

UPPER PARRAMATTA RIVER  
CATCHMENT TRUST

# Report Card

# 2008

Report Card 2008 published on behalf of the Upper Parramatta River Catchment Trust by the Sydney Metropolitan Catchment Management Authority, Ground Floor, Macquarie Tower, 10 Valentine Avenue, PARRAMATTA NSW 2150, Postal Address : PO Box 3720 Parramatta NSW 2124; Website: [www.sydney.cma.nsw.gov.au](http://www.sydney.cma.nsw.gov.au); Telephone: (02) 9895 7898; Email: [sydney@cma.nsw.gov.au](mailto:sydney@cma.nsw.gov.au)

November 2009



Welcome to the Upper Parramatta River Catchment Trust’s Final Report Card.

Over twenty years have passed since the serious flooding in this catchment that resulted in the Upper Parramatta River Trust being established. During that time the Trust, and the four local councils, have achieved many milestones.

However, when it was established it was felt that the Trust should have a finite lifespan, which has now been reached. The State Government decided in February 2005, that the Trust be wound down at the end of 2006 and then merged with the Sydney Metropolitan Catchment Management Authority, which would assume responsibility for co-ordinating natural resource management and related issues in this catchment.

It was a time of mixed emotions for everyone at the Trust. On one hand it is pleasing that so much has been achieved by the Trust and its partners. But, on the other hand, there was disappointment that some tasks remain unfinished and concern about how our achievements will be maintained in the future.

Some of our key achievements have been the:

- spirit of co-operation fostered between all four councils, the Trust and the community
- the delivery of on-ground results in a range of program areas
- Loyalty Road flood retarding basin – protecting the Parramatta CBD and nearby residential areas in major floods
- reduction in number of flood liable homes by 50% and businesses by 70%
- protection of most locations with significant numbers of flood liable properties
- a Catchment Stormwater Management Plan identifying the steps required for improved stream water quality
- catchment Floodplain Risk Management Plan – adopted by all four councils
- On-site Stormwater Detention (OSD) policy – stops the flood threat from returning as development occurs
- development of detailed and comprehensive computer flood models and data collection network
- improvement in water quality at Lake Parramatta – swimming allowed again for specific events
- Waterwatch – Australia’s most active water testing program.
- improvements in bushland and waterway health – though the Green Corridors program
- very successful regional environment awards program recognising local groups.

The following pages contain a summary of the projects the Trust has carried out since 1989, through which we have achieved our objectives.

Thank you for your support over the years, and best of luck for the future,

Bob Junior  
Chairman  
September 2008

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## ABOUT THE TRUST

The Upper Parramatta River Catchment Trust was established in April 1989, following a series of major floods in the area, under provisions formerly in the Water Supply Authorities Act 1987, but now in the Water Management Act 2000.

The upper Parramatta River catchment covers an area of 110 square kilometres that includes parts of the Blacktown, (now) The Hills, Holroyd and Parramatta local government areas. It is located near the demographic centre of the Sydney metropolitan area and has a population of more than 230,000. It is bounded by Prospect Reservoir to the southwest, Blacktown to the northwest, Castle Hill to the north and Carlingford to the east. The catchment is drained by Toongabbie Creek (and tributaries) to the west and Darling Mills Creek to the northeast. The two streams join at Northmead to become the Parramatta River. The catchment outlet is the tidal limit at the Charles Street Weir, just downstream of the Parramatta central business district.

The Trust was governed by a part time board of twelve, that met regularly to set policy, review progress and provide broad direction for the Trust's overall activities. The Trust board comprised two nominees from each of the four local councils, one nominee each from the NSW Ministers for Planning, Natural Resources and Environment, plus an independent chairperson. George Whitehouse was Chairperson of the Trust from its inception to his death in January 2003. Bob Junor has been the Chairperson since February 2003. Other long-serving members of the Trust board were Cr Alan Ezzy (Holroyd), Cr Larry Bolitho (The Hills), Cr Kathy Collins (Blacktown) and Cr Chris Worthington (Parramatta). Responsibility for day-to day operations rested with its Executive Officer, supported by up to ten professional and administrative staff. Dr Stephen Lees was Executive Officer from 1989 to 2007.

The Trust's principal source of income was a river management service charge levied on all rateable properties in the catchment. This was billed and collected quarterly by Sydney Water, on behalf of the Trust. The charge was levied from 1 July 1989 to 31 December 2006. The Trust was also able to attract considerable amounts of State and Commonwealth Government grants for projects, either in its own right or through the local councils.

In February 2005 the State Government decided that the Trust would 'merge' with Sydney Metropolitan Catchment Management Authority by 2007. Since 2007 the Authority has been administering the affairs of the Trust, including its residual activities, pending a decision on which body or bodies will assume responsibility for the Trust's assets and liabilities.



# 1 Introduction

*When the Trust was set up in 1989, a series of objectives and operating principles were adopted. This second report card highlights the various projects and activities undertaken to achieve those objectives and how the Trust complied with those operating principles throughout its eighteen year history.*

*The objectives, set out in the original Government decision, were that the Trust should:*

- *speed up the provision of flood mitigation works and measures*
- *improve water quality and creeks*
- *mitigate natural hazards*
- *institute appropriate planning and development controls*
- *develop ongoing management strategies.*

*The adopted operating principles were that the Trust should:*

- *have a small staff*
- *use consultants and contractors for detailed work*
- *use councils for construction*
- *use its own funds to attract contributions to projects from other parties*
- *rely upon advice rather than direction*
- *complement, not duplicate, work of the councils and other government bodies.*
- *adopt a strategic, co-ordinating role.*

*The Trust's achievements are considered in this Report Card under the Key Performance Areas that cover the Trust's main areas of interest and organisational needs.*





# 2 Organisational Development

## 1989 Situation

Trust was established in April 1989, but did not become fully operational until April 1990. When it was established the Trust had no staff, no office, no funds, no revenue collection system and no profile in the catchment community. Soon after, the Trust adopted a set of operating principles that have guided it ever since.

## Current Position

Trust was successfully established and soon well accepted by catchment community. Arrangements to have Sydney Water bill and collect the Trust's annual Service Charge were successfully implemented at an annual cost of about \$1 per property. There was a very high acceptance of the Trust's service charge with an average of 99.98% of charges paid over the 17½ years to its cessation at the end of 2006.

At its outset a small number of high calibre staff were recruited. Most stayed with the Trust for many years. Considerable technical capabilities were developed by Trust in hydrologic and hydraulic modelling, development controls (particularly On-site Stormwater Detention), project and asset management, GIS mapping, hydrologic data collection and archiving, bushland regeneration and community water quality testing. The Trust initiated a Waterwatch water quality testing program in this catchment that was broadened and strengthened to become the most active of its type in Australia.

For most of its life the Trust had the following staff positions:

- Executive Officer,
- Operations Engineer,
- Administrative Officer,
- Investigation Engineer,
- Environmental Officer;
- Waterwatch Co-ordinator,
- Community Relations Officer,
- Clerical Officer, and
- Stormwater Inspector

The Trust sought to supplement its service charge income by obtaining financial contributions to the cost of flood (and other) projects from other parties. In this respect it was very successful, especially before the cut-back in Commonwealth Government flood grants for metropolitan areas in 1996. Until then the Trust secured \$2.50 for flood-related projects in the catchment for every \$1 it expended.

The table above shows the total spending in the catchment on flood-related activities and the sources of those funds.

The bar graph in Figure 2-1 shows the total flood spending each year and its sources in the 18 years after the Trust was established. The Trust always sought to maintain council contributions for all catchment management projects and activities at a reasonable level, by offering to share project costs on a dollar for dollar basis.

After 1997 the Trust and the local councils had to find one-third of the cost of approved flood projects, compared with one-fifth in earlier years. However the Trust was successful in accessing other government grant schemes to help support stormwater management, waterway improvements, bushland management and climate change projects.

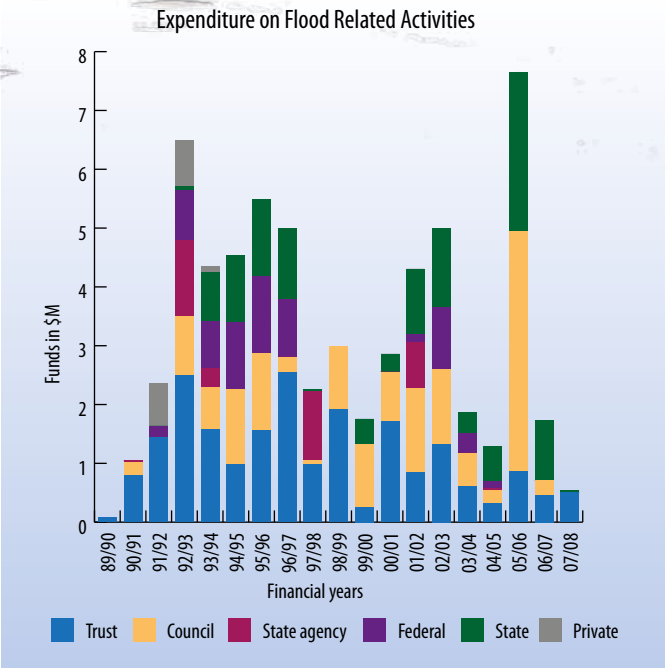


FIG 2-1 Funding sources for flood activities

External Funding	\$M
Total Flood-related Spending:	76.4
Trust Contribution:	31.4
Other Contributors:	
Australian Govt	6.9
NSW Government	16.7
State agencies	3.8
Councils	15.7
Private	1.9



FIG 2-2 Upper Parramatta River Catchment – showing catchment boundary, main streams and main localities



# 3

## Catchment Co-ordination and Planning

### 1989 Situation

There was no overall planning or co-ordination of flood mitigation works, flood-related development controls, hydrologic data collection, stormwater management or vegetation management. There was little co-operation or co-ordination between the four councils in the catchment and no forum to address natural resource problems, on a catchment-wide basis. No regional environment plan or strategy for the catchment existed.

### Current Position

Initially set up to provide catchment wide planning over the four local council areas, the Trust developed a number of strategies to achieve the objectives set out in our key result areas.

These included the Floodplain Risk Management Plan, Green Corridors Vegetation Management Strategy and the Stormwater Management Plan. Copies of these plans can be downloaded over the Internet from the Trust's web site at [www.uprct.nsw.gov](http://www.uprct.nsw.gov).

Flood mitigation works were scheduled and coordinated by the Trust using a regularly updated database and objective ranking procedure. This procedure prioritised areas where constructed flood mitigation options were proposed, as well as those areas where further investigation were required. Catchment-based Floodplain Risk Management, Stormwater (water quality) and Vegetation Management plans were developed and adopted.

A common catchment-wide On-site Stormwater Detention policy was developed, adopted by the four councils in late 1991 and has been implemented since then.

Although initially controversial, the OSD soon became well accepted and widely copied elsewhere in Sydney as an equitable way to ensure that new developments do not increase the potential for increased downstream flooding.

Over the life of the Trust there was good co-operation between the four councils at both councillor and officer levels as a result of the Trust meetings and various ongoing Trust/councils working parties.

