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Onondaga County Department of Water Environment Protection

Floatables Control Facility Plan Amendment

March 2013

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Floatables Control Facility
Plan Amendment

Prepared for:
Onondaga County Department of Water Environment Protection

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Executive Summary

In response to the November 9, 2009, Fourth Stipulation and Order Amending the County's Amended Consent Judgement (ACJ), the County authorized ARCADIS to develop a plan to address floatables controls on the remaining untreated CSO outfalls in the Onondaga Creek and Harbor Brook sewer service areas.

A FCF Plan was submitted to the New York State Department of Environmental Conservation (NYSDEC) and Atlantic States Legal Foundation (ASLF) on November 16, 2010. The FCF Plan included a comprehensive floatables control evaluation, recommended plan, preliminary basis of design, estimated costs and implementation schedule for CSOs 063, 005, 006, 006A, 007, 009, 010, 011, 014, 015, 017, 018, 078, 061 and 076.

Based upon comments received from the NYSDEC and ASLF, the FCF Plan was revised and resubmitted on April 28, 2011. The recommended FCF Plan consisted of a combination of an instream Harbor Brook screenings facility, several individual screening facilities, conveyance of flows to the Lower Harbor Brook Storage Facility and sewer separation.

Based upon comments received from the NYSDEC and subsequent discussions between the County and the NYSDEC, the County decided to approach the FCF Plan in a more holistic and sustainable manner. The County's goal was to gain a more thorough understanding of the specific floatables issues associated with the individual CSOs in the sewer service areas in order to develop a more focused, cost effective and sustainable floatables control program. The County requested that the following amendment be made to the previously completed FCF Plan:

- Perform a limited floatables assessment on the remaining untreated CSOs (005, 006, 006A, 007, 009, 010, 011, 014, 015, 017, 078, 027, 029, 052, 060/077, 061, 067 and 076) in the Onondaga Creek and Harbor Brook sewer service areas;
- assess the composition and relative quantity of the floatables captured during the limited floatables assessment to supplement information gathered at existing County CSO facilities;
- prepare an amended FCF Plan based upon the findings of the limited floatables assessment which, in addition to the previously completed evaluation of end-of-pipe treatment (i.e., FCFs), would include an evaluation of sewer shed management alternatives, e.g., litter control, street sweeping, storm water control measures, etc., to control floatables in the individual CSO sewer sheds; and
- develop a public outreach program to implement sewer shed management alternatives in the affected CSO sewer sheds.

The amended FCF Plan is comprised of the following:

- Source Controls – To augment the City's current MS4 program consisting of street sweeping, targeted trash receptacles and catch basin cleaning, the plan includes the repair/retrofit of the remaining unhooded catch basins in the CSOs sewer sheds and increased catch basin cleaning.

- Public Outreach – A targeted public education and outreach program will be developed and implemented to address floatables control in the CSO sewer sheds. The program will address both street litter and flushables.

- End-of-Pipe Controls – The continued operation at both the Inner Harbor skimming boat and Harbor Brook FCF will provide additional floatables capture and prevent floatables from entering Onondaga Lake.

The County's recommended FCF Plan covers controlling floatables in three distinct areas of the CSO floatables process. Since the source of floatables are derived from street litter and flushables, the County's FCF Plan includes a targeted Public Education and Outreach component to reduce floatables generation through behavioral control. Secondly, in conjunction with the City's existing MS4 program controls, the County will implement enhanced catch basin source controls to help minimize the migration of floatables into the combined sewer system. Finally, floatables which are discharged to Harbor Brook and Onondaga Creek in addition to floatables originating from other sources and areas in the City will be contained using the Harbor Brook FCF and Inner Harbor skimming boat.

The amended FCF Plan has an estimated capital cost equal to $1.2 million and present worth cost estimated at $12.3 million (ENR CCI = 9437). In comparison, the previously completed FCF Plan had an estimated capital cost equal to $15.5 million and present worth cost estimated at $26.0 million (ENR CCI = 9437).

The amended FCF Plan has the following advantages over the previously proposed FCF Plan:

- Amended FCF Plan is more holistic (i.e., it not only targets the remaining untreated CSO outfalls but also other floatables pathways into Harbor Brook, Onondaga Creek and Onondaga Lake environs such as tributary storm sewers, wind-blown debris, illegal dumping and littering).

- Amended FCF Plan is less intrusive to the community, whereby it minimizes construction impacts and long-term facility operation and maintenance requirements associated with multiple screening installations.

- Amended FCF Plan is more sustainable, whereby it addresses the root causes of floatables generation (littering and flushables behavior) through public education and outreach.

- Amended FCF Plan will capture more floatables through the continued operation of the end-of-pipe controls at Harbor Brook and Onondaga Creek.

- Amended FCF Plan is less costly and; therefore, more financially sustainable.

1. Project Background

1.1 General

This section provides a summary overview of the facilities planning efforts completed to date for Onondaga County's (County's) Floatables Control Facility (FCF) Plan for remaining untreated combined sewer overflows (CSOs) into Onondaga Creek and Harbor Brook. This section also presents the rationale for the amendment to the previously completed FCF Plan.

1.2 Previously Prepared FCF Plan

In response to the November 9, 2009, Fourth Stipulation and Order Amending the County's Amended Consent Judgement (ACJ), the County authorized ARCADIS to develop a plan to address floatables controls on the remaining untreated CSO outfalls in the Onondaga Creek and Harbor Brook sewer service areas.

A FCF Plan was submitted to the New York State Department of Environmental Conservation (NYSDEC) and Atlantic States Legal Foundation (ASLF) on November 16, 2010. The FCF Plan provided the following:

- Summary of the remaining untreated CSOs (063, 005, 006, 006A, 007, 009, 010, 011, 014, 015, 017, 018, 078, 061 and 076) included in the FCF Plan;
- description, including location, tributary area, peak flow and estimated annual number of overflow events;
- comprehensive floatables control technology evaluation;
- listing of potential CSO groupings and evaluation of control alternatives; and
- recommended FCF Plan including a preliminary basis of design, identification of required permitting, a description of operation and maintenance requirements and proposed implementation schedule.

Based upon comments received from the NYSDEC and ASLF, the FCF Plan was revised and resubmitted on April 28, 2011.

