CITY OF LOS ANGELES

SANITATION
DEPARTMENT OF
PUBLIC WORKS

WATERSHED PROTECTION DIVISION
DEPARTMENT OF PUBLIC WORKS
BUREAU OF SANITATION
CITY OF LOS ANGELES

Technical Report:

Assessment of Catch Basin Opening Screen Covers

JUNE 2006

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Executive Summary

Introduction

The intent of this report is to present the results gathered by the City of Los Angeles through a pilot study on the effectiveness of catch basin opening screen covers in complying with the Trash TMDL.

In compliance with the Federal Clean Water Act (CWA) and existing consent decree between the U.S. EPA and the environmental groups, the Los Angeles Regional Water Quality Control Board (RWQCB) approved the Trash Total Maximum Daily Loads (TMDLs) for the Los Angeles River and Ballona Creek and Wetlands on September 19, 2001. The Trash TMDL requires a reduction of 10% of trash per year for a ten-year period ending in year 2013. The RWQCB has based compliance on a three-year rolling average, with the milestone in September 2006 when the City must achieve a 20% trash reduction.

Pilot Study

The sole purpose of the pilot study was to determine the CB opening screen cover effectiveness during the wet season. A typical year experiences approximately twenty-five (25) wet days and three hundred forty (340) dry days. The pilot study location is located in the Westlake area of the City, just west of downtown Los Angeles and has a drainage area approximately 55 acres. Stormwater runoff from this area is captured by a total of 24 catch basins and a CDS unit located at the base of this drainage area. All 24 catch basins were retrofitted with opening screen covers having diamond shape

openings measuring 1 inch in the longitudinal direction by ¾ inch in the vertical direction. This means all trash greater than 1 inch would remain out in the street. These covers remain in the closed position by means of two magnetic anchors at each end that release when runoff from a storm builds up to approximately 60% of the curb height. Once the flow diminishes, the screen swings into the closed position and locks itself by means of the magnet anchors. Field measurements from the catch basins and the CDS unit were obtained for this past wet season, FY 2005/06, by crews from the Wastewater Collection Systems Division following storms greater than 0.25 inches.

Conclusion

At the conclusion of the study, the effectiveness of the covers in deflecting trash during a storm greater than 0.25 inches was determined to be 58% to 79% percent. It should be noted that dry days account for approximately ninety-three percent (93%) of the total calendar days in the City. For dry days the trash deflection effectiveness of the opening screen cover will be considered 85 percent, given that the screen will remain in the closed position and only trash smaller than one (1) inch will enter the catch basin. Therefore, using a 1:9.3 weighted average over an entire year, the opening screen cover will have an **86 percent effectiveness rate.**

CHAPTER

1

PILOT STUDY

Background

The intent of this report is to present the results gathered by the City of Los Angeles through a pilot study on trash capture effectiveness of catch basin opening screen covers.

In compliance with the CWA and existing consent decree between the U.S. EPA and the environmental groups, RWQCB approved the TMDLs for the Los Angeles River and Ballona Creek and Wetlands on September 19, 2001. This Trash TMDL requires a reduction of 10% of trash per year for a ten-year period. The RWQCB has based compliance on a three-year rolling average, with the first milestone in September 2006 when the City must achieve a 20% trash reduction.

The RWQCB further identified trash in urban runoff that is conveyed through the storm drain as a primary source of pollution reaching the Los Angeles River and Ballona Creek. Trash that gets into the water bodies can cause water quality problems. Settables, such as glass, cigarette butts, rubber, and construction debris, can be a problem for bottom feeders and can contribute to sediment contamination. Some debris, such as diapers, medical and household waste, is a source of bacteria and toxic substances. The Trash TMDL identified the following beneficial uses as being impaired due to trash in these water bodies: 1) contact recreation like bathing and swimming; 2) non-contact recreation such as fishing, hiking, jogging, and bicycling; and 3) habitat for aquatic life and bird life.

