October 16, 2017

Submitted via e-mail to oceanlitterstrategy@resources.ca.gov

Ocean Litter Prevention Strategy Planning Team

Re: CASA and Coalition Comments on the Ocean Protection Council's draft California Ocean Litter Prevention Strategy: Addressing Marine Debris from Source to Sea

Ocean Litter Prevention Strategy Planning Team:

The California Association of Sanitation Agencies (CASA), Bay Area Clean Water Agencies (BACWA), and the Southern California Alliance of Publicly Owned Treatment Works (SCAP) (collectively referred to herein as "Associations") appreciate the opportunity to comment on the Ocean Protection Council's (OPC) draft California Ocean Litter Prevention Strategy: Addressing Marine Debris from Source to Sea (draft Strategy). For 60 years, CASA has been the leading voice for public wastewater agencies on regulatory, legislative and legal issues. CASA is an association of local agencies, engaged in advancing the recycling of wastewater into usable water, generation of renewable energy, and other valuable resources. Through these efforts CASA's members help create a clean and sustainable environment for Californians. BACWA is a joint powers agency whose members own and operate publicly owned treatment works (POTWs) and sanitary sewer systems that collectively provide sanitary services to over 7.1 million people in the nine-county San Francisco Bay (SF Bay) Area. SCAP represents over 80 public agencies providing water and wastewater service for 19 million people in 7 counties of southern California.

The Associations support statewide and nationwide efforts to reduce ocean litter and marine debris. For instance, in 2015 CASA co-sponsored the plastic microbeads bill (AB 888), and worked with a statewide coalition to enact legislation to reduce plastic pollution. Several of our members have published peer-reviewed research findings on microplastics detection and methods for quantification over the past several years, a key conclusion of which was that more work is needed to standardize sample collection from wastewater treatment plants (WWTPs), as well as laboratory methods for detection of microplastics. Additionally, BACWA has worked independently and collaboratively with the San Francisco Estuary Institute (SFEI) to better understand microplastics coming from wastewater facilities in the San Francisco Bay Area.

Summary of Recommendations

Using the guided questions for feedback provided by the Ocean Litter Prevention Strategy Planning Team, the Associations offer the following recommendations regarding priorities, objectives (with corresponding needs and barriers), resources, and lead and partner organizations:

- *What are your thoughts on the three ocean litter priority strategies?*
  a) *Do they reflect your understanding of what the state's ocean litter priorities are/should be?*

Comments: The Associations support prioritization of source control, product stewardship, and replacing use of plastic in products with alternatives when available (Priorities 1 and 2), as these are the best means to reduce inputs of microplastics and macroplastics to the water environment. Wastewater agencies are at the forefront of source control with our focus on industrial waste pretreatment, but many lack legal authority as well as practical means to regulate consumer use of products that can produce microplastic debris. We support product stewardship and product reformulation, where feasible.

While local efforts may be appropriate in some instances, we believe that source control of plastic products will be most effective at the federal or state level. Similar bans enacted via state and federal legislation on microbeads in cosmetics and personal care products provide a model approach. Localized efforts, as suggested in some of the action items in Objectives 1 and 2, are not likely to be as effective (due to their inconsistent content and applicability), and their efficacy in reducing plastic litter may be difficult to assess. Additionally, more work is needed to identify products that contribute to microplastic pollution in wastewater that are good candidates for reformulation or other measures (e.g. producer responsibility approaches or product bans). Therefore, source reduction efforts focusing on the items identified in Objectives 1 & 2 are likely to be the most beneficial at this point in time.

Priority #3 focuses on advancing research on microplastics and technological solutions to reduce microplastics in wastewater discharges, and Objective #4 includes a number of areas identified for further research. This is the priority area and Objective of greatest interest to the Associations and their members. While we believe this to be an important priority area, as detailed below, at this point in time, efforts should focus less on ways to reduce microfibers in wastewater (as suggested in Action Items 4.1.1 and 4.3.2.), and much more on doing the work needed to standardize sampling and detection methods (as in Action Item 4.3.1), identify and quantify sources of microfibers in the environment, determine fate and transport of microfibers, and determine whether and how microfibers impact marine life. **We strongly recommend that OPC develop an integrated strategy for advancing this research, working in cooperation with SFEI[1], the Water Environment and Reuse Foundation[1], and the Associations.**

