use or waste discharges - Sedimentation - Solvent extraction and recycle - Steam stripping for volatile and semi-volatile organic compound removal - Water reduction and reuse	Suspended Solids and biological flocs from the biological treatment process (EPA 1987; EPA 2004).

EPA has not established effluent limitations for contaminated runoff/stormwater for the Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers industry group, including the Organic Chemicals, Plastics, and Synthetic Fibers (40 C.F.R. § 414) or Plastics Molding and Forming (40 C.F.R. § 463) point source categories. Stormwater is only covered under Part 414 if it is combined with process wastewaters (EPA 1987; EPA 2004).[48]

In other words, there currently are no regulations promulgated under Part 414 regarding the treatment of direct stormwater runoff from plastics facilities. The only restrictions or treatment requirements for stormwater are found in the Best Management Practices contained in either state-issued industrial stormwater permits or EPA's Multi-Sector General Permit. As discussed *supra,* Best Management Practices, which typically include measures such as minimizing exposure of pollutants to precipitation or managing runoff via swales and filtration devices, have been wildly ineffective at preventing plastic particles produced at plastics facilities from entering the nation's waterways.

Plastic pellets, flakes, and powders regularly escape from petro-plastics facilities, contaminating nearby beaches and waterways, and harming wildlife and communities. The toxins from these substances leach into the environment, exposing wildlife and human communities to hazardous compounds that can result in cancer, neurotoxicity, and death. Prohibiting the discharge of *any* plastic debris from these facilities is necessary to safeguard our rivers, coasts, and communities from harmful pollutants.

EPA's failure to regulate plastic pellets, resins, and powders in stormwater violates the Clean Water Act and the agency must promulgate new limits and standards to ensure that no plastic debris escapes into waterways through stormwater. EPA's past failure to promulgate standards to ensure plastic does not discharge from petrochemical facilities is dangerous to public health, aquatic life, and water quality. EPA regularly includes stormwater restrictions in effluent limitations guidelines for other categories, such as Petroleum Refining. It must do the same here.

[48] 40 C.F.R. Part 414.

D. EPA's Duty to Update Effluent Limitations Guidelines and Standards for Wastewater and Stormwater

As technology advances and industry changes, the Clean Water Act requires EPA to revise its regulations at set intervals to reflect progress towards achieving the Act's goals of eliminating pollution into our nation's waters. Specifically, EPA must review and, if appropriate, revise the Effluent Limitations Guidelines and Standards at least annually;[49] it also must review and, if appropriate, revise the effluent limitations for these industrial categories at least once every five years.[50] The Act requires EPA to publish a plan every two years for how it will annually review and revise the Effluent Limitations Guidelines and Standards for new and existing industrial categories.[51] EPA most recently published a Final 2016 Effluent Guidelines Program Plan in April 2018 through which it screens for industrial categories where new or revised Effluent Limitations Guidelines and Standards may be warranted (EPA 2018).

EPA stated that it continued to evaluate three industrial categories that ranked high in the toxicity rankings analysis—including the Plastics category (with a focus on Total Residual Chlorine, Nitrate, and Total Phosphorous) (EPA 2018 at 3-1)—but its final Plan identified just one new rulemaking for the Steam Electric Power Generating Point Source Category. EPA concluded that "no other industries warrant new or revised effluent limitations guidelines and standards." (*Ibid*.).

EPA generally considers four factors when analyzing whether to revise any Effluent Limitations Guidelines and Standards:

- Amount and type of pollutants the industry is discharging, and the relative hazard posed;
- Performance and cost of applicable and demonstrated wastewater treatment technologies, process changes, and pollution prevention alternatives;
- Affordability or economic achievability of the options identified; and
- The opportunity to eliminate inefficiencies or impediments to pollution prevention or technological innovation (EPA 2018)

According to EPA, it also looks for information on:

- Emerging pollutants of concern or new pollutant discharges;
- New, more sensitive analytical methods;
- Industrial process changes;

[49] 33 U.S.C. § 1314(b)
[50] *Id*. § 1311(d) ("Any effluent limitation required by paragraph (2) of subsection (b) of this section shall be reviewed at least every five years and, if appropriate, revised pursuant to the procedure established under such paragraph.")
[51] *Id*. § 1314(m)(1).

- Other regulations that may result in changes to discharges (like air pollution control regulations);

- Advances in wastewater treatment technologies and pollution prevention practices; and

- Other hazard data and information not captured in the toxicity rankings analysis (EPA 2018).

The petro-plastics boom raises concerns under almost every one of these factors. First, this Petition documents additional pollutants of concern and industry changes in terms of growth, feedstocks, and concentration in low-income neighborhoods and communities of color. Second, the decades that have passed since EPA last updated these standards have produced new, more sensitive detection methods, treatment technologies, and other scientific advancements that can remove pollutants better than existing standards. This is true for a long list of pollutants, including but not limited to total and dissolved metals, chlorides, and persistent organic compounds that are not readily degraded by biological treatment, which is the most commonly used end-of-pipe treatment technology at Petroleum Refining and Plastics facilities.

More advanced water treatment options are available, and in some cases, many Petroleum Refining and Plastics facilities are already using them. EPA should adopt such options as BAT for many pollutants, including the following:

- Membrane filtration options such as reverse osmosis, ultrafiltration, and electrodialysis that result in lower effluent concentrations of <u>dissolved solids, chlorides, and dissolved metals</u> than traditional filtration methods or sedimentation/precipitation (EPA Membrane).[52]

- Other filtration processes for solids removal, activated carbon treatment, and extended sedimentation that are commonly used treatment systems at Petroleum Refining and Plastics facilities and have proven effective at removing <u>dioxin</u> (EPA 2004).

