CHAPTER 7

CONTROL OF SOLID AND FLOATABLE MATERIALS IN CSOs

The sixth minimum control is intended to reduce, if not eliminate, visible floatables and solids using relatively simple measures. Simple devices including baffles, screens, and racks can be used to remove coarse solids and floatables from combined sewage, and devices such as booms and skimmer vessels can help remove floatables from the surface of the receiving water body. In addition, as discussed in the next chapter, pollution prevention measures such as street sweeping can prevent extraneous solids and floatables from entering the CSS.

Several other minimum controls (e.g., increased use of the collection system for storage and maximization of flow to the POTW) are also likely to reduce solids and floatables on an incidental basis. The NPDES permitting authority might require evaluation and implementation of some measures specifically aimed at reducing coarse solids and floatables in any CSOs. The LTCP will need to address the effectiveness of the minimum control measures and evaluate other methods (e.g., swirl concentrators and mechanically cleaned screens) for removing solids and floatables.

7.1 Methods for Removing Solids and Floatables from Combined Sewage

Several simple measures can be used to remove solids and floatables from combined sewage before they reach the receiving stream. These include baffles, screens, catch basin modifications, and nets.

7.1.1 Baffles

Floatables can be captured relatively easily within the collection system with baffles placed at overflow locations (Figure 7-1). The effectiveness of baffles will depend on the specific design of the diversion points for the overflows. Baffles are generally simpler than screens and other methods, and have lower capital and O&M costs. Their removal effectiveness is likely to be lower, however, because turbulence in the flow stream tends to entrain floatables, especially those that are relatively close to neutral buoyancy.

