

PARRAMATTA RIVER ESTUARY
DATA COMPILATION REVIEW STUDY

KEY REFERENCES

* All references, including those key references listed below, have been provided to Parramatta City Council. Please contact Council to view these documents. Alternatively, a catalogue search of the Libraries Australia website (<http://librariesaustralia.nla.gov.au/apps/kss>) will facilitate identification of all libraries in which each document may be found.

No.	Reference	Description	Spatial Resolution (Upper, Middle, Lower or Whole Estuary)	Temporal Resolution	Quality (High, Medium or Low)	Key Methodology	Key Findings / Outcomes	Relevant Management Issues
1	Allen, C. B., D. H. Benson, et al. (2007). Vegetation Map of the Sydney Harbour Foreshore, December 2006. NSW Department of Primary Industries, NSW Maritime, Botanic Gardens Trust and Royal Botanic Gardens Sydney, pp. 11.	Maps the distribution of foreshore vegetation (incl. mangroves and saltmarsh) for Sydney Harbour.	Whole estuary	Snap shot	Medium - High - The accuracy and reliability of the methods used are discussed in the report.	Aerial photography, ground-truthing, GIS.	Cleared or man-made areas and weeds are prevalent along the foreshore of the Estuary.	1. Ecology
2	AMBS (2002). Port Survey for Introduced Marine Species - Sydney Harbour. Prepared by Australian Museum Business Services for Sydney Ports Corporation, pp. 46.	Assesses the occurrence of and potential for marine pest species in Sydney Harbour.	Whole estuary	N/A	High	Various.	There are a number of pest species already present in Sydney Harbour. The potential for the introduction of pest species may be high, primarily due to international shipping and other boat traffic.	1. Ecology
3	ANZECC and ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Australia and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.	Guidelines for fresh and marine water Quality within Australia and New Zealand.	Whole estuary	N/A	High	Analysis of water quality and sediment quality throughout Australia and New Zealand. Consultation with government and necessary organisations with regards to the establishment of water quality guidelines.	Establishes benchmarks, long-term and short term levels for all water quality parameters within Australian and New Zealand waters. Trigger values as established by ANZECC assist in identifying levels of contamination within water bodies. Furthermore, primary and secondary contact guidelines are based on the bacteria concentrations and account for the suitability of water for recreational purposes.	1. Ecology 2. Sediment (Quality) 3. Water Quality
4	Arup (2005). Parramatta Valley Cycleway Masterplan, Parramatta City Council: 42.	Arup was appointed by Parramatta City Council ('Council') to develop a Masterplan to detail and diagrammatically represent the specific and prioritised actions required to ensure the coordinated and timely completion of the Parramatta Valley Cycleway (PVC).	Upper Estuary	N/A	High	Data collation and consultation.	<ul style="list-style-type: none"> ~ history of development of PVC ~ review of relevant planning documents ~ assessment of realistic future vision of the PVC ~ current status and issues of each section of the PVC ~ summary of consultation with key stakeholders ~ detailed assessment of selected unconstructed sections ~ broad scale mapping of the route and detailed mapping of selected unconstructed sections ~ masterplan actions required to facilitate the completion of the PVC ~ priorities for implementation 	1. Human Usage and Recreation
5	Bewsher Consulting and WBM Oceanics (2007). Duck River Stormwater Catchment Study - Draft, Bankstown City Council: 21.		Upper Estuary (Duck River)	N/A	High	Hydraulic modelling (TUFLOW)	<ol style="list-style-type: none"> 1. A database of all drainage assets within the study area; 2. Establishment of a computer model capable of assessing flood behaviour; 3. Information on flood behaviour under existing catchment conditions; and 4. A model that can be used to assess flood mitigation options and future development proposals. 	1. Catchment Characteristics. 2. Urban Stormwater, Hydrology and Flood Behaviour.