Throughout this pilot study the word "trash" is used to represent sediment, debris, vegetation and litter and should not be misconstrued to represent only anthropogenic trash.

Description of Study Area

The catch basins retrofitted with opening screen covers were located west of the downtown Los Angeles Civic Center in the Westlake area of the City in close proximity to Koreatown (See Figure 1.1). The drainage area is approximately 55 acres, with three-quarters commercial and the remaining multi-family residential landuses (see Figure 1.2). This area is regarded as a high trash generation area within the City.

Figure 1. Westlake Area (Grand View / Olympic Blvd)

Catch Basin Opening Screen Cover Details

All the opening screen covers being evaluated have been purchased and installed by Practical Technology, Inc. They have been manufactured from ASTM A36 steel, hot dipped galvanized expanded metal with diamond shape openings (1 inch longitudinal by ¾ inch vertical). The screen covers have a smooth edge around the perimeter with no prongs or jagged edges. The opening screen covers encompass the entire curb opening. The opening screen covers were designed to block trash while allowing surface runoff to enter the catch basin. In the event that material obstructs the screen and results in localized ponding, the screen will open due to hydraulic force. The cover is maintained in the closed position by magnets of predetermined force that will release at approximately 60% curb face flow height generated by a moderate to severe storm. At this point the cover will swing open inwards to relieve this condition. Up to this point all trash greater than 1 inch mobilized by this flow will remain outside of the catch basin. See Figures 1.3 through 1.5 for actual pictures of the opening screen cover and Figure 1.6 for the opening screen cover operational sequence.

Figure 1.1 Study Area: Catch Basin Locations

Figure 1.2 Study Area: Landuse

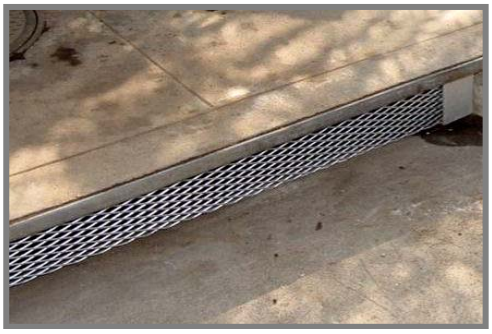
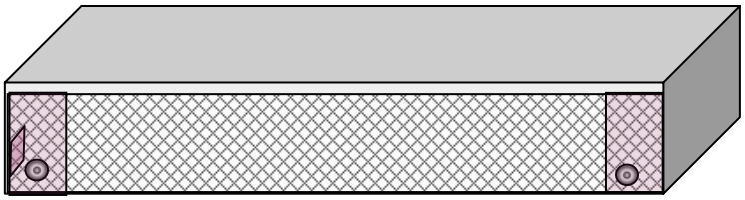


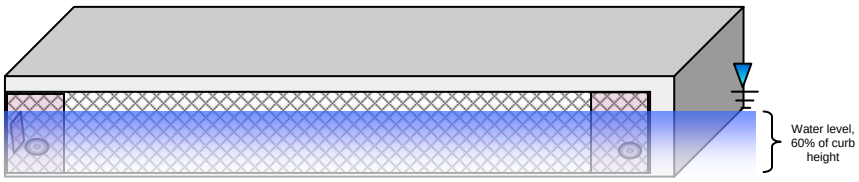
Figure 1.3 Typical Opening Screen Cover (Front)

Figure 1.4 Typical Opening Screen Cover (Back)