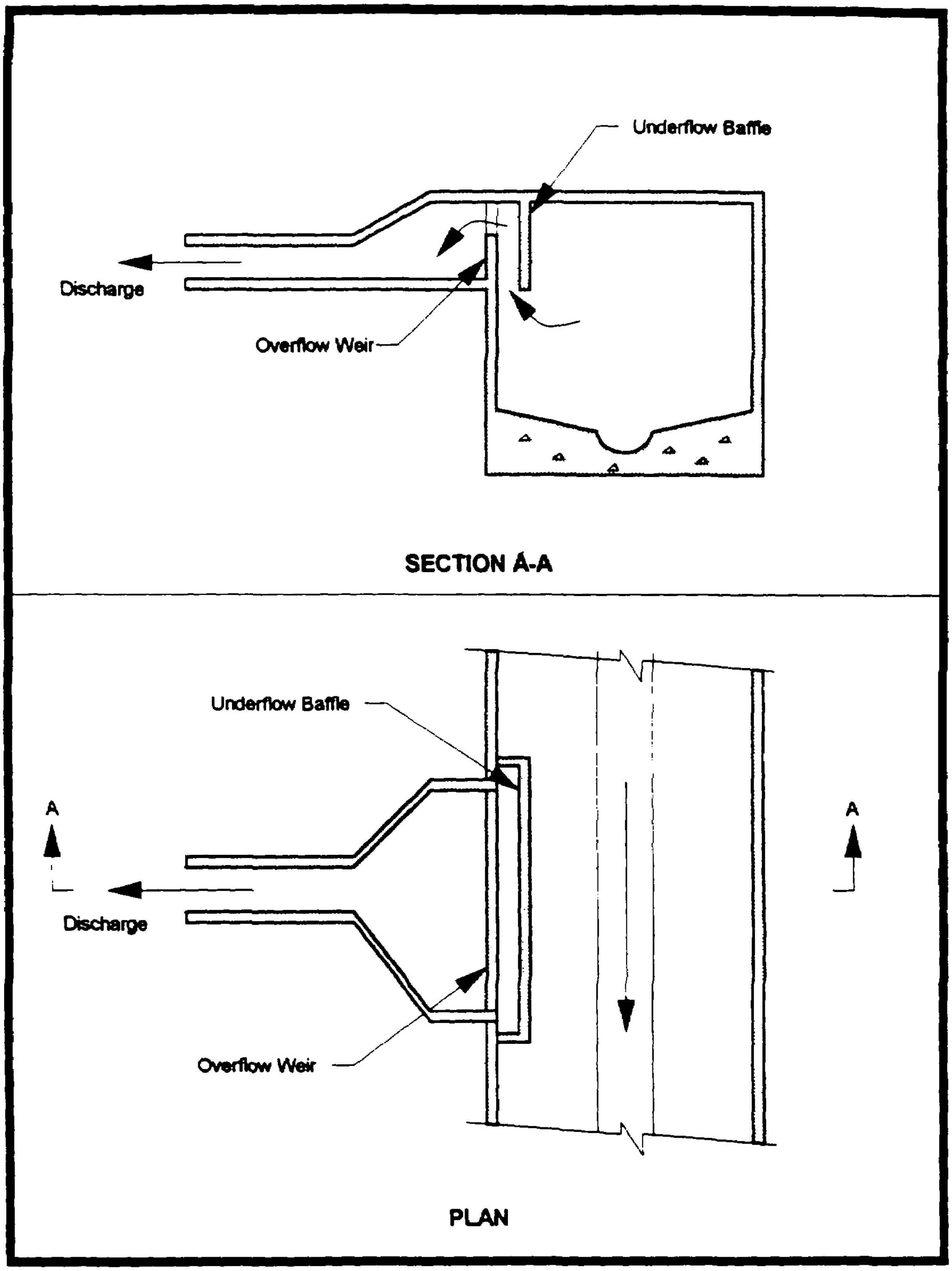

Figure 7-1. Baffles

7.1.2 Trash Racks

A trash rack is a set of vertical bars designed to remove coarse and floating debris from CSOs (Figure 7-2). Trash racks are usually used to prevent floatables from exiting storm water detention ponds and from entering and clogging the pond outlet pipes. Trash racks can be used in a similar manner for CSO floatables, as long as enough outfall pipe or land space is available for a small structure and the outfall is high enough above the receiving water to facilitate regular maintenance.

7.1.3 Static Screens

Static screens (usually vertical bar racks) are manually cleaned screens similar to trash racks (Figure 7-3). Static screens are typically used in sewage treatment plants for preliminary treatment and at pump stations for the removal of debris to protect facility pumps and other internal working areas. They can be used to control coarse solids and floatables in areas where adequate construction space exists and where the outfalls are above the water level of the receiving water body to facilitate maintenance.

7.1.4 Catch Basin Modifications

Catch basin modifications include the installation of horizontal grating restrictions, catch basin outlet restrictors (e.g., hanging traps, hoods), and vertical throat restrictions (Figure 7-4). Restricting the amount of flow that enters the catch basins will also reduce the amount of street litter that enters the catch basin and the CSS. Before modifying catch basins, it is necessary to evaluate whether restricting the catch basin inflow rate will cause unacceptable street flooding. In addition, regular maintenance is necessary to remove trapped floatables and other debris from the catch basin.

7.1.5 End-of-Pipe Nets

Nets can be used to separate floatables from CSOs (Figure 7-5). In general, simple placement of a net across the face of an outfall is not practical because factors such as the discharge velocity and receiving water currents can threaten the integrity and influence the