6	Birch, G. and S. E. Taylor (2004). The Contamination Status of Sydney Harbour Sediments. A Handbook for the Public and Professionals. Sydney, Environmental, Engineering & Hydrogeology Specialist Group, Geological Society of Australia.		Whole estuary	Long-term	High	Sediment cores, surficial sediment sampling.	The quality of estuarine sediments is characterised for the estuary in terms of sources and sinks, enrichment over background and ecological risk.	1. Catchment Characteristics 2. Ecology 3. Sediment Quality
7	Birch, G. F., B. Eyre and S. E. Taylor (1999). "The distribution of nutrients in bottom sediments of Port Jackson (Sydney Harbour), Australia." Marine Pollution Bulletin 38 (12): pp. 1247-1251.	Characterised the concentrations, distributions and major sources of nutrients in Port Jackson.	Whole estuary	Snap shot	High	Sediment cores, surficial sediment sampling.	It was determined that the sediments of Port Jackson, including those in the Parramatta River Estuary, contain high nutrient concentrations, but it is unclear if the sediments are a significant source of nutrients as there is no information regarding the flux of nutrients between the sediments and the water column.	1. Ecology 2. Sediment (Quality) 3. Water Quality
8	Blaxell, G. (2004). The River: Sydney Cove to Parramatta. Eastwood, Brush Farm Historical Society.	Provides a history of the Parramatta River.	Whole estuary	N/A	High	Research and review of historical materials.	This document provides an excellent review of the use of the estuary and the heritage sites located along the river foreshore. This includes details on historical personages, sites and clubs.	1. Heritage
9	BoM. (2008). "Climate Data Online." Retrieved 10/1/08, 2008, from http://www.bom.gov.au/climate/averages/ .		Whole Estuary	Long-term	High	Sydney Olympic Park AWS (Gauge No. 066195, Commenced 1995 – ongoing) and Parramatta (Gauge No. 066046, commenced 1832 – 1966). Several rainfall gauges.	Climate data.	1. Catchment Characteristics.

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10	Cardno Lawson Treloar (2007). Estuarine Planning Levels Study Foreshore Region of Leichhardt Local Government Area - DRAFT. Sydney, Prepared for Leichhardt Municipal Council. 1.	Council often has to assess the feasibility of land for open space, or is undertaking construction or reconstruction of seawalls, walkways or boardwalks along the foreshore area. Council also has the responsibility to ensure that the risks associated with wave action and storm tide inundation from the harbour are properly considered for all development applications. To establish and maintain a consistent approach to the management of these areas, Council has commissioned a study to establish Estuary Planning Levels that can be readily applied to any section of the foreshore.	Lower Estuary	N/A	High	Hydrodynamic modelling	Definition of storm tide, wave run-up and overtopping impacts on water level for the foreshore areas of the Leichhardt Council LGA, so that consistent and informed development decisions can be made for the management of these areas.	1. Hydrodynamics
11	Cardno Willing (2004). Duck Creek - Subcatchment Management Plan: 65.		Upper Estuary (Duck River)	N/A	High	1. DRAINS was used to analyse the performance of the existing tributary pipe systems. 2. XPRAFTS2000 was used for hydrologic study of the overall catchment including A'Becketts Creek. 3. MIKE-11 model was used for hydraulic study of the main channels, culverts and flow paths. 4. XP-AQUALM catchment water quality model was used for the catchment water quality modelling. 5. Stormwater Management Options Analysis.	1. Establishment of computer models capable of assessing flooding and water quality behaviour. 2. Models that can be used to assess flood mitigation options, future development and water quality management options. 3. A prioritised list of catchment management options.	1. Catchment Characteristics. 2. Urban Stormwater, Hydrology and Flood Behaviour.
12	Cardno Willing (2006a). Duck River Flood Study: 52.	This report provides a review and updating of flood information and previous flood studies of Duck River, within the Parramatta City Council area. Duck River is a tributary of the Parramatta River.	Upper Estuary (Duck River)	N/A	High	1. XPRAFTS v6.5 was used for hydrological modelling. 2. MIKE11 was used for hydraulic modelling.	1. Detailed flood behaviour. 2. Establishment of computer models capable of assessing flooding behaviour. 3. Models that can be used to assess flood mitigation options and future development.	1. Urban Stormwater, Hydrology and Flood Behaviour.