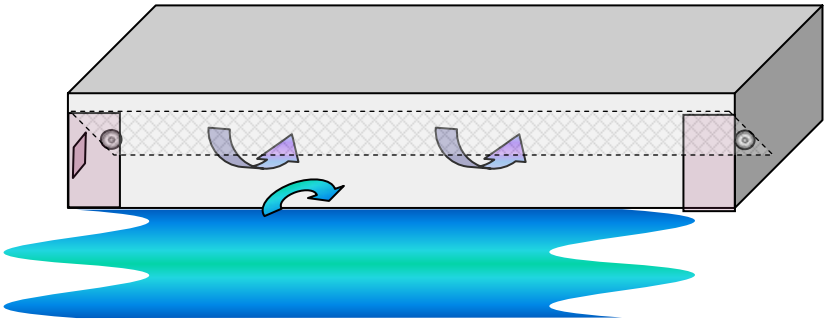
Figure 1.5 Typical Opening Screen Cover Magnet Locking Mechanism



a. Closed position



b. Prior to opened position



c. Open position (flow recedes, cover returns to closed position)

Figure 1.6 Catch Basin Opening Cover operation sequence

Catch Basin and Hydrodynamic Device Details

Catch Basins

The physical parameters of the catch basins included in the study were consistent. Table 1.1 shows the parameters for each CB. As the Table shows, over two-thirds of the catch basins had a curb opening length of 3.5 feet and curb opening height of six (6) to eight (8) inches.

Table 1.1 Pilot Study Catch Basin Parameters

No.	Address	Location	Clamms	Catch Basin Curb Opening	
				Length	Height
				Feet	Inches
1	Westlake & 11th Street	NW	51605461111089	2	8
2	11th St & Westlake Ave	ES	51605461111097	2	8
3	Westlake & 11th Street	NE	51605461111093	3	6
4	11th St & Westlake Ave	EN	51605461111095	3	8
5	Grandview St & Olympic Blvd	NW	51605461111027	3.5	7
6	2222 Olympic Blvd	ES	51605461111037	3.5	8
7	Olympic Blvd & Avarado St	WS	51605461111048	3.5	8
8	Olympic Blvd & Westlake Ave	EN	51605461111054	3.5	8
9	Olympic Blvd & Westlake Ave	ES	51605461111055	3.5	8
10	Lake St & 11th St	NW	51605461111063	3.5	8
11	11th St & Lake St	WN	51605461111064	3.5	8
12	Lake St & 11th St	NE	51605461111068	3.5	8
13	11th St & Lake St	EN	51605461111069	3.5	8
14	Alvarado St &11th St	NW	51605461111078	3.5	8
15	Alvarado St &11th St	NE	51605461111082	3.5	7
16	11th St & Avarado St	EN	51605461111084	3.5	8
17	11th St & Avarado St	ES	51605461111086	3.5	7
18	Grandview St & Olympic Blvd	NE	51605461111032	3.5	6
19	Alvarado St & Olympic Blvd	NW	51605461111040	7	8
20	Olympic Blvd & Avarado St	WN	51605461111041	7	8
21	Westlake & Olympic Blvd	NW	51605461111056	7	8
22	Westlake & Olympic Blvd	NE	51605461111066	7	8
23	Alvarado St & Olympic Blvd	NE	51605461111044	7	7
24	Alvarado St & Olympic Blvd	EN	51605461111050	7	8

Hydrodynamic Device – CDS

The drainage area in which these catch basins are located is serviced by a hydrodynamic unit installed on the downstream end of the mainline storm drain. The unit being used is a CDS Technologies Continuous Deflective Separation (CDS) unit Model PSW 70-70 with treatment design flow rate of 26.5 cubic feet per second (CFS). The CDS unit is located on Parkview St. and Grandview St. Figure 1.7 shows a typical CDS installation.

