

8. Action Plan

A stormwater management Action Plan has been prepared, based on the outcomes of the options evaluation (refer Chapter 7), to clearly link priority management options with associated stormwater issues and provide the mechanisms to achieve the objectives defined for the Cooks River. The Action Plan (*Table 8.1*) prioritises actions, assigns responsibilities, specifies performance indicators, and provides the working document for ongoing stormwater management. To assist in the interpretation of *Table 8.1*, each of the columns are explained below.

Strategy Column: To ensure consistency with existing Action Plans prepared for the Cooks River and with individual Council's Management Plans, practical strategies have been identified to address the causes of each stormwater issue. The strategy column in *Table 8.1* provides a grouping of stormwater management actions which assists in identifying priorities for implementation.

Level Column: Actions have been identified as either "Level 1" or "Level 2". Actions which can be implemented without further investigation have been classified as Level 1 actions. Actions which require further investigation to determine feasibility, ownership, and cost sharing arrangements in more detail have been classified as Level 2 actions. Level 2 actions will be further investigated within the first year of the Plan to confirm their feasibility or to identify an alternative action to achieve the same outcome.

Action Column: Actions listed here are the priority management options assessed in *Table 7.1*. Actions can be linked to *Table 7.1* and *Tables 9.1-9.16* by the rank number as listed in column six. Many actions identified for a particular issue may also address other issues. For example, an action which aims to prevent sediment from roads entering the waterways will also prevent toxicants which bind to the sediments from entering the waterways.

Responsibility and Waterway Columns: The stormwater manager responsible for the implementation of each action and the sub-catchment to be affected by the action is identified in these two columns. The abbreviations used are as for *Table 7.1*(refer to *Section 7.3*).

Rank Column: Each option has been assessed and ranked according to the methodology detailed in *Section 7.3*. A ranking of 1 is considered the most favourable and will be considered of higher priority for implementation. This ranking can be used to link the actions in this table with those in *Table 7.1*.

Performance Indicator:	A performance indicator is identified to enable evaluation of the success of each of the actions within the plan. The Association of Councils recognises the importance of monitoring the success of individual actions as well as the overall success of the Plan.
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8.1 Continual Improvement

The Action Plan is not intended to be static, and will be subject to continual improvement as new information becomes available and priorities change. *Figure 18* illustrates the framework by which the Action Plan is to be implemented and its performance evaluated. The development of a management framework, a supporting investment program, and provision for ongoing consultation with stakeholders, form the components of the Implementation Program detailed in later Chapters of this report.

It is proposed that minor amendments would be made to the Action Plan and the Council Implementation Programs on an annual basis, immediately prior to preparation of Council Management Plans. These changes would reflect the annual results of the monitoring and evaluation program, further investigations and feasibility studies, and budgeting opportunities for the coming year.

The Stormwater Management Plan should be revised with more significant amendments every 4-5 years to enable updating of the short-term objectives for stormwater management, a review of the stormwater issues, and consequent priority actions.

Figure 18 Framework for Management, Implementation and Evaluation of the Action Plan.