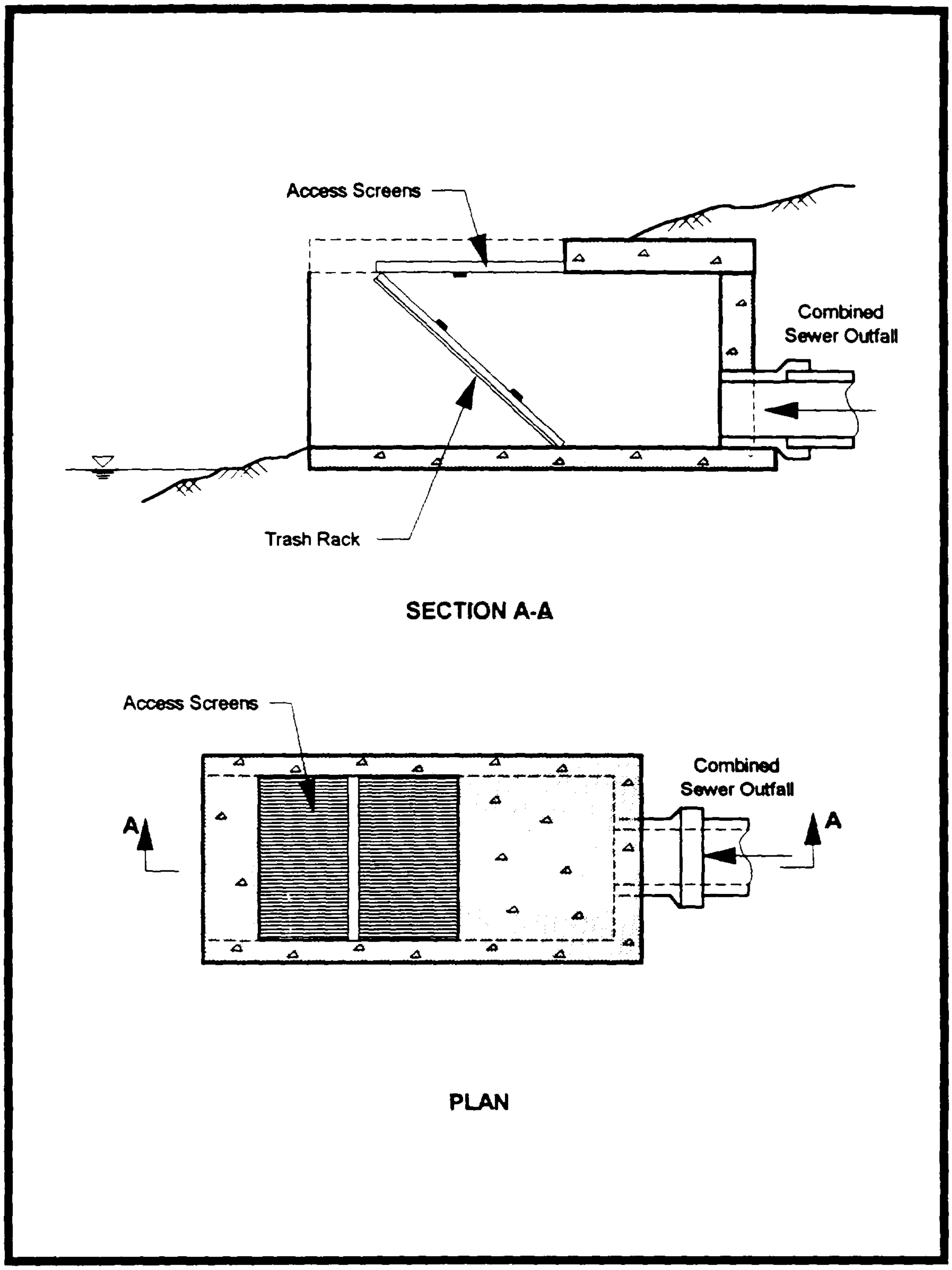

Figure 7-2. Trash Racks

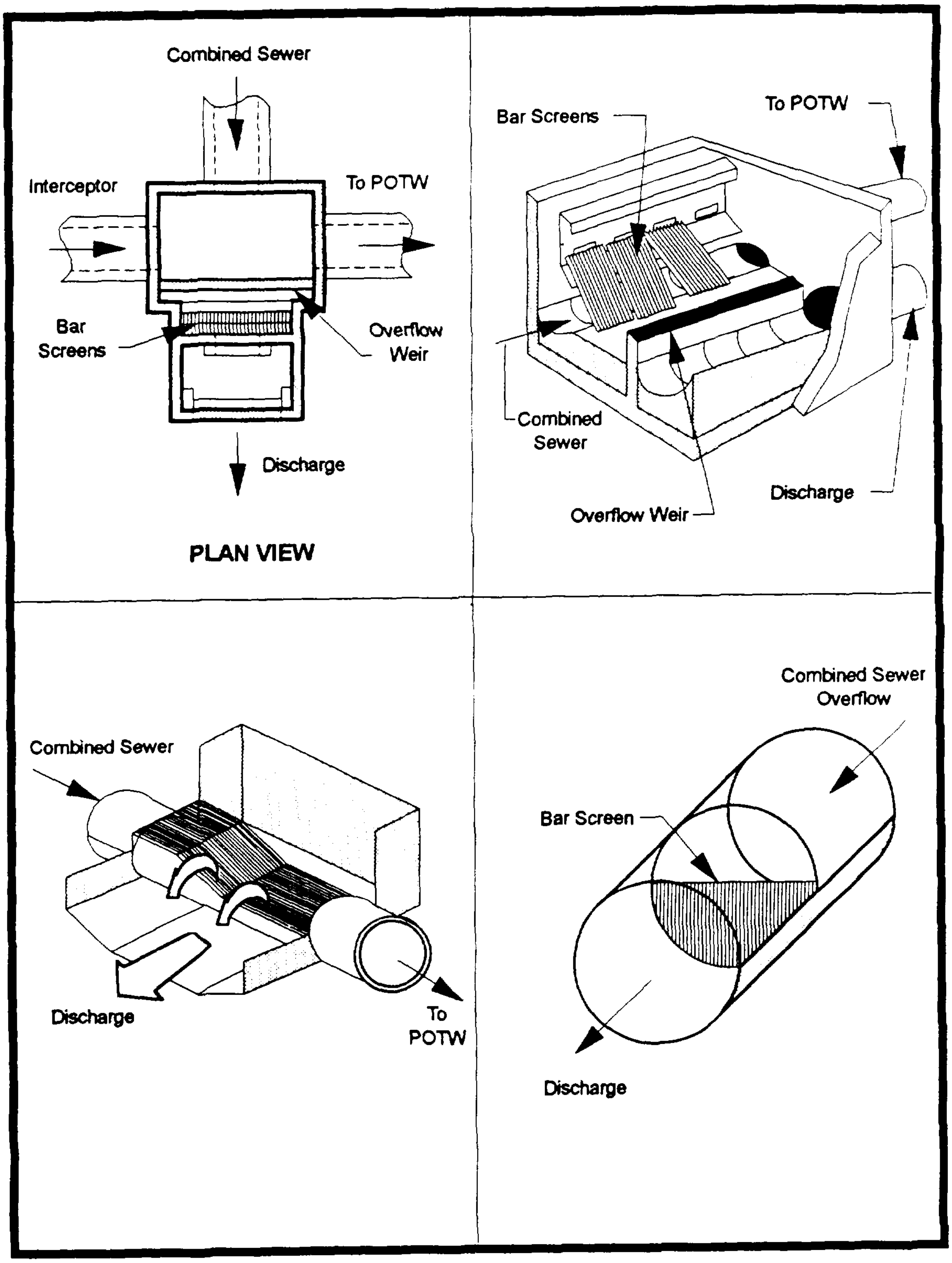

Figure 7-3. Static Screens

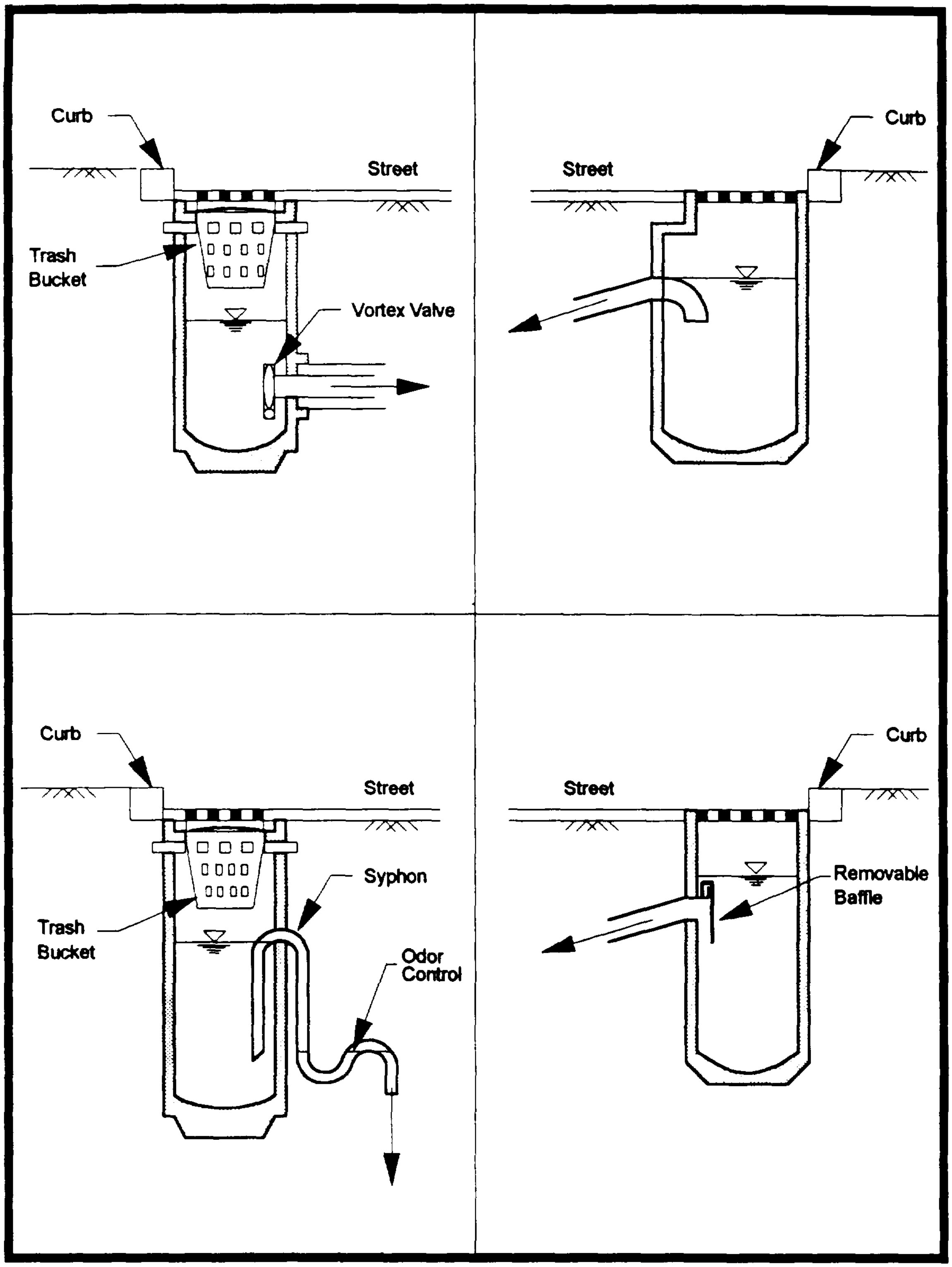

Figure 7-4. Examples of Catch Basin Modifications

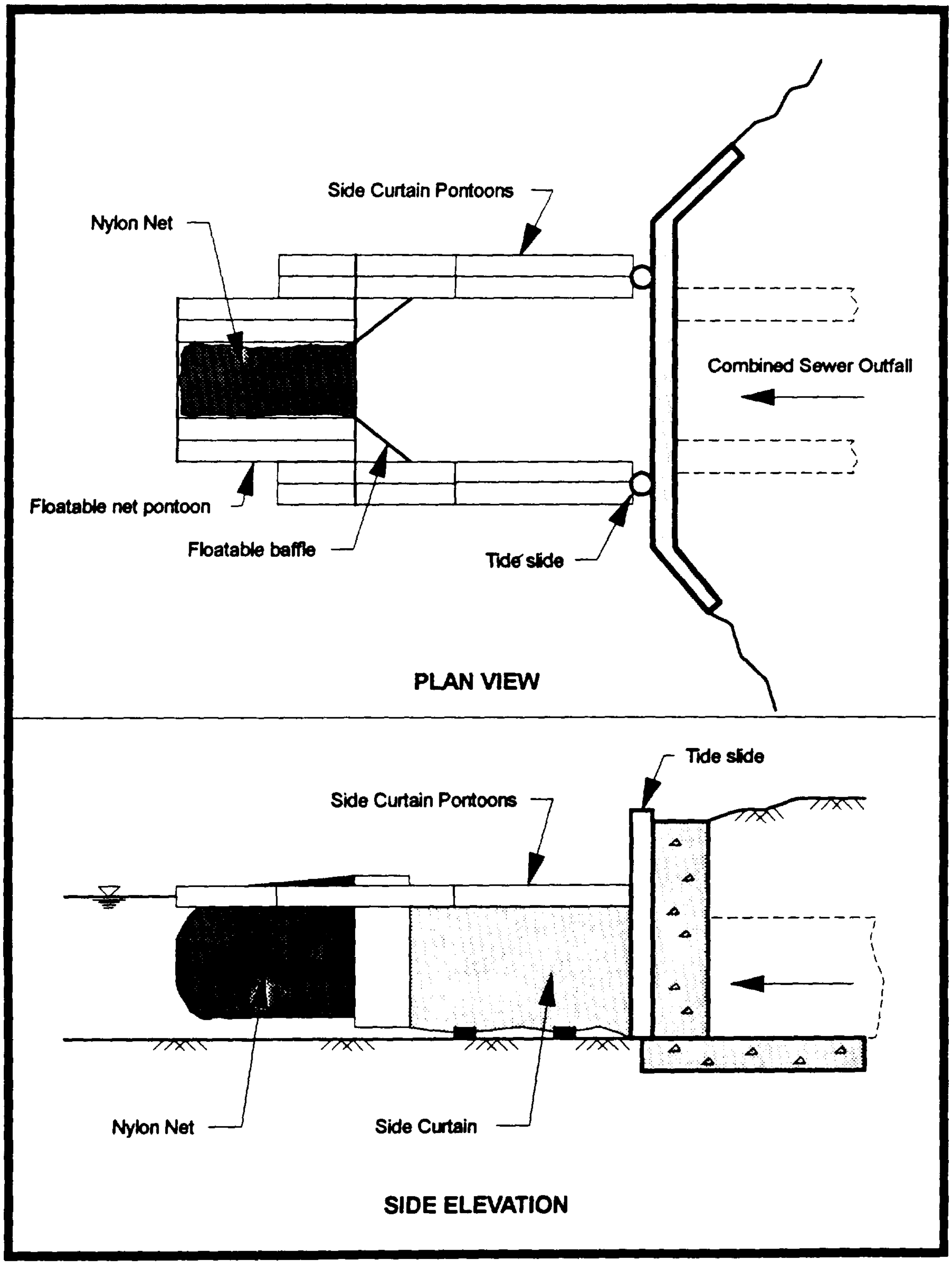

Figure 7-5. Nets

efficiency of a netting system. Usually, a netting installation takes the form of an in-water containment area deflecting CSO flow through a set of netted bags. Floatables are retained in the bags and removed for disposal. The containment system should be sized to handle the volume and force of the CSO. Nets have the potential to work well in lake, tributary, or quiescent estuarine waters at least a few feet deep with an outfall at or close to the level of the water surface. Because these devices are constructions within the natural boundaries of the waterway, however, some NPDES authorities might not approve them.

7.2 Considerations in Removing Solids and Floatables from Combined Sewage

The principal advantage of the removal devices described in Section 7.1 is that they remove larger visible materials from CSOs. One or more of the illustrated screening methods could be considered as a control measure where physical site conditions permit.

The principal disadvantage of these devices is the demand on existing O&M program personnel and budget resources for regular and timely maintenance to clean the screens and dispose of retained materials. Clogged screens will either result in unplanned discharges at other overflow points or produce backups, which cause street or basement flooding. Clogged screens will also cause head loss in the sewer system or act as a barrier in the system and cause surcharges.

7.3 Methods for Removing Floatables from the Surface of the Receiving Water Body

Solids and floatables can also be removed from the receiving water body after discharge. This section briefly describes two commonly-used devices.

7.3.1 Outfall Booms

Simple vinyl oil collection booms, or more elaborate containment systems with specially fabricated flotation structures and suspended curtains, can be placed in the water around outfalls to contain materials with positive buoyancy (which remain on the surface even in turbulent pipeline flows) and materials with neutral buoyancy (which will surface only under the relatively quiescent conditions of the containment zone) (Figure 7-6). Once contained behind booms,