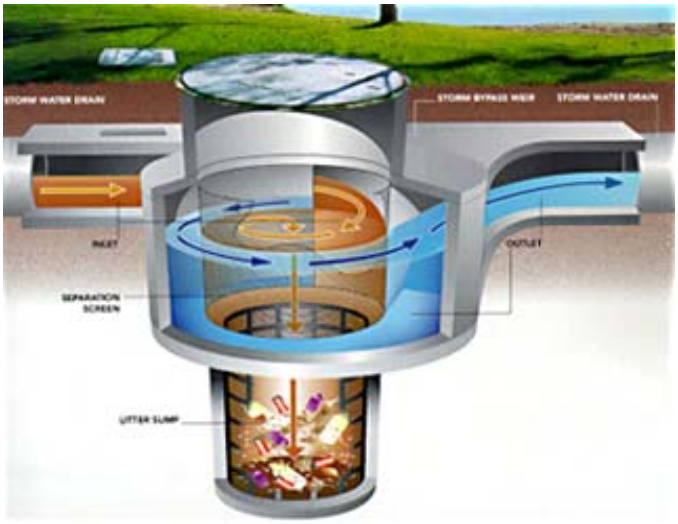


Figure 1.7. Typical CDS installation and operation

CHAPTER

2

PILOT STUDY – TEST PROTOCOL

Goal

The goal of this test protocol is to determine the CB opening screen covers' effectiveness during rainy days with 0.25 inch or greater of rainfall.

Test Protocol

A. General

1. The covers evaluated for the pilot study were purchased from Practical Technology, Inc. They are constructed from hot dipped galvanized expanded metal with a diamond shape opening. The longer dimension of the opening is approximately 1 inch. Covers span the entire length of the curb opening and height.

2. Wastewater Collection Systems Division (WCSD) crews performed data collection and measurements following a storm event having an accumulation greater than 0.25 inches as measured at the civic center of the City of Los Angeles.

3. Existing data collection procedures were employed and amended, as necessary. Data from individual events were recorded in tabular form, using existing WCSD data collection forms or amended forms provided by Watershed Protection Division (WPD).

4. Existing historical CB and CDS cleaning data gathered for comparison with that of the data collection from this study.

5. Data collection and measurements were only performed if the storm events occurred ten or more days apart.

6. Precipitation data of every storm event were obtained from the County of Los Angeles, Department of Public Works real time rain gauge identified as the Los Angeles-Ducommun (#377, Lat. 34-03-09; Long. 118-14-13; Elev. 306). Data was be analyzed for total rainfall, one-hour maximum rainfall, and 30-minute maximum rainfall (rainfall intensity).

7. The following field conditions were recorded by WPD staff at the start of the study at each retrofitted CB:
   a. Location;
   b. Visual observations of street surroundings;
   c. Visual observations of inside of catch basin; and
   d. Street cleaning frequency at CB location.

8. The following field conditions were recorded by WCSD crews during data collection at each retrofitted catch basin:
   a. Existing weather condition;
   b. Visual observations for fullness of CB (i.e., none, minimal, ¼ full, ½ full, ¾ full, full);
   c. Visual observations for signs of ponding immediately adjacent to CB opening; and
   d. Other parameters, as the study proceeds.

9. Following each cleaning WCSD sent results to WPD for data assessment.

B. Evaluation of CB opening covers Effectiveness

Determination of an overall CB opening cover effectiveness relied on field measurements and visual observations. The effectiveness determination will consider the sum of historical data (*Trash Historical*) collected from both the CDS unit and those catch basins feeding into the CDS. This historical data will be compared be then compared to current data (*Trash Current*) collected from both CDS unit and those catch basins feeding into the CDS to determine the effectiveness.

1. WCSD crews visually monitored the CDS unit for floating trash after every storm event described. If no floating trash was visible, such results were recorded, and otherwise crews removed the floating trash.

2. WCSD crews removed all accumulated trash after every storm from all retrofitted CBs. Removal of trash was performed using the described procedure.