Findings reported in existing literature are neither consistent nor conclusive regarding the quantity, WWTP removal efficiency, physical properties, or sources of microplastics. The mixed interpretations are likely due to the use of non-standardized

[1] Sutton, S., Sedlak M. 2017. Microplastic Monitoring and Science Strategy for San Francisco Bay. SFEI Regional Monitoring Program for Water Quality in San Francisco Bay.
http://www.sfei.org/documents/microplastic-monitoring-and-science-strategy-san-francisco-bay

methods, inadequate detection, and/or inadequate sampling approaches. Therefore, a priority action item under Objective 4 should include a step-wise approach to develop standardized methods for detecting and characterizing microplastics, assessing microplastic pathways[2] and WWTPs' relative contributions to ambient conditions, determining whether the microplastics contributions by WWTPs are likely to have an environmental impact, determining whether there are source controls such as product reformulation that can reduce microplastic levels in effluent, and developing and implementing an integrated strategy using science-based research by experts in the microplastics field. Additional research needs include investigation of partitioning of microplastics to solids during the wastewater treatment process, which also may require the development of new standardized methods, as well as assessment of pathways to and impacts on the water environment associated with biosolids reuse. We recommend that OPC make the changes shown below in the table of Objectives and Strategies excerpted from the draft Strategy.

OBJECTIVE 4. Conduct research on emerging issues related to land-based ocean litter.

Strategy 4.1. Conduct a comprehensive characterization study of trash inputs to identify and track the sources of the most common litter products.			
Action Items	**Needs & Barriers**	**Status of Action & Resources Available**	**Lead & Partner Organizations**
4.1.1 Assess plastic and microplastic pathways (including sources and sinks)	-Need standardized methods first. See 4.2.1.	Miller et al. 2017[3] indicates rivers are major source of microfibers to ocean, with no correlation to WWTPs. -PBS Newshour article, http://www.pbs.org/newshour/updates/new-york-river-dumps-millions-fabric-microfibers-ocean-daily/	SFEI
4.1.2 Conduct a survey of microplastics in a range of ecosystems, encompassing freshwater, marine and estuarine waters in areas of known or likely high concentrations of microplastics.			
4.1.3. Assess relative contributions of microplastic sources to ambient conditions			
4.1.~~1~~4. Analyze and quantify discharges from a variety of ~~endpoints~~ sources, including street litter, stormwater, wastewater, and direct discharges ~~form~~ from coastal tourism and homeless encampments, etc. throughout the state of California. Develop targets for reduction and implementation		-New effort	

[2] Miller, R. Z., Watts, A. J., Winslow, B. O., Galloway, T. S., & Barrows, A. P. 2017. Mountains to the sea: River study of plastic and non-plastic microfiber pollution in the northeast USA. Marine Pollution Bulletin. **(Appendix C)**

plans for each product (connect data to action plan, product source).			
Strategy 4.2. Increase the characterization of microplastics and macro-debris.			
Action Items	**Needs & Barriers**	**Status of Action & Resources Available**	**Lead & Partner Organizations**
4.2.1 Form a panel of recognized microplastics experts to work with OPC to develop research plan in 4.2.2.			Panel should include SFEI, WE&RF, wastewater agencies and associations, and other interested federal agencies and organizations.
4.2.2 Develop a strategic research plan to address critical knowledge gaps regarding microplastics within the next 5 years.		- see WE&RF microplastics research recommendations[1] -SFEI Monitoring and Science Strategy[2]	The plan should be conducted in concert with SFEI, WE&RF, wastewater agencies and associations, and other interested federal agencies and organizations.
4.2.3 Develop standardized methods for sampling, detecting, and characterizing microplastics		- see WE&RF microplastics research recommendations[1]	
4.2.~~1~~4. Invest in source identification for plastics by funding studies using Fourier Transform Infrared (FTIR) microscope.	- There is currently not a clear understanding of the source of plastics entering the marine environment - Equipment is costly (e.g. the cost of a microscope is roughly $70,000)	- Ongoing effort - California State University Channel Islands has previously borrowed a FTIR microscope and learned that they had previously underestimated the amount of plastic in their samples. - This type of microscope would allow researchers to determine the composition of the plastic and possibly its source, as well as forensic tracking of substances.	
4.2.~~2~~5. Develop standardized monitoring/data collection and compliance methods for trash and microplastics,		- Ongoing effort	