13	Clouston (1994a). Parramatta River Foreshore Management Strategy. Volume 2 - Technical Information, Prepared for Parramatta City Council: 141. Clouston (1994b). Perceptions and Issues Raised by Focus Groups in Round Three Meetings, Prepared for Parramatta City Council: 9. Clouston (1994c). Perceptions and Issues Raised by Focus Groups in Round Two Meetings, Parramatta City Council: 4. Clouston (1994d). Perceptions and Issues Raised by Focus Groups in Round One Meetings, Parramatta City Council: 5.	This report described the key issues and management options for: urban form, access, water quality and flooding, recreational and community needs, land use, vegetation, visual quality, heritage conservation, tourism, community involvement, natural conservation, administration (planning framework).	Upper Estuary	N/A	High	The study involved comprehensive community consultation including focus group workshops.	~ An inventory of the resources and characteristics of the landscape along the river. ~ A discussion of key issues of river management and design. ~ A vision for the river arising from the assessment of the resource and issues outlined.	All
14	Dallas, M. (2003). Parramatta City Council Aboriginal Cultural Heritage Study. Prepared by Mary Dallas Consulting Archaeologists for Parramatta City Council, pp. 140.	Provides an overview of the history of Aboriginal occupation and use of the Parramatta River.	Whole estuary	N/A	High	Research and review of historical materials; consultation with Aboriginal groups.	The report provides a comprehensive overview of the Aboriginal groups in the area, their lifestyle and culture, and their interaction with European settlers.	1. Heritage (Indigenous)
15	DEAP (1986a). Open Space and Recreation. Volume 1. Parramatta River Regional Environmental Study, Department of Environment and Planning: 73. DEAP (1986b). Open space and recreation. Issue Paper 1: Visual Study. Parramatta River Regional Environmental Study, Department of Environment and Planning: 29. DEAP (1986c). Open space and recreation. Issue Paper 2: Natural Systems. Parramatta River Regional Environmental Study, Department of Environment and Planning: 38. DEAP (1986d). Open space and recreation. Issue Paper 3: Open Space and Recreation. Parramatta River Regional Environmental Study, Department of Environment and Planning: 73. DEAP (1986e). Open Space and Recreation. Heritage Study Parramatta River Regional Environmental Study. Sydney, Department of Environment and Planning: 161.	This study relates to usage of open space and recreation potential within the Parramatta River region. It identifies and outlines the conditions of the natural systems and the major issues of concern. It also describes current usage/facilities and includes the demands/needs and relating issues. Thirdly it looks at assess the role, policies and practices of authorities involved in the administration and management of the Parramatta River. NB: Issue papers 1,2, and 3 cover each topic in greater detail.	Whole Estuary	N/A	High	Data collation and review. Field surveys. Consultation.	It identifies and outlines the conditions of the natural systems and the major issues of concern. It also describes current usage/facilities and includes the demands/needs and relating issues. Thirdly it looks at assess the role, policies and practices of authorities involved in the administration and management of the Parramatta River.	All
16	DECC (2006a). Sydney Harbour and Parramatta River Water Quality and River Flow Objectives. NSW Water Quality and River Flow Objectives, Department of Environment and Climate Change.	This document outlines the interim Water Quality and River Flow Objectives for the Sydney Harbour and Parramatta River catchment	Whole Estuary	N/A	High	Literature review and consultation with the community and stakeholders.	Interim Water Quality and River Flow Objectives for the Sydney Harbour and Parramatta River catchment	1. Urban Stormwater, Hydrology and Flood Behaviour.
