

**Philadelphia Water Department  
Office of Watersheds  
October 2010**

**MEMORANDUM: Recommendation on the Removal of Floatables Collection Nets at Philadelphia's T-04 Outfall**

For the past twelve years, the Philadelphia Water Department has been operating a net for floatables collection at its T-04 outfall. Since PWD is under no permit obligation for the continued operation of the nets and due to PWD's belief that the nets are inefficient and resources could better be used elsewhere, PWD is proposing removal of T4 nets.

## Background

One of the ways that PWD has been complying with EPA's Combined Sewer Overflow Policy is through the implementation of the Nine Minimum Controls (NMCs) outlined under the policy. PWD is constantly working to implement the NMCs by utilizing Best Management Practices to maximize our current system. One important guideline in the CSO Policy is the control and removal of solids and floatables, which falls under NMC 6. The ultimate goal of NMC 6 is, where feasible, to reduce, if not eliminate, by relatively simple means, the discharge of floatables and coarse solids from combined sewer overflows to the receiving waters. PWD has looked at and continues to look at technology-based, non-capital intensive control measures such as skimmer and pontoon vessels, and cleaning of open mouth trapped inlets, in order to implement NMC 6. As part of PWD's floatables control measures, trapped inlets and catch basins are regularly inspected and cleaned to remove accumulated floatables and other debris. PWD operates skimmer and pontoon vessels that remove floatables and other debris on the Delaware and Schuylkill rivers in the spring, summer, and fall seasons.

With NMC6 in mind, and as part of a sewer reconstruction project at CSO Outfall T-04, located at the intersection of Rising Sun Avenue and Tacony Creek, a pilot floatables netting chamber was constructed and installed in April of 1997. The Fresh Creek Technologies, Inc. Netting TrashTrap system was selected for use. The two disposable nets, lifting baskets, and support frames are housed in the chamber and installed in-line with the overflow between the regular chamber and the outfall. This chamber was built to collect floatable materials for subsequent weighing and disposal. The cost of the sewer reconstruction project was \$738,991 and installation of the initial two-net system required a marginal cost increase of \$28,000 in addition to the original contract.

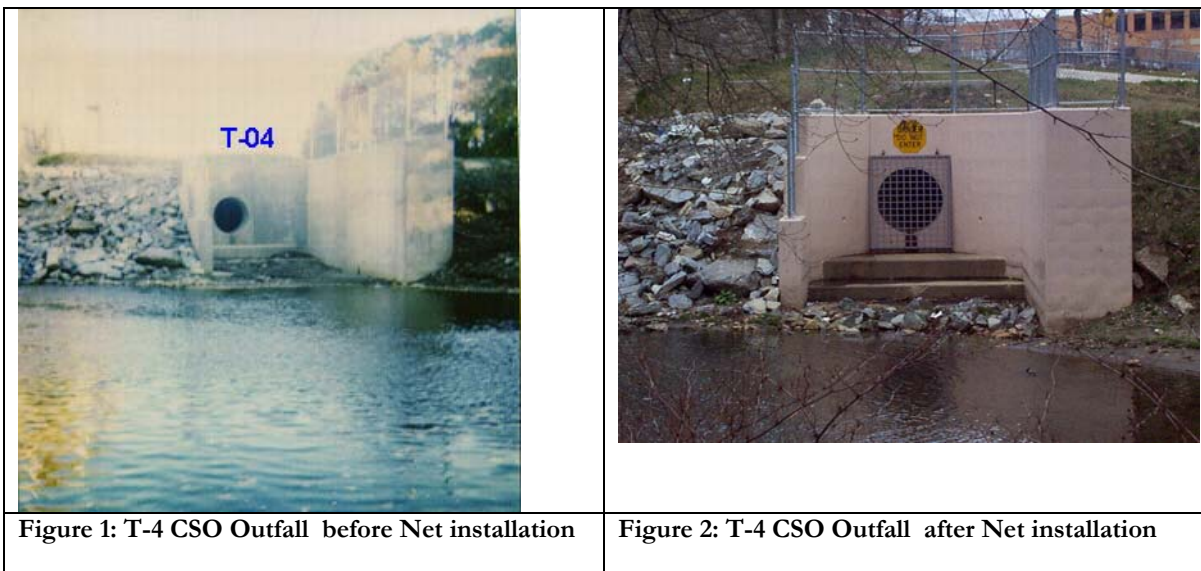
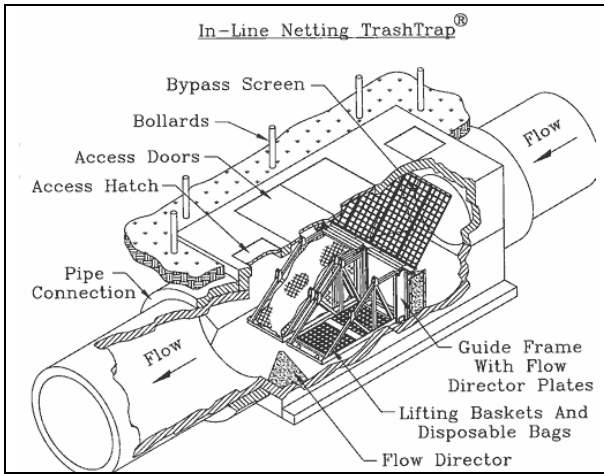


