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ASSESSING AND MONITORING FLOATABLE DEBRIS

August 2002

Section 3
Current Floatable Debris Assessment and Monitoring Methodologies

Floatables Action Plan
Combined Sewer Overflows Studies Program
International Coastal Cleanup Campaign
National Marine Debris Monitoring Program
Storm Drain Sentries Program
Clean Marinas Program

Section 3: Current Floatable Debris Assessment and Monitoring Methodologies

This section provides examples of current plans and programs for assessing and monitoring floatable debris. Although each plan or program seeks to reduce floatable debris in the long term, the specific objectives or strategies of the plans vary. Examples of different objectives include beach cleanup, education, direct floatable debris reduction in specific waterways, classification and tallying of floatable debris for further analysis, and source determination. Most assessment and monitoring programs use volunteers to help with conducting cleanups and collecting and characterizing floatable debris. Determining the type, amount, and sources of floatable debris is an important first step in reducing the amount of floatables reaching aquatic environments.

3.1 Floatables Action Plan for New York and New Jersey Waters

3.1.1 Background

The Floatables Action Plan was developed in 1989 by an interagency work group addressing ocean beach closings in New York and New Jersey waters due to debris washing onto the beaches. This plan is designed to reduce the number of such ocean beach closings. Implementation of the plan was facilitated by the use of helicopter and vessel surveillance, cleanup vessels, volunteers, and prison inmates.

3.1.2 Goals

The Floatables Action Plan is designed to accomplish the following objectives:

- Minimize the amount of floatable debris escaping the Harbor Complex.
- Maintain an effective communication network to coordinate floatable debris removal activities and to respond to the spotting of slicks.
- Ensure timely notification of beach operators of potential wash-ups of floatable debris.
- Minimize beach closings due to floatable debris.

The plan defines floatable debris as waterborne waste material that is buoyant. Examples include wood, beach litter, aquatic vegetation, street litter, sewage-related wastes, fishing gear, and medical wastes. A number of agencies are implementing the plan.

3.1.3 Methodology

The plan calls for the use of skimmer vessels to contain and remove floatable debris before it escapes from the harbor; helicopter flyovers, which provide aerial surveillance to potentially reduce the impact of debris slicks spotted off the coasts; and the use of prison inmates to remove shoreline debris.

3.1.4 Unique Characteristics

The success of the Floatables Action Plan is the result of a partnership involving New York, New Jersey, and local municipalities. The plan uses multimedia approaches, such as aerial surveillance, coastal cleanup of the beaches by volunteers, and containing and removing debris from areas around storm water and CSO dischargers, to reduce the impact of debris on the coasts.

3.1.5 Contact Information

For more information regarding the Floatables Action Plan, contact Larry Gaugler (gaugler.larry@epa.gov), EPA Region 2, Floatables Coordinator, Division of Enforcement and Compliance Assistance, EPA Region 2, 290 Broadway, New York, NY 10007.

3.2 Combined Sewer Overflows Studies Program

3.2.1 Background

In November 1988, to supplement existing information on CSOs and storm water discharges (SWDs) as sources of floatable debris to the aquatic environment, EPA initiated the CSO Studies Program.

3.2.2 Goals

The following are the goals of the CSO Studies Program:

- Characterize CSOs and SWDs as land-based sources of plastic debris in the aquatic environment.
- Determine the types and relative amounts of floating debris contributed by these two sources.
- Characterize the types and composition of debris in Philadelphia and Boston sewage treatment plants (referred to as water pollution control plants [WPCPs] and publicly owned treatment works [POTWs]) to determine the potential waste releases from these facilities during system failures.

3.2.3 Methodology

To implement the CSO Studies Program, a two-component study design was developed. The first component, monitoring of CSOs and SWDs, consisted of the following activities (Battelle Ocean Sciences, 1993):

- *Outfall reconnaissance*. Before making final selections, several CSOs and SWDs were visited to determine the suitability and representativeness of each outfall as a candidate for study.
- *Outfall selection*. Representative CSOs and SWDs were selected based on information acquired through site visits and examination of land use maps and plans.
- *Outfall sampling*. Custom-made nets for containment of debris discharged from selected CSOs and SWDs were designed, manufactured, and installed..
- *Discharge event response*. Floatable debris samples were collected from the containment net at each outfall during or after at least three major storm or discharge events.
- *Sample analysis*. Samples were analyzed to characterize and quantify the types of debris collected.