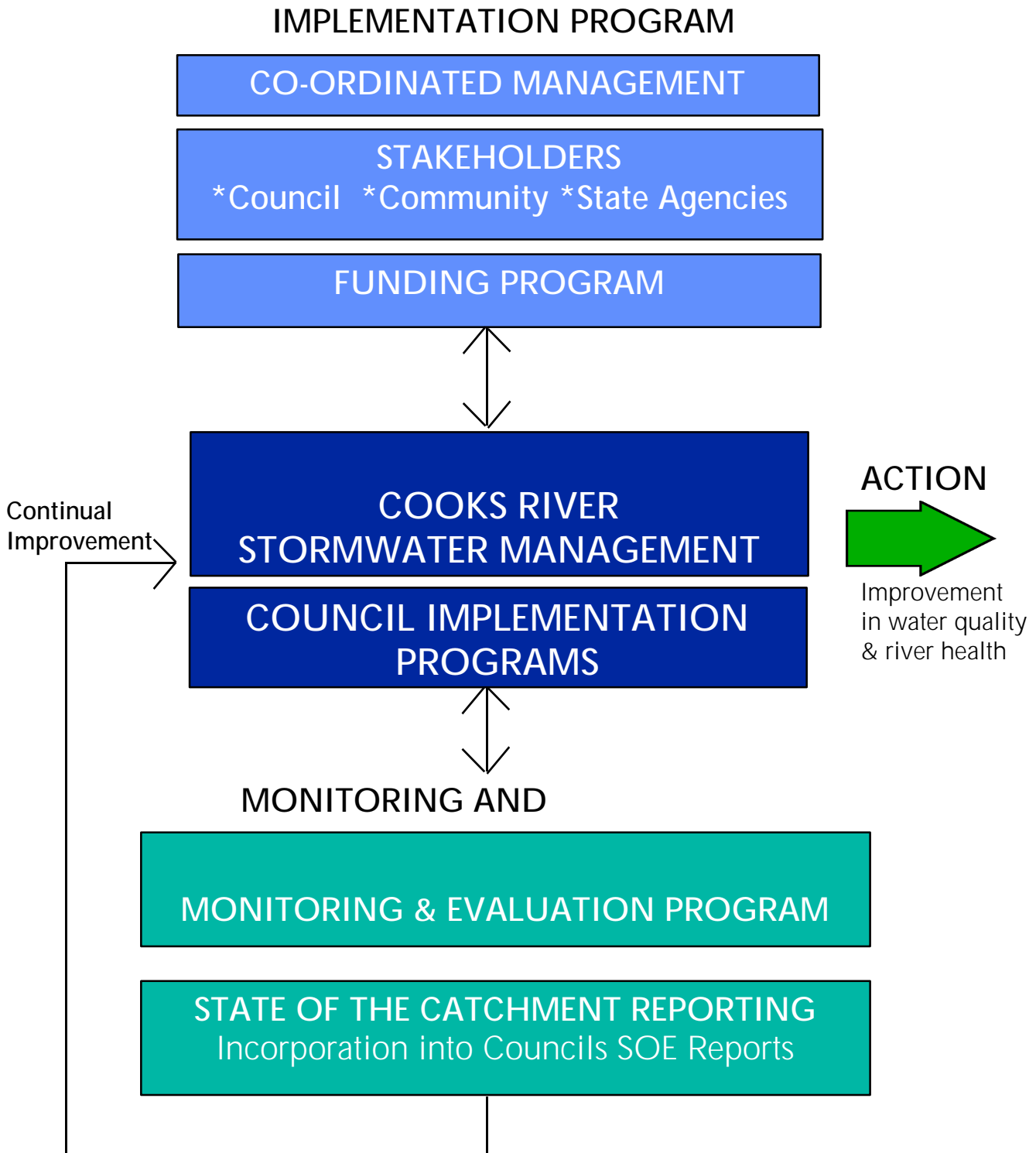


Table 8.1:

LITTER		ISSUE: High volumes of litter within the Cooks River, impacting on visual amenity and habitat values, possibly due to ineffective waste management, littering in residential, industrial and commercial areas, along roads and in parks.				
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
1. To prevent general littering and raise the awareness of the link between the backyard and the river.	1	1.1 Develop an education and awareness program in schools, in cooperation with the Department of Education to link littering with impacts on the waterway.	ALL-C/EDDept	ALL	2	When surveyed, more people understand how their actions affect River health and have changed their polluting practices.
	1	1.2 Develop and construct educational signs in public areas, in particular along waterways adjacent to stormwater control facilities, to provide information and feedback on the status and improvements in stormwater quality and projects being undertaken to improve water quality eg. signs next to a litter boom can report on the volume of litter collected each month and show improvements over time.	ALL-C	ALL	6	
	1	1.3 Support anti-Litter education campaigns at a local level through signage and local education. eg. Clean -Up Australia Day, The Drain is Just for Rain, Streets to rivers project, Cooks River Valley Association garbage and gutters street clean up projects.	ALL- C	ALL	57	
	1	1.4 Stencil Drains to educate people on the link between their backyard and the waterway and make drains readily identifiable (ie. through numbering).	ALL	ALL	58	
2. To prevent dumping of waste.	1	2.1 Support EPA "dob in a dumper" hotline through advertising within Cooks River catchment.	ALL - C and EPA	ALL	60	Reduction in the number of dumping incidents.
	1	2.2 Warn and fine people littering in accordance with EPA authority for action to be taken by authorised Council officers. Implement a recording system for fines issued.	ALL	ALL	115	
3. To provide an effect waste management service.	1	3.1 Influence State Government to introduce legislation to require manufacturers to reduce packaging and provide return fees for recyclables (for example, container deposits, and waste oil).	ALL - C	ALL	14	Reduction in the volume of recyclable material found in waterways.
	1	3.2 Upgrade recycling bins which perform poorly in conjunction with the Inner Sydney Waste Board, by identifying alternate bins or educating users to prevent litter escaping.	ALL	ALL	79	
	1	3.3 Review mixed and recyclable waste removal program to ensure frequency and timing is adequate. Upgrade waste removal program to increase frequency of bins emptied in areas where required.	RTA, Rail, SWC ALL	ALL	155	
4. To prevent litter generated in commercial and industrial areas entering the waterways.	1	4.1 Develop and implement a planning policy requiring GPT and/or litter interceptors to be installed (and maintained by the development), in new commercial, industrial and shopping centre developments and redevelopments.	ALL	ALL	29	Reduction in litter in waterways.
	1	4.2 Implement a policy for new commercial developments and redevelopments to install adequate and appropriately designed bins.	ALL	ALL	36	

	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
	1	4.3 Revise existing dry street sweeping programs based on cost-benefits and continue in commercial, industrial and residential areas, including carparks.	ALL	ALL	154	
	2	4.4 Investigate opportunities to install GPT's where pipes discharge to waterways.	ALL	ALL	158	
	2	4.5 Investigate locations where trapped street gully pits could be installed along roads to trap litter and sediments.	All, RTA	ALL	156	
5. To effectively Manage litter in parks to prevent litter entering the waterways.	1	5.1 Trial management options for litter in parks along the Cooks River foreshore by removing bins and providing signage "Thank You for caring for the park and the Cooks River". In some areas providing additional bin facilities is another. Monitor success of the trial bin project and implement appropriate strategy for ALL parks along the Cooks River foreshore.	MAR, ROC, CANT	ALL	28	Reduction in volume of litter observed in park areas.
	1	5.2 Target regular users of parks adjacent to river eg. sporting clubs. Encourage these clubs to be responsible for leaving the area free of Litter after use of the facilities through leasing or hire arrangements to implement a cleanup charge for areas left in an unsatisfactory state.	ALL	ALL	61	
6. To remove litter that has entered the waterways by maintaining and improving existing stormwater structures.	1	6.1 Maintain the existing pollutec pollutant trap at the park near Belmore Rugby League field.	CANT	CO	62	Litter traps are functioning.
	1	6.2 Maintain existing trash rack at Muir Rd, Chullora.	BANK	UP	108	
	1	6.3 Investigate improvements to litter boom along Cooks River at Fifth Avenue Campsie with Cooks River Valley Association to improve the performance of the boom.	SWC	CO	109	
	1	6.4 Maintain existing GPT at Orissa Drain, Fifth Avenue Campsie.	SWC	CO	125	
	1	6.5 Maintain existing GPT and drainage pumping station/detention basin at the Brickpit, Railway Road, Sydenham.	SWC	MA	127	
	1	6.6 Maintain existing trash rack at Mackey Park, Marrickville.	SWC	MA	141	
	1	6.7 Maintain existing trash rack at Cup & Saucer Creek, Canterbury.	SWC	CS	150	
	1	6.8 Maintain existing GPT at Wolli Creek, Kingsgrove.	SWC	WO	151	
7. To provide litter collection structures at identified hot spot areas.	1	7.1 Require the incorporation of litter & erosion controls into redevelopment of the site upstream of King Georges Rd, Hurstville.	HUR	WO	85	Structures installed reduce "hot spot" litter problems.
	2	7.2 Investigate feasibility of installing a gross pollutant interceptor on pipe outlet near Thornley St, Marrickville.	MAR	MA	86	
	2	7.3 Provide minor gross pollutant traps on pipe outlets to Bardwell Creek near Bardwell Rd.	ROC	BA	87	
	2	7.4 Provide buffer strips behind embankment walls of channel at Rudd Park, Belfield where necessary.	CANT	Omaha	96	

Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
	2	7.5 Retrofit pit litter baskets at selected sites Hercules St area, Dulwich Hill.	MAR	CO	97	
	2	7.6 Install pit litter baskets in area near the Australian Golf Club where appropriate.	RAN	AC	98	
	2	7.7 Provide coarse trash rack along Bardwell Creek near Ellerslie Rd, Bexley North to protect the downstream bushland.	ROC	BA	105	
	1	7.8 Install proposed pollutant trap at Tennyson St, Dulwich Hill subcatchment outlet.	MAR	MA	110	
	1	7.9 Maintain GPT and construct wetland in redevelopment of SRA land at Chullora Rail Workshops and provide maintenance.	SWC/BLG	UC	118	
	1	7.10 Install and maintain proposed GPT at Tasker Park, Campsie.	CANT	CO	128	
	2	7.11 Provide gross pollutant interceptor/GPT near pipe outlet of Mascot West SWS or further upstream where accessible for maintenance.	SWC	AC	131	
	2	7.12 Provide gross pollutant interceptor near pipe outlet of Munni SWS upstream of proposed dechannelisation works.	SWC	AC	132	
	2	7.13 Provide pit litter baskets at selected locations in Campsie industrial area within Cup and Saucer Creek catchment.	CANT	CS	145	
	2	7.14 Investigate provision of Litter baskets at Cosgrove Road/ Madeline St industrial area.	STRA	UC	134	
	2	7.15 Retrofit litter baskets/silt traps at selected pits in Orissa St subcatchment, Campsie.	CANT	Orissa	135	
	2	7.16 Investigate provision of offline GPT or wet pond system on vacant land at bend in Cooks River adjacent to Dean Reserve, Strathfield.	SWC/STRA	UC	136	
	2	7.17 Provide GPT/wetland downstream of Hume Highway along Greenacre Park SWS.	SWC/BANK	UC	137	
	2	7.18 Provide pit litter baskets at selected locations within Bardwell Creek catchment.	ROC	BA	140	
	2	7.19 Provide gross pollutant trap/interceptor at a suitable and accessible location upstream of Botany Rd SWS pipe end.	SWC	AC	142	
	2	7.20 Provide gross pollutant interceptors at pipe outlets (approx. 3) to Cup and Saucer Creek at industrial area near Alfred St, Campsie.	SWC/CANT	CS	143	
	2	7.21 Install gross pollutant traps before pipe outlets (approx. 2) to Cooks River at HJ Mahoney Memorial Reserve, Marrickville South.	MAR	CO	139	
	2	7.22 Install gross pollutant traps before pipe outlets (approx. 3) to Cooks River at Steel Park, Marrickville South.	MAR	CO	152	
	2	7.23 Determine feasibility of providing gross pollutant traps on pipe outlets (approx. 3) to Cox's Creek near King Georges Rd, Greenacre or combined (wetland) facility in the parkland on the northern side of the canal.	SWC	CX	152	

NUTRIENTS & BACTERIA		ISSUE: Elevated levels of nitrogen and phosphorus which can lead to algal blooms, increased weed growth, impacts on aquatic plants and animals and human health. Possibly due to discharge of detergents, excess fertiliser use, animal droppings, and sewerage overflows.				
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
8. To manage nutrient runoff resulting from detergent usage in residential, commercial and industrial areas.	1	8.1 Introduce a planning policy to ensure that adequate facilities such as car washing areas are provided for new developments, including units, residential, commercial and industrial.	ALL	ALL	15	Reduction in nutrient levels in waterways.
	1	8.2 Influence state government to investigate alternatives to phosphorus use in detergents.	ALL-C	ALL	26	
	1	8.3 Educate the community to prevent car washing on the street. In residential areas, where there is no alternative, provide an incentive by negotiating with local car washing places for first visit free coupons to encourage use of carwash centres.	ALL - C	ALL	73	
	1	8.4 Incorporate in council planning controls a policy requiring car washing facilities to be connected to sewer (refer to Strathfield Council model).	ALL	ALL	111	
	2	8.5 Provide public car wash areas in existing high density residential areas which drain and are connected to sewer or a suitable alternative. Also provide signs to educate people about carwashing in the streets.	MAR, CANT BANK,	ALL	119	
	1	8.6 Investigate options to implement requirement for inspection of sewer and stormwater connections into certification required for all residential and commercial property sales.	SWC	ALL	25	
9. To reduce nutrient and bacteria runoff from dog droppings in public areas.	1	9.1 Provide 'doggie dunnit' bags/stations at designated dog exercise parks.	ALL	ALL	22	Reduction in dog droppings observed in parks.
	2	9.2 Investigate the feasibility of introducing dung beetles to decompose dog droppings in council Park areas based on outcomes of Strathfield council trial.	ALL-C	ALL	45	
10. To reduce organic matter entering the stormwater system.	1	10.1 Review procedures of council maintenance crews and park managers in regard to disposal of grass clippings and plant material from maintenance strips and parks. Make any required changes to procedure and educate and enforce implementation.	ALL	ALL	53	Reduction in organic material observed in waterways.
	1	10.2 Educate the community not to sweep or blow leaves into the gutter by providing alternative disposal options (mulch and compost) and supporting the Cooks River Valley Association's "Garbage and Gutters" initiative.	ALL	ALL	59	
11. To reduce nutrient inputs resulting from fertiliser use.	2	11.1 Investigate opportunities to replace fertiliser used on playing fields with worms (based on outcomes of ongoing trial into effectiveness by Marrickville Council) or reuse captured stormwater which may be high in nutrients for ground irrigation.	ALL	ALL	46	Changed fertiliser use practices.
	1	11.2 Educate residents about over-fertilisation by developing and distributing an information brochure.	ALL-C	ALL	148	
	1	11.3 Incorporate in planning controls a requirement for future Golf Course developments to incorporate nutrient management controls.	ALL-C	ALL	42	

Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
12. To address algal blooms in waterways.	1	12.1 Identify appropriate response procedures to manage blue green algal blooms.	ALL- C	ALL	20	Reduction of algal blooms.
13. To remove nutrients that have escaped source controls and entered the waterways.	2	13.1 Investigate water management practices on all Golf Courses and identify opportunities to install wetlands or options for waste refuse.	ALL (not Ash)	ALL	34	
	2	13.2 Investigate provision of constructing an urban stream at Strathfield Golf Course/Freshwater Park.	STRA	UC	91	
	2	13.3 Construct wetland along Bardwell Creek downstream of Ellierslie Road and rehabilitate riparian zone where possible through Shepard Reserve and Favell Picnic Area.	ROC	BA	95	
	2	13.4 Construct small wetland above the tidal limit at Heynes Reserve, Canterbury to receive flows from Cup and Saucer canal.	SWC/CANT	CS	101	
	2	13.5 Investigate feasibility of installing a constructed wetland in Cooke Park downstream of Madeline Street, or upstream of Madeline Street in Begnell Park.	SWC/STRA	CX	102	
	2	13.6 Construct offline wetlands or pond system adjacent to Muddy Creek in White Oak Reserve.	SWC/ROC	MU	103	
	2	13.7 Construct offline wetland upstream of tidal limit on Omaha Canal.	SWC/CANT	Omaha	104	
	1	13.8 Install backwash storage tanks and dispose of backwash from Roselands and Canterbury Pools to sewer.	CANT	CO	106	
	2	13.9 Replace concrete lined canal through Hughes Park, Canterbury with linear wetland or pool/riffle sequences along this reach of Cup and Saucer Creek.	SWC	CS	116	
	2	13.10 Investigate opportunity to develop additional wetland as part of the proposed NPWS regional park in lower Wollli Creek area.	ROC	WO	123	
	2	13.11 Trial the creation of wetlands in the upper sections of Alexandra Canal as proposed in Alexandra Canal Water Environment Plan.	SWC	AC	144	
TOXICANTS		ISSUE: High concentrations of heavy metals, oils and grease, and pesticides which presents a health risk to water way users, and aquatic ecosystems. Possibly due to industrial discharges, runoff from residential areas, roads and railways, landfills leachate and weed spraying along drainage lines.				
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
14. To raise awareness of business managers and prevent the discharge of toxicants by industry.	1	14.1 Lobby EPA to audit all licensed premises in the catchment.	ALL- C, EPA	ALL	21	When surveyed, more businesses and industry understand how their actions affect water quality and have changed their polluting practices.
	1	14.2 Education/Training/Auditing of small industrial premises and businesses through expansion of past solutions to pollution, education and auditing programs. Target metal premises, motor vehicle repairers and chemical manufacturers as a priority.	ALL-C	ALL	84	
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator

	1	14.3 Initiate increased auditing of non-EPA licensed industrial and commercial premises by Council officers. As a priority, investigate industrial area upstream of the high metal concentrations within Cup and Saucer Creek near Kingsgrove Road.	ALL-C, EPA, CANT	ALL	124	
	1	14.4 Encourage the installation of on site detention facilities where feasible within industrial and business properties for water reuse.	All	ALL	77	
	1	14.5 Audit connections from industrial areas to stormwater and implement policies to ensure connections are reviewed on sale, or for any new or redevelopments.	ALL	ALL	81	
15. To manage weeds to reduce toxicants resulting from weed spraying entering waterways.	1	15.1 In all areas where weed spraying is undertaken along drainage lines implement stormwater verge revegetation planting as detailed in the Sydney Water Trial (Durham, 1997).	ALL, SWC, Rail, RTA	ALL	11	Reduction of weeds in drainage lines.
	1	15.2 Review weed management strategies in Council Parks and identify opportunities to reduce spraying through revegetation or improved practise.	ALL	ALL	75	
16. To prevent toxicants in landfill leachate contaminating waterways.	2	16.1 Investigate need for site remediation and leachate control at the former brick pit at Harp St, Campsie.	CANT	CS	12	Identified landfills are remediated to prevent migration of leachate off-site.
	1	16.2 Remediate Tempe Reserve landfill area to prevent off site leachate of contaminants.	MAR	AC	63	
MANAGERIAL		Issue: Inconsistent management of stormwater, uncertainty of responsibility and lack of funding leading to inaction. Possibly due to the large number of stormwater managers, no co-ordination body and lack of public awareness.				
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
17. To raise awareness of stormwater management in the community.	1	17.1 Investigate and develop opportunities for community, schools and businesses which are part of the problem to become part of the solution by becoming involved in stormwater management. For example, through on ground works, green industry awards, bush regeneration/tree planting, community bird watching programs, school problem solving, curriculum.	ALL-C	ALL	50	When surveyed, more businesses and community understand their responsibilities with regard to stormwater management.
	1	17.2 Implement greater use of ethnic media to reach non-English speaking community. Develop information sheets and disseminate through community centres and schools.	ALL-C	ALL	51	
	1	17.3 Include signage with all new 'visible' stormwater management facilities to inform community of stormwater objectives, problems and solutions.	ALL, SWC	ALL	44	
18. To use consistent planning mechanisms across the catchment to prevent contamination of stormwater.	1	18.1 Councils to incorporate detention basins, rainwater collection tanks (where practicable), limiting % of land areas that can be surfaced, and setbacks into planning requirements for new and re-development applications.	ALL	ALL	7	Consistent planning policies implemented throughout Councils in the catchment.
	1	18.2 Incorporate into DCP's additional controls for owner/developers who build or pave over more than 50% of land area. Investigate opportunity to provide incentives/rebates for those who install additional stormwater controls.	ALL	ALL	9	
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator

	1	18.3 State agencies to ensure stormwater management policies for developments (such as the M5 Motorway, Rail Yard redevelopment and Airport expansions etc.) are consistent with Council planning policies and controls for stormwater management.	RTA, SWC, Rail, DOT	ALL	18	
19. To define stormwater management responsibilities.	1	19.1 Identify and map ownership of all government land within the Cooks River Catchment and agree responsibilities between land managers in the catchment.	ALL-C, RTA, SWC, Rail, DOT, CMC, WA, CRCMC, EPA	ALL	3	Management responsibilities defined.
	1	19.2 Define and agree notes and responsibilities for stormwater and catchment management within Cooks River based on Action No. 90.	ALL-C, RTA, SWC, Rail, DOT, CMC, WA, CRCMC, EPA	ALL	17	
20. Increase communications between stormwater managers.	1	20.1 Integrate Council's knowledge and information through catchment wide water quality monitoring and reporting. Evaluate data to determine strategic responses to problems identified by the monitoring program.	ALL - C	ALL	89	Stormwater managers effectively communicating.
	1	20.2 Undertake mapping of stormwater infrastructure in all Council areas using existing GIS base map.	ALL	ALL	52	
SUSPENDED SOLIDS		Issue: Elevated suspended solids and turbidity levels affecting the health of the ecosystem and resulting in brown and murky water, sediment deposition on which weeds may grow, and obstruction to stormwater controls. Possibly due to inputs from construction sites, removal of natural vegetation, poor industrial and commercial practices.				
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
21. To improve industrial/commercial practices to minimise sedimentation.	1	21.1 Educate occupiers of commercial premises and residences about not hosing down footpath areas.	ALL-C	ALL	83	Reduction in sediment loads.
	1	21.2 Develop procedures to manage sediment discharges from industrial activities such as concrete cutting.	ALL, EPA	ALL	92	
22. To manage sediment in stormwater runoff from construction sites.	1	22.1 Require construction sites to implement stormwater controls defined in the "Blue Book" (NSW Government, 1998), by incorporating requirements for the best practise techniques in all Council development approvals and building approvals.	ALL	ALL	37	Sediment concentrations in adjacent water are unchanged from background during construction period.
	1	22.2 Educate construction contractors on appropriate sediment controls based on best practice guidelines (eg. signs on sediment fences).	ALL-C	ALL	90	

Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
	1	22.3 Audit implementation and effectiveness of sediment controls on construction sites. Compliance with development approval conditions to be enforced by Council officers.	ALL	ALL	113	
23. To prevent sediments that have escaped source control from entering the waterway.	1	23.1 Maintain and regularly clean out manholes and sediment traps. Ensure sediments are disposed of appropriately.	ALL, RTA, SWC	ALL	151	Sediment removal structures are functioning.
	2	23.2 Investigate opportunities to install sediment controls immediately prior to all Council and Agency stormwater pipe discharges to waterways.	ALL, RTA, SWC	ALL	138	
	1	23.3 Review maintenance schedules and cleaning techniques for existing road drain sediment traps and implement improvement program. Ensure sediments are tested for contamination and disposed of appropriately.	ALL, RTA	ALL	157	
	1	23.4 Maintain existing detention pit/drainage pumping station at Carrington Road, Marrickville.	SWC	CO	120	
24. To address sedimentation in hot spot areas.	1	24.1 Investigate and install erosion controls for development immediately upstream of drainage channel at eastern boundary of Rookwood Cemetery and for the channel itself.	AUB & BANK	UC	33	Structures installed reduce "hotspot" sediment loads.
	1	24.2 Investigate continued dredging of sediments in most severely silted up reaches of the River, (eg. Third Ave, Campsie) upstream of Footbridge linking Barool Avenue and Church Street, Canterbury and identify actions in accordance with the requirements of the NSW State Rivers and Estuaries Policy.	SWC, ALL	CO	40	
	1	24.3 Refill eroded ground behind embankment along Cooks River downstream of Fore St, Earlwood.	CANT	CS	41	
	1	24.4 Investigate cause of sludge buildup at Mackay Park, Marrickville.	MAR	MA	47	
	2	24.5 Provide buffer strips along drainage line to Bardwell Creek through Jubilee Park and Bardwell Park.	ROC	BA	64	
	1	24.6 Develop erosion & sediment control plan for Council's Waste Transfer Station, St Peters.	SWC	AC	76	
	1	24.7 Develop erosion & sediment control plan for the exposed soil areas of Enfield Marshalling Yards. Investigate opportunities to provide buffer strips and sediment basins at appropriate locations.	Rail	UC	78	
	2	24.8 Develop erosion & sediment control plan for Cooks River Goods Yards, Sydenham.	Rail, MAR	AC	93	
	2	24.9 Investigate appropriate bank remediation works along Bardwell Creek in conjunction with revegetation upstream of Bardwell Rd, Bardwell Park.	ROC	BA	94	
	1	24.10 Develop sediment control plan for Chullora Rail Workshops to control runoff from exposed surfaces. Investigate opportunity for buffer strips and sediment basins at appropriate locations.	Rail	UC	99	

Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
	1	24.11 Develop erosion & sediment control plan for Eveleigh Railway Workshops.	Rail	AC	100	
	2	24.12 Provide bank stabilisation along the Cooks River between Illawarra Rd to Marsh St, Arncliffe.	CANT/MAR	CO	107	
	2	24.13 Provide bank stabilisation, in association with revegetation works, along the Cooks River between Church St to Ford Ave, Hurlstone Park.	CANT/MAR	CO	112	
	2	24.14 Provide stream remediation/bank stabilisation along Cooks River downstream of Chullora Rail Workshops to Strathfield Golf Course.	AUB	UC	117	
	2	24.15 Install detention basin at Chullora Railway Workshops.	BANK	UC	133	
	2	24.16 Install drainage pumping station /detention pit and silt screen at Mary Street, St Peters.	MAR	MA	149	
HABITAT LOSS AND RIVER HEALTH		Issue: River ecosystem of very poor health and low biodiversity due to changes to habitat and removal of natural processes.				
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Measure
25. Recreate riparian and bushland habitats to act as a buffer for stormwater.	1	25.1 Incorporate setbacks of at least 10m from creek lines and 20 m from main river bank in LEPs / DCP's / planning instruments to allow re-establishment of a riparian zone.	ALL	ALL	4	The area of native riparian vegetation is increased.
	1	25.2 Develop a catchment policy for landscaping along foreshore and waterways using native species, based on existing reports and incorporate into Council planning controls.	ALL-C	ALL	27	
	2	25.3 Investigate incorporation of propagation programs for native riparian vegetation in Council nurseries.	ALL	ALL	10	
	1	25.4 Provide native vegetation maps and lists to nurseries, landscapers and residents to promote greater use of native vegetation in landscaping works.	ALL	ALL	24	
26. Protect remnant foreshore vegetation and natural waterways.	1	26.1 Incorporate, preservation of existing foreshore vegetation remnants and natural waterways and land adjacent to the channel, within Council planning policies and development controls.	ALL	ALL	8	Existing remnants and natural channels remain protected.
	1	26.2 Protect Freshwater Creek during redevelopment of the Chullora Site through appropriate planning controls and design. Continue to liaise with Bankstown Bushland Society in this process.	BANK & Rail	UC	66	
Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Measure
27. Protect existing wetlands and intertidal zones from the impacts of stormwater.	1	27.1 Incorporate Wollie Creek Mangroves and Saltmarsh through planning policies and bushcare regeneration programs. Investigate measures to minimise sedimentation and disturbance from railways.	CANT & ROC & Rail	WO	67	Existing wetland are protected.
	1	27.2 Protect the Third Ave Remnant bushland in Campsie, through incorporation in planning policies.	CANT & SWC & RTA	CO	68	
	1	27.3 Protection of remnant vegetation within Marrickville Foreshore Reserves.	MAR	LC	69	

Strategy	Level	Action	Responsibility	Waterway	Rank	Performance Indicator
	1	27.4 Protection of Cooks River Clay Plains Scrub Forest within proposed redevelopment site at Rail Yards.	Rail	LC	71	
	1	27.5 Undertake bush regeneration and protection works on remnant vegetation along Wollii Creek from Bexley Road, eastwards.	CANT / ROC	UC	72	
28. Recreate aquatic habitats suitable for native waterbirds and fish.	1	28.1 Investigate additional opportunities for replacement of concrete stormwater channels with more natural drainage lines based on ownership of land adjacent to the channel.	ALL	ALL	5	An increase in the length of "natural" channel.
	2	28.2 Dechannelise the concrete drain between the head of Alexandra Canal and Green Square (Lower Sheas Creek) as proposed in Alexandra Canal Water Management Plan.	SWC	AC	13	
	1	28.3 Investigate naturalising concrete channel by placing rock and planting native vegetation at Chain of Ponds reserve area, where space allows.	SWC/STRA	UC	48	
	1	28.4 Prepare a Mangrove Management Plan to identify areas for regeneration either via natural colonisation or habitat generation and areas where mangroves are removed to prevent flooding. Comply with NSW State Rivers and Estuaries Policy.	ROC, BOT, MAR, SSC, CANT, Fisheries	ALL	35	
	1	28.5 Negotiate with DLWC to replace sheet piling along Cooks River, between the Undercliff Bridge and the footbridge at Flinders Road with more natural bank stabilisation where possible.	DLWC, MAR, CANT	LC	49	
	1	28.6 Investigate river bank stabilisation works and create a more natural bank and riparian zone at Freshwater Park.	STRA	UC	56	
	1	28.7 Replace concrete embankment along Muddy Creek near White Oak Reserve with rock/vegetation and link to the adjacent reserve.	SWC	MU	80	
	2	28.8 Negotiate with Department of Land and Water Conservation to selectively replace steel sheet piling along Cooks River banks between Church St, Canterbury and Flinders Rd, using rock embankment/natural vegetation, following a feasibility study.	DLWC, MAR, CANT	LC	121	
	1	28.9 Naturalise concrete stormwater channel through Parry Park by placing rock and planting native vegetation.	SWC	CX	130	
	1	28.10 Narrow Alexandra Canal with islands and bank extensions from Canal Rd as proposed in Alexandra Canal Water Management Plan.	SWC	AC	146	
	1	28.11 Dechannel 250m section of stormwater channel between the head of Alexandra Canal and Sydney Park as proposed in Alexandra Canal Water Management Plan.	SWC	AC	147	

8.2 Monitoring and Evaluation Program

The Association of Councils is committed to undertaking a “whole of catchment” approach to monitoring progress towards the stormwater management objectives identified in Chapter 5. The monitoring and evaluation of the Stormwater Management Plan will involve the following key components:

- an action evaluation program to determine the success of individual actions in the Action Plan; and
- an ongoing water quality monitoring program undertaken consistently across the whole catchment;
- a river health monitoring program undertaken in association with the community;
- a “State of the Catchment” reporting process.