- Advanced oxidation processes that effectively remove a wide range of organic compounds, including non-biodegradable <u>organic compounds</u> that can persist as pollutants in wastewater discharges from Petroleum Refining and Plastics facilities.[53]

[52] *Ultrafiltration* is typically used to remove larger metal cations, like those resulting from calcium, and can also remove organic compounds and dioxin. *Reverse osmosis* can remove smaller dissolved solids than ultrafiltration, such as chloride ions, and is typically used for overall total dissolved solids removal in wastewater streams. *Electrodialysis* is capable removing dissolved solids of any size. Membrane separation processes could be used most effectively as an in-plant treatment system for specific process wastewaters with high concentrations of dissolved solids, chlorides, and dissolved metals, such as desalting wastewater (EPA Membrane)

[53] *Advanced oxidation processes* primarily rely upon ozone and hydroxyl radicals (OH-), commonly supplied by hydrogen peroxide or titanium oxide, to oxidize contaminants and UV light to further decompose the oxidized compounds. Advanced oxidation processes could be used most effectively as a final polishing step as part of the

- Ion exchange treatment systems that remove selenium from wastewater and could effectively serve as in-plant treatment BAT for desalting wastewater, the main source of selenium in a Petroleum Refining facility (Reinsel 2016).

EPA is cognizant of technologies that are currently available, achievable, and would significantly reduce pollution discharges from the Plastics industry. EPA cannot ignore what it knows to be the best available technology and must update its Effluent Limitations and Guidelines accordingly.

For example, since EPA last revised the standards for the Petroleum Refining category in 1985, it has expressed concern about other pollutants without Effluent Limitations Guidelines and Standards, including dioxin, metals, and polycyclic aromatic hydrocarbons (EPA 1996; EPA 2004). The 2004 EPA Effluent Guidelines Program Plan documents concluded that dioxin "might be produced in high concentrations at petroleum refineries during reformer catalyst regeneration processes," and that "some dioxin congeners might be present in the treated effluent at some refineries," (EPA 2004, at Section 7), yet EPA has not promulgated Effluent Limitations Guidelines and Standards for dioxin. EPA instead recommended that permit writers use their best professional judgment in drafting permits and committed to engage in further "study" of the Petroleum Refining industrial category. According to EPA, its current study is focused on the discharge of metals and dioxin from petroleum refineries, the effects of new air pollution controls on wastewater discharges at refineries, and information on current and future trends in oil refining processes.

EPA's "study" is wholly inadequate. As part of the "study," EPA issued a questionnaire to nine refinery companies in 2017 to survey the wastewater characteristics of their 22 facilities (EPA Study 2017). The survey contains no questions specifically requesting information on monitoring of dioxin; instead, it contains only a generic "metals" category and a generic "other" category when requesting information on pollutants routinely monitored in end-of-pipe wastewater treatment effluents. It also overlooks other pollutants of concern as discussed in this petition. EPA has failed to finalize its findings even on the limited scope of its study and update the outdated Effluent Limitations Guidelines and Standards accordingly.

As an illustration of the technologies EPA has failed to include in its Effluent Limitations Guidelines and Standards, the table below lists some of the in-plant and end-of-pipe wastewater treatment technologies that have come into common use since the last Effluent Limitations Guidelines revisions for the Petroleum Refining and Plastics industrial categories.

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end-of-pipe treatment train to remove non-biodegradable organic compounds at Petroleum Refining facilities and Plastics (Suzuki et al. 2016).

Table 8. In-Plant and End-of-Pipe Best Available Technology Not Yet Adopted

In-Plant and End-of-Pipe BAT Not Yet Adopted
- Neutralization of wastewater with acidic byproducts from cracking - Air stripping of sour water from cracking processes - Neutralization of wastewater with caustic byproducts from the polymerization process - Wastewater reuse for steam generation, cooling water, and other process needs - Membrane filtration options such as reverse osmosis, ultrafiltration, and electrodialysis for dissolved solids, chlorides, and metals - Chemical precipitation and filtration to remove total and dissolved solids - Activated carbon treatment and extended sedimentation for organic pollutant removal - Advanced oxidation processes to remove organic compounds - Ion exchange treatment - Additional conventional filtration, sedimentation, and precipitation options (EPA 1996; EPA 2004)

Many of these in-plant and end-of-pipe wastewater treatment technologies were confirmed as BAT in 1982, yet the 1996 EPA Review and 2004 EPA Review conducted specifically for this industrial category contained no recommendations for the addition of new treatment technologies (EPA 1996; EPA 2004).