The second component, which focused on characterizing debris from POTWs and WPCPs, included the following activities:

- *POTW and WPCP selection*. Identification and selection of sewage treatment facilities for sampling man-made debris.
- *POTW and WPCP sampling*. Sampling of measured volume of debris (relative to the daily volume of debris) collected by the screening units for the settling and clarifying tanks. Also, sample a measured volume (relative to the daily volume) of scum from the skimmer tanks.
- *Preprocessing*. Separation of all natural materials (including large pieces of cut lumber) and polystyrene foam from man-made debris. Count numbers of dead animals, food items (oranges, apples, etc.), and large pieces of man-made debris, and estimate the amount of fecal matter. Record types and numbers of items removed from the man-made material.
- *Sample processing and analysis*. Sorting of man-made debris from scum and screening samples and enumerate items.

Candidate CSO and SWD outfalls were selected according to the following criteria:

- *Accessibility*. Outfalls had to be accessible by land or small boat.
- *Outfall water depth*. Water depth at the site had to be shallow (less than 20 feet at high tide).
- *Representativeness*. Drainage areas had to be residential or commercial.
- *Outfall dimensions*. The dimensions of each outfall had to be such that the deployed nets would capture all material discharged during a sampling event.

In addition to the four criteria discussed previously, sewage treatment facilities were selected on the basis of the accessibility of screens and the sedimentation tank clarifiers.

3.2.4 Unique Characteristics

The CSO Studies Program provided EPA with preliminary information on the types and amounts of floating debris discharged from commercial and residential wastewater and storm water outfalls in Philadelphia and Boston. The program also provided information on the types and amounts of floatable debris removed by sewage treatment facilities in each city.

3.2.5 Contact Information

For more information, contact Doug Pabst (pabst.doug@epa.gov), USEPA Region 2, 24th Floor, 290 Broadway, New York, NY 10007-1866 or U.S. EPA's Oceans and Coastal Protection Division at (202)-566-1200.

3.3 International Coastal Cleanup Campaign

3.3.1 Background

The Ocean Conservancy, formerly known as the Center for Marine Conservation, established and maintains the annual International Coastal Cleanup Campaign (ICCC) with support from EPA and other stakeholders. The first cleanup was in 1986 in Texas, and the campaign currently involves all of the states and territories of the United States and more than 100 countries around the world. The ICCC is the largest volunteer environmental data-gathering effort and associated cleanup of coastal and underwater areas in the world. It takes place every year on the third Saturday in September.

3.3.2 Goals

The mission of the ICCC is as follows:

- Remove debris from the shorelines, waterways, and beaches of the world's lakes, rivers, and bordering oceans.
- Collect and catalog information on the amounts and types of debris.
- Educate people on the issue of floatable debris.
- Use the information collected from the cleanup to effect positive change—on all levels, from the individual to the international—to reduce floatable debris and enhance marine conservation.

The ICCC provides inspiration to hundreds of thousands of people who mobilize along waterways and beaches worldwide for the annual cleanup.

3.3.3 Methodology

The ICCC is a nonscientific survey designed to provide an annual "snapshot" of floatable debris pollution affecting the shorelines of the U. S. and around the world. Each U.S. state/territory and foreign country participating in the ICCC has a designated Cleanup Coordinator who, by the early spring of each year, begins preparations for the September event. Within each state/territory and country, a local network of site captains are organized and supplied with the materials and information necessary to conduct the local events. Supplies, provided by The Ocean Conservancy, include data cards, trash bags, gloves, posters, and associated educational materials. During the 3-hour ICCC event, volunteers collect, catalogue, and weigh the debris found on their beaches and shorelines. Information is recorded and catalogued on the ICCC data cards by the volunteers, and the information is returned to The Ocean Conservancy to be processed and tabulated. The Ocean Conservancy compiles the data and produces annual debris summary reports. Refer to Appendix A to review the data forms used by local coordinators and 2001 U.S. data summaries.