Key details of these programs are provided in the sections below. The monitoring programs have been scoped in accordance with principles outlined in the EPA’s *Draft Council Handbook for Managing Urban Stormwater* (1997). Further detail in the design of these monitoring programs will be undertaken as the first step in their implementation.

8.2.1 Stormwater Management Action Plan Evaluation Program

The Councils of the Cooks River catchment recognise the importance of monitoring the performance of each action in addressing the associated stormwater issue. For example, localised stormwater quality monitoring will be conducted at hotspot locations to determine the success of structural solutions in addressing specific stormwater management issues.

Performance indicators have been identified in the Action Plan (*Table 8.1*) as the basis for assessment of each action. The monitoring of the performance of each action will be incorporated into the implementation of the action.

The outcomes of the monitoring undertaken for each action or group of actions will determine which actions are effective in addressing the stormwater issue. The results of the action evaluation will also identify actions which require modification to improve their effectiveness.

8.2.2 Cooks River Catchment Water Quality Monitoring Program

Aim

The water quality monitoring program aims to measure the effectiveness of the Plan toward achieving stormwater management objectives 5, 6, 7, 8, and 9 (refer *Table 5.1*). It is intended that this water quality monitoring program be consistently undertaken over a long time period so that real trends in water quality throughout the Cooks River can be measured. A “whole of catchment” approach to monitoring water

quality in the Cooks River and its tributaries will provide a better understanding of the stormwater issues and ensure the best use of the limited funds available. This monitoring program is not intended to measure the success of individual stormwater management actions. The evaluation of implemented actions is addressed in *Section 8.2.1* above.

This 'whole of catchment' water quality program would be supplemented by community monitoring programs at known hotspot locations. These community programs will be undertaken in association with the education programs identified in the Action Plan and will involve school and community groups.

It should be noted that this water quality monitoring program is not specific to stormwater quality as all impacts on water quality will be measured. Nevertheless, such a water quality monitoring program is essential to assess the effectiveness of the Plan against stormwater management objectives identified in *Chapter 5*. The evaluation of the result must be undertaken in context of other major inputs such as sewer overflows and contaminated sediment, groundwater inputs, and tidal influences

Site Selection

It is proposed that water quality monitoring be undertaken at 11 sites, one site within each sub-catchment of the Cooks River (refer *Figure 5*). The sites should be located towards the discharge point of the sub-catchment with regard to:

- safe access for sample collection;
- location of past monitoring point, to maximise use of existing data;
- tidal limits, to avoid dilution; and
- ability to measure flow.

Suggested locations for future monitoring sites are identified on *Figure 5*.

Monitoring Frequency

The monitoring frequency will be determined by the statistical design of the sampling program during the first stage of implementation. It is recommended that three dry weather samples be collected at defined times every year, as well as three event based (wet weather) samples each year. It will be important for the samples to be collected at all eleven sampling sites on the same day. For those sample sites located in the tidal zone, samples should be collected on the outgoing tide.

Water Quality Parameters

To assess water quality of the Cooks River against the objectives for stormwater management identified in *Chapter 5* the following measures are required:

- Assessment of water quality against ANZECC guidelines (ANZECC, 1992) for protection of aquatic ecosystems in all tidal areas (marine waters guidelines) and freshwater natural channels (fresh waters guidelines).

- Assessment of water quality against ANZECC guidelines for primary contact (long term) recreation in tidal areas and against secondary contact (short term) recreation in all waterways.
- Assessment of the visual amenity of the waterway in regard to reduced suspended solid levels and visible litter.

Therefore, water quality parameters have been selected to enable measurement against guidelines for protection of marine and freshwater ecosystems, secondary and primary contact recreation, and visual amenity depending on the waterway. *Table 8.2* identifies the key water quality parameters required to enable assessment against the above objectives. The most sensitive guideline for each parameter is also provided to assist in scoping the methodology detection limits for sample analysis. As the water quality objectives vary for tidal areas, natural channels and piped channels within the Cooks River (refer *Figure 7*), the water quality will be evaluated accordingly. However, it is recommended that all the parameters identified in *Table 8.2* be analysed in each water quality sample to assist in understanding pollution sources and inputs from upstream sub-catchment.

In addition to the parameters in *Table 8.2*, each sampling event will require a description of the climatic conditions (rainfall event, duration and amount) in the 10 days prior to sampling.