With respect to stormwater permitting, new limitations are similarly warranted to address the deficiencies of the regulations relating to stormwater runoff and the Multi-Sector General Permit for industrial sources, which is effective through 2020. A recently published National Academies of Science report included a section titled "Overarching Message" that summarizes Petitioners' concerns with EPA's regulation of industrial stormwater discharges generally and plastic pellets and other materials specifically:

> [T]he [Multi-Sector General Permit] should incorporate the best available science in the MSGP process. Science continues to improve our understanding of the environmental and human health impacts of industrial stormwater. Technologies for water quality monitoring, stormwater treatment, and modeling are advancing at rapid rates, and new data can inform understanding of the performance of stormwater control measures. New tools are being developed to improve toxicological assessments and data management and visualization… In general, EPA has been slow to adopt new knowledge into its [Multi-Sector General Permit] permit revisions, but the [Multi-Sector General Permit] should not be a static enterprise. Both permitted facilities and the nation's waters would be best served by a progressive and continuously improving [Multi-Sector General

> Permit] based on analysis of new data and focused data-gathering efforts, advances in industrial stormwater science and technology, and structured learning to develop and evaluate permit improvements.

(NAS 2019).

Given the decades that have passed since EPA last updated these rules, the scientific and technological progress made in the intervening years, and the changes in the Plastics industry stoked by the fracked natural gas boom in the United States, EPA has the opportunity and duty to support better pollution wastewater and stormwater prevention by this industry.

IV. Requested Rulemaking to Revise Effluent Limitations Guidelines and Standards for Plastics Facilities

Petitioners request that EPA protect public health and the environment by ensuring its Effluent Limitations Guidelines and Standards for the Plastics industry evolve with the significant expansion of the industry; the changing nature of the petro-plastics feedstocks and products; and advancements in pollution detection, prevention, and treatment technology. The Effluent Limitations Guidelines and Standards for this industry are almost unchanged from when EPA promulgated them in the 1970s and 1980s. This is contrary to the Clean Water Act's mandates to regularly review and update these standards; implement improvements in science, technology, and economics; and progress toward the Act's ultimate goal of eliminating discharges of pollutants into aquatic ecosystems.

The 5th Circuit Court of Appeals recently addressed a similar situation related to outdated Effluent Limitation Guidelines for steam-electric power plants, stating,

> [f]or quite some time, ELGs for steam-electric power plants have been, in EPA's words, 'out of date.' *80 Fed. Reg. 67,838*. That is a charitable understatement. The last time these guidelines were updated was during the second year of President Reagan's first term, the same year that saw the release of the first CD player, the Sony Watchman pocket television, and the Commodore 64 home computer. In other words, 1982.[54]

The same can be said for the Effluent Limitations Guidelines and Standards EPA issued to plastic monomer and polymer manufacturers under Part 419 (Petroleum Refining) and Part 414 (Plastics).

An update of the Effluent Limitations Guidelines and Standards that apply to petro-plastics facilities is essential to achieve the purposes of the Clean Water Act to eliminate pollution discharges and protect public health and the environment. EPA must update its Effluent Limitations Guidelines and Standards to reflect:

- Changes in plastics feedstocks;

[54] *Sw. Elec. Power Co. v. U.S. EPA*, 920 F.3d at 1003.

- Changes and growth in the plastics industry;

- The consequent changes in the amount and type of pollutants the industry is discharging and relative hazard posed, especially to minority and low-income communities who bear the heavy environmental, public health, social, aesthetic, and economic costs of not regulating these pollutants;

- New, more sensitive analytical methods available to detect and analyze pollutants;

- New and emerging pollutants of concern, including microplastic pollution; and

- New best available wastewater and stormwater treatment technologies, process changes, and pollution prevention alternatives.

Specifically, the petitioning organizations request that EPA initiate a rulemaking to update the Effluent Limitations Guidelines and Standards in the Part 419 Petroleum Refining industrial category (Subpart B Cracking and Subpart C Petrochemicals subparts)[55] and Part 414 Plastics industrial category as follows:

(1) <u>Promulgate a Zero Discharge Effluent Limitation Guideline and Standard for Plastic Pellets, Powders, Flakes, Granules, and Other Plastic Material in Industrial Wastewater and Stormwater</u>

A limit of zero plastic material in industrial wastewater and stormwater Effluent Limitations Guidelines and Standards is urgent and necessary. Plastic pellets, powders, and other materials are driving the plastic pollution crisis that is entangling and otherwise harming (in increasing cases, fatally) over 700 different marine species, including sea turtles, whales, fish, and sea birds. EPA must as a first step stop this plastic pollution at its source.

Discharges from existing facilities and the lack of effluent limits that squarely apply to plastic pellets, powders, and other plastic materials make it clear that neither the existing Effluent Limitations Guidelines and Standards or the stormwater regulations and general permits control or prevent plastic pollution. For example, while some permits might theoretically regulate wastewater discharges of plastics under the Total Suspended Solids limits, many plastic pellets and powders float and are therefore not subject to "suspended solids" regulation. And while some facilities, like Formosa's Point Comfort, Texas facility, include wastewater discharge permits with a "trace amounts" limit for "floating solids," industry has argued, albeit unsuccessfully, that this can include vast quantities of plastic. A numeric limit of 0 discharge of plastic is needed to stop this pollution problem.[56]

Considering the adverse impacts of plastic pellets on the aquatic environment and human health, plastic pellets' specificity to plastics facilities, and its status as an emerging and persistent

[55] As noted *supra,* to the extent that EPA regulates facilities producing ethylene, propylene, or other monomers for Plastics under 40 C.F.R. Part 419, subpart E (Integrated Subcategory), this Subpart should also be reviewed and updated as proposed below for subparts B and C.
[56] *San Antonio Bay Estuarine Waterkeeper v. Formosa Plastics Corp*., Case No. 6:17-cv-00047 (S.D. Tex.) (judge concluded in its June 27, 2019 opinion (at 11 of 21) that "no expert evidence supports using [Formosa's] numbers as constituting a 'trace amount' for purposes of compliance.").

environmental pollutant, EPA must use its authority under Part 414 (Plastics) and Part 122 (provisions related to stormwater and authority to issue multi-sector general permits) to prevent further degradation of water resources and harm to organisms from plastic pellets and other plastic material.