including methodologies for measuring reductions of litter.			
4.2.~~3~~6. Develop a program to model and monitor microplastics transport and degradation.		- Ongoing effort	
Strategy 4.3. Advance research on microplastics and technological solutions to ~~reduce~~characterize microplastics in wastewater discharge.			
Action Items	**Needs & Barriers**	**Status of Action & Resources Available**	**Lead & Partner Organizations**
4.3.1. Develop step-wise, comprehensive wastewater research plan based on input from a newly formed consortium of microplastics expert scientists.		WE&RF[1], SFEI research strategies[2]	
4.3.~~1~~2. Research wastewater effluent to identify and quantify microfibers and microplastics.		- Ongoing effort - San Francisco Estuary Institute	
4.3.~~2~~3. Research technological solutions at wastewater treatment plants or in washing machines (filtration/collection system).		- Ongoing effort - Rozalia ball **(Note: Cora ball is made of plastic which will likely break down into microplastic over time, so alternative materials or design may be necessary)**	
4.3.~~3~~4. Research technical solutions for microfibers in apparel (i.e., washing machines/add-ons and innovative solutions).		- Ongoing effort	
Strategy 4.4. Research ecological and toxicological impacts of commonly found ocean litter (including plastics, microplastics, and microfibers) on marine resources and human health.			
Action Items	**Needs & Barriers**	**Status of Action & Resources Available**	**Lead & Partner Organizations**
4.4.1 Determine whether ambient concentrations of microplastics are likely to have an environmental impact.		-WE&RF 2017 white paper – Microplastics in Aquatic Systems[1]	

4.4.2 Determine concentrations of microplastics which have an effect for a range of marine and freshwater and sediment species.		-WE&RF 2017 white paper – Microplastics in Aquatic Systems[1]	
4.4.~~1~~3. Work with DTSC and others to identify ongoing research and other work that may help fill knowledge gaps on the chemical components of common ocean litter items; the potential for chemicals to migrate from litter items into the environment; and the potential for chemicals from various forms of ocean litter to expose and harm people, aquatic organisms and the marine environment.	- Scope of DTSC priorities	- Ongoing effort - Unknown, may depend on scope of DTSC 2018-2020 Priority Products Work Plan; potentially the Safer Consumer Products Program	Lead: OPC, Partner: DTSC
4.4.~~2~~4. Research on relationship between plastic toxicity and human health via consumption of seafood exposed to plastic debris.		- Ongoing effort - EPA compilation paper	
4.4.~~3~~5. Research alternative materials and composition of plastics so they break down easier, and are less likely to absorb and/or emit toxins.		- Ongoing effort	
Strategy 4.5. Assess the effectiveness of existing bans and policies.			
Action Items	**Needs & Barriers**	**Status of Action & Resources Available**	**Lead & Partner Organizations**
4.5.1 Conduct cost benefit analyses for implementation of different litter reduction policies/strategies and provide them to cities (i.e. local ordinances to ban expanded polystyrene).		- New effort - Reporting on effectiveness of bag ban (a few NGOs and local governments are collecting data)	
4.5.2. Analyze impact of the statewide plastic bag ban (i.e. how many bags are kept out of circulation, corresponding environmental protection gains, cost savings to government, if any).		- Ongoing effort	

4.5.3 Determine whether source controls such as product reformulation can reduce microplastic levels in wastewater effluent			

b) If not, what do you think the top priorities should be?

Comments: In addition to methods standardization and collaborations on strategies mentioned above, the Associations would like the OPC to consider adding a priority area to explore the potential for mitigation of macroplastics already in the environment. Even with reduction of inputs from land-based ocean litter, a significant amount of plastics are already present in the environment and will remain there for a very long time. There have been many technological innovations developed in recent years for devices that help trash cleanup of ports and harbors[3,4] which are close to land and an ideal area to catch the greatest trash inputs to the ocean, and for a device that can help clean up the Pacific Gyre garbage patch[5]. With sufficient funding, these devices could make a difference.
The Associations also support prioritization of research-based public education (Objective 3). Environmental education efforts should recognize recent efforts to understand microplastics in WWTP effluent, and should emphasize steps individuals can take to help reduce the problems associated with microplastics and macroplastics.

c) What ocean-based litter strategies do you think should be included as a priority strategy?