From 2003 to 2006 the Trust co-ordinated the development of a catchment Floodplain Risk Management Plan, following the process set out in the Floodplain Development Manual, 2000.

Three of the four councils adopted the Plan and are now in varying stages of incorporating it into their local planning instruments.



Planting Greystanes



4

# Floodplain Management – Protect All At-risk Properties

### 1989 Situation

2,316 properties at 63 separate locations were subject to flooding during a 100-year flood. Many homes and businesses were flooded even in small storms. Numerous properties had been flooded repeatedly. One-third of the Parramatta CBD was flood prone. Only one large flood basin had been built. The construction of flood mitigation works was slow and uncoordinated. There was no overall flood mitigation strategy. Funding for flood works was inadequate. Cooperation between councils was poor.

### Current Position

By 1999 there was a 31% reduction in the number of homes flooded over-floor as a result of a 100-year flood; 65% reduction for business premises and no properties subject to flooding in minor to moderate storms. The Parramatta CBD was protected from 100-year flooding. An overall flood mitigation strategy, coordinated by the Trust, was in place, with thirteen flood retarding basins built and six sections of creek upgraded in capacity. Good cooperation between councils had been established.

By 2007, there was a 51% reduction in the number of flood liable homes by and 74% reduction for businesses. A comprehensive database and prioritisation system had been developed and maintained to manage works and studies, and monitor progress.

The progress made can be seen in the following diagrams. In these diagrams the circles represent flood problem areas, the size of each circle indicates the relative number of flood-liaible properties at each location: red shows that no action has yet been taken to address the flood problem at that location, amber shows that action is underway to solve the flood problem, whilst green indicates that the flood problem has been solved.

The graphs in Figures 4-2, 4-3 and 4-4 show the dramatic reduction in the number of properties subject to once in 20 year and once in 100 year flooding in the catchment during the life of the Trust.

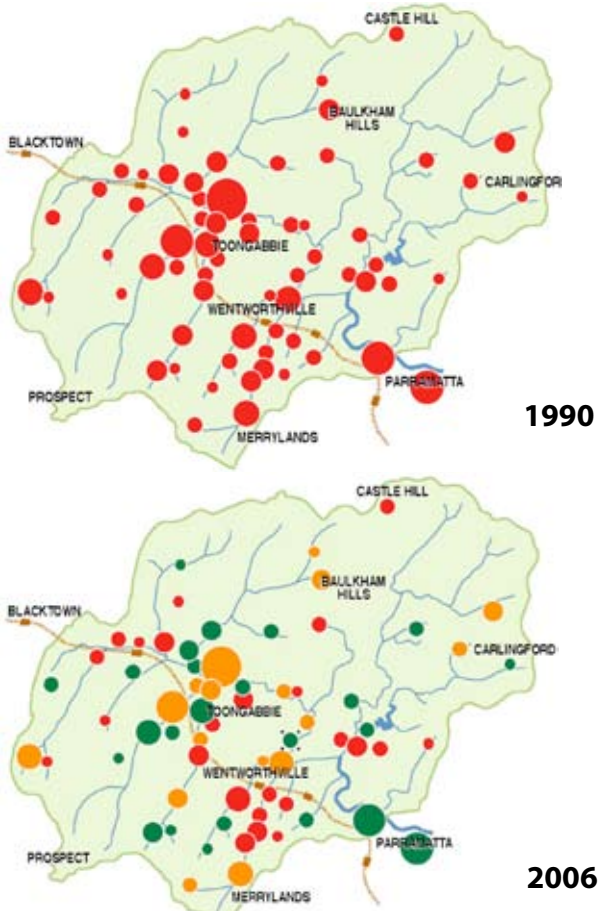


FIG 4-1 Progress made over life of the Trust in reducing mainstream flooding problems. Size of circle indicates number of flood liable properties. Colour – red, amber, green – shows progress in providing 100 year flood protection.

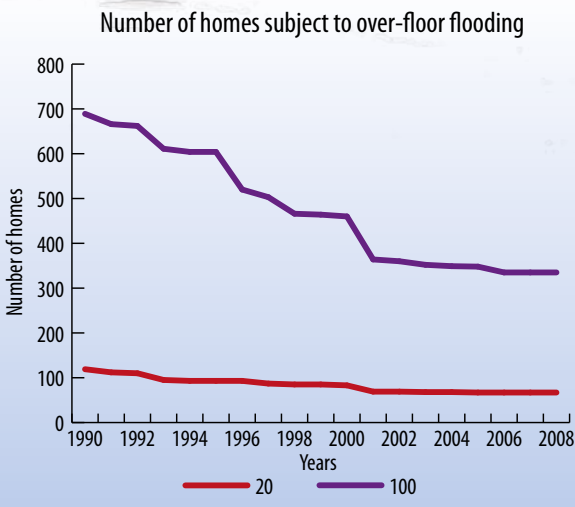


FIG 4-2 Reduction in number of homes subject to over-ground flooding in 20 year and 100 year ARI event

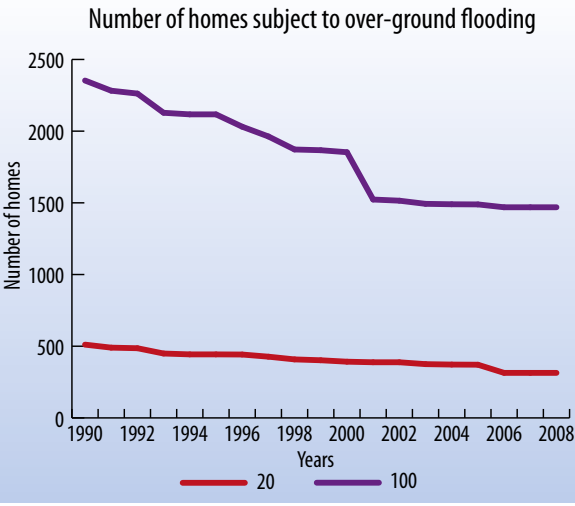


FIG 4-3 Reduction in number of homes subject to over-floor flooding

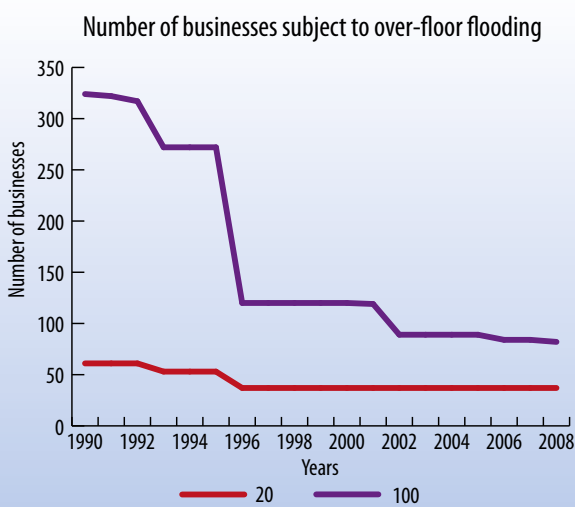


FIG 4-4 Reduction in number of business premises subject to over-floor flooding



Individual Projects

Stephenson Street and Lister Street Diversion Drain	
Winston Hills (Toongabbie Creek)	
Total Cost	\$299,030
Trust Contribution	\$149,515
Other Contributors	Parramatta City Council
Year	1990

This project involved the construction of a major diversion drain to complement a levee constructed along the northern bank of Toongabbie Creek. The drain prevents flooding behind the levee.

Flood Mitigation Database and Priority Setting Procedure	
Entire Catchment	
Total Cost	\$129,200
Trust Contribution	\$129,200
Other Contributors	–
Year	1990/1991

This study collected and systematically recorded details of all known flooding and trunk drainage problems in the catchment and possible solutions, soon after the Trust was established. An objective and regularly updated procedure for ranking outstanding problems and solutions was also developed at that time. This procedure has been used by the Trust ever since to select works and studies to be included in the Trust’s annual works program and budget. The final ranking of all flood problems was completed in June 2008.

House Raising at North Wentworthville	
Hopkins St, North Wentworthville (Coopers Creek)	
Total Cost	\$300,000 (approx)
Trust Contribution	\$151,832
Other Contributors	Householders
Year	1990 – 1991



Raised house in Hopkins Street, North Wentworthville

Seven residences in Hopkins Street were subject to repeated flooding, causing great distress to the elderly residents. This project involved the Trust subsidising the cost of raising the houses to above the 100-year flood level and providing residents with an interest-free loan for the remaining costs.

Upgraded Creek Channel at Transfield’s	
Seven Hills (Blacktown Creek)	
Total Cost	\$750,000
Trust Contribution	\$80,000
Other Contributors	Transfield
Year	1991

This project involved upgrading the Blacktown Creek channel through the then-Transfield’s property to a 20-year flood capacity. Together with minor bunding and raising flood sensitive equipment, the upgraded channel has minimised flood damage and disruption to a major local employer in all but the largest floods. The Trust coordinated the design, obtained the necessary approvals and paid for a structure in the creek channel, with Transfield paying the balance.



Reconstructed section of Blacktown Creek through the former Transfield property at Seven Hills. Photo taken around 1993 looking upstream towards Station Road bridge.

Early Voluntary acquisition of Severely Flood-liable Houses	
9 Hood St Old Toongabbie, 68 Darcy Rd Wentworthville and 16 Bogan St Greystanes,	
Total Cost	\$645, 000
Trust Contribution	\$190,000
Other Contributors	Parramatta City Council (\$90,000) Holroyd City Council (\$100,000), RTA (\$65,000), State Government \$50,000, Commonwealth Government (\$150,000)
Year	1991, 1993

Parramatta Council acquired the former two frequently flooded homes and the dwellings were demolished. The cost was met by Council, the Trust, the RTA (Darcy Road only) and the State and Commonwealth Governments (Hood Street only). The Trust and Holroyd City Council shared the cost of acquiring the Bogan Street property in 1991.

Pendle Hill Creek Floodway	
Burrabogee Road to Barangaroo Road (Budgerree Road area), Toongabbie	
Total Cost	\$3.72M
Trust Contribution	\$1.658M
Other Contributors	Parramatta City Council, NSW and Commonwealth Governments
Year	1991 – 2008



FIG 4-7 View along Pendle Hill Creek Floodway from above Industrial Area

A broad grassed floodway was built through 40 private properties to contain 100 year flood flows in order to prevent over-floor flooding of 28 homes and overground flooding of 64 others. The project has only been possible because property owners have allowed the floodway to be built through their land without any compensation or purchase. A new bridge at Barangaroo Road to replace an under capacity culvert, and bank protection works immediately downstream, were completed in 2003. Bank protection works immediately upstream of Barangaroo Road, were completed in 2005. To finalise the project Parramatta City Council voluntarily acquired and demolished the last flood affected residence at 23 Budgerree Road. It also carried out channel and floodway works in 2008 to improve flow characteristics.



FIG 4-8 Recent floodway and channel improvements on Pendle Hill Creek next to Budgerree Road



FIG 4-9 Pendle Hill Creek Floodway just upstream of Barangaroo Road in Toongabbie



Duncan Reserve Flood Retarding Basin	
Seven Hills (Grantham Creek)	
Total Cost	\$265,000
Trust Contribution	\$132,500
Other Contributors	Blacktown City Council
Year	1992

A flood-retarding basin was constructed by building an embankment across the northern end of the reserve to reduce flooding of nearby homes and prevent bank erosion downstream. This basin also helps reduce flooding further downstream in the Seven Hills industrial area.