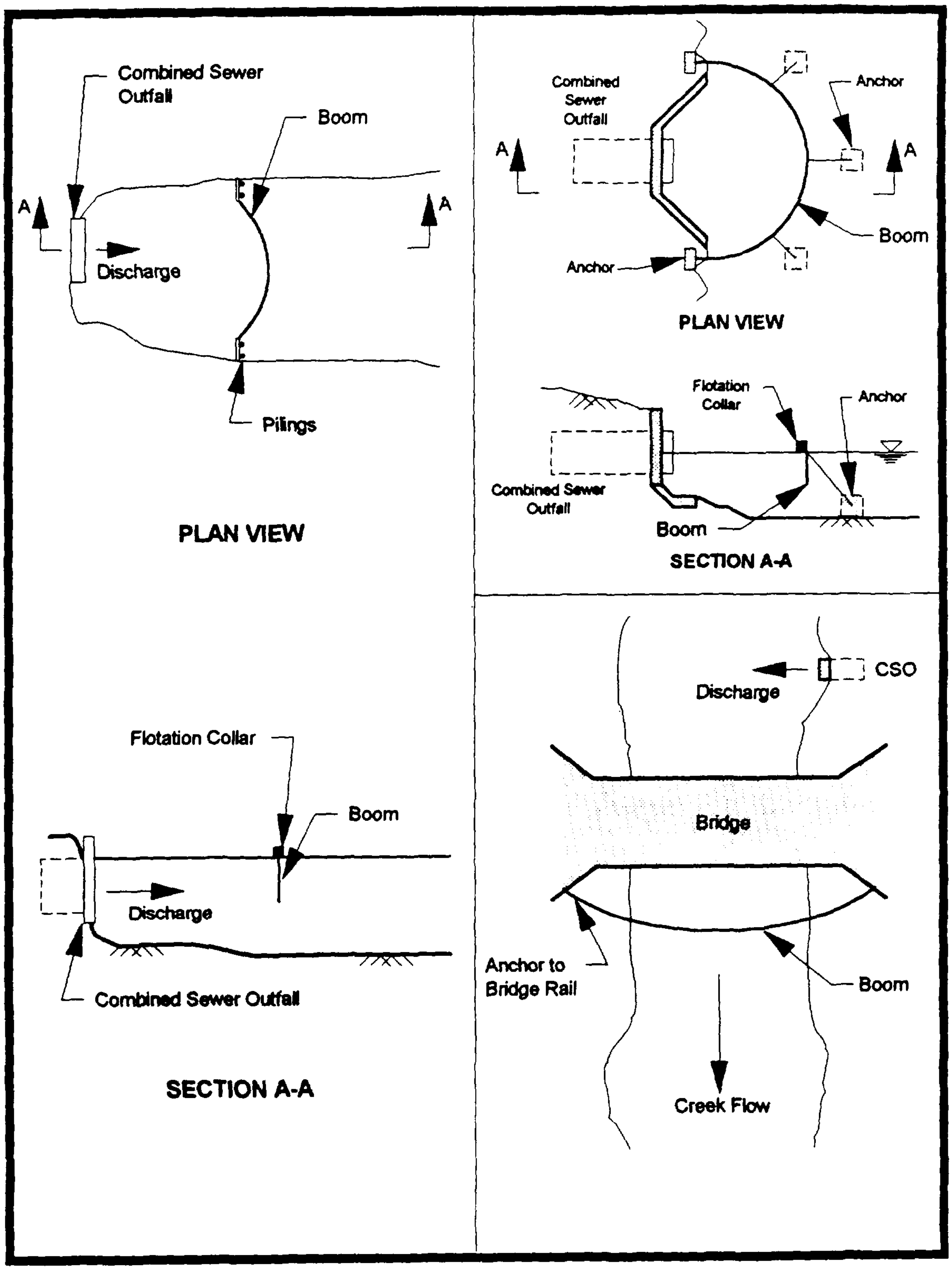

Figure 7-6. Outfall Boom

floatables can be removed by hand, skimmer vessels, or vacuum trucks. Booming systems can also be deployed downstream of one or several outfalls in a river.

Site-specific conditions should be considered in the evaluation, design, and placement of any boom system. Ambient water velocity, CSO exit velocity, provision for a stilling area, allowance for submerged material to rise to the surface, selection of a cleanup method, and the anchoring of the system are all important factors. Because booms are constructions within the natural boundaries of the waterway, however, some NPDES permitting authorities might not approve them.

7.3.2 Skimmer Boats

Skimmer boats remove floating materials within a few inches of the water surface and are being used in cities including New York, Baltimore, and Chicago (Figure 7-7). These vessels range from less than 30 feet to more than 100 feet in length. They can be equipped with moving screens on a conveyor belt system to separate floatables from the water or can lower a large net into the water to collect the materials. Skimmer vessels can be used in water bodies, including back embayments, lakes, reservoirs, and sections of harbors, where currents do not carry floatables away from the CSO outfall area. They might not be effective in areas where fast-moving river or estuary currents rapidly carry floatables downstream or where other conditions impede retrieval. Vessels can also be employed in open water areas where slicks from floatables form due to tidal and meteorological conditions.

7.4 Considerations in Removing Floatables from the Surface of the Receiving Water Body

Simple outfall booms are relatively inexpensive. If the shoreline geometry is favorable, they can be effective in preventing floatables from reaching areas of the water body of higher visibility and sensitivity. More elaborate containment systems, although much more expensive, might be appropriate if CSO outfalls are large but few in number.