17	DNR. (2008). "Estuaries in NSW: Parramatta River." Retrieved 10/01/08, from http://www.dnr.nsw.gov.au/estuaries/inventory/parramatta.shtml .	General description of the estuarine attributes within the context of the estuary management process.	Whole Estuary	N/A	Medium - High quality data, although limited.	Literature review.	General description of the estuarine attributes within the context of the estuary management process.	All

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18	EDAW and SKM (1996). Duck River Management Plan, Prepared for the Duck River Steering Committee: 94.	Provides a strategy for the restoration of Duck River as a functioning, diverse river system maximising habitat, recreation and aesthetic opportunities.	Upper Estuary (Duck River)	N/A	High		Describes landform, soils, vegetation (mapping), wildlife, hydrology and water quality, meteorology, stormwater, water quality, stream erosion and sedimentation, irrigation, landfill and earthworks, structures and buildings, landuse, access and circulation, recreation, visual character, safety and security, community awareness and education, maintenance, catchment management. Provides management recommendations. Appendices include detailed information on vegetation, fauna species, meteorological data, stormwater monitoring data and water quality.	All
19	Environmental Partnership (2008). Draft Parramatta River Foreshore Plan. Prepared for Parramatta City Council, May 2008: pp. 162.	Provides a framework for the future management of the Parramatta River Foreshore.	Whole estuary	N/A	High	Various (esp. consultation).	Extensive consultation of relevant agencies and the community was undertaken to develop an understanding of how people use the estuary, what management issues are associated with the use of foreshore lands and to develop a vision for the future management of the river foreshore.	1. Human Usage and Recreation
20	GHD (1990). Environmental Impact Statement for the Extension of Ferry Services on the Parramatta River, West of Silverwater Bridge, NSW Department of Transport: 1.1-11.19.	This EIS examines the impacts of a proposal to extend ferry services upstream of Silverwater Bridge.	Upper Estuary	N/A	Medium	Data compilation and Review. Public consultation. Field survey and data collection.	An assessment of the potential impacts of the ferry service on various environmental and social aspects.	All
21	Henry, G. W. (1984). Commercial and Recreational Fishing in Sydney Estuary. NSW Fisheries, pp. 47.	Provides an overview of the species found in Sydney Harbour (incl. the study area).	Whole estuary	Snap shot	Moderate - High - Does not incorporate a variety of survey methodologies.	Analysis of recreational and commercial fisheries statistics; sampling by trawling.	At that time, the fish stocks in Sydney Harbour did not appear to be on the decline, although the secondary impacts associated with fishing were thought to be an issue. List of species caught are also provided.	1. Ecology 2. Human Usage and Recreation
22	Irvine, I. and G. F. Birch (1998). "Distribution of heavy metals in surficial sediments of Port Jackson, Sydney, New South Wales." Australian Journal of Earth Sciences 45 (2): pp. 297-304.	Provides an assessment of sediment quality and also sediment grain size for the whole of Sydney Harbour, including the Parramatta River.	Whole estuary	Long-term and snap shot	High	Sediment cores, surficial sediment sampling.	Contaminants are associated with the fine fraction. The two most contaminated areas in Port Jackson are the Parramatta and Duck Rivers, particularly Homebush, Hen and Chicken Bay and Iron Cove.	1. Ecology 2. Sediment (Quality)
23	Lawson & Treloar (2000). Port Jackson Current Modelling, Prepared for the Australian Yachting Federation: 4.	As part of preparation of the Australian Sailing Team for the Year 2000 Olympic Games, Lawson and Treloar Pty Ltd were engaged by the Australian Yachting Federation to undertake numerical current modelling of Port Jackson.	Lower Estuary	N/A	High	Hydrodynamic modelling	<ul style="list-style-type: none"> • Indicative sailing courses and modelled current output locations • Tides for the time of Olympic sailing (Eastern Standard Time) • North Head and Fort Denison wind time series used for simulation • Sample comparisons between modelled 'no wind' and 'with wind' cases • Indicative modelled current vector plots • 'No wind' time series plots of modelled current speed and direction (Eastern Standard Time) • 'No wind' time series tabulations of current speed and direction (Eastern Summer Time) • 'With wind' time series tabulations of current speed and direction (Eastern Summer Time) 	1. Hydrodynamics

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24	Laxton, J. H., E. Laxton, et al. (2008). Water Quality of the Upper Parramatta River. Analysis of data collected between 1990 and 2007, Parramatta City Council: 164.	This report is the most recent addition in an ongoing water quality monitoring program which now accounts for 18 years of data. The long term trends and seasonal variability in water quality are assessed for the Parramatta River Estuary.	Upper Estuary	Long-term	Medium - Data is extensive however shortfalls occur within analytical methodology.	Data collection and analysis of physical, chemical and biological water quality parameters.	<ul style="list-style-type: none"> Statistical analysis of water quality data collected at 12 sampling locations across the Upper Parramatta River Estuary. Spatial variability between sampling locations and temporal changes over the previous 17 years of sampling. 25 water quality parameters have been sampled within bottom and surface water. No significant difference in mean water temperatures over 18 years. Large variability in salinity values, dissolved oxygen, and nutrient concentrations for the upper estuary during 2007. Turbidity, suspended solids and concentrations of Chlorophyll-a remained consistent with long-term trends and seasonal variability. Large fluctuations in Faecal coliforms concentrations occurred during wet weather sampling. The ecology of the Parramatta River Estuary was assessed to be very productive and dynamic supporting a wide range of biodiversity however considered to be finely balanced. 	1. Water Quality
