6. Stormwater Management Issues

Stormwater management issues are considered to be factors that currently prevent, or may prevent, the stormwater management objectives identified in Chapter 5 from being realised (EPA, 1998). Environmental, social and managerial issues were identified for the Cooks River, with major issues relating to:

- large volumes of litter reducing visual amenity;
- elevated levels of nutrients and bacteria;
- high concentrations of toxicants;
- lack of co-ordination of management efforts;
- elevated suspended solid levels; and
- loss of natural habitats and poor river health.

Specific stormwater management issues have been identified through the review of existing information as detailed in previous chapters of this Plan. In addition, consultation with Council officers, stormwater managers, Government Authorities, the community and stakeholder groups enabled identification of issues on a sub-catchment basis. Field inspections of the catchment following consultation, enabled identification of specific "hot spot" stormwater problem areas. Hot spots are locations within the catchment which are considered to be pollution sources affecting stormwater quality or impacting on the ecological values of the waterway. Hot spots also include areas that are known stormwater pollution problem areas, such as areas that collect a lot of litter or areas where water quality is particularly poor.

The stormwater management issues, causes and hot spots identified for the Cooks River are summarised in *Table 6.1* and illustrated in *Figure 8*.

6.1 Causes of Pollution

The Cooks River Catchment Management Committee recently undertook a Pollution Inventory of the Cooks River (CRCMC, 1997). This Pollution Inventory involved the compilation of all the potential sources of water pollution and an estimate of their relative impact on the water quality and health of the Cooks River. The outcomes of the Pollution Inventory are summarised in *Figure 9*, which indicates the major water pollution sources and illustrates their estimated impact on water quality in the Cooks River.