3.3.4 Unique Characteristics

The success of this event is the result of volunteerism and sponsorship. In 2001, over 140,000, people across the U.S. participated in the cleanup. They removed about 3.6 million pounds of debris from more than 7,700 miles of coasts, shorelines, and underwater sites. The 3.6 million pounds of debris constitutes more than 3.7 million debris items. Most of the states and local organizations involved have multiple sponsors to support their efforts.

3.3.5 Contact Information

For more information, visit The Ocean Conservancy web site at *www.oceanconservancy.org* or contact The Ocean Conservancy headquarters, 1725 DeSales Street, NW, Suite 600, Washington, DC 20036. Additional information about the cleanup is available from *www.epa.gov/OWOW/oceans/debris* or by contacting EPA's Oceans and Coastal Protection Division at (202)-566-1200.

3.4 National Marine Debris Monitoring Program

3.4.1 Background

EPA along with other federal agencies helped to design the National Marine Debris Monitoring Program (NMDMP), and EPA is supporting The Ocean Conservancy's implementation of the study. NMDMP is designed to gather scientifically valid marine debris data following a rigorous

statistical protocol. The NMDMP is designed to identify trends in the amounts of marine debris affecting the U.S. coastline and to determine the main sources of the debris. This scientific study is conducted every 28 days by teams of volunteers at randomly selected study sites along the U.S. coastline. The program began in 1996 with the establishment of 40 monitoring sites ranging from the Texas/Mexico border to Port Everglades, Florida, and includes Puerto Rico and the U.S. Virgin Islands. The NMDMP calls for the establishment of 180 monitoring sites located along the coast of the contiguous U.S., Alaska, Hawaii, Puerto Rico, and the U.S. Virgin Islands. To date 163 study sites have been designated and 128 sites are collecting data. The program will run for a 5-year period once all of the study sites have been established.

3.4.2 Goals

The NMDMP is designed to answer two specific questions:

- Is the amount of debris on our coastlines increasing or decreasing?
- What are the major sources of this debris?

3.4.3 Methodology

As a result of power analysis, fiscal constraints, and logistics, the NMDMP has developed the following guidelines:

- Approximately 88,000 miles of U.S. coastline (including Puerto Rico and the U.S. Virgin Islands) have been divided into nine regions based on available information on the types of marine debris found, the prevailing currents, and logistics.
- Twenty 500-meter sites per region will be surveyed monthly. The potential sites are selected based on specific criteria (e.g., substratum, slope) advocated by other marine debris monitoring studies and then finally selected by a geographically stratified random selection process.
- Approximately 30 indicator items will be surveyed every 28 to 30 days, on the same day at all 20 sites within a region. This approach will facilitate regional as well as national comparisons.
- The monitoring will be conducted by trained and certified volunteer surveyors, who will be guided and checked by a survey director, who in turn is supervised by the program team.
- The program will adhere to all scientific protocol, and quality assurance procedures will be conducted to ensure quality at all levels of the program.

> Statistical power analysis is the evaluation of the ability to detect significant statistical results when real differences exist in a particular monitoring variable. Application of this tool enables the investigation of the statistical implications of alternative sampling strategies (e.g., numbers of sample replicates or sampling stations). This application is especially useful in designing new monitoring programs or in evaluating the effectiveness (or cost efficiency) of existing programs (USEPA, 1987).

- The study will detect a 30 percent change in the frequency of indicator items over 5 years (if it occurs), with a power of 0.84 and a Type I error of 0.10.

Refer to Appendix B for examples of the data forms used in the NMDMP.

3.4.4 Unique Characteristics

The program considers the physical characteristics of the beach (e.g., slope, substratum, composition, uniformity), prevailing weather patterns (e.g., onshore winds, frequency of storms), beach accessibility (e.g., private or public roads and parking nearby), and beach debris composition (e.g., land-based and ocean-based categories). Any of these variables has the ability to influence the number of potential beaches that can be used for sampling.