FIG 4-10 Duncan Reserve Basin embankment being formed – August 1992.



FIG 4-11 Duncan Reserve Basin on Grantham Creek at Seven Hills, looking upstream

Toongabbie Creek Reconstruction from Powers Road to McCoy Park Basin	
Seven Hills (Toongabbie Creek)	
Total Cost	\$800,000
Trust Contribution	\$0 – but considerable co-ordination
Other Contributors	Transfield, NSW Waste Service, strata owners at 25a Powers Rd
Year	1992/1993

Meandering through several industrial properties, Toongabbie Creek from Powers Road to the upstream end of the McCoy Park basin, used to be overgrown and had severely-eroded banks that threatened buildings. A new creek channel with 100 year flood capacity and a curved alignment was designed in 1991 and constructed in 1993 with guidance from the trust, Blacktown Council and the owners. With the owners' prior approval, the works were charged totalling \$800,000 on the three benefiting properties.



FIG 4-12 Work in progress reconstructing Toongabbie Creek from Powers Road, Seven Hills to McCoy Park Flood Retarding Basin; looking downstream – August 1992.

Greystanes Creek Restoration Project	
Memphis Crescent to Octavia Street, Toongabbie (Greystanes Creek)	
Total Cost	\$2,592,000
Trust Contribution	\$432,000
Other Contributors	Blacktown City Council \$216,000 Holroyd City Council \$216,000 Commonwealth and NSW Governments \$864,000 each
Year	1993

This 1,200 metre section of the creek was reconstructed to 100-year flood capacity, saving 75 properties from flooding. The project also involved the replanting of hundreds of propagated local trees and shrubs along the creek banks and revegetation of a denuded reserve just upstream of the works. A cycleway was constructed along the length of the new channel for recreation and maintenance access.

The project was only able to proceed when affected landowners, through whose properties the original creek meandered, agreed to give up small portions of their land without compensation or acquisition, to allow the creek to be widened. In 1998, a common Plan of Management and Development Control Plan (DCP) for this

creek corridor were finally adopted by both councils: the first time such a thing has been achieved. Unfortunately the delay in finalising the DCP meant most of the development in the area did not leave a buffer to the stream.



FIG 4-13 Reconstructed Toongabbie Creek channel from Powers Road (in foreground), Seven Hills, to upstream of the McCoy Park Flood Retarding Basin; looking downstream



FIG 4-14 Restored Greystanes Creek, looking upstream near Portia Road



FIG 4-15 Reconstructed Greystanes Creek, Toongabbie, looking downstream.



FIG 4-16 Restored Greystanes Creek, looking downstream from Portia Road



Muirfield Golf Course Basins	
North Rocks (Rifle Range Creek)	
Total Cost	\$415,265
Trust Contribution	\$207,632
Other Contributors	Baulkham Hills Shire Council
Year	1993

Two small retarding basins were built on fairways at the Muirfield Golf Course to prevent serious flood damage to fourteen houses and to prevent over-floor flooding to eight additional houses immediately downstream in Perry Street and Randal Crescent, North Rocks.



FIG 4-17 Trust and Council staff inspecting Muirfield Golf Course Basins at North Rocks

Foundry Road Bridge	
Seven Hills (Toongabbie Creek)	
Total Cost	\$650,000
Trust Contribution	\$325,000
Other Contributors	Blacktown City Council
Year	1993

An inadequately sized culvert over Toongabbie Creek was replaced with a bridge able to pass major flood flows, thereby preventing flooding of eleven nearby factories.



FIG 4-18 Flooding downstream of Foundry Road Bridge at Seven Hills in April 1988 flood



FIG 4-19 The reconstructed Foundry Road Bridge at Seven Hills

Cumberland Golf Course Flood Retarding Basins	
Greystanes (Pendle Hill Creek)	
Total Cost	\$670,000
Trust Contribution	\$275,000
Other Contributors	Holroyd City Council \$279,000 Cumberland Country Golf Club \$116,000
Year	1993

Two wet basins, with both water storage and flood storage, and one dry flood retarding basin were built on the north-west corner of the golf course by Holroyd City Council to protect 8 homes from over-floor flooding and 35 from over-ground flooding. The Golf Club contributed because the works also provide additional water storage benefits. To minimize disruption to the golf course, construction took only four months.



FIG 4-20 Air photo of Cumberland Golf Course basins at Greystanes

Meryll Avenue/Landscape Street Overland Flow Path	
Baulkham Hills (Toongabbie Creek tributary)	
Total Cost	\$700,000
Trust Contribution	\$350,000
Other Contributors	Baulkham Hills Shire Council \$350,000
Year	1993 – 1997

An unobstructed overland flow path through five residential properties in Landscape Street and Meryll Avenue was created by purchasing, modifying and reselling properties. As a result these properties are no longer subject to over-floor flooding.



FIG 4-21 Trust staff view overland flow path between homes in Meryll Avenue, Baulkham Hills

Hart Drive Flood Culvert	
Wentworthville Housing Estate (minor tributary of Toongabbie Creek)	
Total Cost	\$500,689
Trust Contribution	\$85,389
Other Contributors	Dept. of Housing \$212,800 RTA \$202,500
Year	1994



FIG 4-22 Exit from flood culvert that runs under Hart Drive at Wentworthville

Construction of a flood culvert under Hart Drive (Cumberland Highway) at Wentworthville and associated works, allows 100-year flood flows to pass beneath the highway, preventing the frequent above-floor inundation of 11 previously flood prone townhouses. The project was co-ordinated by the Trust, but most of the construction cost was met by the Roads and Traffic Authority and the Department of Housing.

Loyalty Road Flood Retarding Basin	
North Rocks (Darling Mills Creek)	
Total Cost	\$9,226,000
Trust Contribution	\$1,798,922
Other Contributors	Parramatta City Council \$250,000 Commonwealth Government \$3,463,539 NSW Government \$3,713,539
Year	1995/96

This project created the largest flood basin in NSW and successfully integrated flood mitigation and environmental objectives. Located in an environmentally – sensitive bushland reserve within 100 metres of several homes, the 30 metre high flood retarding basin wall was constructed using innovative techniques such as a zig-zag conveyor system and roller compacted concrete, to minimise disturbance to nearby residents. As well as reducing major flooding in North Rocks, Northmead, parts of North Parramatta, the Parramatta CBD and Rosehill, the project included extensive bushland regeneration and other environmental measures to overcome degradation of bushland and reduce stormwater pollution of the creek. Baulkham Hills Shire Council unanimously approved the project after thorough consideration of the Trust’s four volume Environmental Impact Statement that summarised the results of 40 separate studies undertaken over a two year period.



FIG 4-23 Downstream face of the Loyalty Road flood basin, showing culvert outlet at bottom right

The basin wall and environs have been maintained by the Trust since its construction. In 2005 an agreement was reached with Baulkham Hills Shire Council and Parramatta City Council, by which the Trust continued to maintain the structure. The ongoing



maintenance of this regional facility is one of the key issues to be resolved when the Trust closes down. Pending resolution, the Sydney Metropolitan Catchment Management Authority will maintain the basin and its temporary impoundment area using carry over funds, at least until June 2010.



FIG 4-24 Opening ceremony for the Loyalty Road Flood Basin on 13 October 1996.



FIG 4-25 Loyalty Road Flood Basin wall on Darling Mills Creek at North Rocks, viewed from above, looking downstream



FIG 4-26 Loyalty Road Flood Basin during small flood in 1996, view from parapet towards stilling basin

North Wentworthville Floodplain Management Study	
Briens Rd/Mayfield St area at North Wentworthville (confluence of Toongabbie, Finlayson's and Coopers Creeks)	
Total Cost	\$61,303
Trust Contribution	\$61,303
Other Contributors	–
Year	1997 – 1999

This area originally contained the second largest number of flood liable properties. It was estimated that 180 properties would be inundated in a 100-year storm. Many properties here were flooded repeatedly in the storms of the late 1980's. Immediately downstream of the concrete-lined sections of Finlayson's and Coopers Creeks, the natural creeks were badly degraded, with severe bank erosion and pollution. The study was undertaken by consultants under the guidance of a Steering Committee comprising representatives of the Trust, Parramatta City Council, Sydney Water and local residents. After detailed studies of the flood behaviour and all feasible measures to address both the flooding and the creek degradation, the local community was consulted via public meetings, newsletters and briefings. This lead to the preparation of a draft Floodplain Management Plan, which was publicly exhibited by Parramatta Council in early 1999 and adopted in December 2001 after additional studies were undertaken.



FIG 4-27 Car stalled in floodwaters on Hart Drive during August 1988 flood



FIG 4-28 Floodwaters inundate intersection of Hart Drive and Darcy Road, Wentworthville during the August 1988 flood



FIG 4-29 Air view of North Wentworthville, with Darcy Road in centre and Toongabbie Creek at bottom

Gooden Reserve Flood Retarding Basin	
West Baulkham Hills (Toongabbie Creek)	
Total Cost	\$770,000 (approx)
Trust Contribution	\$140,000
Other Contributors	RTA \$490,000 BHSC \$140,000
Year	1997/1998



FIG 4-30 Air photograph of Gooden Reserve Basin looking downstream, with basin wall along downstream edge of reserve at top of photograph and M2 Motorway to left of reserve.

A flood basin was built in Gooden Reserve to detain stormwater runoff from the adjoining M2 Motorway as well as the local catchment. It protects 10 homes and 28 properties downstream, from flooding. The RTA and the builders of the M2 met two-thirds of the cost of this project. An innovative fuse plug spillway, extensive landscaping and cost sharing were significant features of this project.



FIG 4-31 Oblique view of Gooden Reserve Basin, with basin wall along downstream edge of reserve Photo taken from pedestrian bridge over the Motorway.

Sydney Smith Park Basin	
Westmead (Domain Creek)	
Total Cost	\$1, 000, 000
Trust Contribution	\$305,000
Other Contributors	Holroyd City Council \$400, 000 NSW Stormwater Trust \$360, 000
Year	1998/99

A flood retarding basin built in the piped reaches of the Domain Creek drainage line at Westmead to protect 24 flood liable homes downstream and improve water quality in the creek. The basin has an infiltration medium and an underground storage to retain stormwater for reuse and to improve water quality.



FIG 4-32 Air photo of Sydney Smith Park at Westmead showing basin under construction.



Upper Toongabbie Creek Flood Mitigation Strategy (Stage 1)	
Toongabbie ‘confluence’ area and West Baulkham Hills (Toongabbie Creek)	
Total Cost	\$1,700,000
Trust Contribution	\$1,600,000
Other Contributors	Parramatta City Council \$100,000
Year	1998/99

This project involved excavating a high level floodway next to Toongabbie Creek in Sue Savage Reserve (Package A, completed in 1999 and raising the height of the existing Sierra Place flood basin wall and adjoining land to increase its flood capacity (Package B, which was completed in April 2002. These works significantly reduced the flood threat to 309 residential properties in the ‘confluence’ area, including 44 homes that had previously flooded over-floor in a 100 year storm. The works also safeguarded the Sierra Place basin by enabling it to contain the 100-year flood.