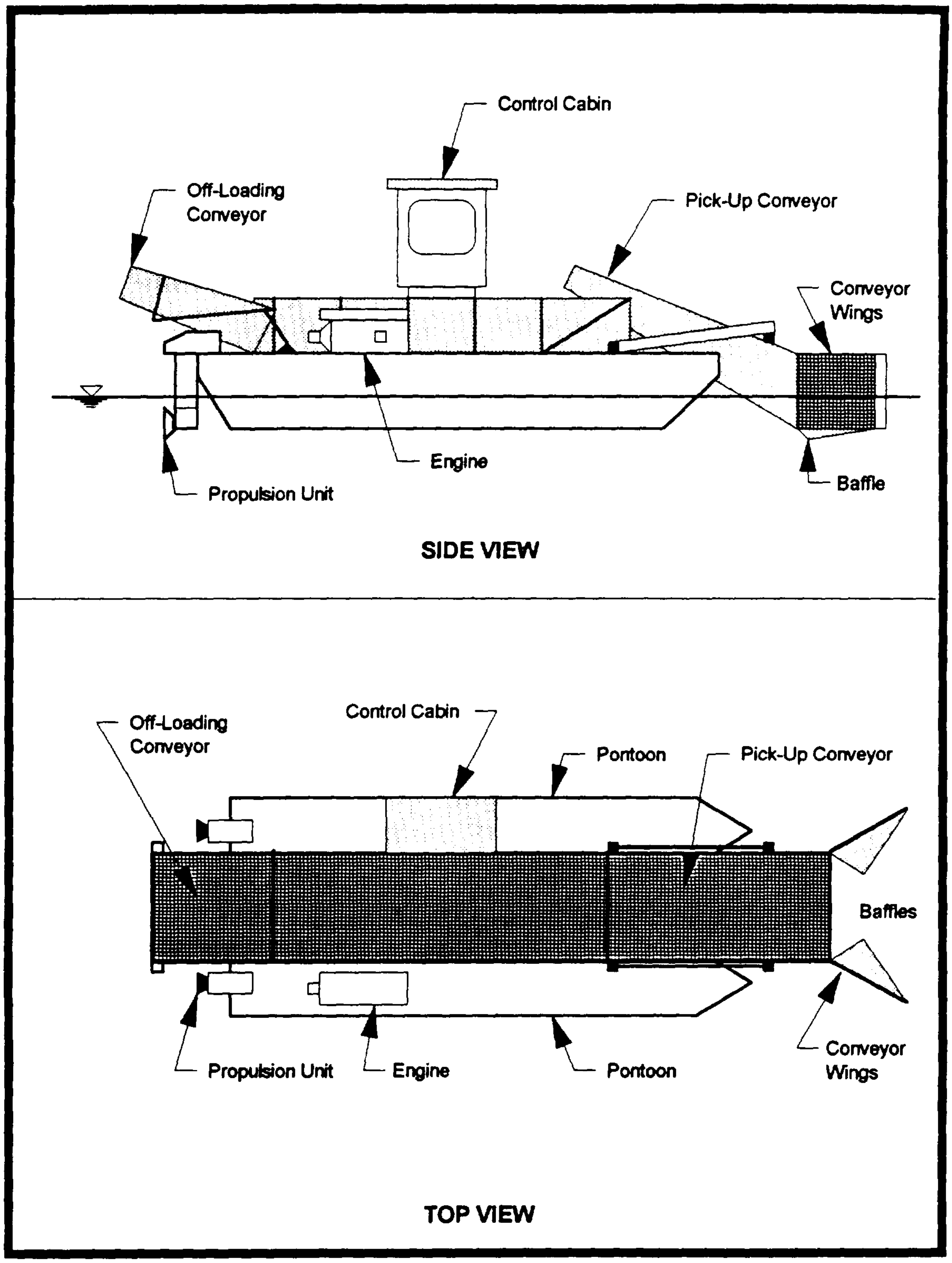

Figure 7-7. Skimmer Boats

Skimmer boats are relatively expensive to purchase and operate. They might satisfy minimum technology criteria if they provide an alternative to the individual control of a large number of widely-dispersed CSO outfalls. In addition, skimmers might be a feasible alternative if geometry and currents make it possible to intercept the floatables before they reach sensitive waterfront areas and beaches. A single skimmer could be used in a cost-effective manner, for example, to clean several containment systems and to recover slicks in open waters.

The principal disadvantage of booms and skimmer boats is that floatables enter the receiving water before removal. The more effective the containment, the more unsightly the appearance of the containment area. Containment can temporarily downgrade the conditions of the receiving waters between cleanings. Therefore, the systems must be cleaned frequently and as soon as possible following overflow events. As mentioned previously, capital and O&M costs for skimmer boats might exceed minimum technology criteria but provide a cost-effective interim program.

7.5 Methods to Prevent Extraneous Solids and Floatables from Entering the CSS

An extensive monitoring program conducted by the city of New York suggests that most floatables in CSOs (about 95 percent) originate as street litter. The remainder includes personal hygiene items flushed down toilets, which are some of the more objectionable material causing beach closings (Figure 7-8).