Figure 8

Potential Pollution Sources and Identified Hotspots

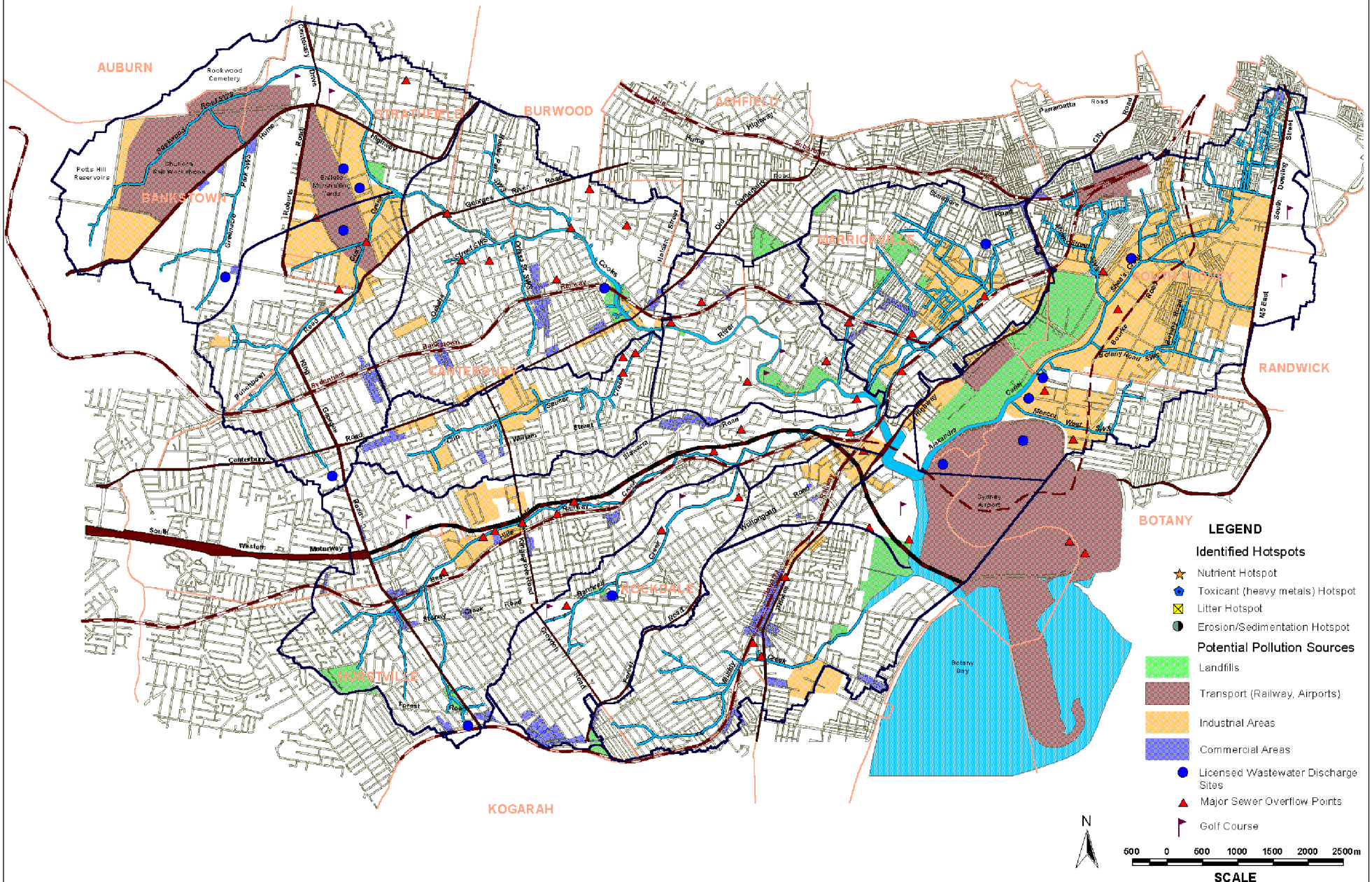

Figure 9: Major Sources of Pollutants and Their Estimated Relative Impact on Water Quality in the Cooks River (Source: CRCMC, 1997)

Based on the outcomes of the Pollution Inventory, pollution loads and sources have been identified for each of the major stormwater management issues (CRCMC, 1997).

Litter

The Pollution Inventory estimated that about 1,300 cubic metres of litter (not including sediment and organic material) are washed from the catchment each year. The main source appears to be streets and gutters in both residential and commercial areas. Other sources identified by the study area were parks, especially those along the river foreshore used for events on weekends. The Pollution Inventory indicated that the most common items of litter were cigarette butts, takeaway food containers, confectionery wrappers, plastic bags, polystyrene packaging and bulkier items such as clothing, furniture, building waste and shopping trolleys.

Major litter hotspots within the Cooks River are identified by *Figure 8*.

Nutrients and Bacteria

The Pollution Inventory estimates the total average annual loads of phosphorus and nitrogen in the Cooks River to be about 50 tonnes and 110 tonnes respectively.

The sewer system is estimated to be the largest source of nitrogen (almost 50%), but is considered to be a less significant source of phosphorus.

Streets are also estimated to be a major source of nutrients, possibly from atmospheric deposition, roadside and domestic fertiliser runoff, and detergents from car washing. Fertilisers used in parks, golf courses, and residential lawns and gardens are another major source of nutrients. Key nutrient hotspots identified for the Cooks River are illustrated in *Figure 8* and listed in *Table 6.1*.

The Pollution Inventory identifies the major source (more than 90%) of faecal coliforms, the indicator of pathogenic organisms (bacteria and viruses), to be the sewer system. It is estimated that about 70% of sewage and coliforms entering the Cooks River do so via five major overflows at Muddy Creek. Minor sources of

bacteria are streets, open space, dog exercise areas, and residential land, presumably from domestic and native birds and animals.

Toxicants

The Pollution Inventory identifies the key toxicants to be heavy metals (lead, zinc, copper and cadmium), oils and grease, pesticides and herbicides.

The Pollution Inventory estimates that about half of the lead entering waterways in the catchment comes from roads (atmospheric fallout from lead petrol, other automotive components). Other significant sources include roofs (atmospheric fallout, lead in roofing and guttering) and poor practices at some industrial premises, particularly some metal fabrications and recyclers. The total average annual lead load is estimated to be about five tonnes.

Galvanised roofing is considered to be the largest source of zinc in the catchment, followed by roads (zinc is used in a number of automotive components) and then small industrial premises (notably some galvanisers) and groundwater inflows from contaminated land. The total average annual zinc load is estimated to be about 23 tonnes.

Copper in roofs, guttering and pipes is considered to be the largest source in the catchment (about half), followed by roads (copper is used in some automotive components) and small industrial premises. The total average annual copper load is estimated to be about three tonnes.

Roofs are also considered to be the largest source of cadmium (almost 50%), followed by contaminated groundwater and roads (cadmium is found in automotive components). The total average annual cadmium load is estimated to be approximately 0.2 tonnes.