Figure 1 and Figure 2 show the T-04 outfall before and after the netting chamber was constructed.



**Figure 3: Diagram of In-Line Netting TrashTrap**



**Figure 4: Photo of Nets installed in T-4 CSO Outfall**

**Figure 3** and **Figure 4** demonstrate the In-line netting system.

## Operation and Maintenance of Floatables Nets at T-04 Outfall

Over the past twelve years PWD has continuously operated and inspected the netting system at its T-04 outfall. The weight of material collected has been continuously monitored in order to evaluate the feasibility of any further implementation of this type of control facility.

Servicing of the debris net at the T-04 regulator is approximately 1 hours work. This includes a two man crew from Inlet Cleaning to remove the nets and dump the debris and a two man crew from Flow Control to install new nets. Each replacement costs roughly \$355.80, including the physical net and the man-hours required to replace them.

Net cost for 2 nets	\$190.00
Crew cost	\$160.04
Average Disposal cost	\$5.76
<b>Total per Job</b>	<b>\$355.80</b>

Table 1: Breakdown of net-related maintenance costs

The maintenance of the nets is shown in the pictures of **Figure 5** and **Figure 6**.



Figure 5: Maintenance of floatables nets at T-04



Figure 6: Maintenance of floatables nets at T-04

The nets are usually replaced every two to three months. **Table 2** shows the total cost of all the net replacements that have been done each year.

Year	# of Replacements	Total Cost
1997	8	\$2,846.40
1998	5	\$1,779.00
1999	6	\$2,134.80
2000	7	\$2,490.60
2001	6	\$2,134.80
2002	7	\$2,490.60
2003	7	\$2,490.60
2004	7	\$2,490.60
2005	5	\$1,779.00
2006	8	\$2,846.40
2007	7	\$2,490.60
2008	3	\$1,067.40
2009	2	\$711.60

Table 2: Total cost of net replacements done each year

A major problem with the operation of T-04 netting system is that there have been several occasions over the years where the nets were torn or lost due to high flow velocity. This made it more difficult to accurately determine the total debris removed by the nets.

## Captured Floatables Composition

Over the twelve years that the nets have been in operation, we have determined that the outfall nets are not as efficient as previously believed for the PWD system. Although no formal analysis has been conducted on the ratio of organic matter to floatables collected, visual inspection and historic field notes show that the nets mostly collect leaves and very little floatables like cans or bottles. This is mainly because most of the floatables that get in the wastewater system are removed by existing catch basins before they get to the outfalls, so the majority of what the nets collect is organic matter.

Figure 7 and Figure 8 show the mostly organic debris collected by the T-04 nets.