FIG 4-33 Floodway in Sue Savage Reserve in Toongabbie, under construction.

Upper Toongabbie Creek Flood Mitigation Strategy (Stage 2) -Sierra Place Flood Retarding Basin Augmentation	
West Baulkham Hills (Toongabbie Creek)	
Total Cost	\$1,600,000
Trust Contribution	\$800,000
Other Contributors	NSW Govt \$800,00
Year	2000/2001

Stage 2 of this combined project involved raising the height of the main embankment of the Sierra Place Basin and the secondary levee behind properties in Valerie Place. In addition, the basin's culvert was modified to improve its flood mitigation performance and make it easier to remove flood debris. The project included extensive landscaping and bush regeneration.

The works were undertaken to greatly increase the basin's flood capacity, thereby preventing the basin from overtopping in a 100 year flood, as well as reducing the extent of overtopping of the McCoy Park flood basin a few kilometres downstream in Toongabbie and helping to prevent flooding of hundreds of residential properties in Toongabbie.



FIG 4-34 Air view of enlarged Sierra Place Basin on Toongabbie Creek at West Baulkham Hills. Outlet is to right (downstream). Concrete wall across crest is in middle. Paths built as part of associated landscaping are also shown. M2 Motorway is at lower left.



FIG 4-35 Reinforced concrete wall across the crest of the Sierra Place basin embankment greatly increased the basin's flood capacity.



FIG 4-36 Secondary levee of the Sierra Park Basin protects homes in Valerie Crescent, West Baulkham Hills, just upstream of the M2 Motorway crossing



FIG 4-39 Reconstructed section of Greystanes Creek at Toongabbie Bowling Club. View looking downstream from beneath Railway bridge.

Creek Reconstruction at Toongabbie Bowling Club	
Toongabbie (Greystanes Creek)	
Total Cost	\$750,000
Trust Contribution	\$375,000
Other Contributors	Parramatta City Council \$375,000
Year	2000/2001



FIG 4-37 Section of Greystanes Creek opposite Toongabbie Bowling Club, showing dramatic bank erosion endangering adjacent pedestrian path, prior to reconstruction of creek.



FIG 4-38 Trustees inspect serious bank erosion along Greystanes Creek opposite Toongabbie Bowling Club – 2000.



FIG 4-40 Reconstructed section of Greystanes Creek, after shaping completed, but landscaping not yet carried out. Reach extends from the Main Western Railway at top to Station Road in Toongabbie, adjacent to the Toongabbie Bowling Club at left.

This section of creek was overgrown with willows and weeds, had poor soil and poor channel alignment and stormwater lines discharged straight into the creek, causing massive bank erosion that threatened a pathway and private land, as shown in the photographs. This project reconstructed the creek creating a stable channel able to contain at least the 20-year peak flow. The channel will be maintained by Parramatta City Council once the ownership of the land is transferred by the bowling club.



Metella Road Floodway	
Metella Rd, Toongabbie (Greystanes Creek)	
Total Cost	\$1,069,775
Blacktown City Council Contribution	\$935,000
Developers' Contributors	\$134,775
Year	2004–2008

Computer modeling by the Trust of two townhouse developments adjacent to Greystanes Creek at Toongabbie showed that with full development of these and other adjoining undeveloped land, there would be a significant increase in the flood levels on adjoining and upstream properties. Despite strong opposition from the Trust and Blacktown Council, the Land & Environment Court allowed the initial townhouse development to go ahead in 1999.

To compensate for this, a works scheme was developed which would allow full development without any increase in flood levels; with a recommendation that a Section 94 contributions plan be levied on the developers to assist with funding. Both developers chose to make the equivalent contribution rather than provide OSD in accordance with the court approval and Council has constructed key elements of the compensatory works – the Octavia Street culverts in early 2008 and the by-pass channel in late 2008.



FIG 4-41 Air view of Metella Road Floodway at Toongabbie, looking upstream, with Greystanes Creek at left.

Gollan Avenue Detention Basin & Pipe upgrade	
Gollan Ave – Gowan Brae Avenue, North Parramatta (Brickfield Creek sub-catchment)	
Total Cost	\$750, 000
Trust Contribution	\$375, 000
Other Contributors	BHSC \$375, 000
Year	2001

In 2001 Baulkham Hills Shire Council enlarged stormwater pipes and built a small detention basin to relieve frequent flooding of homes in the Gollan Avenue and Gowan Brae Avenue area at North Parramatta. Council and the Trust shared the estimated \$750,000 cost.



FIG 4-42 Air view of Gollan Avenue sub-catchment with reserve in which small basin was built

Ollier Crescent/Myrtle St Trunk Drainage Upgrade	
Prospect (Blacktown Creek sub-catchment)	
Total Cost	\$1,400,000
Trust Contribution	\$233,500
Other Contributors	NSW Govt \$933,000; Blacktown City Council \$233,500
Year	2001/2002

A flood retarding basin, located behind the Woolworth's store on Flushcombe Road in Prospect, and amplification of the trunk drainage system, helps protect 95 homes in the Ollier Crescent/ Myrtle Street area from major flooding. The basin was designed by Council's engineering staff, whilst Robinson GRC of Parramatta designed the trunk drainage improvements.



FIG 4-43 Flooding in Myrtle Street, Prospect in August 1988, which the Ollier Crescent/ Myrtle St Trunk drainage upgrade was designed to mitigate.



FIG 4-44 Ollier Crescent Flood Retarding Basin at Prospect; basin behind Woolworth's in Flushcombe Road, soon after completion of construction



FIG 4.45 Air view looking downstream along route of Ollier Crescent/Myrtle St Trunk Drainage Scheme at Prospect. Construction of basin in foreground and downstream residential areas now protected are in background.

Bevidere/Merlin St's Pipe Amplification	
Bedivere St & Merlin St, Blacktown (Blacktown Creek sub-catchment)	
Total Cost	\$750,000
Trust Contribution	\$375,000
Other Contributors	\$375,000 (Blacktown City Council)
Year	2001/02

A comprehensive review of all known flooding problems in the catchment was undertaken in 1990 in order to set priorities. Frequent flooding of several homes in Bedivere and Merlin Streets in Blacktown was one of the problem areas identified. In 2002/02 Blacktown City Council carried out pipe amplification works in the area to relieve the problem, with funding support from the Trust.



FIG 4-46 Trust staff member views kerb inlet of stormwater system augmented at Merlin Street in Blacktown.

The Hills Cr/Federal Rd (Seven Hills Shopping Centre) Drainage Improvements	
Seven Hills (Blacktown Creek sub-catchment)	
Total Cost	\$1,150,000
Trust Contribution	\$266,500
Other Contributors	\$716 500 (Blacktown City Council)
Other Contributors	\$716, 500 (Private)
Year	2002

In 2001 routine hydraulic investigations by Blacktown City Council staff identified a serious risk of deep flooding within and adjacent to the Seven Hills Shopping Centre. Council acted swiftly to design and construct works to greatly reduce the flood potential. The Trust contributed \$265,000, with the balance shared between Council and the Shopping Centre owners.



Later Voluntary acquisition of Severely Flood-liable Houses	
Lydbrook St (2), Briens Rd North Wentworthville (2), 63 & 65 Fulton Ave Nth Wentworthville (Finlayson's Creek sub-catchment); 22 & 27 Lindsay St Baulkham Hills (upper Toongabbie Creek sub-catchment)	
Total Cost	\$3.2M (indicative)
Trust Contribution	\$0.5M (indicative)
Other Contributors	\$0.5M (Councils); \$2.2M (State Govt)
Year	2002–2005

Sometimes a floodplain management study concludes that there is no cost-justifiable alternative but to offer to voluntarily acquire and remove a home in order to comprehensively solve a local flooding problem. It may be that there is no feasible way to protect the property from frequent and/or severe flooding. Or the property's dwelling and fencing are obstructing floodwater flow and their removal is the only way to relieve the situation.

The North Wentworthville Floodplain Management Study recommended various flood mitigation, which have been implemented, but two residential properties in Lydbrook Street and another two properties in Fulton Avenue remained highly flood liable. These four homes were voluntarily acquired by Parramatta City Council over four years with financial assistance from the Trust (1/6) and the State and Commonwealth Governments (1/3 each). After each acquisition the improvements were removed and the land became public open space.

Two further homes in Lindsay Street, Baulkham Hills were voluntarily acquired by Baulkham Hills Shire Council on a similar funding basis after a study of local overland flooding concluded that they needed to be removed.



FIG 4-47 Overland flow path created at Lindsay Street, Baulkham Hills, by voluntary acquisition of two homes.

Michigan Road bridge	
Michigan Rd, Grantham Creek, Seven Hills	
Total Cost	\$495,000
Trust Contribution	\$82,000
Other Contributors	Blacktown City Council \$83,000 NSW Government \$330,000
Year	2003/2004



FIG 4-48 New Michigan Road bridge over Grantham Creek at Seven Hills, viewed from upstream.



FIG 4-49 Downstream view of new Michigan Road bridge over Grantham Creek at Seven Hills.

In 2001 consultants carried out a floodplain study of the Michigan Road area on Grantham Creek at Seven Hills as part of the Trust's program of flood studies of outstanding flood problem areas. It found that 30 residential properties would be inundated in a 100 year flood, with seven subject to over-floor flooding. The study recommended replacing the under-capacity Michigan Road culvert with a new bridge to prevent all over-floor flooding and reduce property flooding from 30 to 7. Blacktown City Council constructed the new bridge in 2003/04 with Trust and NSW Government funding.

Briens Road Flood Culvert	
Briens Rd, North Wentworthville	
Total Cost	\$1,700,000
Trust Contribution	\$285,000
Other Contributors (indicative only)	\$285,000 (Council), \$570,000 each (State Govt, Federal Government)
Year	2005

The North Wentworthville Floodplain Management Study, completed in 1999, recommended a range of works and measures to reduce flooding in the residential area surrounding the confluence of Toongabbie, Coopers and Finlayson's Creeks. The largest work recommended was a culvert under Briens Road to allow floodwaters backing up in the Toongabbie Creek billabong (behind Hopkins and Mayfield Streets) to escape into the lower reach of Finlayson's Creek. Flood modelling showed that the culvert would lower 100 year peak flood levels in the vicinity by up to 300 mm. The flood culvert was constructed by contractors to Parramatta City Council in 2005 with funding from Council, the Trust and the State and Commonwealth Governments. It was opened by Minister Ian Macdonald in June 2006.



