Problem Description:
There have been substantial improvements in the NY-NJ Harbor Estuary in terms of floatable debris, largely thanks to the implementation of the Floatables Action Plan (FAP). This Plan was put in place in 1989 due to the efforts of the interagency Harbor Estuary Program Floatables Work Group and has resulted in significant reduction in beach closures.

NYC DEP has a well-established program to capture and remove marine debris through floating barriers, skimmer vessels, underflow baffles and screens, as well as source control programs such as street sweeping, clean streets-clean beaches, adopt-a-basket, water-on-the-go, adopt-a-catch-basin and a B.Y.O campaign. NYC DEP also initiated an interim media campaign in 2016 for reducing street litter at the source and to amplify the existing relevant programs.

New Jersey also has a number of programs in place to capture and remove debris from the waterways. Netting or screening facilities exist at NJ Combined Sewer Overflow (CSO) outfalls, NJDEP's Municipal Separate Storm Sewer System (MS4) and CSO permits require street sweeping programs, and the Passaic Valley Sewerage Commission (PVSC) operates skimmer vessels to remove floatable debris from the Passaic River.

In spite of the progress achieved, floatable debris continues to negatively impact our region, and current efforts mostly deal with debris after the fact (aerial surveillance to spot slicks, skimmer vessels to collect the debris, shoreline cleanup programs, and booms and nets to contain debris from outfalls) rather than attacking the root of the problem. In 2014, an estimated total of $59M was spent on marine debris waste management activities in the Hudson-Raritan Estuary[1]. While efforts to clean up floatable debris will continue to be necessary for the foreseeable future, there is a growing interest among a wide range of stakeholders in exploring pollution prevention options as a more sustainable and rational manner of tackling the issue. At the same time, there is growing concern globally about the ultimate fate of marine debris (in particular plastics) and its many potential effects throughout the food web (including humans).

Objectives:
- Characterize and identify sources of trash focusing on floatables entering local waterways and local conditions contributing to trash dispersal in order to target specific actions for reducing trash at the source.
- Build on Columbia University's 2016 data collection efforts in NYC (funded by NYC DEP). Implementing the protocol in additional areas in NJ will fill data and information gaps to better characterize local sources and types of floatable debris to the greater NY-NJ Harbor Estuary.
- Utilize the data collected at each location to help identify the most effective source reduction actions, including voluntary source control, preventative and reactive policy options, and targeted public awareness and education campaigns.

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[1] Columbia Marine Debris Research Team (2015) Quantifying the Financial Costs to Communities of Managing Trash in the Hudson-Raritan Estuary. Columbia University.

- Create and evaluate a model for engaging citizens and stewardship organizations in identifying sources of litter.
- Showcase this project to educate local businesses and residents about trash impacts and solutions to encourage responsible vendor and consumer behavior and stewardship.