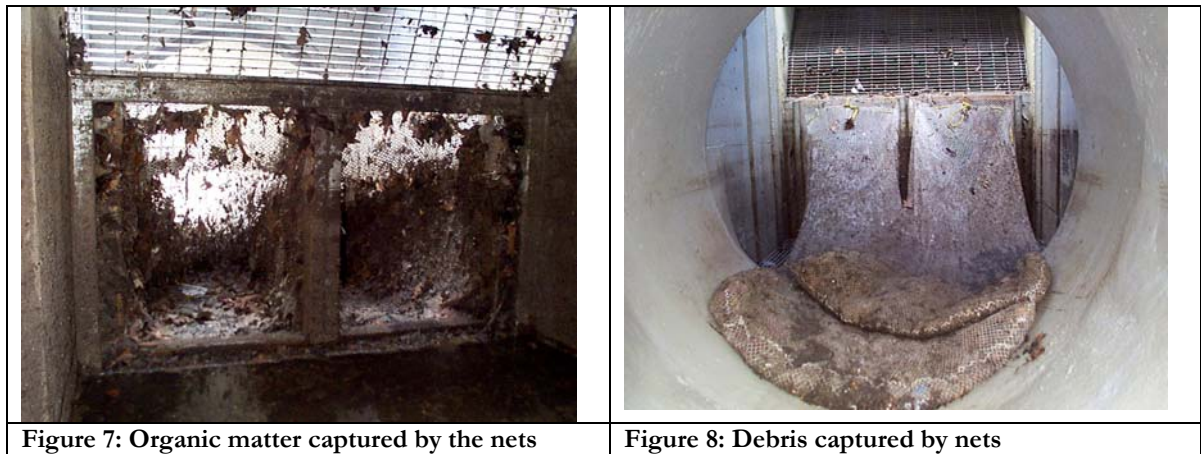


Figure 9 below shows the weight of debris measured during replacements each year.

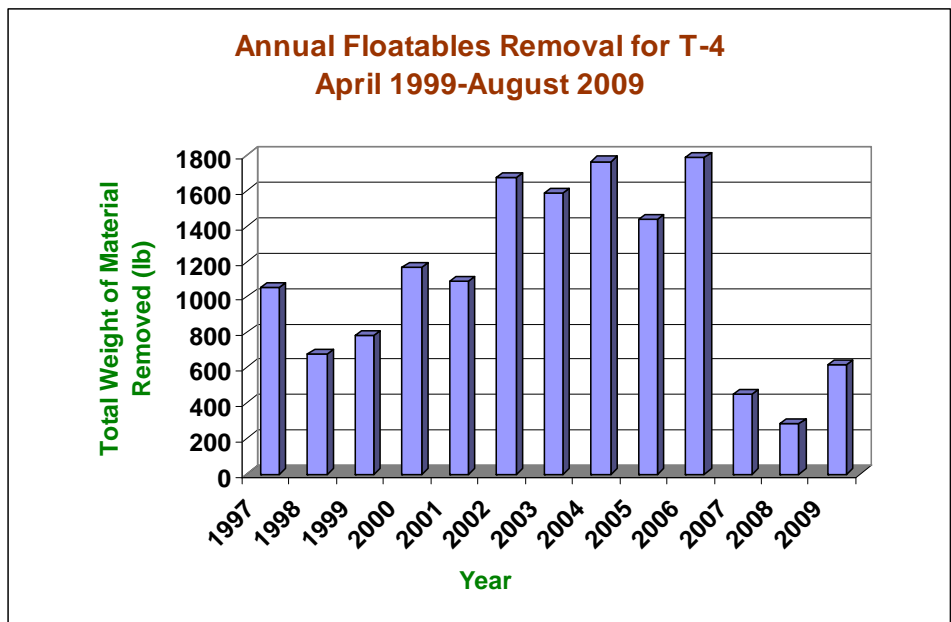


Figure 9: Annual floatables removal of T-04 nets



## Comparison of Methods

Data collected over the years shows that other floatables removal methods are more effective than using nets in the PWD system.

### *Floatables Vessels*

PWD's Skimming Vessel is a 39-ft, debris skimming vessel with a hydraulically controlled grated bucket and a 5.6 cubic yard on-board hold equipped with a main diesel engine. The vessel is operated approximately five days per week, eight months of the year and mainly collects debris from the Delaware and Schuylkill Rivers. PWD also operates a Floatables Pontoon Vessel that is being used as a workboat on the Upper Schuylkill, Lower Schuylkill, and Delaware Rivers within Philadelphia. The vessel is used to retrieve floating trash and debris from the waterways within the service area. The debris is hand netted from the water surface by operators standing on the vessel deck. The hand nets are emptied into ten 44-gallon debris containers on the deck and the containers are offloaded by hand. The use of both the skimming and pontoon vessels allows for a mobile control program capable of managing debris at various locations, increasing the effectiveness of this type of control measure. Besides removing debris from the waterways, the skimming and pontoon vessel operations serve as great public outreach programs.



Figure 10: Floatables Skimming Vessel



Figure 11: Floatables Pontoon Vessel

Figure 12 compares the debris removed by the T-04 nets with the Skimming vessel in 2007.