Landfills are also considered to contribute to the toxicant load in the Cooks River. Filled sites in the catchment are identified in *Figure 8* and include parts of the Kingsford Smith Airport, large areas along Alexandra Canal, Henson Park, Steel Park, Hurstville Aquatic Centre, Olds Park, Penshurst Park, Kempt Field, Laxton Reserve, Morton Park, Jarvie Park, and Wicks Park (Total Environment Centre 1976).

It is noted that licensed industrial discharges are not considered by the Pollution Inventory to be a significant source of metals, and the sewer system is thought to make only a minor contribution (0-4%).

The Pollution Inventory estimates the total annual load of oils to be about 230 tonnes. The main types of oils and greases in the catchment are considered to be petroleum products and animal and vegetable oils used in foods and cooking. The main source (75%) of petroleum oils is considered to be runoff from the roads, the ultimate sources being vehicles which drip oil and other hydrocarbons, and possibly hydrocarbons in the bitumen road surfaces. Toxicants on road surfaces are likely to bind to sediment and therefore management of sediment from roads will also result in management of toxicants.

Spilt petrol will normally vaporise before it is washed off the catchment, but the heavier diesel fuel may remain and form part of this runoff. Secondary sources include poor practices at some motor vehicle repair premises, fuel depots and outlets and transport companies, and "backyard" mechanics. No estimates were able to be made of cooking and fool oils although it is known that these substances can cause significant pollution when disposed of illegally.

The Pollution Inventory reported insufficient information to estimate sources or quantities of pesticides and herbicides, but considered the major sources to be weed sprays and termite treatment of houses. However, use of chlordane, and other longer living pesticides such as DDT has been phased out, so quantities entering the river can be expected to reduce over time.

Suspended Solids / Sediments

The Pollution Inventory estimated that on average about 11,000 tonnes of sediment is eroded from the catchment each year resulting in murky waterways. Key erosion hotspots along the Cooks River are identified in *Figure 8* and discussed in *Section 3.1*. Sources of suspended solids, including roads, residential blocks, open space, eroding river banks and building and renovation sites. There may be 3,000 construction sites in the catchment at any one time, with perhaps a third involving soil disturbance and thus likely to contribute sediment load.

Other Pollution Sources

Other pollutants identified as impacting on the water quality of the Cooks River include; releases from public and private swimming pools, which may be high in chlorine and suspended solids, runoff from concrete batching plants which may be highly alkaline, and the possible release of acid from acid-sulphate soils. These pollutant sources are considered to be relatively minor in comparison to the major causes of stormwater management issues discussed above.

Table 6.1: Stormwater Management Issues, Causes and Hot Spots in the Cooks River

Issues	Potential Causes	Specific 'Hot Spots' (Figure 8 Reference Location)	Corresponding Objective*
1. Litter in Waterways			
Large volumes of litter including food wrappers, plastic bags, packaging, PET bottles and other forms of litter are all readily visible in the Cooks River. Litter and other gross pollutants are the pollutants Councils receive the most complaints about. Litter is an issue for the Cooks River due to its potential to: ■ degrade the visual quality of the waterways; ■ obstruct existing stormwater controls and transport pollutants; ■ alter aquatic habitats; and ■ become a hazard to recreational users and wildlife.	The litter which ends up in the waterways of the Cooks River is generally thought to come from the following sources: ■ commercial & industrial areas; ■ schools and shopping centres; ■ roads where street sweeping is infrequent; ■ people dumping cigarette butts out of cars and littering generally; ■ parks where there are an insufficient number or type of bins, or bins are uncovered and removal of rubbish is not frequent enough; ■ kerbside recycling bins, particularly PET which is left out for collection and blown away due to delay in collection; ■ fast food outlets; and ■ kids at bus stops, train stations.	■ Large quantities of litter are observed in Muddy Creek estuary following rain events. ■ Parks along the Cooks River foreshore are a significant source of litter. ■ Litter in Bardwell Creek at Shepherd Reserve and Favell Picnic Area. ■ Litter discharging from the Marrickville Piped Subcatchment to the Cooks River. ■ Potential for litter input from Chullora redevelopment area. ■ Litter at the head of Alexandria Canal. ■ Litter from downstream of Campsie industrial area in Cup and Saucer Creek. ■ Litter downstream of Cosgrove Road/ Madeline Street industrial area, Strathfield. ■ Litter discharged from Orissa Street subcatchment. ■ Litter from the Hume Highway in the Upper Cooks River.	Objective 8 Objective 2 Objective 10