The County's recommended FCF Plan included the following:

- Close and convey CSO 063 to the Lower Harbor Brook Storage Facility (currently under construction);
- treat the group of CSOs (005, 006, 006A, 007, 009, 010, 011, 014 and 015) which are discharging to the closed-conduit portion of Harbor Brook to a new in-stream mechanical screening facility located adjacent to the Harbor Brook Storage Facility;

- install individual mechanical bar screen facilities for CSOs 017, 018, 076 and 078; and
- close and perform sewer separation for CSO 061.

A copy of the FCF Plan is included as Appendix A.

Since the completion of the FCF Plan, the County has initiated the conveyance of CSO 063 to the Lower Harbor Brook Storage Facility and has slated CSO 061 for separation and closure; therefore, CSO 061 and 063 are not included in the amended FCF Plan.

1.3 Amended FCF Plan

Based upon an original request from the NYSDEC in their January 11, 2011 FCF Plan review comments to perform a limited floatables assessment and subsequent discussions between the County and the NYSDEC, the County decided to approach the FCF Plan in a more holistic and sustainable manner. The County; therefore, decided to perform a targeted floatables assessment on the remaining untreated CSOs in the Onondaga Creek and Harbor Brook sewer service areas in order to supplement existing floatables information gathered from the operation of the temporary Harbor Brook FCF, Inner Harbor skimmer boat operations located at the confluence of Onondaga Creek and Onondaga Lake and the Midland Avenue Regional Treatment Facility. In addition to the CSOs included in the April 28, 2011 FCF Plan, a separate report entitled *CSO Facilities Plan for CSOs 022, 027, 029, 052, 060/077, and 067*, as prepared by CH2MHill, dated May 2011 were included in the floatables assessment. This separate CSO Facilities Plan had recommended the installation of individual mechanical or static bar screens at each of the CSOs.

By performing a more focused floatables assessment, the County's goal was to gain a more thorough understanding of the specific floatables issues associated with the individual CSOs in the sewer service areas in order to develop a more focused, cost effective and sustainable floatables control program. The County requested that the following amendment be made to the previously completed FCF Plan:

- Perform a limited floatables assessment on the remaining untreated CSOs (005, 006, 006A, 007, 009, 010, 011, 014, 015, 017, 078, 027, 029, 052, 060/077, 061, 067 and 076) in the Onondaga Creek and Harbor Brook sewer service areas;
- assess the composition and relative quantity of the floatables captured during the limited floatables assessment to supplement information gathered at existing County CSO facilities;
- prepare an amended FCF Plan based upon the findings of the limited floatables assessment which, in addition to the previously completed evaluation of end-of-pipe treatment (i.e., FCFs), would include an evaluation of sewer shed management alternatives, e.g., litter control, street sweeping, storm water control measures, etc., to control floatables in the individual CSO sewer sheds; and
- develop a public outreach program to implement sewer shed management alternatives in the affected CSO sewer sheds.

2. Limited Floatables Assessment

2.1 General

Two studies were recently completed by the County to assess floatables control for select CSOs that were not, at the time of the studies, part of the County's long-term floatables control abatement program. These studies are as follows:

- Floatable Control Facility Plan, as prepared by ARCADIS, dated April 2011.
- CSO Facilities Plan for CSOs 022, 027, 029, 052, 060/077, and 067, as prepared by CH2M Hill, dated May 2011.

Regulatory review of the above studies has resulted in the need for the County to conduct a limited floatables assessment as described herein to further assist in developing the most appropriate floatables control for the remaining County CSOs that have no defined control plan at this time.

The purpose of the limited floatables assessment was to obtain supplemental floatables characterization data for the County's CSOs long-term floatables abatement program. The overall intent is for the County to develop a long-term FCF Plan which embodies a more holistic, sustainable approach to control floatables at the source that will have the greatest overall impact for Onondaga Lake, its tributaries and surrounding communities.

2.2 Summary of Limited Floatables Assessment

To accomplish the limited floatables assessment, the County undertook a program to capture floatables at each of the 18 CSOs for the purpose of better defining their associated floatable characteristics (types and composition of debris) and potential origin.

To capture the floatables, the County constructed and deployed a floatables sample net at each of the 18 CSOs. Sample net installation began on June 18, 2012 and concluded prior to the first recorded overflow event on June 29, 2012. The County installed the floatables sample nets in each of the 18 CSOs on the downstream side of the overflow weir in the regulator structures, downstream overflow structure or outfall pipe.

For rainfall intensities of 0.15 in/hr and above, County and ARCADIS staff visited the CSOs to assess the characteristics and quantity of floatables captured for each CSO event. Due to its close proximity to the CSO sample locations, ARCADIS utilized the permanently installed rain gauge "KNYHOMER2" located at the Syracuse Museum of Science and Technology (MOST) building to monitor the rainfall intensities during the precipitation events.

For each of the recordable sampling events, the following activities were performed at each CSO:

- Collected floatables were retrieved from the regulator structure, downstream overflow structure or outfall pipe by County staff.
- Collected floatables were emptied from the sample net onto a 10-foot x 10-foot reinforced polyethylene tarpaulin by County staff.
- ARCADIS staff sorted the collected floatables into categories, and then photographed, inventoried and characterized the floatables by percent observed volume for a spread flat area.
- A relative floatables total capture volume (in cubic feet) was recorded by using a graduated 5 gallon bucket.
- After the floatables inventory, County staff properly disposed of all collected floatables following completion of the floatables inventory.
- The floatables sample net was then inspected, repaired and/or replaced and re-installed in the CSO for the next CSO event by County staff.

ARCADIS staff categorized and estimated the percent of the captured floatables by volume.

In addition to the floatables capture sampling program described above, the County's current pressure transducer overflow monitoring system was used for supplemental data acquisition at the 18 CSOs. The pressure transducer overflow monitoring system provides an estimation of depth of flow over the CSO overflow weir and the duration of time that the overflow was occurring over the weir. In those CSOs where a pressure transducer monitoring probe is not installed, the County utilized an area velocity flow meter to record the overflow discharge characteristics. This level data was utilized to indicate if an overflow occurred, the maximum overflow depth and the approximate overflow duration at each CSO.