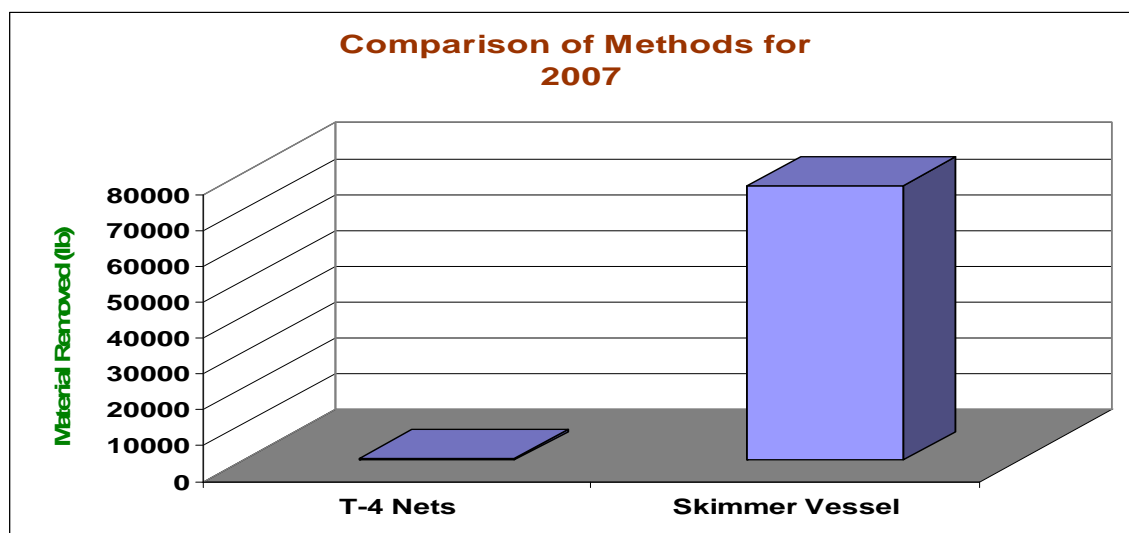


Figure 12: Graph comparing debris removal of T-04 nets with that of the Skimming Vessel

Figure 13 demonstrates that unlike the T-04 nets, most of the debris collected by the Floatables Pontoon Vessel is floatables like bottles, cans, and jugs.

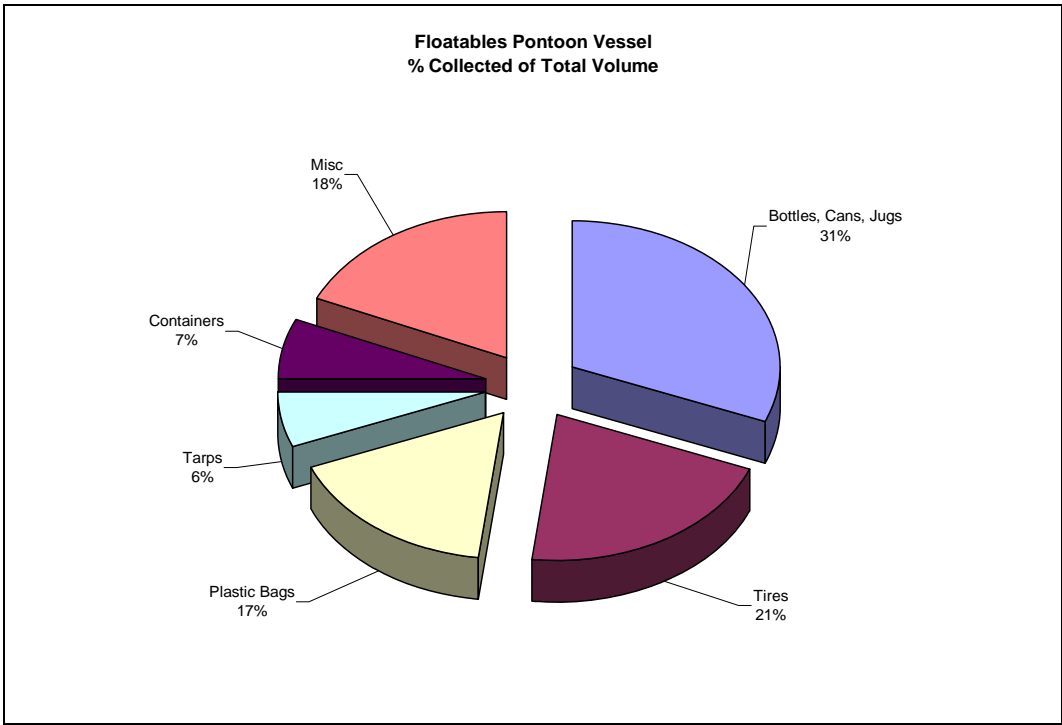


Figure 13: Breakdown of materials captured by the Floatables Pontoon Vessel

**Inlet Cleaning**

Inlet cleaning is another method that effectively collects floatables from the wastewater system. The Inlet Cleaning Unit is responsible for the inspection and cleaning of inlets as well as the maintenance of inlet covers and relieving choked inlet traps. Figure 14 shows the monthly inspection and cleaning of inlets over a 12-month period.