25	Long, E. R., D. D. MacDonald, et al. (1995). "Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments." Environmental Management 19 81-97.	Establishes guidelines for the incidence of biological effects associated with sedimentary contaminants	N/A	N/A	High	Effects database from laboratory and field exposures to contaminated sediments.	This paper refers to the original research undertaken in the US investigating the biological effects of sedimentary contamination and forms the basis of the sediment guidelines provided in ANZECC and AMRCANZ (2000).	1. Ecology 2. Sediment (Quality)
26	McLoughlin, L. C. (2000a). "Estuarine wetlands distribution along the Parramatta River, Sydney, 1788-1940: implications for planning and conservation." Cunninghamia 6(3): 579-610.		Whole Estuary	N/A	Medium - Although data available do not permit detailed quantitative analysis, and no single source is definitive, in total they yield a more detailed picture has hitherto been available.	This study examined a variety of written, cartographic and pictorial historical materials.	This study documents the extent and distribution of inter-tidal wetlands and riparian vegetation along the Parramatta River and its bays from 1758 (first settlement in Port Jackson) to c. 1940 (when documentation by aerial photographs commenced).	1. Catchment Characteristics.
27	McLoughlin, L. C. (2000b). "Shaping Sydney Harbour: sedimentation, dredging and reclamation 1788-1990s." Australian Geographer 31 (2): pp. 183 - 208.	Provides a history of reclamation and dredging works in Sydney Harbour from European settlement until 1990.	Whole estuary	Long-term	Low - Medium - Heavily reliant on historical records and anecdotal evidence for which the accuracy is likely to be poor.	Review of historical records.	The Parramatta River Estuary has been extensively modified due to reclamation and dredging works. Sedimentation rates were rapidly accelerated following European settlement, but have declined somewhat in contemporary times.	1. Ecology 2. Human Usage 3. Sediments 4. Water Quality
28	MHL (2006). Survey of Tidal Limits and Mangrove Limits in NSW Estuaries 1996 to 2005, Prepared by the Manly Hydraulics Laboratory for the Department of Natural Resources: 116.		Whole Estuary	N/A	High	1. Survey of high tide. 2. Survey of mangroves (furthest mangrove upstream)	Tidal and mangrove limits for the Parramatta River and the majority of the tributaries.	1. Catchment Characteristics. 2. Urban Stormwater, Hydrology and Flood Behaviour. 3. Ecology.
29	MHL. (2008). "NSW Water Level Data Recording Sites." Retrieved 7 April, 2008, from http://mhl.nsw.gov.au/www/water_data_where.htmlx .	List of NSW water level data recording sites.	Whole Estuary	Long-term	High	Water level data	Locations of water level gauges.	1. Hydrodynamics
30	Morris, A. K., V. Tyler, et al. (1990). "A Waterbird Survey of the Parramatta River Wetlands, Sydney, New South Wales." Australian Birds 23 (3): pp. 44-64.	Survey of the avifauna of the Estuary.	Whole estuary	Snap shot	Medium - Actual numbers of birds not always recorded; reliance on timing with appropriate tides etc.	Observational census.	A total of 73 waterbirds were observed, of which 37 occur regularly. Homebush Bay provided large areas of habitat for these birds.	1. Ecology
31	National Trust (1976). Parameters for the River, National Trust of Australia and the Parramatta River Conservation Co-ordination Committee.	Very detailed report broken up into 2 parts. Part 1 describes and analyses the structure of the river estuary and river valley. It includes details of the natural systems, vegetation, water quality, usage, impacts of development and historical details. It also outlines specific problems and threats. Part 2 includes methods of management, recommendations and designs of river improvements.	Whole Estuary	N/A	Medium - Some of the information in this report is now somewhat outdated.	Data collation and review. Mapping. Consultation.	A prospectus for rehabilitation of the Parramatta River.	1. Catchment Characteristics 2. Human Usage and Recreation 3. Urban Stormwater, Hydrology and Flood Behaviour
32	Olympic Co-ordination Authority (1996a). Homebush Bay Ecological Studies 1993-1995. Volumes 1 and 2. Olympic Co-ordination Authority, pp. 187.	Provides an ecological assessment of Homebush Bay.	Middle	Snap shot	High	Various.	Characterises the bird, fish, invertebrate and floristic diversity of Homebush Bay.	1. Ecology

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33	PCC (2002d). Rivers of Opportunity. Waterways Strategy and Plan. 1 - 4: 119.	This document describes the vision and outcomes for improved waterways in Parramatta and a set of Strategies to achieve them.	Upper Estuary	N/A	High	Literature review and consultation with the community and stakeholders.	A strategy for the Parramatta River that sets goals, outlines strategies and provides guidance on monitoring.	1. Urban Stormwater, Hydrology and Flood Behaviour.