FIG 4-50 Trust Chairman, Bob Junor, with Minister Ian Macdonald MLC, at opening of Briens Road flood culvert on 21 June 2006



FIG 4-51 Guests arriving at opening of Briens Road flood culvert

New bridge over Blacktown Creek at Station Road	
Blacktown Creek, Seven Hills	
Total Cost	\$2,693,061
Trust Contribution	\$408,333
Other Contributors	\$408,333 (Council); \$817,105 (State Govt); \$817,105 (Federal Govt)
Year	1999 (sewer adjust), then 2006 – Sept 2007

The most frequently flooded road crossing in the catchment was where Blacktown Creek passes under Station Road in Seven Hills. In conjunction with Blacktown City Council, consulting engineers designed a new 20-year flood capacity bridge to replace the existing smaller four-cell culvert. To allow the new bridge to be built without having to raise the roadway either side, several years ago the Trust had a contractor remove a sewer on the upstream side of Station Road that crossed the creek on the existing culvert, by connecting it to a main on the downstream side of the road. The consultants have extended the bridge design to deepen the channel and improve the waterway area below the road. Construction by Blacktown City Council started in October 2006 and finished in September 2007.



FIG 4-52 Floodwaters recede in Blacktown Creek at Station Road in Seven Hills after flood event in February 1990.



FIG 4-53 New Station Road Bridge under construction in 2006



# 5 Maintain Flood Protection

### 1989 Situation

There was very little consideration by councils of the downstream flood impacts of new developments. No catchment-wide floodplain management plan policy was in place. Indeed, most individual councils had no formal flood policies or plans for their area. There had been no comprehensive investigation of the many flood problem areas. There was no monitoring of the safety of flood and drainage works. Only two stream flow stations and three recording rain gauges were operating in the catchment. There was no catchment-wide flood model to predict flood behaviour. Nor was there any single authoritative source of reliable advice on flood impacts of developments.

### Current Position

A common On-site Stormwater Detention (OSD) policy was adopted in 1991 and has since been applied to all new developments by all four councils. Approximately 3,900 OSD systems have been built to date. The safety of all major flood works is assured by a safety study of all existing flood mitigation works in 1989/90, substantial remedial works, a safety audit in 1995 and regular inspections by Trust/council staff members. A comprehensive network of fifteen recording rain gauges and five stream flow stations was operated by the Trust. A very detailed and refined computer model allowed flooding characteristics to be determined at 4,000 locations throughout the catchment.

Trust staff worked hard to improve the design, construction, maintenance and assessment standards of OSD systems; strengthen existing asset maintenance arrangements; complete catchment flood modelling and integrate the modelling with Geographic Information Systems to allow regular update of flood levels.

In the early 2000's a catchment-wide Floodplain Risk Management Study was completed and a common Floodplain Risk Management Plan developed. Despite some changes made by individual councils, the key principles are consistent across the four councils. Most of a comprehensive program of investigations of the outstanding flood problem areas has been completed and mitigation works undertaken in several areas where they were found to be warranted. Finally, surveys have been carried out to measure the residence floor levels and ground level of most flood liable properties in the catchment.

Rainfall and Stream Flow Monitoring	
Entire Catchment	
Total Cost	\$1,162,888
Trust Contribution	\$1,162,888
Other Contributors	–
Year	1990 – present

A network of fifteen recording rain gauges and three stream level recorders were established in the early 1990s to measure stream level, and hence flows, in real time. This, in conjunction with two other stream flow recorders, operated by another agency, provided one

of the most intensive data collection systems anywhere in Australia. The data were used by the Trust to validate and refine its detailed computer model of flood behaviour. It could also be used during storms to guide emergency services and field monitoring.

Flood Hydrologic and Hydraulic Modelling	
Entire Catchment	
Total Cost	\$1.5M (indicative)
Trust Contribution	\$1.5M (indicative)
Other Contributors	–
Year	1990 – 2009

A detailed and refined hydrologic model and hydraulic model of the catchment and its waterways were developed by the Trust. The models are used to calculate flood flows and flood levels at 4,000 locations throughout the catchment for storms of various frequencies and durations. These flood levels are still being used by the four local councils to apply flood-related development controls in order to contain future flood losses. The models are also used by the Trust to assess proposed flood mitigation works and the impact of major developments. This activity was carried out by the Trust's own staff because the flood modelling underpinned all of the Trust's floodplain management functions.



FIG 5-2 Flood extent overlay of Seven Hills and nearby areas prepared by Trust staff using flood modelling procedures.



FIG 5-1 Trust staff checks recording rain gauge operated by the Trust

On-site Stormwater Detention Policy	
Entire Catchment	
Total Cost	\$1,515,944
Trust Contribution	\$1,515,944
Other Contributors	–
Year	1991 – present

A detailed series of computer simulations were undertaken in 1991 to determine the maximum rate of runoff from a development site that would ensure no increase in flood flows and flood levels at any downstream point in all storms, up to and including the





FIG 5-3 Trust Stormwater Inspector, James Henderson, inspecting an OSD system

100 year storm. This led to the adoption in November 1991 of a catchment-wide OSD policy. An OSD Handbook, (the fourth edition is now available from the Trust's website) detailing the policy and providing advice, was issued to support the new policy. Over the next few years, a series of studies and testing to further develop the OSD approach was undertaken. The Trust's OSD Handbook is now regarded as the OSD standard.

A Development Control Working Party, comprising technical representatives from the Trust and the four local councils, met regularly from 1991 to 2006 to monitor implementation of the OSD policy and identify particular needs.

To encourage regular inspection of constructed OSD systems (there were in the order of 1000 by 1999) – the Trust (1) fully-funded maintenance inspections by Council officers (2) established and maintained a database with details of constructed OSD systems and inspection results (3) conducted an independent audit to determine the effectiveness of constructed OSD systems, and (4) since late 1998 employed a full-time Stormwater Inspector to inspect OSD systems and educate owners on how to maintain the systems.



FIG 5-4 Trust Operations Engineer, John Carse, conducts OSD training for council staff.

A valid criticism of the OSD policy was that the storages only filled in a 100 year storm and made no difference in smaller, more frequent rainfall events. Over several years the Trust, with support from the Development Controls Working Party, had consultants develop a revised OSD policy based on outlets at two different levels in order to temporarily detain stormwater runoff in smaller, more frequent storms, whilst still being able to hold and control runoff in the 100 year event. This would mean that OSD systems provided benefits across a wide range of storm events. Moreover, post-development runoff would then more closely resemble pre-development runoff, thereby helping both the piped stormwater drains and the downstream waterways.

A revised Trust OSD Handbook detailing the revised OSD policy was released in December 2006. Training in the new OSD policy was conducted for staff from two of the councils in early 2007. However concerns of council staff about lack of technical support for the revised OSD policy in the future have so far delayed its full adoption.



FIG 5-5 Trust staff inspect a discharge control pit, a key element of OSD systems.



FIG 5-6 Launch of 4th edition OSD Handbook at the Holroyd Centre in December 2006.

Asset Maintenance	
Entire Catchment	
Total Cost	\$250,000 (indicative)
Trust Contribution	\$250,000 (indicative)
Other Contributors	council inputs
Year	1990 – 2005

By working with, and supporting, the efforts of local councils, the Trust sought to ensure proper maintenance, repair and enhancement of waterways, trunk drainage and flood mitigation systems within the catchment. Inspections were jointly carried out by Trust and Council staff.

A Safety and Maintenance Working Party, comprising drainage and/or maintenance staff from the four councils and the Trust, met every six months from 1991 to 2004 to oversee the provision of maintenance and remedial work. The Trust contributed to the cost of training and essential remedial works.

As well, from 2000 to 2003 the Trust funded the development of an internet-based asset database and inspection forms to record details and facilitate inspections of all flood works in the catchment.



FIG 5-7 Trust Operations Engineer, John Carse, discusses asset maintenance with Hugh Dowd of Baulkham Hills Shire Council.

Safety Study of all existing Flood Mitigation works	
Entire Catchment	
Total Cost	\$116,180
Trust Contribution	\$116,180
Other Contributors	–
Year	1990/91, 1995

This study investigated the safety of all existing flood mitigation works soon after the Trust was established. A follow up study in 1995 reviewed the condition of works investigated in the earlier study and found them to be generally satisfactory.



FIG 5-8 Regular safety inspections of flood mitigation works are undertaken to identify any areas that require remedial work.

Remedial works following Safety Study	
Old Toongabbie, Toongabbie, Northmead and Prospect	
Total Cost	\$882,000
Trust Contribution	\$327,000
Other Contributors	Parramatta City, Baulkham Hills Shire and Blacktown City Councils, Commonwealth and NSW Governments
Year	1992 – 1995

The 1991 Safety Study identified several works with deficiencies. These were rectified in 1992-95, with the cost shared equally between the Trust and the relevant local councils and, in some cases, the Federal and State Governments. The works rectified were Peter Parade Levee at Old Toongabbie (\$550,000); McCoy Park Basin at Toongabbie (\$90,000); Northmead Reserve Basin at Northmead (\$272,000) and Greystanes Creek Basins at Prospect (\$70,000).



FIG 5-9 The Peter Parade levee at Old Toongabbie, which was reconstructed in 1993 under a Trust-sponsored asset safety program.



Catchment Floodplain Risk Management Plan	
Entire Catchment	
Total Cost	\$80,000 (indicative)
Trust Contribution	\$80,000 (indicative)
Other Contributors	–
Year	2003 – 2005

The Trust engaged consultants Bewsher Consulting and Don Fox Planning to prepare a catchment Floodplain Risk Management (FRM) plan, supervised by a catchment Floodplain Risk Management Committee with resident, council and agency representatives. Parramatta, Baulkham Hills Shire and Blacktown councils have adopted the FRM plan, and are implementing as they revise relevant development control plans (DCP) and flood maps. Holroyd Council is preparing its own LGA-wide FRM using the same process.

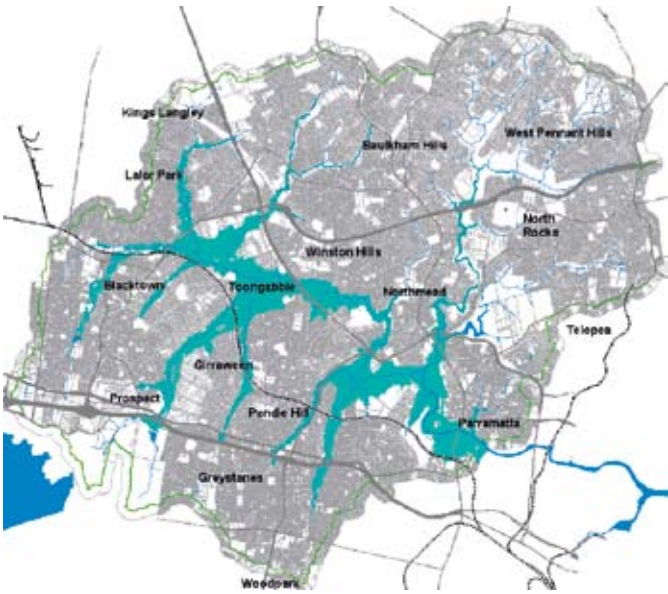


FIG 5-10 Map of Low Hazard Flood Extent (pale blue) prepared for consultations held during development of the catchment Floodplain Risk Management Plan.