Comments: We support prioritizing the ocean-based litter strategies under Objective 5. Through trawl monitoring conducted by several of our members across Southern California, marine debris data has been collected for over 20 years. Plastic fishing gear is the most common component of the trash found in the trawl samples, and is well-documented as being detrimental to marine life. Source reduction of fishing gear, including macro-plastic debris (>5 mm) such as fishing line and traps, would reduce harm to marine animals that come into contact with this trash.

- *Are there any actions that were not included in the draft Strategy that you would like to see incorporated?*

Comments: Please see our recommendations in the comments above.

- *Do you think five years is the appropriate time scale for this document? Do you think it would be better if the time frame was longer or shorter?*

[3] http://www.marinatrashskimmer.com/
[4] http://seabinproject.com/
[5] https://www.theoceancleanup.com/

Comments: Five years is an appropriate time scale. It will take 5 years to develop the appropriate methods and conduct the needed impact and source tracking research. After that, an additional assessment of needed action items should be made based on best available knowledge.

- *Please identify any action items that you (and your organization) may be interested in taking a lead or partnership role in implementing or feel strongly that you may want to be involved in.*

Comments: Several member agencies within CASA, BACWA and SCAP have done considerable research to characterize microplastics in WWTP influent and effluent. Knowledge of these agencies' efforts may help improve the draft Strategy. Please see Appendix C for a summary of recent microplastics research. Some of these member agencies are also involved in the collaborative research efforts of SFEI and of the Southern California Coastal Waters Research Project (SCCWRP), both of which are or may be able to carry out some of the research that is needed.

In addition to providing the Planning Team with information regarding past method development, the Associations would like to participate in OPC's future efforts to develop methods through continuing efforts to refine microplastic sampling, quantification and characterization. The Associations would also be interested in participating in efforts to identify and promote source control solutions through product reformation and legislation, as they are developed.

The Associations would also like to contribute local and regional trawl macro-plastic debris data. Some members have collected data regarding the trawl-caught marine debris for over 2 decades. They found that plastic fishing gear is the most common component of the marine trash. We would be happy to provide this rich dataset to help with the effort to help minimize lost fishing gear. In addition, other regional trawl debris datasets are also available[6].

Finally, as a stakeholder, the Associations are committed to ongoing participation in the State's efforts to further understand and reduce plastic pollution in the ocean.

Specific Recommendations from WE&RF and SFEI

The Water Environment & Reuse Foundations (WE&RF) recently released a white paper on the risk of microplastics in the aquatic environment titled *Microplastics in Aquatic Systems: An Assessment of Risk*[1] (Appendix A), which provides a valuable overview of the state of knowledge regarding microplastics. The white paper reviewed the risk of microplastics to aquatic systems by conducting a critical literature review and identifying key knowledge gaps. The author, Allen Burton, Ph.D.[7], is an aquatic toxicologist at the University of Michigan. Dr. Burton suggests that there is enough

[6] Southern California Bight Regional Trawl Surveys 1994-2013
http://www.sccwrp.org/ResearchAreas/RegionalMonitoring.aspx
[7] http://seas.umich.edu/research/faculty/allen_burton

information to say the occurrence of microplastics in the environment has not been shown to cause adverse effects to aquatic wildlife. The paper also identified several knowledge gaps and research to better manage and understand the environmental implications of microplastics.

The paper further suggests that a strategic research plan is needed to address these critical knowledge gaps within the next five years, and proposed that it be conducted in concert with interested federal agencies and organizations. Some of the knowledge gaps are currently being addressed by these agencies and individual researchers, so we believe that the draft Strategy should include an action item to engage key parties and stakeholders to optimize research expenditures, topics, and leads and coordinate the development and implementation of an overall strategic research plan.

Another key source describing ongoing research and monitoring studies is SFEI's 2017 report titled "*Microplastic Monitoring and Science Strategy for San Francisco Bay*"[2] (Appendix B), which describes SFEI's research and management program, which should also be considered in the development of this draft Strategy.

Each of these documents identifies management questions and strategies to address issues brought forth in the draft Strategy. **OPC should support the work outlined in these documents and allow it to be completed before continuing to the next phases such as control measures.** Additional investigations may be necessary to ensure the recommendations are relevant across the State, though imposition of routine monitoring requirements on POTWs is unnecessary, since research to develop standardized methods is needed first. Special studies are a more appropriate approach to determine if and how much microfibers are present, as well as to conduct further investigations into whether there are any associated environmental impacts.