34	PCC (2003a). Vineyard Creek Waterways Maintenance and Rehabilitation Masterplan. Volume 1 - Masterplan, Parramatta City Council: 140.	In the preparation of the Masterplan an assessment of the pre-European condition of Vineyard Creek including vegetation structure and stream dynamics was undertaken. This included a review of impacts over time as a result of urbanisation and a history of reconstruction and restoration activities. Based on this history and current status, specific actions were prepared which responded to the desired Vision for Vineyard Creek that was determined through a consultation and focus group process.	Upper Estuary (Vineyard Creek)	N/A	High	Literature review and consultation with the community and stakeholders.	Prioritised list of management actions for Vineyard Creek.	1. Catchment Characteristics
35	Roach, A. C. and J. Runcie (1998). "Levels of selected chlorinated hydrocarbons in edible fish tissues from polluted areas in the Georges/Cooks Rivers and Sydney Harbour, New South Wales, Australia." Marine Pollution Bulletin 36 (5): pp. 323-344.	Assesses the uptake of chlorinated hydrocarbons by recreationally fished species.	Whole estuary	Snap shot	Medium - Covers a limited number of samples collected from a limited number of sites.	Sampling of fish muscle tissues.	Chlorinated hydrocarbons were found in the tissues of fish sampled from every location. The major contaminants were PCBs and the Group A organochlorine pesticides, which include chlordane, dieldrin and heptachlor epoxide. The highest mean concentrations of PCBs were detected in fish from Duck River and Homebush Bay. The highest mean concentrations of Group A pesticides, particularly chlordane and dieldrin, were detected in fish from Duck River. The fish species which accumulated contaminants to concentrations exceeding the relevant MRLs were yellow-fin bream (Duck River, Homebush Bay and Parramatta River), sea mullet (Duck River, Homebush Bay and Iron Cove) and silver biddy (Iron Cove), whereas the luderick, fan-tail mullet and sand whiting had mean concentrations of contaminants below the relevant MRLs.	1. Ecology 2. Sediment (Quality)
36	Robinson GRC Consulting (1999b). Mid Parramatta (North) River Stormwater Management Plan, Prepared for City of Ryde and Parramatta City Council: 97.		Upper Estuary	N/A	High	Literature review and consultation with the community and stakeholders.	Catchment characteristics, identification, assessment and prioritisation of stormwater management actions. Influence and impacts of stormwater with regards to estuary water quality.	1. Catchment Characteristics. 2. Urban Stormwater, Hydrology and Flood Behaviour. 3. Water Quality.
37	SCCG (2002). Sydney Harbour / Parramatta River Local Government Needs Analysis Regional Report. Stormwater Extension Officer Program, Sydney Coastal Catchments Group and the Stormwater Trust.	The stormwater extension officer program is an initiative of the second phase on the NSW Government's Urban Stormwater program. This report presents findings of the needs analysis for the Sydney Harbour / Parramatta River Catchment.	Whole Estuary	N/A	High	~ Collation of existing information on stormwater management for each council as well as relevant regional / state information. ~ Interviews with every council who has completed a stormwater management plan. ~ Consultation with councils and other stakeholders.	~ A needs profile for the region based on data and interviews. ~ Regional actions and outcomes for the Stormwater Extension Officer Program based on the needs profile.	1. Urban Stormwater, Hydrology and Flood Behaviour.