EPA should add a subsection (c) to 40 C.F.R. sections 414.91, 414.101, and 414.111 to establish effluent limitations for runoff of 0 mg/l of plastic pellets or other plastic material. These limits must be reflected in all stormwater permits and general permits issued by EPA and state-delegated NPDES Programs in addition to other applicable limits and standards. EPA should also add "total plastic pellets and other plastic material" to the lists of regulated "effluent characteristics" in 40 C.F.R. sections 414.91, 414.101, and 111 with "effluent limitations BAT and NSPS" set at zero for both the "maximum for any one day" and "maximum for any monthly average" limitations.

Promulgating a zero stormwater and wastewater discharge limit for plastic pellets, powders, flakes, and other plastic material in the Effluent Limitation Guidelines and Standards under Parts 414 and Part 122 will set a federal standard that all state industrial stormwater permitting programs will be required to meet.

A zero discharge limit for plastic pellets, powders, flakes, and other plastic material applied to existing and new Plastics facilities is a reasonable response to a problem that threatens the well-being and safety of both the natural environment and human health. Scientists estimate that the majority of plastic, including microplastic, in the environment originates from land-based sources, with a significant portion made up of stormwater runoff (Gordon 2006). The only way to mitigate the dangers posed by microplastics is to ensure they do not enter our waterways in the first place.

In addition, the technology necessary to prevent the escapement of plastic pollution is readily available. Some states currently require Best Management Practices that are easy and low-cost solutions to trap plastic pellets before they enter stormwater drains, such as the one-millimeter mesh screens California mandates for plastics manufacturers.[57] Other methods that have been available for decades include settling or filtration ponds and are equally available and effective to achieve a zero discharge limit.[58] (EPA 1992).

The vast expansion of the plastics industry will add billions of plastic pellets and other materials into stormwater runoff unless EPA takes action now. The health of our birds, fish, and mammals, as well as our own human health, depends on clean waterways free of hazardous plastic pollution. In accordance with its authority under the Clean Water Act, EPA must

[57] California NPDES General Permit for Storm Water Discharges Associated with Industrial Activities, effective July 1, 2015, Part XVIII, https://www.waterboards.ca.gov/water_issues/programs/stormwater/docs/industrial/2014indgenpermit/wqo2014_0057_dwq_revmar2015.pdf.
[58] *See* U.S. EPA, Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, 80 Fed. Reg, 67,837 (Nov. 3, 2015).

therefore promulgate regulations ensuring that the plastics industry does not discharge any more plastic waste through stormwater and wastewater runoff.[59]

(2) Require Individual Stormwater Permits for Plastics Facilities and Ensure Other General Permits Include a Zero Discharge Limit for Plastic Pellets and Other Plastic Materials

The plastic pollution crisis makes it essential for EPA to require individual stormwater permits for Plastics facilities instead of using an industrial General Permit. Individual permits must be tailored specifically towards the plastic materials these facilities are producing and releasing in order to achieve the most effective pollution controls.

Clean Water Act regulations recognize that the Multi-Sector General Permit benchmark monitoring requirements, Stormwater Pollution Prevention Plans, and Stormwater Control Measures may be inadequate to address pollution from industrial stormwater. Therefore, EPA (as well as State Directors) can and should exclude Plastics facilities from industrial General Permits and require individual NPDES permits for these facilities given their discharge of plastic materials and other high risk pollutants.[60] An individual stormwater permit can be required for any number of reasons, including a change in demonstrated technology or practices that better control pollutants, Effluent Limitation Guidelines promulgated for point sources, and the nature of the discharge.[61] Here, as demonstrated above, existing technology makes it feasible to completely eliminate plastic debris from a plastic facility's stormwater.

An individual permit can better regulate these facilities by requiring more extensive monitoring and coverage of a greater number of pollutants relative to the General Permit, where benchmark monitoring is determined by standard industrial classification (SIC) code (NAS 2019). Individual permits can also be structured with enforceable discharge criteria expressed as numerical effluent limits, which then trigger a permit violation when exceeded (*Id.*) As the National Academies of Sciences, Engineering, and Medicine concluded in a 2019 review of EPA's stormwater regulations, "[t]his stricter enforcement of pollutant exceedances can be helpful for sites that represent a high public concern or that raise environmental justice issues." (NAS 2019). Plastics facilities are of high public concern, and their proliferation in low-income communities of color raises environmental justice concerns. Each facility should be required to receive an individual NPDES permit.

For other industrial facilities, including facilities that do not produce plastic but may use pellets and powders in their manufacturing processes, the General Permit must include a zero discharge limit for plastic pellets and other plastic materials along with monitoring and reporting requirements to ensure compliance with the zero discharge limit.