In addition to characterizing the floatables captured at the 18 CSOs described above, the County, in conjunction with ARCADIS staff, assessed and characterized the floatables captured at the existing Harbor Brook in-stream FCF and from the Inner Harbor skimmer boat after each of the recordable sampling events. Similar to the processing of the captured floatables at the 18 CSOs, the in-stream FCF and skimmer boat captured floatables were photographed, inventoried and visually characterized. A relative total volume (in cubic feet) of the captured floatables was also recorded. This was useful in comparing relative events for each individual CSO; however, since the sample nets did not capture all of the CSO and their installation configuration and locations varied between CSOs, the relative volume cannot be a predictor of actual floatables quantities deriving from each CSO.

2.3 Summary of Results

The floatables assessment sampling was commenced on June 18, 2012. Floatables sample nets were deployed by County staff with ARCADIS assistance. All of the sample nets were installed in the 18 CSOs prior to the first recordable CSO event which occurred on June 29, 2012. After achieving six recordable CSO events, the sampling period was concluded on August 31, 2012.

A copy of the Floatables Assessment Results report is included as Appendix B.

Composition results obtained from the floatables sampling from the individual CSOs indicates that the vast majority of material sampled was natural debris ranging from 52 percent (at CSO 027) to 98 percent (CSO 078). This finding is consistent with the high percentage of natural materials captured at both the Harbor Brook FCF (88 percent) and Inner Harbor skimming boat (92 percent). Including the other debris assumed derived from street litter, i.e., paper, plastics and foam, the total percent of street derived material ranged from 68 to 100 percent with an average composition of 87 percent from the individual CSOs. This percentage is slightly lower than the observations at the downstream Harbor Brook FCF (98 percent) and Inner Harbor skimming boat (99 percent).

Between individual CSOs there was some variability in the composition of the floatables captured. CSOs 005, 011, 029, 061 and 067 had the lowest percentage of street derived material ranging from 68 to 80 percent and the highest percent of material presumed to be originating predominately from sanitary sewage (textiles, colloidal and health/hygiene), ranging from 20 to 32 percent.

The control of floatables into Onondaga Lake and its tributaries is a key component of the County's ACJ. The recently completed floatables assessment tends to suggest that the majority of material discharging from the 18 observed CSOs is natural and/or street derived debris. This would suggest that source control such as street sweeping, catch-basin modifications, cleaning programs, etc., would be an effective method for floatables control. In addition, it was observed that some health and hygiene products such as sanitary napkins and condoms, in addition to textiles such as sanitary/household wipes, were observed at some of the CSOs. These floatables should be removed from the sanitary sewer system and could effectively be controlled through a public education program.

Since the floatables assessment results are based on a limited assessment consisting of a total of six precipitation events and the installation and floatables capture effectiveness of the sampling nets varied between CSOs, the results of this assessment should only be used to provide a general composition of the floatables derived from each CSO. The additional observations made from the downstream Harbor Brook FCF and Inner Harbor skimming boat provides additional confirmation of the floatables composition.

3. Public Education and Outreach Program

3.1 General

An important component of an effective floatables control program is a coordinated public education and outreach program designed to educate and inform the public in the targeted CSO sewer sheds about the impact of floatables on water quality impacts.

The goals of the public education and outreach program are to accomplish the following:

1. Educate the public including transient populations about what floatables are, the importance of floatables control and how floatables negatively impact the health of Harbor Brook, Onondaga Creek and Onondaga Lake.

2. Implement a community-based education program to encourage residents, businesses and community organizations to partner with City and County governments to help control and reduce floatables impacting the targeted waterways.

To achieve the above goals, the Onondaga Environmental Institute (OEI) was contracted to characterize a generic education and outreach plan for floatables control in the targeted CSO sewer sheds. This section presents a summary of the development and recommendation for a public education and outreach plan to address floatables.

3.2 Summary of Program

As part of the development of the education and outreach plan, a comprehensive review of effective anti-littering campaigns and various case studies were conducted to:

- Understand trends in littering and flushable behaviors;

- identify effective approaches to deterring littering and undesirable flushable practices; and

- identify effective components of public anti-littering and flushable campaigns.

From the comprehensive literature review, the following key points on how to best address the problem of litter and flushables were identified:

- Utilize a combination of approaches including public education programs, improved enforcement of existing ordinances, creation of additional ordinances and the implementation of new tools and resources to deter undesirable behaviors; and

- public awareness campaigns need to focus on changing individual behavior by emphasizing social norms and community values.

Based upon the above, a set of overarching objectives and strategies to guide future implementation of a public education plan designed to reduce floatables in Onondaga Lake and its tributaries were developed. The following key points were identified:

- Actively engage stakeholders and potential partners as a strategy for success;
- develop a message that supports the social norm that we do not litter in Syracuse;
- use the appropriate educational tools for each target group and be sure to use them in a manner that supports the social norm; and
- demographic data is valuable in determining how to target outreach.

The plan evaluated land-use data in conjunction with the results gathered from the limited floatables assessment (Appendix B) to develop a targeted outreach strategy for each of the 18 untreated CSO sewer sheds. In addition, a recommended program evaluation model and an extensive listing of stakeholders were also included.

A copy of An Education and Outreach Plan for Floatables Control is included as Appendix C.

4. Amended Floatables Control Plan

4.1 General

This section provides the recommended FCF Plan and associated opinion of probable project costs and a proposed implementation schedule.

4.2 Description of Approach

4.2.1 Source Controls

To help prevent floatables from entering into Onondaga Lake from each of the remaining untreated CSO sewer sheds, more active source controls could be employed. Source controls currently being used within and by the City of Syracuse (City) as part of their municipal separate storm sewer (MS4) program are catch basin maintenance, street sweeping and trash receptacles. The City owns and maintains the combined sewer collection system within the City of Syracuse. The combined sewer system enters the main interceptor and trunk sewer systems that are owned and maintained by the County. ARCADIS conducted discussions with City Department of Public Works (DPW) staff in regards to these source controls. A summary of these discussions, as reported by the City, are provided below:

Catch Basins

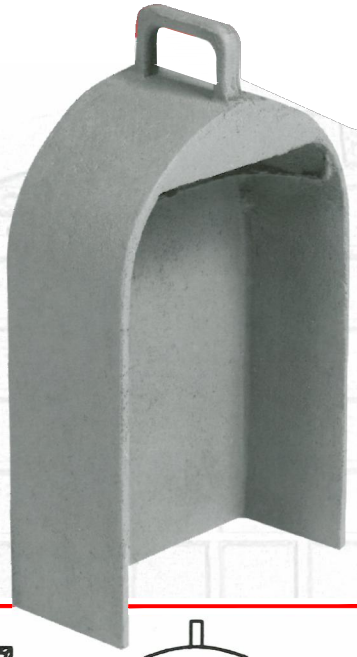
The City's catch basin maintenance program consists of two parts: catch basin cleaning and catch basins hood/trap installation.