38	Simpson, S. L., L. Rochford and G. F. Birch (2002). "Geochemical influences on metal partitioning in contaminated estuarine sediments." Marine and Freshwater Research 53 (1): pp. 9-17.	Considers metal partitioning in the sediments of Iron Cove in relation to sulfidic sediments.	Middle	Snap shot	High	Surficial sediment sampling.	Contamination was greatest near stormwater outlets where sediments were anoxic and contained high concentrations of sulphide in the porewater. Away from the canal a layer of non-cohesive, sub-oxic surficial sediment containing high dissolved iron was found overlaying a more cohesive substratum. Negligible metal release was observed upon sediment resuspension and the ecological risk is likely to be low. The rapid oxidation then hydrolysis of iron(II) in porewaters caused a drop in pH and the formation of iron hydroxide precipitate. These processes may affect dissolved metal concentrations; hence, oxidation of samples must be avoided during sampling and extraction procedures.	1. Ecology 2. Sediment (Quality) 3. Water Quality

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39	SKM (2002a). Lower Parramatta Additional Data Required Report: 10. SKM (2002b). Data Compilation Report: 13. SKM (2002c). Review of Flood Reports. 2: 35. SKM (2005a). Lower Parramatta River Floodplain Risk Management Study and Plan. Volume 1 - Main Report, Parramatta City Council: 104. SKM (2005b). Lower Parramatta River Floodplain Risk Management Study and Plan. Volume 2 - Planning, Parramatta City Council: 42. SKM (2005c). Lower Parramatta River Floodplain Risk Management Study - Flood Study Review.	These documents collectively provide a review of previous flood studies undertaken in the Parramatta River Estuary, an update an combination of these flood studies and a floodplain risk management study and plan (as per the NSW Govt. Floodplain Development Manual).	Whole Estuary	N/A	High	Data collection and review. XP-RAFTS v5.1 hydrological modelling. MIKE11 v1999b hydraulic modelling. Options analysis.	Description of flood behaviour in the study area. Hydrologic and hydraulic models. Prioritised management options.	
40	SKM (2003). Lower Parramatta River Floodplain Risk Management Study Vegetation Assessment, Parramatta City Council: 50.	This study was undertaken as part of the larger Floodplain Risk Management Study by SKM. This study provides important baseline vegetation data for use in the FRMS.	Whole Estuary	N/A	High	Literature review, aerial photo interpretation, flora field survey, assessment of biological diversity, threatened species habitats, conservation significance and recommended management strategies.	~ Identified the presence of threatened or significant species, endangered ecological communities or key threatening processes. ~ Documented field surveys. ~ Identification of remonant vegetation. ~ Identification of existing habitat corridors.	1. Ecology. 2. Urban Stormwater, Hydrology and Flood Behaviour.
41	SMCMA (2007). "SMCMA CAP Draft Targets."	This document lists the CMA's aims for the Sydney Metropolitan catchment in regards to Community, Biodiversity, Water, Estuary, Coastal & Marine Theme, Land and Development. Management targets necessary to achieve the broad goals are also included.	Whole Estuary	N/A	High	Unknown.	Catchment targets.	All
42	SMEC (2004). Vineyard Creek Sub-Catchment Management Plan, Parramatta City Council.	This study describes the current stormwater and flooding issues and impacts and provides stormwater management strategies (both quality and quantity).	Upper Estuary (Vineyard Creek)	N/A	High	Literature review, DRAINS modelling of pit and pipe system, MUSIC modelling of water quality, RAFTS modelling of hydrology, MIKE11 modelling of hydraulics.	~ Description of flood behaviour. ~ Description of pollutant loads from the catchment. ~ Costed and ranked stormwater management actions.	1. Urban Stormwater, Hydrology and Flood Behaviour.