3. Effectiveness of screen covers (SC) was determined as follows:

$$SC_{effectiveness}\ \% = (TH_{tCDS + CBs} - TC_{tCDS + CBst} \,/\, TH_{tCDS + CBs}) \times 100$$

$TH_{CDS + CBs}$ = $Trash\ Historical_{tCDS + CBs}$
= *860 lbs (based on average 2003/2004 wet season cleaning)*
$TC_{CDS + CBs}$ = $Trash\ Current_{CDS + CBs}$

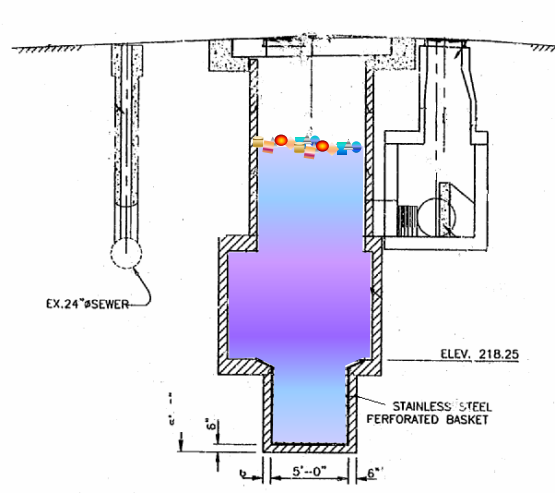
CHAPTER

3

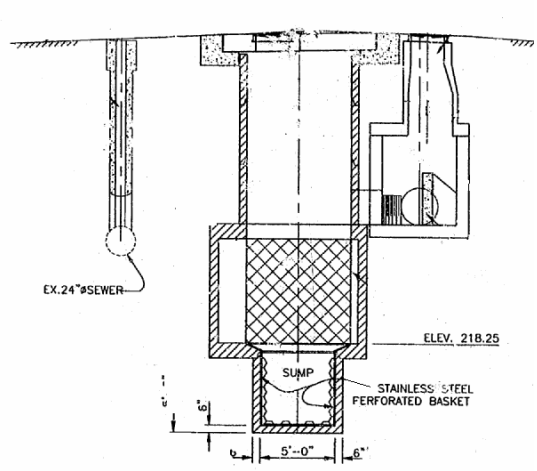
PILOT STUDY – RESULTS

The intent of this section is to present the results obtained by the Wastewater Collection System Division (WCSD) crews during the cleaning of the catch basins and CDS unit after every storm greater than 0.25 inch. There were a total of 4 rain events of a magnitude that triggered a cleaning event during the 2005/2006 wet season.

Data collection consistency was maintained by employing the same practice/protocol throughout the study. To ensure less variability in data gathered, at the start of the pilot study the CDS unit was thoroughly cleaned (emptied). Figure 3.1a shows the condition of the CDS unit prior to cleaning, whereas Figure 3.1b shows condition after cleaning. During the study, only floatable materials within the CDS were gathered as shown in Figure 3.2. Vactor trucks were used to remove all floatables from the surface. Vactor trucks then traveled to the Hyperion Treatment Plant to measure the weight of the floatables. Every effort was made to decant the truck thoroughly prior to obtaining the wet weight of the floatables collected.