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[59] 40 C.F.R. § 122.26(a)(4).
[60] 40 C.F.R. § 122.28(b)(3) (General permits (applicable to State NPDES programs) subsection on requiring an individual permit).
[61] *Id.*

(3) Prohibit Any Detectable Priority Pollutants in Wastewater or Stormwater Discharges for New Plastics Facilities Unless and Until EPA Can Justify Higher Limits Using Best Available Technology

EPA must ensure that the boom of new petro-plastics facilities built in the coming decade are equipped with the most stringent control technology to minimize toxic pollutants in their wastewater and stormwater streams. This is necessary to lessen the chemical burden these facilities discharge and ensure they do not unduly burden surrounding communities and the environment with compounds known to harm human health and wildlife.

The Clean Water Act mandates that new source performance standards (NSPS) reflect "the greatest degree of effluent reduction" that is achievable based on the "best available demonstrated control technology, . . .including, where practicable, a standard permitting no discharge of pollutants."[62] Owners of new facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. As a result, NSPS generally represent the most stringent controls attainable through the application of control technology for all pollutants (conventional, nonconventional, and toxic). In establishing NSPS, EPA can consider the cost of achieving the effluent reduction and any non-water quality environmental impacts and energy requirements. [63]

EPA should prohibit any detectable discharge of priority pollutants from new sources in the Petroleum Refining and Plastics categories unless and until it can justify other limits using updated best available demonstrated control technology.

(4) Promulgate Effluent Limitations Guidelines and Standards for Wastewater and Stormwater Pollutants of Concern Not Currently Regulated for Existing Petro-Plastics Facilities Under Parts 419 and 414

EPA currently allows the Plastics industry to discharge unlimited quantities of certain toxic chemicals into our waters. Many of these chemicals cause cancer, impair reproduction, and cause immune deficiencies in humans and wildlife. EPA's failure to regulate these chemicals violates the Clean Water Act. EPA must update the existing Effluent Limitations Guidelines and Standards for pollutants that do not currently have limitations, including but not limited to selenium, dissolved solids (including dissolved metals like vanadium and selenium[64]), chlorides,[65] and organic pollutants like dioxin for Petroleum Refining facilities, and dioxin, di(2-ethylhexyl)phthalate, 1,3-butadiene, lead, and plastic pellets for Plastics facilities.

[62] 33 U.S.C. 1316(a)(1).
[63] *Id.* § 1316(b)(1)(B).
[64] The 2004 EPA Review determined that vanadium and selenium in Petroleum Refining facility discharges were of particular concern; however, the only metals EPA has currently promulgated Effluent Limitation Guidelines for under Part 419 is total chromium and hexavalent chromium. The 2004 EPA Review concluded that since effluent limits for vanadium have not been issued through the permitting process, this "indicates" that vanadium from wastewater discharges from Petroleum Refining facilities has not been identified as a water quality issue. Vanadium has been shown to have potential adverse impacts on aquatic life (*See, e.g.* Environment Canada 2016).
[65] While EPA has acknowledged that chlorides have one of the greatest pollutant mass loads from end-of-pipe wastewater discharges from Petroleum Refining facilities, it has not established Effluent Limitations Guidelines for chlorides under Part 419 (EPA 1996; EPA 2018).

For some of these pollutants, there is no established safe level of discharge, and limitations for wastewater and stormwater must be set at zero. For example, the National Academies of Sciences, Engineering, and Medicine concluded the following in 2019 with respect to polycyclic aromatic hydrocarbons (PAHs) in stormwater:

> [N]o benchmark has been set for PAHs for any of the industrial sectors. Analytical methods for determination of PAHs are standardized and readily available (EPA, 2015c). It may appear that [Chemical Oxygen Demand] can be used as a surrogate for PAHs, but PAHs can be toxic at concentrations orders of magnitude lower than the [Chemical Oxygen Demand] benchmark (120 mg/L). Canadian water quality guideline values for PAHs for the protection of aquatic life range from 0.012 μg/L (anthracene) to 5.8 μg/L (acenaphthene) (Canadian CME, 1999). Currently, EPA has no recommended aquatic life criteria for individual or total PAHs.

(NAS 2019 at 43). EPA must remedy these omissions from its current regulations.

(5) Update Existing Effluent Limitations Guidelines and Standards Under Parts 419 and 414 to Reflect Best Available Technology and Progress Toward the Elimination of Pollutant Discharges as the Clean Water Act Requires

EPA has not met its duty to work toward the elimination of pollution discharges to waters of the United States. Its decades-old Effluent Limitations Guidelines and Standards for petro-plastics facilities do not reflect the best available technology; advances in laboratory detection and analytical methods; or improved scientific understanding of the public health and environmental threats of these pollutants. Requirements for best available technology were intended to drive technological innovation and to ultimately eliminate water pollution. Instead, EPA has not required polluters to keep pace with technology at all—let alone innovate.

As the 4th Circuit Court of Appeals stated decades ago,

> The BAT standard reflects the intention of Congress to use the latest scientific research and technology in setting effluent limits, pushing industries toward the goal of zero discharge as quickly as possible. In setting BAT, EPA uses not the average plant, but the optimally operating plant, the pilot plant which acts as a beacon to show what is possible.[66]

In fact, technologies do not have to be in use by the industry to be best available technology. As the 5th Circuit Court of Appeals recognized, "a technological process can be deemed 'available' for BAT purposes 'even if it is not in use at all' or if it is used in unrelated industries."[67]

EPA must revise all existing Effluent Limitations Guidelines and Standards to reflect best available technology and analytical methods and to achieve the no discharge objective of the

[66] *Kennecott v. U.S. EPA,* 780 F.2d 445, 448 (4th Cir. 1985).
[67] *Sw. Elec. Power Co. v. U.S. EPA,* 920 F.3d at 1031.