Issues	Potential Causes	Specific 'Hot Spots' (Figure 8 Reference Location)	Corresponding Objective*

2. Elevated Levels of Nutrients & Bacteria in the Waterways
 	
Much of the Cooks River is considered to have excessive levels of nitrogen and phosphorus which can lead to:
■ algal blooms and increase of aquatic plant growth;
■ increase in weed growth along waterways;
■ impacts on native plants and animals which can not tolerate high nutrient levels; and
■ health risks in cases where extreme algal blooms are toxic.
	Potential causes of elevated nutrient levels in Cooks River include:
	■ detergents entering the stormwater system from sources such as car washing (private and commercial), industrial and commercial discharges, illegal sewage connection to stormwater;
	■ sewage overflows and leaks from sewerage pipes;
	■ animal droppings, particularly dogs; and
	■ excess fertiliser usage in residential properties, Golf Courses, Council managed recreation areas, commercial nurseries.
		High dry weather nitrogen concentrations in Bardwell Creek, possibly resulting from fertiliser use in Bexley and Bardwell Valley Golf Courses or leakages from nearby sewer main;
		■ Major areas of sewer overflow and exfiltration:
		  ■ Sheas Creek/Alexandra Canal
		  ■ Muddy Creek
		  ■ Overflow at Crn Holmer Street and Illawarra Road
		  ■ Sewerage leak at sugar mill site
		  ■ Sewerage leak at Girraween Park
		■ Very high nutrient levels within Alexandra Canal and Muddy Creek creating eutrophic waterway.
		■ Elevated nutrient levels in Coxs Creek Channel around Madeline Street, South Strathfield.
		■ Elevated nutrient levels in Cup and Saucer Canal.
			Objective 6
			Objective 3
			Objective 5
			Objective 1
			Objective 4
			Objective 2

3. Elevated Levels of Toxicants in the Waterways The Cooks River is considered to have high levels of heavy metals, oils and grease, and pesticides which in areas: ■ represent a health risk to waterway users;	Sources of toxicants in the Cooks River have been identified by a pollution inventory of the catchment including: ■ illegal connections to stormwater from industrial areas; ■ spraying of weeds in parks, and along	■ High metal concentrations in the Kingsgrove Road area of Cup and Saucer Creek possibly as a result of industrial discharges. ■ Metal finishing premises, motor vehicle repairers, chemical manufacturers and	Objective 6 Objective 5 Objective 10 Objective 2

Issues	Potential Causes	Specific 'Hot Spots' (Figure 8 Reference Location)	Corresponding Objective*
■ make it unsafe to eat fish caught in the River; ■ provide a heath risk to aquatic food production for example, recreational fishing; ■ are a risk to aquatic flora and fauna; and ■ result in fish kills.	the drainage lines; ■ houses, roofs and guttering found to be a significant source of Zn, Cu, Pb, Cd; ■ petrol and oils from roads and railways (Note: Pollutants from roads are often attached to sediments) and airborne pollutants; and ■ leachate from landfills.	building sites are the small industrial premises considered most likely to be key sources of oil and heavy metals. ■ Oil pollution in Freshwater Creek thought to be caused by motor wrecker and dismantler business. ■ Leachate input from former landfills at: ■ Tempe Reserve, Marrickville ■ Harp Street brickpit , Campsie	Objective 9
4. Managerial Issues			
There are many stormwater managers within the Cooks River catchment and in many circumstances responsibilities are unclear. For example, if litter generated at a railway station is washed down from one Council area to another where it is deposited on the banks of the river owned by Sydney Water who is responsible for its clean up? Managerial Issues include: ■ inconsistencies in management of stormwater systems between different managers; ■ the ownership of infrastructure and control of stormwater pollution is undertaken by separate authorities; and ■ uncertainty of ownership and responsibility for the river banks and pollution within the river. In addition, there is a lack of awareness of individual and business responsibility with regard to stormwater management.	Potential causes of poor management relate to lack of resources and lack of co-ordination and communication between managers. Examples include: ■ railways are controlled and owned by different departments; ■ within Councils there are different departments with different responsibilities; ■ Sydney Water owns much of the drainage system but is not responsible for stormwater quality and can no longer prosecute under the Clean Water Act; and ■ Public Works/Department of Land and Water Conservation undertook the bank stabilisation works along the River but are not responsible for maintaining them.	These issues apply to all of the waterways within the catchment .	Improved management increases ability to meet all objectives.