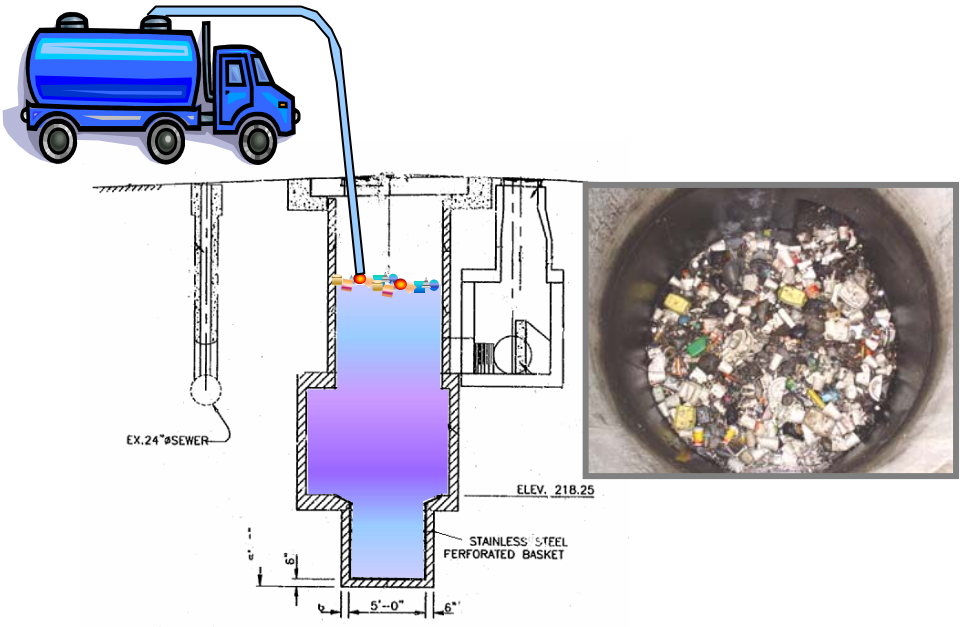


a. CDS unit prior to cleaning.

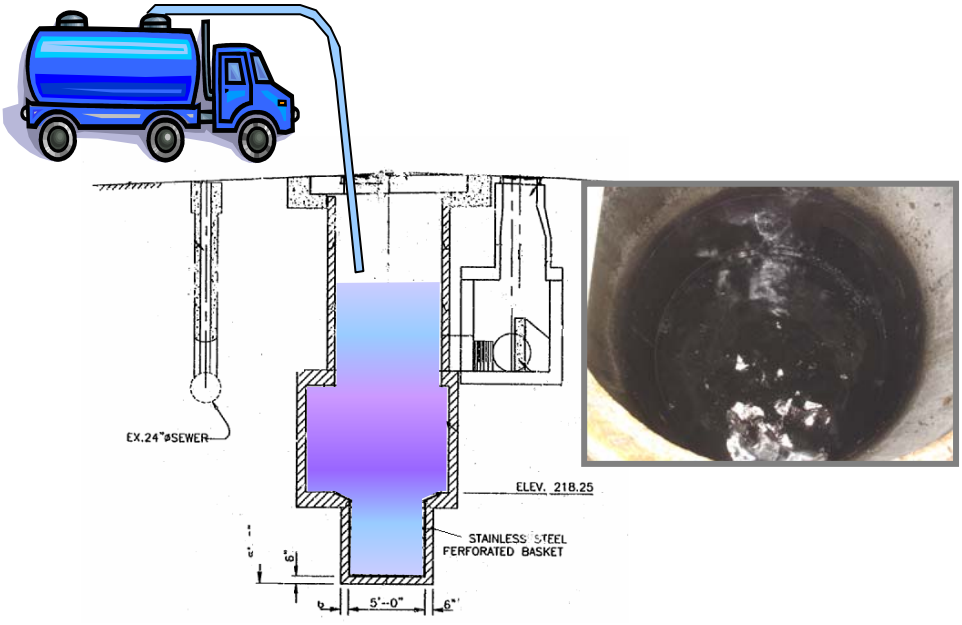


b. CDS unit after cleaning.

Figure 3.1 Preparation of CDS unit for pilot study



a. Contents of CDS unit after storm event



b. CDS unit after cleaning

Figure 3.2 Method of cleaning of CDS unit during pilot study duration.

Table 3.1 illustrates the rain event and the corresponding deflection effectiveness based on the Test Protocol procedure.

Table 3.1 CB Opening Screen Cover Deflection Effectiveness
(During storm event only)

Event	Date	Collected Trash (lbs)		Screen Cover % Deflection Effectiveness (c)
		CBs (a)	CDS (b)	
1	10/17-18/05	91	170	70
2	12/31/05- 1/2/06	69	110	79
3	2/17-18/06	155	200	59
4	3/20-21/06	112	250	58

Figures 3.3 and 3.4 below show typical contents found in the CDS unit after a storm event. Note that the predominate material is floatable materials such as styrofoam cups and containers, light film plastics used in packaging, and some paper products. Figures 3.5 through 3.10 show the typical conditions of the opening covers after the rain events. Note that Figure 3.9 and 3.10 depict condition of the opening covers for rain events (late March and early April) less than 0.25 inches and staff only documented these through photos.