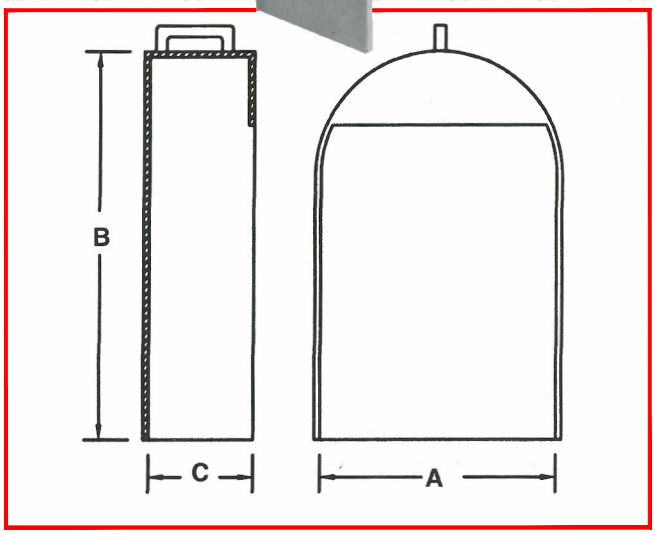
- Per the City, the majority of the City's catch basins are equipped with either a catch basin hood or a turned down 90 degree elbow (trap) to capture floatables. It is estimated that of the 11,500 catch basins in the City that 90% of them are equipped with hoods or traps (Note: It is estimated by the City that 10% of the catch basins are either not equipped with hoods or the hoods are damaged). It is a City policy to install hoods/traps in combined sewer areas to minimize odors from combined sewers. A catch basin hood is a casting that is mounted over the outfall pipe of a catch basin. Refer to Figure 4-1 for a typical catch basin hood or trap arrangement.

- It is a City standard for catch basins to contain sumps to collect debris below the outfall pipe. Refer to Figure 4-2 for a typical City catch basin with sump. As part of the City's MS4 program, the catch basins are routinely cleaned by the City with one of 3 cleaning trucks and DPW staff. Catch basins in problem areas, where frequent clogging occurs, are cleaned on a more frequent basis. Per the City, catch basins are cleaned on average every two years with problem catch basins being cleaned more frequently as needed.

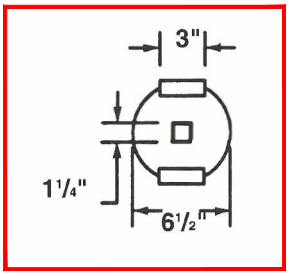
- The City's catch basins are also equipped with grates. The grates help mitigate the transport of debris and floatables such as yard waste and litter from entering the catch basin. Debris which is

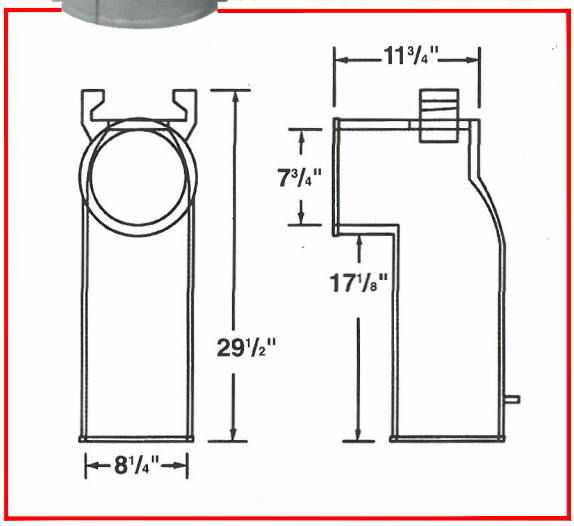
CATCH BASIN HOOD





GOOSENECK TRAP WITH CLEANOUT COVER





Pattern Number	A	B	C	Pipe Size
2560	9½	16	4¾	6
2561	11½	20½	5½	8
2562	13¼	23½	6½	10
2563	15¾	26	7½	12
2564	18	27	9	15
2565	20	27	10	18
2566*	25¼	30	11¼	21

SOURCE NOTE:

1. IMAGE BY EAST–JORDAN IRON WORKS, FORMERLY SYRACUSE CASTINGS.

ONONDAGA COUNTY DEPARTMENT OF WATER ENVIRONMENT PROTECTION

FLOATABLES CONTROL FACILITY PLAN AMENDMENT

TYPICAL CATCH BASIN HOOD/TRAP

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FIGURE **4-1**

CITY:SYRACUSE, NY DIV/GROUP:ENVICAD DB:K.SARTORI LD:K.SARTORI PIC:D. LOEWENSTEIN PM/TM: J. PERRIELLO LYR:(Opt)ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB0000380\0000000010\DWG\AMENDMENT\003800G01.dwg LAYOUT: 4-1 SAVED: 2/19/2013 8:04 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 2/19/2013 8:04 AM BY: SARTORI, KATHERINE
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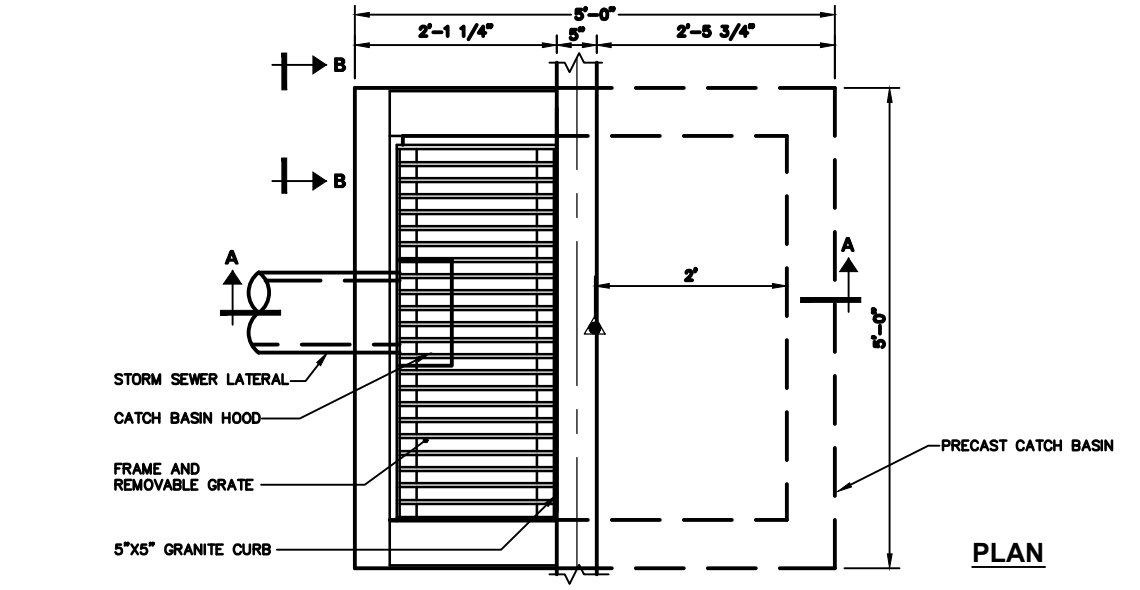
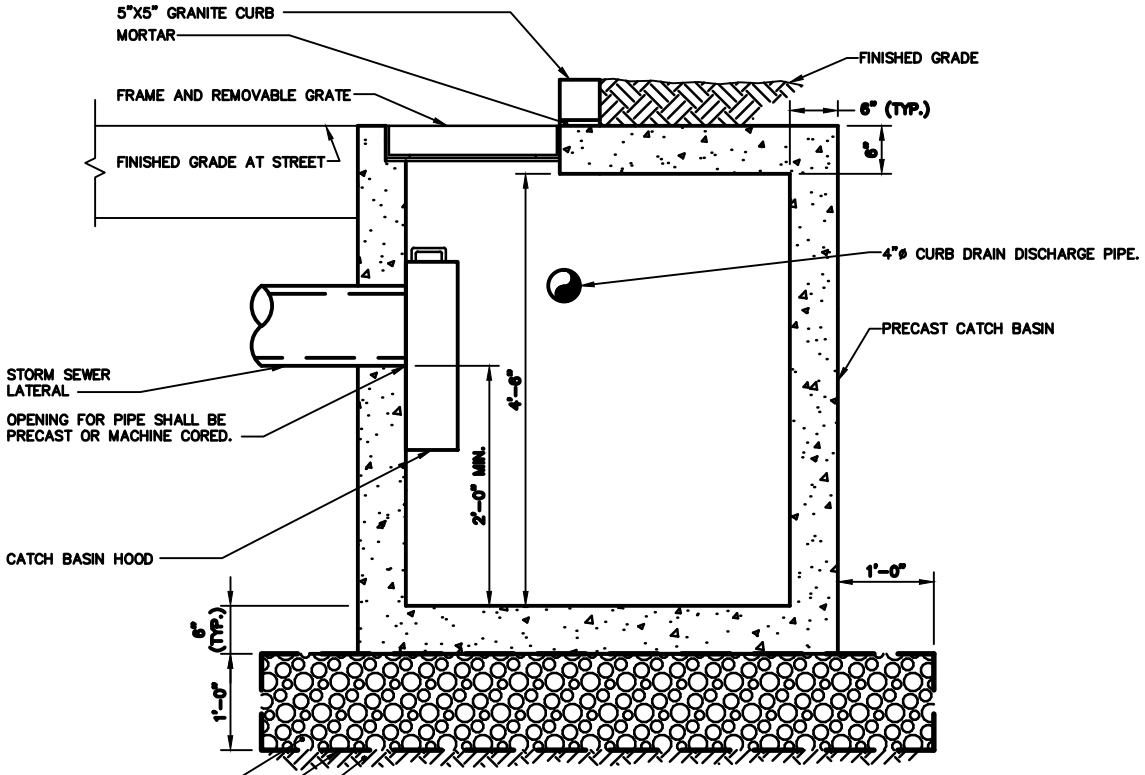
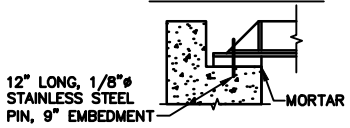


PLAN



SECTION A-A



SECTION B-B

CATCH BASIN DETAIL - ROADWAY WITH CURBS

NOT TO SCALE

ONONDAGA COUNTY DEPARTMENT OF
WATER ENVIRONMENT PROTECTION
FLOATABLES CONTROL FACILITY PLAN AMENDMENT

CITY OF SYRACUSE STANDARD CATCH BASIN

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FIGURE
4-2

prevented from entering the catch basins is subsequently removed by City street sweepers or City DPW yard waste crews.

Street Sweeping

The City street sweeping program involves the use of mechanical sweepers that sweep all curbed streets within the City. Per the City, 5 to 6 street sweepers are operated continually so that on average, each curbed street is cleaned 5 to 6 times per month. The use of street sweepers is dependent on weather and parking arrangements for that particular day. The City utilizes an odd/even parking system, so only one side of a particular street can be swept on a given day. Typically, there will be 2 or 3 street sweepers and a dump truck working in a specific area of the City on a given day. The swept debris is collected by a dump truck once the sweeper hopper is full and then disposed of at the Onondaga County Resource Recovery Agency (OCRRA). The City DPW operates both Elgin and Johnston model mechanical street sweepers.

Trash Receptacles

The City's trash receptacle program involves providing and maintaining public waste receptacles within high pedestrian traffic areas of the City. The City currently utilizes approximately 300 trash receptacles with the largest concentration located in the downtown commercial areas. Trash receptacles are also located along major thoroughfares, bus stops, etc. The City DPW dedicates one trash removal crew to continually empty these receptacles. On average, each receptacle is emptied twice a week. The collected trash is then disposed of at OCRRA. One disadvantage mentioned by City DPW staff is that the trash and recyclables are collected in a common receptacle making separation of recyclables difficult.