Issues	Potential Causes	Specific 'Hot Spots' (Figure 8 Reference Location)	Corresponding Objective*
5. Social			
There are a number of social issues associated with the current state of the Cooks River: ■ odours may occur from deposited materials but are not considered a big issue in the catchment as the concrete lining prevents collection of organic materials; ■ health risks associated with the River being unsafe to swim and unhealthy to eat fish; ■ downstream impacts on Botany Bay; ■ reduction in visual amenity of the waterway; and ■ impact on recreational values.	Sources of odour within the catchment include: ■ organic material decomposing; ■ sewer overflows; and ■ illegal discharge from industrial areas. Health risks causes: ■ poor water quality; and ■ bioconcentration of contaminants in fish. Poor visual quality results from: ■ dewatering metal sheet piling in some areas; ■ litter in the waterways; ■ degraded natural systems; ■ turbid murky brown water in waterways; and ■ removal of natural vegetation and weed growth.	Social issues are linked to a number of other issues identified in this Table and hotspots in regard to social issues are addressed by other sections of this table.	Objective 10 Objective 6 Objective 7 Objective 8 Objective 9
6. Suspended Solids/ Sedimentation			
The Cooks River has elevated suspended solids and turbidity levels which may result in: ■ degradation of the water quality affecting the health of the ecosystem; ■ unsightly waterways due to brown and	Possible causes of high suspended solids and sedimentation include: ■ run-off from construction sites; ■ inadequate or lack of maintenance of erosion and sediment controls;	■ Sediment discharges from construction sites throughout the catchment; ■ Discharges from construction activities such as concrete cutting. ■ Erosion of River banks and drainage lines at:	Objective 7 Objective 2 Objective 1 Objective 5 Objective 3

Issues	Potential Causes	Specific 'Hot Spots' (Figure 8 Reference Location)	Corresponding Objective*
murky water; ■ sediment deposition and as a result an environment for weed growth; ■ changes to channel morphology and therefore altered habitats	■ removal of natural vegetation and riparian vegetation and soil disturbance; ■ high flow velocities over unsealed surfaces; and ■ surface run-off from paved areas.	■ Rookwood Cemetery, stormwater drain along eastern boundary; ■ Chullora Railway Workshop, areas of exposed soil; ■ Enfield Marshalling Yards ■ Cooks River Goods Yards, Sydenham; ■ Banks of lower Bardwell Creek; ■ Cooks River at Fore St, Earlwood. ■ Sludge build-up at Mackay Park, Marrickville. ■ Pool Backwash inputs from Roselands and Canterbury Public Pools.	Objective 4
7. Habitat Loss & River Health			
Changes to habitats and the health of the Cooks River have been significant. The result is a river ecosystem of very poor health with low biodiversity. It is unsafe to fish due to contaminant levels concentrated in the fish flesh. The natural processes that contribute to a healthy waterway are no longer in place. The poor quality of water and ecosystems in the Cooks River also impacts on Botany Bay.	Within the Cooks River aquatic and riparian habitats have been significantly altered due to: ■ weed invasion and litter dumping; ■ removal of natural vegetation throughout catchment; ■ altered stream flow regimes as a result of higher velocity flows; ■ channelisation and piping of natural drainage lines; ■ contamination of water quality to the extent where the river supports only the most resilient aquatic life; ■ foreshore erosion and sediment deposition; ■ steep sided channels with no mud flats	■ Need to protect remnant wetlands in Wolli Creek. ■ Need to manage mangrove growth. ■ Opportunities to recreate habitat at: ■ lower Sheas Creek channel; ■ Chain of Ponds Reserve; ■ Parry Park; ■ Alexandra Canal from Sydney Park; and ■ along banks of the Cooks River.	Objective 1 Objective 2 Objective 3 Objective 4 Objective 5

Issues	Potential Causes	Specific 'Hot Spots' (Figure 8 Reference Location)	Corresponding Objective*
	or intertidal zones; and ■ replacement of natural tributaries with concrete lined open drains and pipes.		

* Objective Numbers identified in Table 5.1.