3.4.5 Contact Information

For more information, visit *www.oceanconservancy.org* or contact The Ocean Conservancy headquarters, 1725 DeSales Street, NW, Suite 600, Washington, DC 20036. Additional information about NMDMP is available from *www.epa.gov/OWOW/oceans/debris* or by contacting U.S. EPA's Oceans and Coastal Protection Division at (202)-566-1200.

3.5 Storm Drain Sentries Program

3.5.1 Background

The Ocean Conservancy (formerly the Center for Marine Conservation) in partnership with EPA, has established a program to raise awareness and prevent floatable debris (among other pollutants) from being washed down storm drains and ultimately reaching coastal recreation waters. The Storm Drain Sentries program aims to increase public awareness regarding the impact of trash and other pollutants being dumped or poured into storm drains by painting warning messages on one million storm water drains across the United States. Volunteers stencil storm drains with clean water messages such as "Don't Dump! Protect Your Water."

3.5.2 Goals

The goals of the program include: (1) educating people about the connection between people, land, and waterways and the detrimental effects of nonpoint source pollution; and (2) dramatically demonstrating the problem's pervasiveness by identifying the locations of the stenciled drains as potential portals for the introduction of floatable debris into coastal recreation waters.

3.5.3 Methodology

The Ocean Conservancy sends interested groups a storm drain stenciling kit that contains a fact sheet about nonpoint source pollution, its impacts, and what citizens can do to prevent it. The kit also contains instructions for managing a stenciling project and a data card for recording the number of storm drains stenciled and the types of pollutants found around each (CMC, 2000). Refer to Appendix C for examples of storm drain stenciling data cards.

3.5.4 Unique Characteristics

This program, which continues to grow rapidly, involves more than 90 organizations in 34 states and Canada. Volunteers have painted more than 330,000 storm drains. State and local governments, as well as private groups and citizens, have also joined the program (CMC, 1998).

3.5.5 Contact Information

For more information, visit *www.oceanconservancy.org* or contact The Ocean Conservancy headquarters, 1725 DeSales Street, NW, Suite 600, Washington, DC 20036. Additional information about the Storm Drain Sentries Program can be obtained from *www.epa.gov/OWOW/oceans/debris* or by contacting U.S. EPA's Ocean and Coastal Protection Division at (202) 566-1200. Stencils on loan and project guidelines can be obtained from Ron Ohrel of The Ocean Conservancy at (757)-496-0920.

3.6 Clean Marinas Program

3.6.1 Background

The EPA document, National Management Measures Guidance to Control Nonpoint Source Pollution from Marinas and Recreational Boating (USEPA, 2001b), promotes clean marinas through management measures and practices to achieve clean water. Each management measure addresses approaches to prevent nonpoint source pollution, including trash that could become floatable debris, from adversely affecting receiving waters. The measures identified relate to the siting and design of new and expanding marinas and to the good housekeeping activities practiced at marinas.

3.6.2 Goals

The program's goals are to increase awareness of clean water at and within marinas, to protect coastal and inland waterways, and to prevent the degradation of coastal habitats from nonpoint source pollution.

3.6.3 Methodology

Good marina water quality depends on water circulation within the boat basin. In a poorly flushed boat basin, floatables and other pollutants tend to concentrate and collect in corners, poorly flushed coves, and secluded or protected areas to cause offensive odors, stagnant water, and reduced dissolved oxygen. Good flushing of marina basins in tidal waters is primarily driven by the ebb and flow of the tide. Inland basin flushing in lakes and rivers depends on wind-driven circulation and current speed. Marina flushing is enhanced by design considerations such as limiting the number of enclosed areas in the marina, and vice versa, providing an open design with more than one entrance, ensuring that the entrance channel is not deeper than adjacent channels and the depth of the basin, and using mechanical aerators.

3.6.4 Unique Characteristics

Clean Marinas is a voluntary program that encourages marina managers to adopt best management practices to address the impacts of nonpoint source pollution. It also includes management practices that promote the proper and safe handling of solid and liquid waste, fish waste, petroleum control, boat cleaning, sanitation, and pumpout systems for boat holding tanks.

3.6.5 Contact Information

For more information, visit EPA's web site at *www.epa.gov/owow/nps* or call EPA's Assessment and Watershed Protection Division at (202) 566-1146.