Catch basins can be an effective floatables trap, retaining solids and floatables and preventing them from passing into the combined sewer system. The effectiveness of catch basin modifications has been evaluated by the Sanitation District No. 1 of Northern Kentucky (SD1) (Courter, 2009). In 2007, SD1 determined that "catch basins with elbows or hoods were more than twice as likely to retain significant amount of debris (greater than 3 cubic feet) than catch basins without hoods." The evaluation also determined that "a combination of a grated inlets, which keep debris out, and elbows (hoods), which trap more debris in the catch basin, make the best combination for keeping solids and floatables out of the sewer system." In addition to the SD1 study, several studies were conducted in New York City (Grey, 1999) which determined that catch basin hoods were 70 to 90% effective at retaining floatables as compared to catch basins without hoods.

The City's standard catch basin design includes a grated inlet, a sump and hood (Figure 4-2), which effectively keeps solids and floatables out of the combined sewer system. It is also imperative that the catch basins are routinely cleaned to prevent the washout of the captured floatables. As part of the County's FCF

Plan, it is recommended that existing catch basins without hoods or with damaged hoods located within the remaining untreated CSO sewer sheds be retrofitted with new hoods. Refer to Table 4-1 for the estimated number of catch basins per CSO sewer shed and estimated number of catch basins requiring hood repair or retrofit. Furthermore, to enhance floatables capture it is recommended that increased frequency of catch basin cleaning be performed in the remaining untreated CSO sewer sheds. Instead of each catch basin in the remaining untreated CSO sewer sheds being cleaned on average once every two years, it's recommended that the cleaning frequency be increased to a minimum of once per year to help ensure that the captured floatables are not conveyed to the combined sewers. Given the effectiveness of catch basin modifications and maintenance as active source controls, it is recommended that the County maintain these as part of its long term FCF Plan.

Although the City reported approximately 10% of the existing catch basins required hood installation and/or repairs, for planning purposes, the County should assume up to 50% of the catch basins will require retrofit and/or hood repairs. Furthermore, to accommodate the recommended increased catch basin cleaning frequency, the County should plan on purchasing two additional catch basin cleaning vehicles (vacuum/flushing trucks). By utilizing this more conservative source control capital cost assumption (i.e., 50% assumed catch basin repair/retrofit), it will afford the County additional flexibility in potentially utilizing emerging new technologies such as catch basin inserts which in addition to providing floatables capture, could also contribute to nutrient removal.

Street sweeping by use of mechanical street sweepers can also be an effective source control. The effectiveness of street sweeping for floatables control has been evaluated by the New York City Department of Environment Protection (HydroQual, et al., 1997). This study examined street sweeping by mechanical street sweepers as well as manual (by hand) street sweeping. The study assumed a Baseline Sweeping Level, which included two mechanical sweeps each week; a Level 1, which included two mechanical and four manual sweeps per week and; a Level 2, which included two mechanical sweeps and 10 manual sweeps per week. The results of this study indicated that street derived floatable litter levels were reduced significantly from the Baseline condition with enhanced Level 1 and Level 2 manual street sweeping. However, manual street sweeping is expensive and not practical in all locations. The study indicated that "manual sweeping may be an attractive alternative in urban areas such as Manhattan, where the impacts of cleaner streets, space constraints and construction periods are particularly favorable." The City currently has a group of business owners located in the Armory Square area (Armory Square Association), which is located within CSO sewer sheds 027 and 029 that currently manually sweep the sidewalk from curb to store front. The manual sweeping in addition to the mechanical sweeping by the City DPW in CSO shed 029 has been effective in reduction of street derived floatables (lowest percent observed, 68% during the Floatables Assessment included in Appendix B). Given the City's current program of mechanical and manual street sweeping as an effective source control, it is not recommended at this time that the current frequency be increased as part of the County's proposed FCF Plan.

Table 4-1: Source Control Improvements

Receiving Stream	CSO ID	Drainage Area (Acres)	Land-Use	Estimated Number of Catch Basins	Estimated Number of Catch Basins Requiring Hood Repair/Retrofit[3]
Harbor Brook	005	13	Commercial	20	10
	006	10	Mixed	10	5
	006A	7	Commercial	16	8
	007	24	Residential	17	9
	009	28	Residential	20	10
	010	16	Commercial	33	17
	011	20	Mixed	21	11
	014	196	Residential	130	65
	015	40	Residential	26	13
	017	25	Residential	21	11
	078	86	Residential	64	32
Onondaga Creek	027	136	Commercial	356	178
	029	9	Commercial	17	9
	052	221	Residential	153	77
	060/077	473	Residential/ Mixed	411	206
	067	44	Residential	28	14
	076	86	Commercial	115	58

Notes:

1. Land-use determined by Onondaga Environmental Institute (OEI) in the Education and Outreach Plan for Floatables Control (Appendix C).
2. The estimated number of catch basins per CSO sewer shed was determined by a limited field assessment performed by ARCADIS in CSO sewer sheds 006 and 029. The limited field assessment included counting the catch basins and determining the approximate catch basin spacing. Distance was then compared to land-use to obtain representative catch basin spacing (i.e., 100' commercial, 200' mixed and 300' residential).
3. Assumed 50% of existing catch basins require hoods or need hoods repaired/replaced.

Another potential source of floatables is debris generated from motorists traveling on Interstates 81 and 690. Interstate 81 transects CSO sewer sheds 076, 077 and 027 and Interstate 690 borders CSO sewer shed 027 to the north. The New York State Department of Transportation (NYSDOT) has jurisdiction for the maintenance and cleaning of these highways. To help prevent the migration of litter from these highways into Onondaga Creek it is imperative that the NYSDOT maintain these highways by regularly sweeping the highway shoulders, cleaning the medians, picking up the litter and debris from the roadside right-of-way and cleaning the catch basins. Failure to maintain these highways will lead to the generation of floatables.