Table 8.2: Proposed Water Quality Parameters for Cooks River

Parameter	Proposed Measure for each Parameter based on the most Stringent ANZECC (1992) Guideline* or other appropriate measure. (Protection of Aquatic Ecosystems and & Primary Contact Recreation)
OBSERVED PARAMETERS	
Litter (estimate number and type of litter items visible)	Number of litter items per square metre quadrant.
Water Clarity/ Colour	Visual amenity guidelines
Flow Rate estimate (m ³ /s)	Appropriate flow gauging methodology
PHYSICO-CHEMICAL INDICATORS	
Total Phosphorous (ug/L)	less than 50
Total Nitrogen (mg/L)	less than 0.50
Faecal Coliforms (CFU/100mL)	less than 150 (median)
Dissolved Oxygen (mg/L or % saturation)	more than 6 mg/l or 80-90%
Suspended Solids (Turbidity NTU)	less than 10% change /6 NTU
Chlorophyll-a (ug/L)	10
pH	6.5 - 8.5
TOXICANTS (ug/L)	
Cadmium	2
Copper	5
Lead	5
Zinc	50
Oil and Grease	Visible Oil

* Note: These criteria are provided to assist in identification of the measure, methodology and detection limits by indicating the most sensitive criteria. The sample results should be compared to appropriate guidelines as detailed in the *Evaluation and Reporting of Results* section below.

Sampling Method and Analysis

The methodology used to collect the water quality samples should be standardised for all samples and follow established techniques for grab sampling (EPA, 1995). Grab samples should be taken approximately 30 centimetres below the surface where possible so as to not collect surface film and as far away from the waters edge as practicable. Depth integrated sampling could be undertaken for the lower reaches of the Cooks River. Three replicate sample should be taken at each location.

Analysis of water samples for the identified parameters should be undertaken by a NATA accredited laboratory to ensure quality control and consistent analytical methodology. Water samples should be analysed as soon as possible after sampling.

Evaluation and Reporting of Results

The results of water quality sampling are to be recorded on a Standard Record Form and imputed into a computer database. The evaluation water quality sampling results against the objectives of the water quality program requires a comparison against ANZECC (1992) guidelines. As indicated in *Table 8.3*, the guidelines for evaluation vary depending on the waterway type. These waterway boundaries are mapped in *Figure 7*.

Table 8.3: Evaluation of Water Quality Results

Waterway in which Sample was taken	Guidelines to be Evaluated Against ANZECC (1992)
Close to river mouth in the lower section of the Cooks River	<ul style="list-style-type: none"> ▪ ANZECC Guidelines for Human Consumers of Fish, Crustaceans and Shellfish. ▪ ANZECC Guidelines for Protection of Marine Ecosystems ▪ ANZECC Guidelines for Primary & Secondary Contact Recreation ▪ Visual Amenity Guidelines
Tidal waterways	<ul style="list-style-type: none"> ▪ ANZECC Guidelines for Protection of Marine Ecosystems ▪ ANZECC Guidelines for Primary & Secondary Contact Recreation ▪ Visual Amenity Guidelines
Non-tidal Natural Channels	<ul style="list-style-type: none"> ▪ ANZECC Guidelines for Protection of Freshwater Ecosystems ▪ ANZECC Guidelines for Secondary Contact Recreation ▪ Visual Amenity Guidelines
Non-tidal Artificial Channels	<ul style="list-style-type: none"> ▪ ANZECC Guidelines for Secondary Contact Recreation ▪ Visual Amenity Guidelines

To provide a measure against achievement of the short term objectives for stormwater management, the number of times the criteria are met should be recorded for each sub-catchment and mapped as demonstrated in **Figure 7**.

A comprehensive annual report should be prepared providing the following information:

- objectives of the water quality monitoring program;
- sampling method and limitations;
- map indicating sampling locations and results;
- results of water quality monitoring and evaluation against guidelines;
- evaluation against objectives for stormwater management;
- identification of stormwater pollution issues; and
- recommendations for future stormwater management and evaluation.

In the evaluation of the effectiveness of the Plan, the report must also discuss relative impacts of other major inputs such as sewer overflows, contaminated sediment, groundwater inputs, and tidal influences.

Funding and Resources

The water quality monitoring program will be funded proportionally by the Councils of the Cooks River catchment on a land area basis. Many Councils within the catchment already undertake water quality monitoring and will direct their existing water quality monitoring budget towards this catchment wide monitoring program. Sydney Water, and other Government Authorities conducting water quality monitoring within the Cooks River are likely to benefit from the results and will also be asked to contribute towards this catchment wide program.

Auburn, Randwick, Kogarah and Ashfield Councils will not be required to contribute to this program as their local government areas represent areas of less than 1% of the Cooks River catchment and include no open waterways. These Councils will be involved in the "hotspot" water quality monitoring undertaken for specific management actions as detailed below.

8.2.3 River Health Monitoring Program

The River Health Monitoring Program aims to assess the effectiveness of the Plan toward achieving stormwater management objectives 1, 2, 3 & 4 (refer *Table 5.1*). It is intended the program will result in a map of the changes in ecological values of the Cooks River on an annual basis.

On an annual basis, the Association of Councils will consult with Council officers, Government Agencies, and community environment groups to update a map of ecological values of the Cooks River (refer to *Figure 6*). It is proposed that the following ecological values be identified and mapped on an annual basis.

1. Foreshore vegetation and natural waterways, including areas of:
 - remnant foreshore vegetation;
 - regeneration or planting of foreshore areas with native vegetation;
 - natural channel;
 - recreated natural channel (once concrete lined or piped);
2. Wetlands and inter-tidal zones, including areas of:
 - remnant wetland;
 - remnant mangrove and saltmarsh;
 - recreated wetlands;
 - recreated mangrove stands and inter-tidal habitats

A comparison of maps each year will enable evaluation of progress towards short term objectives for stormwater management.

Community "bird watch" groups and recreational fishermen can contribute valuable information to this river health monitoring program. Mechanisms to encourage and provide for feedback of this type of monitoring program form a component of the education programs identified in the Action Plan and will involve both school and community groups.

8.2.4 State of the Catchment Reporting

The outcomes of the above monitoring programs will be reported in a State of the Catchment Report. This information can then be incorporated into the State of the Environment Reports for each Council.

The outcomes of the monitoring programs will be used to continually improve the Stormwater Management Plan.