Clean Water Act. Updated Effluent Limitations Guidelines and Standards will help achieve the most protective public health and water quality standards.

In addition, EPA must ensure that all Plastics facilities include chronic and acute whole effluent toxicity monitoring for chronic and acute toxicity to ensure that pollutant-specific limits for the effluent are sufficient to attain numeric and narrative water quality standards. Based on a review of permits for petro-plastics facilities, several states, including Ohio and Texas, require facilities covered under Part 414 to perform whole effluent testing.[68] EPA must require these tests, which are the best indicators of toxicity in wastewater effluents from Plastics facilities and will be most protective of aquatic life in surface waters receiving discharges from Part 414 and 419 facilities.

(6) Ensure No Facilities Are Exempted and No Regulations Are Withheld from the Plastics' Effluent Limitation Guidelines

EPA must rigorously review anything previously deemed "reserved," "exempted," or otherwise relegated to best professional judgment. For example, in Part 414, EPA reserved BCT, which is purportedly a more stringent standard than BPT, instead defaulting to the original 1977 BPT baseline standards for conventional pollutants. Also, EPA has not established BAT limits in Part 414 for Plastics facilities that produce less than five million pounds annually. EPA finalized its development document for Plastics under Part 414 in October 1987—over 30 years ago—and concluded that achieving BAT Effluent Limitations Guidelines for priority pollutant removal was not economically achievable by facilities under that production threshold. In the over 30 years since EPA made that determination, treatment technologies and their associated costs have changed. These and any other exemptions or reserved provisions must be revisited.

V. Proposed Regulatory Changes

A. Revise 40 CFR Part 414 As Follows:

Apply Best Available Technology (BAT) limitations in Part 414 to facilities that produce less than or equal to five million pounds of products per year.

Amend the limitations and standards for direct and indirect discharge point sources to add a subsection 414.91(c), 414.101(c), and 414.111(c) that states:

> *Effluent limitations for runoff. Runoff from facilities regulated under this Part may not contain more than 0 mg/l of plastic pellets or other plastic materials. This requirement must be reflected in all stormwater permits and general permits issued by EPA and state-delegated NPDES Programs in addition to other applicable limits and standards.*

Amend all Best Available Technology (BAT) and New Source Performance Standards in Part 414 to reflect updated and revised Best Available Technology and Best Available

[68] *See, e.g.,* Exxon-SABIC, Texas Commission on Environmental Quality, Permit to Discharge Wastes Under Provisions of Section 402 of the Clean Water Act and Chapter 26 of the Texas Water Code, GCGV Asset Holding LLC, TCEQ Docket No. 2018-0663-IWD, TPDES Permit No. WQ0005228000, August 3, 2018 (Texas Permit).

Demonstrated Control Technology. Amend 414.91(b), 414.101(b), and 414.111(b) tables for New Source Performance Standards to state:

Pollutant or pollutant property	Effluent limitations NSPS	
	Maximum for any 1 day (mg/l)	Maximum for any monthly average (mg/l)
The 126 priority pollutants (listed at 40 CFR Part 423, Appendix A)	([1])	([1])

[1] No detectable amount unless and until EPA can justify higher limits using best available demonstrated control technology.

Add plastic limits to the tables for BAT and NSPS in 414.91(b), 414.101(b), and 414.111(b):

Pollutant or pollutant property	Effluent limitations BAT and NSPS	
	Maximum for any 1 day (mg/l)	Maximum for any monthly average (mg/l)
Total plastic pellets and other plastic material	0	0

B. Revise 40 CFR Part 419 as follows:

Amend all Best Available Technology (BAT) and New Source Performance Standards (NSPS) in 40 C.F.R. 419.23, 419.26 (Cracking subcategory) and 419.33, 419.36 (Petrochemical subcategory) to reflect updated BAT and Best Available Demonstrated Control Technology for all pollutants.[69]

Amend 419.26(a) and 419.36(a) tables to reflect:

[69] As noted *supra*, to the extent that EPA regulates facilities producing ethylene, propylene, or other monomers for Plastics under 40 C.F.R. Part 419, subpart E (Integrated Subcategory), this Subpart should also be reviewed and updated as proposed below for subparts B and C.

Pollutant or pollutant property	NSPS	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
The 126 priority pollutants (listed at 40 CFR Part 423, Appendix A)	([1])	([1])

[1] *No detectable amount unless and until EPA can justify higher limits using best available demonstrated control technology.*

Amend 419.26(e) and 419.36(e) to include runoff limitations that reflect Best Available Demonstrated Control Technology.

In sum, EPA must thoroughly review and revise its Part 414 and Part 419 Effluent Limitations Guidelines and Standards to reflect the best available science and technology and to protect human health and the environment from the petro-plastics buildout. It must adopt zero discharge limits for plastic and adopt the stringent standards for priority pollutants proposed here unless and until it can justify higher limits using best available demonstrated control technology.

VI. Severability

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. Thus, the provisions of this petition are severable.

VII. Conclusion

The petrochemical industry is embarking on a massive expansion of plastics facilities that will drastically increase plastic production in this country and abroad. The associated wastewater and stormwater pollution from these plants is expected to skyrocket in tandem, jeopardizing wildlife, aquatic ecosystems, and surrounding communities. EPA has a duty to minimize water pollution and ensure that toxic chemicals do not harm human health and the environment. Accordingly, Petitioners respectfully request that EPA grant this petition and comply with its overdue obligation under the Clean Water Act to update the Effluent Limitation Guidelines and Standards for wastewater and stormwater discharges from petro-plastics facilities.