Trash receptacles located in key high pedestrian traffic areas can also be an effective source control. As previously mentioned, the City currently maintains approximately 300 trash receptacles with the largest concentration in the downtown area, which is in or near CSO sewer sheds 027 and 029. If deemed necessary, the quantity of trash receptacles could be increased in the other 16 untreated CSO sewer sheds as part of a public education program. One disadvantage of the current trash receptacle program is that each trash receptacle does not have a means for segregating recyclables. The addition of a recycling container next to each of the 300 trash receptacles may increase public awareness to not only recycle, but dispose of waste properly instead of littering. Given the current effectiveness of trash receptacles as a source control, it is not currently recommended to increase the quantity of trash receptacles in the CSO sewer sheds. If conditions change or sources of new litter emerge, the County should consider the implementation of additional trash and/or recyclable receptacles in targeted areas.

4.2.2 Public Outreach

The Public Education and Outreach Plan for Floatables Control discussed in Section 3 and included in Appendix C provides a framework for the County to develop a comprehensive and holistic approach to floatables control. The following recommended next steps for the development of a focused plan are presented below:

1. Decide on the range of the plan – county-wide or city-wide and develop the appropriate mass media strategy.

2. Form an advisory committee with representation from involved City Departments (i.e., Public Works, Parks, etc.) as well as the Mayor's office.

3. Develop anti-littering and anti-flushable messages and test them on representative focus groups.

4. Customize the program to target the 30 years of age and under population by utilizing such tools as social media, contests and other tools described in the plan.

5. Work with the advisory committee to identify and partner with neighborhood stakeholders.

6. Initial flushables target areas should include business areas in CSO sewer sheds 027 and 029 (Armory Square, Hanover Square and West Genesee business areas) due to their higher observed percentages of flushables derived floatables and their currently active community participation efforts.

4.2.3 End-of-Pipe Treatment

To help control floatables entering into Onondaga Lake, the County currently employs two end-of-pipe treatment control methods on Harbor Brook and Onondaga Creek. Since 2002, the County has operated an in-stream floatables control facility on Harbor Brook (Harbor Brook FCF) which is located just north of Hiawatha Boulevard and the County has subcontracted with a skimming boat contractor to capture and dispose of floatables from Onondaga Creek in the Inner Harbor area at the confluence with Onondaga Lake.

The Harbor Brook FCF consists of an in-stream net bag facility which is operated seasonally by the County between April and December. The County regularly maintains the facility by monitoring the contents of the net bags and changing out the net bags on an as-needed basis. The net bags are typically replaced after a storm event when they are filled. The captured floatables and used net bags are then disposed of at OCCRA. On average, the County captures and disposes of approximately 5 tons of floatables annually from this facility.

The Inner Harbor skimming boat operation involves the operation of a skimming boat in the Onondaga Creek Inner Harbor area and on an as-needed basis along the adjacent Onondaga Lake shoreline. The skimming boat operation operates approximately 8 hours per week during the months of April, May, September, October and November and on a more frequent basis at 16 hours per week during the months of June, July and August. The floatables removed from the skimming boat are loaded into roll-off containers and disposed of at OCRRA. The average floatables capture varies year to year depending on weather conditions but generally averages approximately 22 tons per year.

The County, in response to the ACJ, installed the Harbor Brook FCF as a temporary measure until a more permanent floatables control plan was developed and implemented in the Harbor Brook sewer service area. The Inner Harbor skimming boat operation was initiated after it was determined that the ACJ mandated Onondaga Creek floatables control boom was piloted and deemed ineffective. Since 2002, these facilities have removed over 250 tons of floatables from Harbor Brook and Onondaga Creek.

Given the effectiveness of the Harbor Brook FCF and Inner Harbor skimming boat operation for not only capturing floatables originating from upstream CSOs but also from floatables originating from tributary storm sewers, wind-blown debris, illegal dumping and littering and floatable debris transported via wind and currents from Onondaga Lake, the County has elected to maintain these operations as part of its proposed long term FCF Plan.

4.3 Opinion of Probable Project Costs

Preliminary opinion of probable construction and total present worth costs were estimated for the following three components of the recommended FCF Plan: source controls, public outreach and end-of-pipe treatment. Assumptions and methodologies used to develop the costs are provided in the following sections.

4.3.1 Source Controls

Opinion of probable project costs for recommended source controls were developed from actual costs obtained from SD1 and were updated using the Engineering News Record Construction Cost Index (ENR CCI) to January 2013 dollars. It was also assumed that annual catch basin hood repairs would equal approximately 2.5% of the total or an annual replacement cost of approximately $10,000 per year.

In order to increase the catch basin cleaning frequency on the estimated 1,461 catch basins in the untreated CSO sewer sheds, it is recommended that two additional cleaning crews (2 person crew with new catch basin cleaning vehicle) be dedicated to catch basin cleaning in the untreated CSO sewer sheds.

Based upon the above assumptions, the annual operation and maintenance cost for the increased catch basin cleaning is equal to approximately $135,000 per year. The 30-year present worth cost was determined and is summarized in Table 4-2.

Table 4-2: 30-Year Present Worth Cost, Source Controls

Source Control Component	Capital Cost	Annual O&M Cost	30-Year Present Worth Cost[5]
Catch Basin Retrofit/Repairs	$214,000[1]	$10,000[2]	$408,900
Increase Catch Basin Cleaning	$600,000[3]	$135,000[4]	$3,230,600
Total Source Control Cost	$814,000	$145,000	$3,639,500

Notes:

1. Catch basin retrofit and repairs assumes a total of 733 catch basins at $292/catch basin per SD1 updated to January 2013.
2. Catch basin annual operation and maintenance costs include the annual repair or replacement of 2.5% of the total number of catch basins.
3. Catch basin cleaning capital costs assumes the cost of two new catch basin cleaning vehicles at $300,000 each.
4. Assume 1-crew hour per catch basin plus debris disposal costs.
5. Assumes discount rate equal to 3%.
6. Costs are based on January 2013 Dollars (ENR CCI = 9437), rounded.