43	Sydney Water (2007). Biological and Water Quality Monitoring Spring 2007, City of Ryde: 91	Ongoing biological sampling and ecological assessment of waterquality within the Parramatta River Estuary.	Middle	Long-term and short-term	High	In situ water quality monitoring, Macroinvertebrate sampling, data collection and analysis, comparison with historical data.	All sites within the study area were indicative of urban creeks, with significant to severe impairment of the ecological health. The main influence on these sites and the creeks on which they are located include poor water quality and poor habitat diversity. Some long-term improvement has been noted within specific locations however more intensive management is required for ongoing sustainability.	1. Water Quality
44	Taylor, S. E. and G. F. Birch (1999). "Contaminant dynamics in offchannel embayments of Port Jackson, New South Wales." AGSO Journal of Australian Geology and Geophysics 17 (5/6): pp. 233-237.	Focuses on sediment quality and sedimentation in Iron Cove, Hen and Chicken Bay and Homebush Bay. Also considers pathways by which contaminants may enter the foodchain.	Middle	Snap shot	High	Sediment cores, surficial sediment sampling.	Sediment settling rates are higher in summer than in winter. Resuspension and secondary sourcing of contaminated sediments probably occurs in many of the extensive shallow water environments of Port Jackson, thereby providing a pathway for contaminants to enter the estuarine food chain.	1. Ecology 2. Sediment (Quality)
45	Taylor, S. E., G. F. Birch and F. Links (2004). "Historical catchment changes and temporal impact on sediment of the receiving basin, Port Jackson, New South Wales." Australian Journal of Earth Sciences 51 (2): pp. 233-246.	Provides an assessment of the chronology of sedimentary contamination in the Parramatta River Estuary.	Whole estuary	Long-term	High	Sediment cores, radio-isotopic dating.	Contamination first occurred around 1860 and typically followed the progress of development in the catchment, particularly with respect to the establishment of industry. Maximum concentrations were reached in the 1970's and have subsequently declined.	1. Sediment (Quality) 2. Water Quality
46	West, G. and R. J. Williams (2008). A preliminary assessment of the historical, current and future cover of seagrass in the estuary of the Parramatta River. NSW Department of Primary Industries, NSW Maritime and the Sydney Metropolitan Catchment Management Authority, pp. 61.	Analyses changes in the distribution of seagrasses in the Parramatta River Estuary since the 1970's.	Whole estuary	Long-term	Medium - High - The accuracy and reliability of the methods used are discussed in the report.	Aerial photography, ground-truthing, GIS.	The extent of seagrass in the estuary has remained relatively stable. However, the area suitable for colonisation by seagrass is larger and it is recommended that management actions take this potential into account.	1. Ecology
47	West, G., R. J. Williams and R. Laird (2004). Distribution of estuarine vegetation in the Parramatta River and Sydney Harbour, 2000. NSW Department of Primary Industries - Fisheries, NSW Maritime and the Sydney Metropolitan Catchment Management Authority, December 2000: pp.	Maps the distribution of macrophytes, seagrass, saltmarsh and mangroves in Sydney Harbour, including the Parramatta River Estuary	Whole estuary	Snap shot	Medium - High - The accuracy and reliability of the methods used are discussed in the report.	Aerial photography, ground-truthing, GIS.	There appeared to have been large net losses in seagrasses compared to historical mapping, despite some localised increases. The extent of saltmarsh appeared to have remained steady, while the extent of mangroves had increased.	1. Ecology
48	Woodlots and Wetlands, Molino Stewart Environmental Services, et al. (1999). Lower Parramatta River Stormwater Management Plan, Lower Parramatta River Stormwater Management Councils and the Stormwater Trust: 172.	This stormwater management plan was developed in accordance with the EPA Document "Managing Urban Stormwater: Council Handbook" (EPA, 1997).	Majority of Estuary (Ryde Bridge to Port Jackson)	N/A	High	Literature review and consultation with the community and stakeholders.	Catchment characteristics, identification, assessment and prioritisation of stormwater management actions.	1. Catchment Characteristics. 2. Urban Stormwater, Hydrology and Flood Behaviour.
49	WP Geomarine (1998). Parramatta River Seawall Damage Appraisal. Prepared for Parramatta City Council, January 1998: pp. 20.	Assesses the condition of seawalls in the Parramatta River Estuary	Middle - Upper Estuary	Snap shot	Medium - relies on an assessment of visible damage only.	Visual survey.	At many locations, seawalls and other foreshore protection works had been damaged through undercutting of the river banks due to changes to the main channel and/or wave climate. It was considered that the RiverCat was responsible for altering the wave climate.	1. Human Usage and Recreation 2. Hydrodynamics 3. Sediments (Bank Erosion)