Figure 3.3 CDS contents after first storm event

Figure 3.4 CDS contents after last storm event

Figure 3.5 Typical opening cover after Rain Event No. 1 (10/17-18/05)

Figure 3.6 Typical opening cover after Rain Event No. 2 (12/31/05 – 01/02/06)

Figure 3.7 Typical opening cover after Rain Event No. 3 (2/17-18/06)

Figure 3.8 Typical opening cover after Rain Event No. 4 (3/19-20/06)

Figure 3.9 Typical opening cover after rain event less than 0.25in (3/29/06)

Figure 3.10 Typical opening cover after rain event less than 0.25in (4/4-5/06)

CHAPTER

4

PILOT STUDY
ANALYSIS AND RECOMMENDATIONS

Data Analysis

The study objective was to determine the CB opening screen cover effectiveness during the wet season. Chapter 3 shows that this type of opening cover demonstrated an effectiveness rate in the range of 58% to 79% during the rain events greater than 0.25 inches. As stated beforehand, the only time trash would enter a retrofitted catch basin with an opening screen cover would be when sufficient flow is generated by a medium to large storm to mobilize floatable trash in the area and push the cover open. It should be noted however that the City of Los Angeles during a typical year experiences twenty five (25) wet days and three hundred forty (340) dry days (93% of the calendar year; Source: www.cnrfc.noaa.gov/rainfall_data.php). For dry days the effectiveness of the opening screen cover will be considered 85 percent, given that the screen will remain in the closed position and only trash smaller than one (1) inch will enter the catch basin. The 85 percent was arrived at by data collected from a waste characterization study conducted on 30 catch basins in June 2004. The waste characterization resulted in 85 percent of the collected waste being plastic material (i.e., plastic bags, plastic film, moldable plastic), and paper greater than 1 inch. It was assumed that 7% of the styrofoam and paper was smaller than 1 inch and not used in determining the 85 percent. See Table 4.1. Therefore, using a 1:9.3 weighted average over an entire year, the opening screen cover will have an **86 percent effectiveness rate.**

Table 4.1 Catch Basin Trash Characterization (June 10, 2004, 30 catch basins)

Category	Volume (%)
Plastic-Bags	19
Plastic-Film	24
Plastic-Moldable	19
Styrofoam	17
Paper	17
Cloth	1
Metal	3
Wood	1
Glass	0
Cardboard	0
Cigarette Butts	0
Other	0

Observations

Throughout the study many observations, other than deflection effectiveness trash rate, were recorded and below are some aspects that need to be considered with the use of this type of opening screen cover:

- This type of opening screen cover tended to snare bottles, beverage cups, and other large material as the cover receded to the closed position. Thus, resulting in the CB opening screen cover remaining in the unlocked position.
- This type of opening screen cover relies on static pressure from the accumulation of flow outside the catch basin resulting in some occasions in localized ponding.
- This type of opening screen cover was installed flush with the curb face and was prone to damage by vehicles that have large wheel lug nuts, such as buses and heavy duty trucks.
- The placement of this type of opening screen cover flush with the curb face allowed for it to sometimes open when street sweepers swept the streets, resulting in trash being pushed into the catch basin.

Recommendations

The City should continue the use of catch basin opening screen covers in high trash generation areas based on its preliminary high trash deflection capability. However, the city should continue to evaluate different configurations of covers based on the following criteria:

- Maximize the amount of trash kept on the streets;
- Minimize flooding potential;
- Prevent large trash from entering the catch basin; and
- Ease of maintenance