4.3.2 Public Outreach

The education and outreach plan for floatables control can be targeted and customized to achieve the programs goals and objectives. To develop a conceptual program cost, the budgets for two existing County outreach programs (OCCRA recycling education and the County's Save the Rain Program) were reviewed. Based on the costs expended for these two very effective programs, it should be possible to offer a comprehensive floatables education and outreach program for approximately $350,000 per year. It is recognized that the program startup costs may be initially higher and that individual yearly budgets will vary; however, for planning purposes, a conservative yearly investment of $350,000 is assumed. The 30-year present worth cost was determined to be equal to $6,820,000 (ENR CCI = 9437).

4.3.3 End-of-Pipe Treatment

Opinion of probable project costs for end-of-pipe treatments were developed from actual costs incurred by the County during 2011 and 2012. Since 2011 represented an above-average precipitation year and 2012 represented a below-average year, the captured floatables quantities and associated disposal costs were averaged for the two years and used to estimate average annual operational costs.

Based upon the current County contract for the Inner Harbor skimming boat and average expenses incurred for the operation and maintenance of the Harbor Brook FCF, the annual operation and maintenance cost for the two facilities were approximately $75,000. Assuming that the Harbor Brook FCF will need a complete rebuild in the next 20 years at an estimated present worth cost of $400,000, the 30-year present worth cost was determined and is summarized in Table 4-3 for the recommended end-of-pipe treatment.

Table 4-3: 30-Year Present Worth Cost, End-of-Pipe Treatment

Facility	Capital Cost	Annual O&M Cost	30-Year Present Worth Cost[3]
Inner Harbor Skimming Boat	n/a	$49,200	$958,700
Harbor Brook FCF	$400,000[2]	$25,535[1]	$897,600
Total End-of-Pipe Treatment Cost	$400,000	$74,735	$1,856,300

Notes:

1. Consists of average operation cost of $20,535 per year and estimated annual maintenance cost at $5,000 per year.
2. Cost based on full equipment replacement.
3. Assumes discount rate equal to 3%.
4. Costs are based on January 2013 Dollars (ENR CCI = 9437), rounded.

4.4 Recommended FCF Plan

The recommended FCF Plan for CSOs 005, 006, 006A, 007, 009, 010, 011, 014, 015, 017, 078, 027, 029, 052, 060/077, 067 and 076 is comprised of the following:

- Source Controls – To augment the City's current MS4 program consisting of street sweeping, targeted trash receptacles and catch basin cleaning, the plan includes the repair/retrofit of the remaining catch basins in the CSOs sewer sheds with catch basin hoods. In addition, to enhance floatables removal, catch basin cleaning will be increased to a frequency of once per year.

- Public Outreach – A targeted public education and outreach program will be developed and implemented to address floatables control in the CSO sewer sheds. The program will address both street litter and flushables.

- End-of-Pipe Controls – The continued operation at both the Inner Harbor skimming boat and Harbor Brook FCF will provide additional floatables capture and prevent floatables from entering Onondaga Lake.

The County's recommended FCF Plan covers controlling floatables in three distinct areas of the CSO floatables process. Since the source of floatables are derived from street litter and flushables, the County's FCF Plan includes a targeted Public Education and Outreach component to reduce floatables generation through behavioral control. Secondly, in conjunction with the City's existing MS4 program controls, the County will implement enhanced catch basin source controls to help minimize the migration of floatables into the combined sewer system. Finally, floatables which are discharged to Harbor Brook and Onondaga Creek from the targeted CSO sewer sheds in addition to floatables originating from other sources and areas in the City will be contained using the Harbor Brook FCF and Inner Harbor skimming boat.

Estimated capital, operation and maintenance, and present worth costs for the recommended FCF Plan are summarized in Table 4-4.

Table 4-4: Opinion of Probable Project and Present Worth Costs Recommended FCF Plan

Plan Component	Capital Cost	Annual O&M Cost	30-Year Present Worth Cost
Source Controls	$814,000	$145,000	$3,637,500
Public Outreach	n/a	$350,000	$6,820,000
End-of-Pipe Treatment	$400,000	$74,735	$1,856,300
Totals	$1,214,000	$569,735	$12,315,800

Notes:

1. Assumes discount rate equal to 3%.
2. Costs are based on January 2013 Dollars (ENR CCI = 9437), rounded.

In comparison, the previously completed FCF Plan (Appendix A) had an estimated capital cost equal to $15.5 million and present worth cost estimated at $26.0 million (adjusted to January 2013, ENR CCI = 9437).

The amended FCF Plan has the following advantages over the previously proposed FCF Plan:

- Amended FCF Plan is more holistic (i.e., it not only targets the remaining CSO outfalls but also other floatables pathways into Harbor Brook, Onondaga Creek and Onondaga Lake environs such as tributary storm sewers, wind-blown debris, illegal dumping and littering).
- Amended FCF Plan is less intrusive to the community, whereby it minimizes construction impacts and long-term facility operation and maintenance requirements associated with multiple screening installations.
- Amended FCF Plan is more sustainable, whereby it addresses the root causes of floatables generation (littering and flushables behavior) through public education and outreach.
- Amended FCF Plan will capture more floatables through the continued operation of the end-of-pipe controls at Harbor Brook and Onondaga Creek.
- Amended FCF Plan is less costly and; therefore, more financially sustainable.

4.5 Implementation Schedule

Per the Fourth Stipulation and Order, the County is required to submit this FCF Plan to the NYSDEC and ASFL for review and approval. Further, the FCF Plan should include a proposed implementation schedule for completing the recommended projects and upon approval from the NYSDEC, the proposed completion dates shall become milestone compliance dates.

Since the County currently has several large CSO abatement projects in various stages of construction in the Harbor Brook and Onondaga Creek sewer service areas, it is the County's intent to monitor the impacts from these major projects, including the Lower Harbor Brook Storage Facility and the Clinton Street Storage Facility for impacts on floatables capture prior to initiating the recommended FCF Plan. In the interim, the County will continue to operate and maintain the Harbor Brook FCF facility and the Inner Harbor skimming boat on Onondaga Creek.

The following is the recommended implementation schedule for the recommended FCF Plan.

Project Schedule

Activity	Proposed Date
Acceptance of FCF Plan	Assume Effective Date of Acceptance is May 2013
End-of-Pipe Treatments	Ongoing
Develop and Initiate Public Education and Outreach Program	January 1, 2017
Increase Catch Basin Cleaning/Retrofit Hoods	June 1, 2018