Outstanding Flood Problem Areas Studies	
Catchment wide	
Total Cost	\$200,000 (indicative)
Trust Contribution	\$200,000 (indicative)
Other Contributors	–
Year	2003–2009

Despite significant reductions in the number of flood liable homes and businesses, solutions are yet to be found for many of the 63 flood problem areas identified soon after the Trust was established. In 2000 the outstanding flood problems were reviewed. Due to insufficient information for many such areas it was recommended to conduct a program of studies. In August 2003 the Trust appointed a panel to undertake the outstanding flood problem areas flood studies, with each area to be investigated in a series of staged studies, with full funding from the Trust. Each study

provided data that enabled the mitigation works to be prioritised across the catchment. Of the 27 outstanding flood problem areas identified in 2003, and one additional area subsequently identified at Toongabbie, by mid 2009 twenty had been completed, two were in progress and five were waiting final review by the Trust.



FIG 5-11 Trust Chairman, Bob Junor, and Executive Officer, Stephen Lees, inspect flood study area along Finlayson's Creek at Merrylands West in 2005.

Survey of all Flood Liable Residential Properties	
Entire Catchment	
Total Cost	\$200,000 (indicative)
Trust Contribution	\$200,000 (indicative)
Other Contributors	–
Year	2004–2007

Owners of flood liable properties need to know the extent of inundation on their property during major floods, whilst local councils need to know the extent of 100 year flooding on each property in order to apply flood-related development controls.



FIG 5-12 Floor level surveys in progress in Bulli Road, Toongabbie

However that requires ground and floor level surveys of individual properties, which is quite expensive. Accordingly, the Trust arranged for surveys, over several years, to measure the ground and floor levels of all catchment properties at or below the 100 year flood levels. Surveys of the last two areas, along Blacktown and Lalor Creeks, were completed in late 2007. The surveyed levels were provided to the relevant councils to help them advise owners and potential purchasers of flood liable properties.

Brickfield Creek Floodplain Management Study	
Brickfield Creek sub-catchment, Parramatta & Baulkham Hills LGAs	
Total Cost	\$59,864
Trust Contribution	\$29,932
Other Contributors	Parramatta Council \$29,932
Year	2005/06

The Brickfield Creek sub-catchment is located in the far east of the catchment, with its upper third in the Baulkham Hills LGA and its lower two-thirds in the Parramatta LGA. This sub-catchment was excluded from the 2003 catchment Floodplain Management Study because its flood study had not yet been completed. But when the flood study was completed in 2005 the Trust, Parramatta City Council and Baulkham Hills Shire Council commissioned the same consultants to develop a Brickfield Creek Floodplain Management Study. The catchment Floodplain Management Committee, with community and agency representatives, was reconvened to oversight the new study. The study was completed in mid 2006, publicly exhibited by the two councils and subsequently adopted by each council.



FIG 5-13 Looking downstream along Brickfield Creek at North Parramatta. This is typical of much of the lower Brickfield Creek, with development close to both creek banks.



FIG 5-14 Lower reaches of Brickfield Creek sub-catchment showing its outlet to the Parramatta River.

FloodSafe- Community Flood Awareness Project	
Entire Catchment	
Total Cost	\$90,000 (indicative)
Trust Contribution	\$30,000
Other Contributors	\$60,000 (Federal Govt NDMP grant)
Year	2005/06

The catchment Floodplain Risk Management Plan recommended an ongoing and comprehensive community flood awareness strategy to combat growing complacency about the continuing flood threat. With a Natural Disasters Mitigation Program (NDMP) grant from government, consultants Molino Stewart were engaged to develop the FloodSafe project. They were guided by a steering committee with Trust, councils, SES and other agency representatives. A FloodSafe communications plan and tool kit were completed in October 2006 and issued to the four councils. Unfortunately the wind up of the Trust meant that the intended ongoing support of FloodSafe had to be abandoned.



# 6 Promote Sustainable Water Usage

## 1989 Situation

When the Trust was established in 1989 water was regarded as a cheap commodity to be used without regard for its scarcity or cost. The previous two decades had been relatively wet and water restrictions were rare. Per capita water consumption was high. The price of water was low. The value of water as a landscaping or amenity feature was not generally recognised in urban design. The term Water Sensitive Urban Design (WSUD) was yet to be suggested by Mario Evangelista in Perth in the early 1990s.

## Current Position

WSUD is now widely accepted and utilised as ‘best practice’ in urban design across Sydney and throughout Australia. It is commonly required by local councils as a condition of development consent. The practice of WSUD is well documented in a series of guidelines. The standard of design and construction of WSUD features has improved steadily in recent years. There is a strong and active WSUD advisory and support program, started by the Trust and now run by the Sydney Metropolitan Catchment Management Authority (SMCMA). Many good examples of WSUD practice can be found around Sydney.

Water Sensitive Urban Design Capacity Building in Sydney	
all of Sydney and nearby regional NSW	
Total Cost	\$700,329
Trust Contribution	\$245,863
Other Contributors	\$454,466 Sydney Water, Landcom, SMCMA
Year	2001/02 – 2007/08

In his 1999 review of the Trust Michael Mobbs suggested that the Trust adopt WSUD as a key new theme. WSUD is a holistic approach to urban water management that uses natural processes of storage and infiltration to reduce the demand for mains water and the amount of stormwater and wastewater discharged into the environment. WSUD can be implemented in all types of developments and at a range of scales.

The Trust embraced Mobbs’ suggestion. In late 2000 the Trust led the establishment of a Sydney WSUD Reference Group with representatives from other like-minded state agencies and regional local government organisations to plan and deliver the Sydney WSUD

Capacity Building program. This was launched at a WSUD seminar in November 2001.

The group arranged for two councils to seek grants from the NSW Stormwater Trust. In March 2002 a \$325,000 grant was received for the Sydney WSUD ‘capacity building’ program. In 2002/03 two project officers were employed under this program to deliver a series of workshops and seminars, a NSW-wide WSUD design competition (Sustainable Water Challenge), a seminar with awards and a tour of demonstration sites, and a model planning code and WSUD Design Guidelines for use in western Sydney. From early 2004 Sydney Water and the Trust funded the employment of one project officer (John Dahlenburg) to run the program as an advisory and advocacy service for local councils focussing on the annual Sustainable Water Challenge. Further grants of \$100,000 from the Natural Heritage Trust maintained the program in 2005/06 and 2006/07. As of late 2009 the Sydney WSUD Capacity Building program was still operating, with its Project Officer (Kate Black) providing valuable advice , encouragement and resources to WSUD practitioners throughout NSW. The program has proven to be highly cost effective, helping to make WSUD accepted ‘best practice’.



FIG 6-1 Associate Professor Tony Wong addresses participants at the Victoria Park in June 2004 during the WSUD demonstration sites tour following the second Sustainable Water Challenge seminar.



FIG 6-2 Participants inspecting the Heritage Mews medium density development at Castle Hills in June 2004 during the WSUD demonstration sites tour.

Sydney & Region Rainfall Extremes (Climate Change) Study	
all of Sydney and central coastal NSW	
Total Cost	\$1M (approx)
Trust Contribution	\$326,012
Other Contributors	Australian Greenhouse Office (\$275,217), Sydney Water (\$80,000); CMAs (\$21,000); CSIRO (\$350,000 in kind indicative)
Year	Sept 2003 – date

When scientist Dr Debbie Abbs of CSIRO addressed a Trust board meeting in November 2003 it was realised that climate change would, by increasing rainfall intensities, degrade the degree of protection provided by the catchment’s system of basins and levees designed to cope with the 100 year flood event.





**FIG 6-3** Although climate change will bring hotter and drier conditions to Sydney, it will also cause more frequent and severe storms, including heavy rainfalls.

This prompted the Trust to negotiate with CSIRO, the then-Australian Greenhouse Office (AGO) and interested local agencies (Sydney Water and the Sydney Metropolitan, Hunter Central Rivers and Southern Rives CMAs) to have CSIRO undertake a major study over three years. The study aimed to provide fine spatial and temporal scale projections of rainfall intensities under climate change in 2030 and 2070. The study, lead by Dr Abbs, used dynamic downscaling from global climate models, in conjunction with statistical modelling, hopes to permit estimation of extreme rainfall intensities anywhere in the study region. The tasks have proven very challenging. Although the study budget has remained at \$1M, it has taken CSIRO longer than expected to complete and it has not been possible to predict future rainfall intensities with sufficient certainty.

WSUD Demonstration Projects	
Seven Hills, Winston Hills, Kellyville	
Total Cost	\$1M (indicative)
Other Contributors	\$807,000 (NSW Stormwater Trust)
Year	2002 – 2004

The Sydney WSUD Reference Group was also successful in having Baulkham Hills Shire Council secure a grant from the NSW Stormwater Trust, awarded in March 2002, to develop three WSUD demonstration projects in western Sydney in partnership with various councils and agencies. Completed in 2004 these comprised an aged housing development by the NSW Department of Housing at Seven Hills, a stormwater capture and treatment project at Model Farms High School in Winston Hills and WSUD features in a NSW Landcom sales office in Kellyville.



**FIG 6-4** Bioswale at Model Farms High School in Winston Hills, constructed as part of the WSUD demonstration project.



**FIG 6-5** Opening of WSUD demonstration project at Model Farms High School in Winston Hills by (left to right) Chris Johnson (school principal), Wayne Merton MP, Bob Junor (Trust Chairman) and Mike Sharpin (NSW Stormwater Trust) in 2004.



**FIG 6-6** WSUD Demonstration Project at Homeworld 4 display centre in Kellyville.



**FIG 6-7** WSUD demonstration project in Department of Housing townhouse development at Pioneer Street in Seven Hills.



# 7

## Improve Water Quality

### 1989 Situation

In 1989 there was no regular monitoring of water quality anywhere in the catchment. There had been no assessment of the condition of local creeks. Little consideration was given to possible water quality impacts of new developments. Creeks were often badly degraded and infested with weeds and rubbish. Swimming was no longer allowed in Lake Parramatta due to poor water quality and weeds. There was little community use of creeks and creek banks for recreation. Nor was there any agreed strategy to improve water quality in catchment. No works were in place to protect water quality.

### Current Position

Monthly water quality testing was carried out continuously at four sites in lower catchment by a professional consultant from early 1990 to the end of 2006. The quantities of major pollutants exported from the catchment in storm events were measured near the catchment outlet for three years, from 2002 to 2005.

A very active Streamwatch/ Waterwatch community water quality testing program was established and operated for 14 years, providing valuable data and raising community awareness of stream health.

Community-endorsed water quality objectives for catchment streams were developed in 1995/96 through the Trust's 'Streamly Clean' project.

A water quality management plan was developed for Lake Parramatta and partially implemented so that, in 2006, Parramatta City Council allowed swimming in the Lake under controlled conditions for the first time in over 30 years. A toxic spill containment strategy was developed and implemented. Audits of industrial premises were carried out by three councils for several years to reduce spill risks, but were not continued. With Trust financial assistance, four large wetlands and numerous gross pollutant trap were built.

A catchment-based Stormwater Management Plan (SMP) was developed by the councils, Trust and relevant agencies in 1998/99 with community input. Many of its recommended actions have been implemented and the Plan was extensively reviewed and revised in 2001/02.