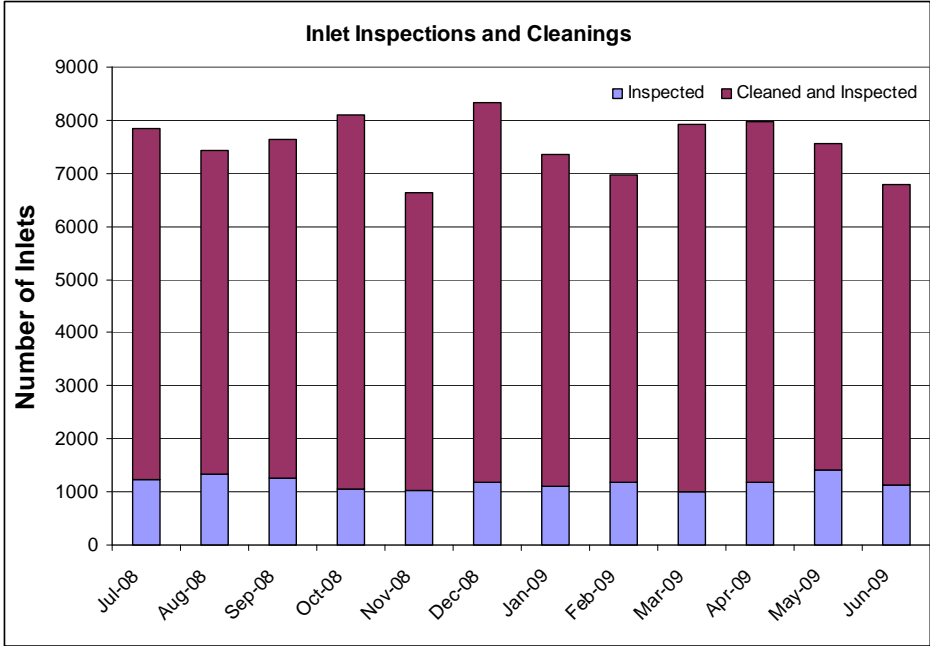


Figure 14: Monthly Inlet Cleaning Statistics



## **Use of Floatables Removal Nets in Other Cities**

Other cities such as Newark, NJ and New York City have used a similar netting system called Netting TrashTrap. The standard nets used in the system were designed to hold up to 25 cubic feet of floatables and a damp weight of 500 lbs each. In New York, the netting system was installed at the Fresh Creek outfall, a tributary to the Jamaica Bay. In Newark, the netting systems were installed at the Peddie outfall by the Newark Airport and the Saybrook outfall on the Passaic River.

The overall efficiencies of the Netting TrashTrap system ranged from 90 to 95 percent. This is because unlike the City of Philadelphia, both cities do not have trapped inlets that can remove most of the floatables before reaching the outfalls where the nets are located. The netting systems in both cities include curtains in front and under the units to provide lift during high flows and therefore prevent damage to the units. This makes it highly unlikely that the nets would be lost during CSO events that result in the discharge of large volumes. As mentioned before, there have been several instances in our case where nets were lost because they were unable to handle high flow velocities, further decreasing the efficiency of the netting system.

Similar netting technology was implemented at Anacostia River Outfall 018 in the District of Columbia. It was determined that the majority of the material captured by the nets consisted of organic debris such as leaves and small tree branches, with the remainder consisting of plastic bottles, bags, paper, glass, etc. Approximately 40 percent of the catchment area has trapped inlets. A survey was conducted to determine the effect of the trapped inlets on the floatables load removed by the netting system. The survey results showed there was a significant level of blockage caused by debris in study area catch basins, with 77 percent exhibiting complete blockage (i.e. outlet pipe 100 percent submerged). The survey also estimated the quantity of debris and floatables trapped within the catch basins in the study area was on the order of 9,500 lbs. This resulted in the floatables and solids load to the outfall being significantly reduced. The study further demonstrates that in areas with existing trapped inlets and catch basins, the efficiency of netting systems is significantly reduced.

## **Conclusion**

The PWD has concluded that, due to the pilot testing of the net technology, this technology is not an efficient method of removing floatables from Philadelphia's outfalls. PWD would like to discontinue the operation of the net technology at the T-4 pilot site and redirect the resources to other floatables control technologies such as the floatables vessels and city-wide inlet cleaning.