Summary

The Associations' recommendations regarding actions that are not currently incorporated into the draft Strategy closely align with the aforementioned WE&RF 2017 white paper assessing risks of microplastics[1], as well as SFEI's 2017 Microplastic Monitoring and Science Strategy for San Francisco Bay[2].

Specifically, development of a strategic research plan should be added to expand Strategy 4.2, which currently outlines limited efforts to increase the characterization of plastics. This strategic research plan is needed to address critical knowledge gaps within the next 5 years, prior to implementing solutions to reduce microplastics in WWTP effluent as currently included in Strategy 4.3. The plan should be conducted in concert with SFEI, WE&RF, and other interested federal agencies and organizations. Most importantly, standardized microplastics definitions, sampling, quantification and characterization methods are needed. We recommend that a group of recognized microplastics experts be engaged to work with OPC to develop these methods.

Thank you for the opportunity to review and comment on the draft Strategy. We look forward to working with OPC and the Planning Team as the Strategy is finalized and

implemented, and we hope to have the opportunity for several representatives of our organizations (and/or member agencies) attend the upcoming stakeholder workshop on Nov. 15-16, 2017 at the NOAA Southwest Fisheries Science Center in La Jolla.

Sincerely,

Adam Link, Director of Government Affairs
California Association of Sanitation Agencies

Dave Williams, Executive Director
Bay Area Clean Water Agencies

Steve Jepsen, Executive Director
Southern California Alliance of POTWs

Attachments

Appendix A Water Environment & Reuse Foundation (WE&RF) 2017 Recommendations and Risk Assessment regarding Microplastics in Aquatic Systems

Attachment:

Burton Jr., G.A., Water Environment & Reuse Foundation (WE&RF) 2017, *Microplastics in Aquatic Systems: An Assessment of Risk*. Summary of Critical Issues and Recommended Path Forward. http://werf.informz.net/werf/data/images/CEC7R17.pdf

Appendix B SFEI Microplastic Monitoring and Science Strategy for San Francisco Bay

Attachment:

Sutton, S., Sedlak M. 2017. *Microplastic Monitoring and Science Strategy for San Francisco Bay*. SFEI Regional Monitoring Program for Water Quality in San Francisco Bay. http://www.sfei.org/documents/microplastic-monitoring-and-science-strategy-san-francisco-bay

Appendix C Scientific Research on Microplastics

BACWA – Studies of Microplastics in the San Francisco Bay

In the San Francisco Bay Area, the San Francisco Estuary Institute (SFEI) has become a statewide leader on studying microplastics in the environment. SFEI produced a Fact Sheet that provides a brief summary of their work[8].

SFEI's efforts began in 2015 with coordinating a small study looking at microplastic particles in wastewater treatment effluent, fish, and ambient San Francisco Bay water. The results were presented as a poster at the State of the Estuary meeting and at the Society for Toxicology and Chemistry.

Following the release of these results, a group of BACWA member agencies' laboratory staff, led by East Bay Municipal Utilities District, formed a workgroup to independently verify the results in wastewater effluent[9]. They considered different effluent sample collection regimes, and used the same NOAA method as described in the SFEI study for analysis. The BACWA group found that this method, developed for marine environment, was not effective at removing part of the naturally-occurring solid material in wastewater effluent. Thus, many of the particles that may have been characterized as plastics were in fact natural materials. Cellulose and fatty acids were found to be major interferents in the method. Compounding this problem, it is often not possible to visually distinguish natural and anthropogenic plastic particles. For example, a cotton-indigo fiber and a blue plastic fiber are visually indistinguishable. The study also showed that some microplastic particles crumble during processing, inflating the counted number of particles.

The BACWA study further established that the only way to positively identify a microparticle as plastic is through a spectroscopic method such as Fourier-transform infrared spectroscopy (FTIR) or Raman spectroscopy. These techniques, in addition to microscopy, significantly increase the analysis time and cost of any study on microplastics, especially since many microparticles are not homogenous and would need to be characterized at multiple sites on the particle.