Water Quality Testing	
Monthly Water Quality Testing -Lake Parramatta, Darling Mills Creek, Toongabbie Creek, Parramatta River (4 test sites)	
Total Cost	\$392,600
Trust Contribution	\$392,600
Other Contributors	–
Year	1990 – 2006

Each month from January 1991 to December 2006, a consultant, Dr John Laxton, tested the water quality and ecology in the lower reaches of the upper catchment and seven estuarine sites on the Parramatta and Duck Rivers. This regular and consistent testing over such a long period provided a sound picture of the water quality in the catchment. This provides baseline data against which the effectiveness of future water quality improvement measures can be assessed. A detailed report summarising the test results for all years to date was published each year and made available on the Trust's website.

Waterwatch/ Streamwatch	
Entire Catchment	
Total Cost	\$1,109,074
Trust Contribution	\$982,074
Other Contributors	\$102,000 National Waterwatch grants
Year	1992 – 2006

Waterwatch was a community based water quality monitoring program. The Trust employed a Waterwatch Co-ordinator who



FIG 7-1 Consultant Dr Robyn Tuft sampling for water quality tests in Lake Parramatta



FIG 7-2 Junior Waterwatch students display their testing equipment



FIG 7-3 Greystanes High School Waterwatch Team at work.



provided supervision, support, training and quality control for Waterwatch / Streamwatch groups at nineteen secondary schools, thirteen primary schools and seven community groups in the catchment. These groups tested water quality at 70 locations around the catchment. An internet-accessible database was set up to allow archival and retrieval of the test results. The Waterwatch program was expanded to include primary schools, bushcare groups, girl guides and a disabilities centre.

In terms of number of groups and number of test results obtained, the Waterwatch program in this catchment was the most active and successful anywhere in Australia. In 1997/98 schools in this catchment submitted nearly half of all the Waterwatch/ Streamwatch test results produced in the greater Sydney region. A highlight of the Waterwatch program was the end-of-year Harbour Cruise organised by the Trust to thank the catchment Waterwatch group members and their teachers for their efforts during the past year.

The Trust's Waterwatch Co-ordinator was also active in giving lectures at schools, conducting inspection tours for school and community groups and co-ordinating Catchment Field Days with local council officers at which agency and councils' staff, assisted by secondary students conducted exercises in environmental topics for local primary students.

When the Trust's source of funding stopped at the end of 2006 arrangements were made for Sydney Water's Streamwatch team to take over support for the catchment Waterwatch groups.



FIG 7-4 Members of the James Ruse Agricultural High School Waterwatch team receive their platypus award from Trust Executive Officer, Stephen Lees, during the annual Waterwatch Harbour Cruise in December 2003

Streamly Clean' Project	
Entire Catchment	
Total Cost	\$154,600
Trust Contribution	\$154,600
Other Contributors	—
Year	1995/96

The 'Streamly Clean' project determined community-endorsed water quality objectives for the catchment. It was one of the first times that had been attempted in Australia. It was undertaken over 18 month by a consortium of consultants guided by a Steering Committee with Trust, Council, agency, environmental and community group representatives. The first consultancy compared all available water quality data with nationally recognised criteria to determine the water's suitability for different uses or values. The second consultancy engaged the community directly through surveys, focus groups and interviews to find out what environmental values or uses of catchment creeks and water bodies were desired. Finally, the community was asked, in a survey, to choose between three sets of water quality objectives, given the cost per household of achieving the necessary improvements. The more than 2,000 survey returns showed that the community wants the water in the catchment creeks to be healthy for plants and animals that live in the creeks; good enough for limited contact recreation (wading, fishing, boating) and swimming in Lake Parramatta. These water quality objectives were supported by the Trust, adopted by the State Government and provided the basis for the subsequent catchment Stormwater Management Plan prepared in 1998/99. The 'Streamly Clean' project won a Gold Award in the 1996 RiverCare awards.

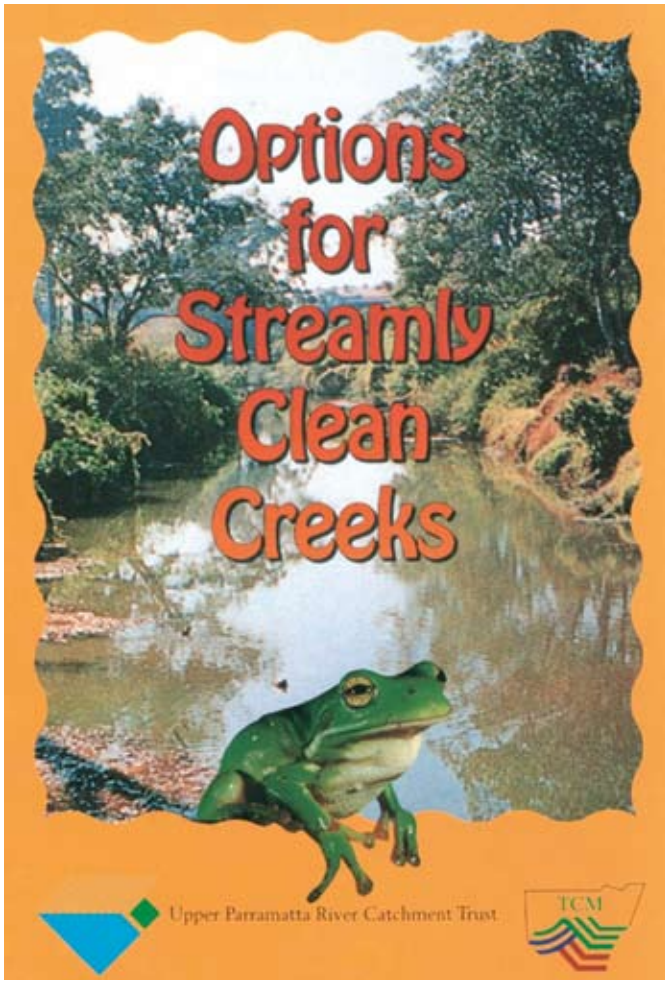


FIG 7-5 Cover of Streamly Clean options report distributed to seek community views on desired water quality in catchment streams

Civic Park Wetland at Pendle Hill	
Civic Park, Pendle Hill (Pendle Hill Creek)	
Total Cost	\$254,500
Trust Contribution	\$69,500
Other Contributors	Holroyd City Council \$85,000; EPA \$100, 000
Year	1995/96



FIG 7-6 Civic Park Wetland on Pendle Hill Creek at Pendle Hill



FIG 7-7 Aerial view of the Civic Park Wetland at Pendle Hill

Holroyd City Council constructed a small wetland on Pendle Hill Creek at Civic Park, Pendle Hill, just upstream of the Railway Line. The creek was widened and deepened, and a small island created as a wildlife refuge. The edges were planted with reeds, the surrounding area landscaped and a bridge built over the wetland. A floating boom was installed at the upstream end to trap litter. Over the following three years the wetland collected a large amount of sediment that would otherwise have degraded downstream water quality. This required extensive dredging of the wetland in early 1999 and 2006. The wetland is of limited effectiveness in regard to water quality, because it is too small relative to its catchment. Nevertheless the wetland serves as an effective sediment and litter trap, and greatly improves the amenity of the park.

Lake Parramatta Water Quality Management	
Hunts Creek (Carlingford, North Rocks, North Parramatta)t	
Total Cost	\$489,632
Trust Contribution	\$467,132
Other Contributors	\$22,500
Year	1996–2006

Until the mid 1970s Lake Parramatta was a very popular local swimming venue. It even had its own life saving club. However with gradual urbanisation of the catchment water quality declined and swimming was eventually banned by Parramatta City Council. In 1994 the entire surface of the Lake was covered with the aquatic weed *Salvinia molesta* requiring physical harvesting and ongoing spraying.

Recognising the community's desire to be able to swim in Lake Parramatta once again, the Trust sponsored a consultant's study of the Lake and its sub-catchment in 1996/97. It found that the water in the Lake is frequently unhealthy for aquatic life because of high nutrient concentrations due to sediments in its bed and stormwater inputs. It also found that high bacterial levels caused by sewage overflows, leaks and waterfowl make the Lake unsuitable for swimming most of the time, although it is suitable for boating



FIG 7-8 Lake Parramatta, with dam wall in lower left





FIG 7-9 Lake Parramatta scene at sunset.

most days. From that understanding, an integrated water quality management plan was devised. Elements of the plan were progressively implemented, under the slogan ‘Swim Towards 2005 – Help Clean Up Lake Parramatta’.

In order to promote community support for efforts to improve the water quality in Lake Parramatta, from March 1999 to March 2004 the Trust, supported by Parramatta and Baulkham Hills Shire Councils, held an annual Lake Parramatta Open Day at the Lake Reserve. The event included free entertainment, displays by local groups and environmental messages. The numbers attending each year increased from 2,000 to over 5,000.

In 2003 the Trust reviewed progress on the plan and identified the need to focus on reducing pathogens, which are the main impediment to allowing swimming in the Lake. It therefore engaged the Centre for Water and Wastewater Technology (CWWT) at the University of New South Wales, which was at the forefront of efforts

to set new bathing water standards for the World Health Organisation. CWWT carried out detailed studies over three years involving:

- a sanitary survey of the Lake’s catchment to identify probable sources of contamination in the Lake
- sampling and analyses showing that dry weather concentrations of water borne pathogens pose an acceptably low risk for swimming based on relevant national guidelines
- further studies to determine how long it takes after a rainfall event before it is safe to swim in the Lake again
- development of a Water Safety Plan to manage recreational water quality and pathogens.

The results of the CWWT studies lead Parramatta City Council to agree in June 2006 to allow swimming in Lake Parramatta during events controlled by clubs under the guidance of Council. The Trust and Council jointly organised an inaugural swimming event in the Lake on 3 December 2006. Although 1,300 people attended the event, swimming was precluded by heavy rain the day before.

William Lawson Park Wetland	
Lancelot St, Blacktown (Blacktown Creek)	
Total Cost	\$1,363,000
Trust Contribution	\$344,000
Other Contributors	Blacktown City Council \$534,000 NSW Stormwater Trust \$485,000
Year	1998/99

This project involved the construction of a small wetland by Blacktown City Council in what used to be a dry retarding basin. Council obtained a Stormwater Trust grant for three gross pollutant traps on streams leading into the wetland to collect coarse pollutants before they enter the wetland. Council provided extensive landscaping which, with the wetland, greatly improved the amenity of the area. This wetland is regularly visited by technical tours as an example of what can be achieved with wetlands.



FIG 7-11 Then–Minister John Aquilina MP inspects the William Lawson Park Wetland at Lancelot Street, Prospect, with Trust Chairman George Whitehouse on 28 April 2002.

Catchment Stormwater Management Plan & its Implementation	
Entire Catchment	
Total Cost	\$1,586,328
Trust Contribution	\$539,009
Other Contributors	\$991,000 NSW Stormwater Trust \$31,079 councils \$25,000 RTA
Year	1998/99 to 2007/08

In 1998 the then-NSW Environment Protection Authority directed all councils to prepare catchment-based Stormwater Management Plans (SMP). The SMP for this catchment was prepared by a contract project officer (Peter Morison) guided by a taskforce comprising representatives of the Trust, all four councils, Sydney Water, RTA and Parramatta Regional Park Trust. The plan aimed to achieve the community-endorsed water quality objectives resulting from the earlier ‘Streamly Clean’.