EPA must: (1) prohibit the discharge of any plastic pollution in stormwater and wastewater; (2) prohibit the discharge of toxic pollutants in wastewater from new facilities; (3) promulgate limitations for wastewater pollutants of concern that are not currently regulated; (4) update the Effluent Limitation Guidelines and Standards to reflect scientific and technological advancements in the decades since their last revision; and (5) ensure all plastics facilities are covered by the updated BAT and NSPS effluent limitations. Granting these requests will allow

EPA to meet the objectives of the Clean Water Act and protect public health and the environment from this rapidly expanding and increasingly polluting industry.

Any responses and all correspondence related to this petition should be directed to the Center for Biological Diversity at the email and address provided below.

Respectfully submitted this 23rd day of July, 2019.

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On behalf of:

100% Green Schools L.A.
350 Bay Area
350 Butte County
350 New Orleans
350 Pittsburgh PetroChemical Action Team (P-CAT)
350 Santa Cruz
350.org
Adventures in Waste
Algalita
Altamaha Riverkeeper
Anacostia Riverkeeper
Animal Welfare Institute
Another Gulf Is Possible
Apalachicola Riverkeeper
Assateague Coastal Trust
ATA Law Group
Atchafalaya Basinkeeper
Athens County's Future Action Network, aka Athens County (OH) Fracking Action Network
Azul
Bayou City Waterkeeper
Beaver County (PA) Marcellus Awareness Community
Berks Gas Truth
Better Path Coalition
Beyond Plastics
Big Blackfoot Riverkeeper, Inc.
Black Warrior Riverkeeper
Blue Sphere Foundation
Blue Water Baltimore/Baltimore Harbor Waterkeeper
Bluecology
Boulder Waterkeeper
Bream Fishermen Association, Inc
Breast Cancer Action
Breast Cancer Prevention Partners
Breathe Project
Buckeye Environmental Network
Buffalo Niagara Waterkeeper
CA Urban Streams Alliance-The Stream Team, a Waterkeeper Affiliate
Cafeteria Culture
Cahaba Riverkeeper
California Coastal Protection Network
California League of Conservation Voters
Californians Against Waste
Californians for Western Wilderness
Cape Fear River Watch/ Cape Fear Riverkeeper
Catawba Riverkeeper Foundation

Center for Biological Diversity
Center for Coalfield Justice
Center for Environmental Health
Center for Food Safety
Center for International Environmental Law (CIEL)
Change Begins With ME / Indivisible CD-52
Charleston Waterkeeper
Chattahoochee Riverkeeper
ChicoBag Company / To-Go Ware
Chispa - League of Conservation Voters
Choctawhatchee Riverkeeper
Citizen Coalition for Safe Community
Citizens' Climate Lobby, Santa Clarita Chapter
Clean Ocean Action
Coachella Valley Waterkeeper
Coastal Alliance to Protect our Environment (CAPE)
Coastal Carolina Riverwatch
Columbia Riverkeeper
Congaree Riverkeeper
Conservation Law Foundation
Cook Inletkeeper
Coosa Riverkeeper
Coosa River Basin Initiative / Upper Coosa Riverkeeper
Copper River Delta Sound Waterkeeper
CORALations
Courage Campaign
CREATE
Crystal Coast Waterkeeper
Delaware Ecumenical Council on Children and Families
Earth Ethics, Inc.
Earth Island Institute
Earthworks
East Valley Indivisibles
EcoJustice Working Group, Thomas Merton Center
Ecological Rights Foundation
Emerald Coastkeeper
Endangered Habitats League
Endangered Species Coalition
Environment America
Environment California
Environmental Action Committee of West Marin
Environmental Protection Information Center
Environmental Youth Council of St. Augustine Florida
Eureka Recycling
Extinction Rebellion Kentucky
Eyak Preservation Council
Food & Water Watch
FracTracker Alliance
Friends of Hurricane Creek / Hurricane Creekkeeper
Friends of Penobscot Bay, a Waterkeeper Alliance Affiliate
Friends of the Earth
Friends of the Kaw / Kansas Riverkeeper
Friends of the Pogonip
Gas Free Seneca
Gasp
Good Neighbor Steering Committee
Good Stewards of Rockingham / Dan Riverkeeper
Great Old Broads for Wilderness
Greater Hells Canyon Council
Greenpeace
Gunpowder Riverkeeper
Hackensack Riverkeeper
Hands Across the Sand
Harambee House, Inc.
Haw River Assembly / Haw Riverkeeper
Heal the Bay
Healthy Gulf
Heartwood
Howling for Wolves
Hudson Riverkeeper
Idle No More SF Bay
Indian Riverkeeper
Indivisible CA-33
Indivisible CA-7
Indivisible Monterey Hill
Indivisible NAPA
Indivisible OC 48
Indivisible Sacramento
Indivisible San Jose
Indivisible Sausalito
Indivisible SF