These findings led SFEI to edit their publications on wastewater effluents to read 'microparticles' instead of 'microplastics'. In SFEI's 2017 Microplastic Monitoring and Science Strategy for San Francisco Bay[2], which lays out a microplastics science program through 2020, all samples will be confirmed as plastic via spectroscopy. Additionally, USEPA is developing methods for microplastic sampling and analysis under the marine debris program, with results expected this fall, and NOAA is conducting interlaboratory comparison studies to evaluate the precision and reproducibility of various methods. Pending the results of these efforts, SFEI may

[8] http://www.sfei.org/sites/default/files/biblio_files/RMP%20Sutton%20FactSht%20Microplastics%20081116web.pdf

[9] Dyachenko, et al. 2017, Extraction and identification of microplastic particles from secondary wastewater treatment plant (WWTP) effluent, Analytical Methods, 9, p. 1412 https://bacwa.org/wp-content/uploads/2017/03/BACWA-method-article.pdf

include additional interlaboratory comparison studies in 2018 as part of its Microplastics Strategy.

Lessons Learned From Sanitation Districts of Los Angeles County's Studies of Microplastics in WWTP Effluent

There have been varying findings regarding the amounts and characteristics of microplastics in WWTP effluent. Amounts in published literature vary from very little (0.000004 particles/ gallon in tertiary to 0.003 particles/ gallon in secondary)[10] to larger amounts (0.02 particles / gallon)[11]. These differences in amounts are likely due to varying expertise and methods amongst studies.

To ensure sample representativeness, valuable lessons can be learned from the Sanitation Districts' work with microbeads[10]. The Sanitation Districts found that microplastics can have varying densities, so samples must be taken to capture both high and low density particles in WWTP effluent. Sample volume has been variable in recent studies and should be standardized in future methods to characterize microplastics in WWTP. For example, the Sanitation Districts' results were determined after sampling more than 189,000 liters taken over several days at each plant, while literature data were based on much smaller statistically non-representative volumes, typically 4-2000 L. During sample collection, standard sieve sizes should be established, and care should be taken to keep sieves from clogging during the sampling process. Following collection, sample preparation should also be standardized. Many of the plastic particles observed by the Sanitation Districts, especially in secondary effluent, were either coated with a biofilm or bound up in larger floc particles, which altered the expected density of coated particles. To properly characterize and count the microplastics, the Sanitation Districts found that "soft" Fenton-type digestions are necessary to assure the plastics are identified without being destroyed. Finally, a standardized determinative method should be established. Microbeads can be visually identified and counted using a microscope. Plastic microfibers, however, are much more ambiguous and might be impossible to distinguish from natural fibers using only visual inspection cues. Fourier Transform Infrared Spectroscopy (FTIR) with a microscope attachment should be used as the determinative method in order to characterize fibers as plastic or other. The NOAA document, "Methods for the Analysis of Microplastics in the Marine Environment"[12] is a good starting point for method development, but needs to be further modified for wastewater effluent samples[1,9], to rule out non-plastic materials such as grease and cotton.

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[10] Carr et al. 2016. Transport and fate of microplastic particles in wastewater treatment plants, Water Research, 91, p. 174-182

[11] Sutton et al. 2016. Microplastic contamination in the San Francisco Bay, California, USA, Marine Pollution Bulletin, 109, p. 230-235.

[12] Masura, J., et al. 2015. Laboratory methods for the analysis of microplastics in the marine environment: recommendations for quantifying synthetic particles in waters and sediments. NOAA Technical Memorandum NOS-OR&R-48. https://marinedebris.noaa.gov/sites/default/files/publications-files/noaa_microplastics_methods_manual.pdf

Appendix C Attachments:

Carey, T. L. August 2017. *This New York river dumps millions of fabric microfibers into the ocean daily*. PBS News hour article http://www.pbs.org/newshour/updates/new-york-river-dumps-millions-fabric-microfibers-ocean-daily/

Carr, S.A., J. Liu, A.G. Tesoro, 2016. Transport and fate of microplastic particles in wastewater treatment plants, Water Research, 91, p. 174-182

Carr, S. A. 2017. Sources and dispersive modes of micro-fibers in the environment. Integrated Environmental Assessment and Management, 13 (3), p. 466-469.

Dyachenko, A, J. Mitchell, N. Arsem. 2017. Extraction and identification of microplastic particles from secondary wastewater treatment plant (WWTP) effluent, Analytical Methods, 9, p. 1412
https://bacwa.org/wp-content/uploads/2017/03/BACWA-method-article.pdf

Miller, R. Z., A.J. Watts, B.O. Winslow, T.S. Galloway, & A.P. Barrows. 2017. Mountains to the sea: River study of plastic and non-plastic microfiber pollution in the northeast USA. Marine Pollution Bulletin.