Accordingly, source control programs that address the prevention or removal of street litter and the proper disposal of personal hygiene materials can contribute greatly to the control of floatables. The next chapter identifies practices to reduce the introduction of such materials into the CSS.

7.6 Considerations in Preventing Extraneous Solids and Floatables from Entering the CSS

Source control techniques for reducing floatables can offer a relatively cost-effective method for preventing floatable materials from appearing in overflows. Citizen action or

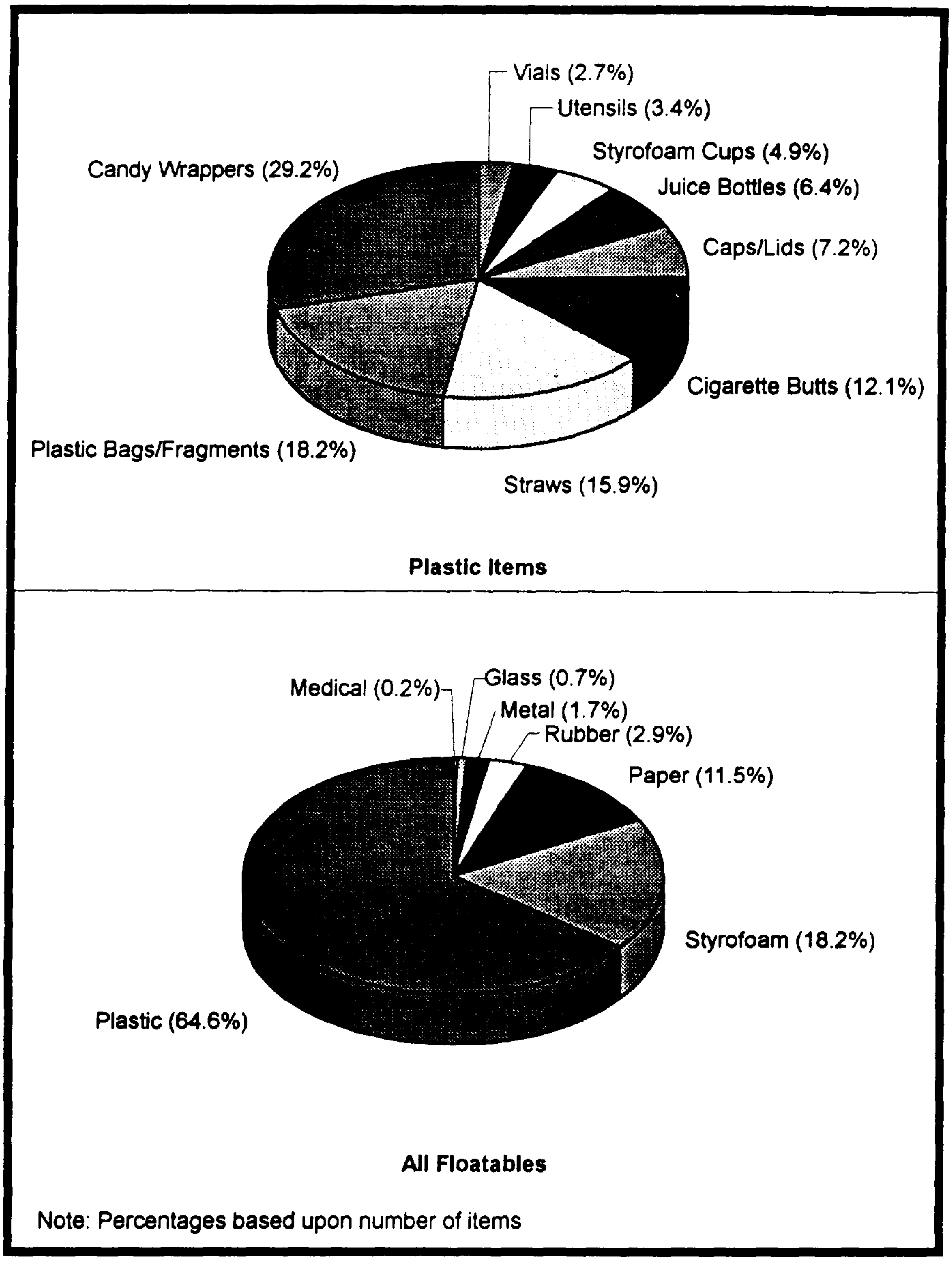

Figure 7-8. Floatable Material in New York City CSOs

education programs can also raise public awareness of the problems associated with CSOs and of the need for the broader control programs.

7.7 Documentation

The following list provides examples of documentation that could be submitted to demonstrate diligent effort in evaluating this minimum control and a clear understanding of the measures being implemented:

- An engineering evaluation of procedures or technologies considered for controlling solid and floatable materials
- A description of CSO controls in place for solid and floatable materials
- A cost estimate (including resource allocation) and implementation schedule for each of the control measures being implemented
- An estimate of the decrease in solids and floatables expected from the minimum control efforts
- Documentation of any additional controls to be installed or implemented.