Indivisible Ventura
Inland Empire Waterkeeper
Inland Ocean Coalition
Institute for Policy Studies
Interfaith Climate Action Network of Contra Costa County
International Marine Mammal Project of Earth Island Institute
Jampac (Jamesville Positive Action Committee)
Klamath Forest Alliance
Lake George Waterkeeper
Lake Pend Oreille Waterkeeper
Lake Worth Waterkeeper
League of Conservation Voters
Little River Waterkeeper
Living Rivers & Colorado Riverkeeper
Lonely Whale
Louisiana Bucket Brigade
Lower Ohio River Waterkeeper
Lower Susquehanna Riverkeeper Association
ManaSota-88, Inc.
Matanzas Riverkeeper
Middle Susquehanna Riverkeeper Association, Inc.
Milwaukee Riverkeeper
Missouri Confluence Waterkeeper
Mobile Baykeeper
Mondo Bizarro
Mountain Watershed Association / Youghiogheny Riverkeeper
MountainTrue / Broad Riverkeeper
MountainTrue / French Broad Riverkeeper
MountainTrue / Green Riverkeeper
Movement for a People’s Party
Natural Resources Defense Council
No Waste Louisiana
North American Climate, Conservation and Environment (NACCE)
Northcoast Environmental Center
NY/NJ Baykeeper
NY4WHALES
Ocean Conservation Research
Ocean First Institute
Oceana
Oceanic Preservation Society (OPS)
Ogeechee Riverkeeper
Ohio Valley Environmental Coalition
One World Adventure
Orange County Coastkeeper
Pacific Environment
Patuxent Riverkeeper
PAUSE - People of Albany United for Safe Energy
Pearl Riverkeeper
Peconic Baykeeper
PennEnvironment
PennFuture
People Concerned about Chemical Safety
People Over Petro Coalition
Physicians for Social Responsibility Florida
Physicians for Social Responsibility Philadelphia
Plastic Pollution Coalition
Post-Landfill Action Network (PLAN)
Potomac Riverkeeper Network / Potomac Riverkeeper
Potomac Riverkeeper Network / Upper Potomac Riverkeeper
Puget Soundkeeper Alliance
Quad Cities Waterkeeper Inc.
Quick Service Bike Shop
Rainforest Action Network
RE Sources for Sustainable Communities / North Sound Baykeeper
Rio Grande Waterkeeper
RISE St. James
Rogue Riverkeeper
Russian Riverkeeper
Sacred Places Institute
Safe Alternatives for our Forest Environment
Safina Center
San Antonio Bay Estuarine Waterkeeper
San Francisco Baykeeper
San Juan Citizens Alliance / Animas Riverkeeper
Santa Barbara Channelkeeper
Santa Cruz Climate Action Network
Satilla Riverkeeper
Savannah Riverkeeper
Save Our Shores
Save the Albatross Coalition

Save the Bay / South County Coastkeeper
Save The Bay / Narragansett Bay Riverkeeper
Save The Colorado
Save The River
Save The River / Upper St. Lawrence Riverkeeper
SeaLegacy
Seneca Lake Guardian, a Waterkeeper Alliance Affiliate
Seven Circles Foundation
Seventh Generation Advisors
Shenandoah Riverkeeper
ShoreRivers / Choptank Riverkeeper
Sierra Club and its Lonestar, Ohio and West Virginia Chapters
Snake River Waterkeeper
SoCal 350 Climate Action
SocioEnergetics Foundation
Solidarity Committee of the Capital District
Sound Rivers / Pamlico-Tar Riverkeeper
Spokane Riverkeeper
St. Johns Riverkeeper
Stand.earth
Stop Fracking Long Beach
Student Public Interest Research Groups
Suncoast Waterkeeper
Sunflower Alliance
Sunrise Bay Area
Surfrider Foundation
SustainUS
Sylvia Earle Alliance / Mission Blue
Tar Sands Action Southern California
Team Marine
Tennessee Riverkeeper
Texas Campaign for the Environment
The 5 Gyres Institute
The Center for Oceanic Awareness, Research, and Education (COARE)
The Climate Reality Project
The Climate Reality Project, Los Angeles Chapter
The Climate Reality Project, Pittsburgh & SWPA
The Endocrine Disruption Exchange
The Last Beach Cleanup
The Last Plastic Straw
The Resistance Northridge - Indivisible
The Shame Free Zone
The Story of Stuff Project
Topanga Peace Alliance and MLK Coalition of Greater Los Angeles
Trash Free Maryland
Trinity Waters, a Waterkeeper Alliance Affiliate
Tualatin Riverkeepers
Turtle Island Restoration Network
Twin Harbors Waterkeeper
U.S. PIRG
Unexpected Wildlife Refuge
Union of Commercial Oystermen of Texas
Upper Allegheny River Project, a Waterkeeper Alliance Affiliate
Vanishing Earth
Venice Resistance
Ventura Coastkeeper
Wabash Riverkeeper Network/ Banks of the Wabash Inc
Waterkeeper Alliance
Waterkeepers Chesapeake
Western Nebraska Resources Council
White Oak-New Riverkeeper Alliance
White River Waterkeeper
WILDCOAST
WildEarth Guardians
Willamette Riverkeeper
Winyah Rivers Alliance
Winyah Rivers Alliance / Lumber Riverkeeper
Winyah Rivers Foundation / Waccamaw Riverkeeper
Wishtoyo Foundation
WWALS Watershed Coalition, Inc. / Suwannee Riverkeeper
Yellow Dog Watershed Preserve / Yellow Dog Riverkeeper
Yuba River Waterkeeper
Zero Waste USA
Zero Waste Washington

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