Methodology:
- **Task 1: Refinement of data collection protocol for litter survey, site selection and QAPP development.** The Hudson River Foundation/NY-NJ Harbor & Estuary Program (HEP) and Montclair State University's Passaic River Institute (PRI) will make any necessary adjustments to the protocol developed and used by Columbia University students in NYC. We will develop and/or build on a pre-existing QAPP and training materials so that this effort can be replicated in other areas of the Estuary. HEP will take the lead on QAPP development while PRI will identify data collection locations to implement the protocol. Locations are likely to be areas within the separate storm sewer areas that are highly impacted by trash, close to public shorelines and other environmentally sensitive areas, as well as other areas with special considerations, including identification of low-income communities. Sites will be selected using a combination of GIS databases, Land Use and Land Cover data, US Census data, and other data sources as well as ground-truthing. Specific deliverables include:
  - An EPA/NEIWPCC approved QAPP (Task 1.1);
  - A finalized data collection protocol, including any field materials such as data collection sheets and instructions (Task 1.2);
  - A selection of sites at which to implement the litter survey protocol (Task 1.3).
- **Task 2: Field data collection, analysis and reporting.** Similarly to the effort in NYC over the summer of 2016, PRI will implement the protocol by conducting street litter surveys during the spring/summer of 2017 at 25 pre-determined sites along the Lower Passaic River and its tributaries in New Jersey; HEP will engage two community groups to implement the protocol at 10 additional sites. Each site will be visited at least twice during the data collection phase. Data from this project will be used to track trash to specific points of sale, identify brand items and to record visual observations of conditions that could influence transport of trash to storm drains. All data from both PRI and community group surveys will be collated and analyzed. If the data is made available, a comparison analysis on types, sources, and distribution of litter will be conducted with the New York City data. The field data analysis and results will be described in a final report. The final report will include recommendations for how to best eliminate or reduce local and/or regional sources of floatable debris. Specific deliverables include:
  - Raw data from surveys (Task 2.1);
  - Analyzed data and findings in a report that will identify types of trash by location, distribution and similarities/differences of results in NJ and NYC (Task 2.2).
- **Task 3: Outreach campaign and communication of results.** Following data collection, analysis and reporting, HEP will present the results to the communities where the data was collected and work with local partners, municipalities and other stakeholders to provide resources and technical assistance. A "Community Trash Reduction Toolkit" for local stakeholders will also be developed. This toolkit will include lessons learned, how to replicate the litter surveys and recommended courses of action for local source reduction depending on results. HEP will also

engage partners and the Trash Free Waters Partnership to identify potential ways to control trash at its source based on the data and propose next steps, including identifying sources of funding and strategies for continuing/expanding the surveys in the future. Specific deliverables include:

- o Presentations to local communities in pollution prevention efforts (Task 3.1);
- o A toolkit/user's manual for community groups (Task 3.2);
- o Discussion with the Trash Free Waters Partnership to review findings and identify possible next steps for implementing identified source control measures (Task 3.3).

Additionally, HEP plans to display all data collection locations and results from the 2016 and 2017 surveys in the Estuary through an interactive mapping feature on HEP's website. While this will be completed under a separate agreement, an interactive map will be a straightforward way for serving the data out to the public through HEP's newly updated and redesigned website.

Roles and Responsibilities:

This project is a collaborative effort between HEP and PRI. HEP will serve as the lead institution of this project and be responsible for coordinating the project components and supervising subcontractors. PRI will share responsibilities in project design and implementation.

The Hudson River Foundation (HRF) seeks to make science integral to decision-making with regard to the Hudson River and its watershed and to support competent stewardship of this extraordinary resource. This purpose is pursued through support of scientific research; communication to expand knowledge about the river among the scientific community, policy makers, and the public at large; initiatives to enhance management of the Hudson ecosystem; education about the River; and physical improvements to the riverfront. The Hudson River Foundation is the host of HEP and the contracting entity for this grant. **NY-NJ HEP** is one of 28 National Estuary Programs in the country. The Program is an ongoing effort to protect, conserve, and restore the estuary. Participants in the Program include representatives from local, state, and federal environmental agencies; scientists; citizens; businesses; and environmentalists, among others.

Ariane Giudicelli is the water quality program manager at HRF/HEP. Previously she worked for the NJDEP and has over 10 years' experience in the water quality field. For this project she will oversee QAPP development, community group data collection and outreach efforts.

Montclair State University's Passaic River Institute (PRI) actively engages in environmental research and education with a focus on prioritizing area environmental needs and identifying sustainable solutions. PRI has been especially active in providing environmental training and education programs, and promoting public awareness in environmental management and sustainability.

Meiyin Wu is the Director of PRI and Professor of Biology at Montclair State University, an environmental scientist with specialization in water quality and aquatic ecology. For this project, Dr. Wu will share the responsibilities in QAPP development, designing and implementing the litter surveys, performing data sharing and outreach activities, and report preparation**.**