Under the SMP the Trust’s actions were those necessary for its management and support, such as coordinating implementation of the plan, arranging all water quality monitoring; reporting results, auditing of council sediment and erosion controls on building sites, determining pollutant export targets; raising community awareness; running Streamwatch and monitoring pollution at the catchment outlet.

Local councils obtained significant grants from the NSW Stormwater Trust in 1999 to encourage implementation of catchment SMPs. These included grants for demonstration ‘source control’ projects at Castle Hill and Parramatta shopping centres, St Martins Field bulky goods centre at Seven Hills and the Girraween Industrial Area. As well, Baulkham Hills Shire Council obtained a \$165,000 grant to evaluate the applicability of stormwater infiltration in this catchment via field trials. In 2001 the Trust and Parramatta City Council won a \$148,000 grant to promote stormwater awareness amongst ethnic communities in western Sydney. To minimise management costs all projects were jointly run by co-ordinating group administered by the Trust.

However once the grants ceased implementation of the SMP slowed. In 2001/02 the catchment SMP taskforce reviewed and



FIG 7-13 Trust staff finalising Catchment Stormwater Management Plan

extensively revised the SMP to make it more focussed and to clarify accountabilities. Despite limited funding many of the SMP actions were implemented, including:

- two environmental trade shows for small businesses
- developing a guide for maintenance of stormwater quality improvement devices
- establishing and calibrating a catchment MUSIC water quality model
- construction by Holroyd Council of a gross pollutant trap on Greystanes Creek
- Sydney Water armouring a large scour hole on Finlayson’s Creek
- purchase and trialling of pollution spill containment devices
- Parramatta Park Trust undertaking stream improvements and building a viewing deck along Murray Gardens Creek
- measurement of pollutants exported from the catchment each storm and each year
- design by Blacktown Council of the Metella Reserve wetland
- audits of the effectiveness of erosion and sediment controls on building sites.



FIG 7-12 Guests at opening of the Murray Gardens Creek viewing platform in Parramatta Park in 2005.





FIG 7-15 Girraween Industrial Area, where stormwater pollution audits were conducted to stop pollutants entering nearby Greystanes Creek.



FIG 7-16 Parramatta Lord Mayor Cr David Borger, Trust Executive Officer, Stephen Lees and DEC Director Operations, Joe Woodward, admire a pollution inductor truck hose, during the Main Street, Clean Stream promotion.



FIG 7-17 Pollution boom across Toongabbie Creek, funded by Trust as part of the implementation of the catchment Stormwater Management Plan.

Pollutant Export Monitoring	
Storm Event measurement of Key Pollutants –Parramatta River at Cumberland Hospital	
Total Cost	\$90,000 (approx)
Trust Contribution	\$90,000 (approx)
Other Contributors	–
Year	2002 – 2005

Water quality in catchment streams is fair to good, but pollutants swept out of the upper catchment during significant storms can accumulate in the estuarine Parramatta River immediately downstream due to shallow water depths and limited tidal mixing. To better understand how management of the upper catchment affects estuarine water quality the Trust worked with consultants to set up a MUSIC water quality model of the entire upper Parramatta River Catchment and partially calibrated it to local data. To better calibrate this model, and to monitor the effectiveness of stormwater quality improvement measures in the upper catchment, the Trust engaged Sydney Water in 2002 to set up and operate s sampling station on the Parramatta River at Cumberland Hospital close to the catchment outlet. There, both flow rate and the concentrations of suspended solids, total nitrogen and total phosphorus were measured using flow-weighted samples during significant storms, from which the total loads of these key pollutants exported from the catchment each storm and each year could be computed. Potentially valuable results were obtained and reported for the three years.

Metella Reserve Wetland	
Greystanes Creek, Prospect	
Total Cost	\$945,000
Trust Contribution	\$401,471
Other Contributors	Blacktown City Council \$543,529
Year	2005 –08

A major tributary of Greystanes Creek flows through Metella Reserve at Prospect. This channel, with a catchment area of 138 hectares, receives polluted runoff from Prospect Highway,



FIG 7-18 Metella Reserve Wetland

commercial and residential areas. With financial assistance from the Trust, Blacktown City Council has designed and built a water quality treatment wetland to remove the pollution from the water flowing into the channel, whilst remaining in harmony with the overall use of the Reserve.

Erosion and Sediment Control Audits	
whole catchment	
Total Cost	\$20,000 (indicative)
Trust Contribution	\$20,000 (indicative)
Other Contributors	–
Year	2002, 2003

Sediment from poorly managed building sites was identified as a critical issue in the catchment Stormwater Management Plan due to its ability to collect other contaminants. The Trust arranged for soil specialists to conduct random audits of 135 construction sites in the catchment. The initial audits in November 2002 found that just over 50% of the sites inspected had insufficient erosion and sediment controls, with compliance rates varying from 35% in one council area to 60% in another. Even after discussions with councils, a follow up audit in October 2003 revealed similar results. The Trust formed a working group comprised of Trust and council staff to try to reduce sediment from building sites. But, despite several useful meetings, no co-ordinated improvements eventuated.



FIG 7-19 Sediment washed off building sites into the stormwater drains, and then into catchment streams.

Toxic Pollution Spills Containment	
Whole catchment	
Total Cost	\$80,000 (indicative)
Trust Contribution	\$80,000 (indicative)
Other Contributors	–
Year	1995/96 and 1997/98

In 1993 a large quantity of building adhesive spilled into Toongabbie Creek from a Seven Hills factory, spreading several kilometres downstream and harming aquatic life in the creek. In the aftermath it was noted that, had plans and equipment been in place, the spread of the adhesive could have been limited by quickly blocking flow at a suitable point just downstream. This prompted the Trust to commission a study to develop a toxic spill containment strategy. The resulting study recommended a range of simple equipment to block flows and identified suitable points where they could be deployed. The booms, aluminium stop board and inflatable balloons for blocking pipes were purchased, tested and handed over to the Fire Brigade, which is the combat agency for spill incidents. In 1997/98 the Trust conducted dispersion tests with biodegradable dye to determine how quickly spills spread along the creek system. In 2006, the Trust, Fire Brigades and local councils conducted an exercise to test deployment of the spill containment equipment.



FIG 7-20 Spills containment trial on Greystanes Creek at Station Road, Toongabbie in 2006



FIG 7-21 Trial deployment of spill containment boom across Toongabbie Creek in 2006.



# 8

## Biodiversity and Waterways Management

### 1989 Situation

No information available about the extent or quality of native vegetation in the catchment. No council staff with training or responsibility for managing bushland areas. No agreed plan to conserve and improve vegetation on a catchment basis. No encouragement or support for community groups wishing to regenerate bushland areas. Urban bushlands largely neglected.

### Current Position

Bushland areas are valued by the community. All local councils actively support work by their own staff and community volunteers to protect and regenerate bushland areas.

The Trust's 'Green Corridors' Vegetation Management Plan provided considerable information about the values, condition and extent of native vegetation, as well as an agreed strategy, with prioritised actions for each creek, to conserve and protect vegetation on a catchment basis. Considerable technical support from council staff is now available for community groups undertaking bushland improvement projects, although financial assistance has dropped sharply in recent years as Trust programs ceased.

Weeds have been removed, bushland replanted and the treated area is being maintained in 10 hectares of Excelsior Reserve. A total of 45 hectares of bushland along creeks were cleared of weeds by Periodic Detention workers under a program involving the Trust, councils and the Department of Corrective Services. However maintenance of regenerated areas is required to deal with continual weed re-infestation.

The Waterways Restoration Program to co-ordinate and encourage rehabilitation and maintenance of the creek and river systems within the catchment was devised and put into operation. It included annual grants to the four councils, a willow control management plan, the installation of four fish ladders at various points on the course of Parramatta River, creek bed stabilisation, design and construction of a River Heritage Walk along a degraded section of the Parramatta River, preparation and initial implementation of the Toongabbie Creek Master Plan and a comprehensive assessment of conditions and remedial actions required along all catchment creeks was completed by the University of Technology Sydney.

Clearing of Noxious Weeds along Creek Banks by Periodic Detention Workers	
Toongabbie and Darling Mills Creek (various sites)	
Total Cost	\$2M (indicative)
Trust Contribution	\$1,067,206
PDC Contribution	\$1M (indicative, but uncosted)
Other Contributors	Baulkham Hills Shire, Parramatta City Council, Westmead Hospital, Children's Hospital
Years	1993 – 2007

From 1993 to 2007 periodic detainees made significant contributions to improving the condition of 45 hectares of catchment waterways under a partnership between the Trust and the NSW Department of Corrective Services' Periodic Detention Centre (PDC) detainees cleared noxious weeds along the stream banks in the catchment under the guidance of a bushland regenerator funded by the Trust and under the control of a Prison Officer. Councils contributed by removing the weed debris. The clearing then allowed community groups to replant in the treated areas.

Sites cleared of weeds in recent years include along Toongabbie Creek from Parramatta Park to Old Windsor Road at Westmead; near Sierra Place, West Baulkham Hills; Darling Mills Creek at North Rocks and the Parramatta River, from O'Connell Street to Marsden Street in



FIG 8-1 Cumberland Plain Woodland at Impressa Reserve, Winston Hills.



FIG 8-2 Blue Gum Forest, Excelsior Reserve, North Rocks.





FIG 8-3 Periodic detainees removing weeds along creek banks.

Parramatta . As well, the Trust funded a native plant nursery set up and run by detainees at Parramatta and Silverwater Gaols to produce native plants for regeneration on PDC projects.

From 2001 to 2006 one of the most successful of all the sites treated by the PDC workers was along the southern bank of Toongabbie Creek, behind Westmead and the Children’s Hospital at Westmead. Under a memorandum of understanding the Trust and the two hospitals shared the cost of a PDC Field Officer, Neil Rogers, who was both a Department of Corrective Services officer and a trained bushland regenerator. The work undertaken began with primary weed removal, followed by replanting with stock propagated at the native plant nursery at the Gaol and then walking track construction. The PDC workers also built the Redbank Track along the Toongabbie Creek bank from near Mons Road, past Ronald McDonald House at the Children’s Hospital to the confluence with Darling Mills Creek, where there is a splendid view of the two creeks. The Redbank Track was officially opened by then Corrective Services Minister John Hatzistergos MP in 2006.



FIG 8-4 Entrance to the Redbank Track constructed along the southern bank of Toongabbie Creek at Westmead by Periodic Detainees in 2005.



FIG 8-5 During a visit to the site in 2006 the Minister for Corrective Services, John Hatzistergos MP (at right), inspects a bird box built by Periodic Detainees and installed in trees along Toongabbie Creek, behind Westmead Hospital. With him are, left to right, Parramatta State MP, Tanya Gadiel MP, Prison Officer Neil Rogers and Trust Chairman, Bob Junor.

Greystanes Creek Reserve Bush Regeneration	
Greystanes Creek at Toongabbie	
Total Cost	\$1,800,000
Trust Contribution	\$900,000 (approx)
Other Contributors	\$900,000 Blacktown & Holroyd Councils
Year	1994–2006



FIG 8-6 Air view of regenerated Greystanes Creek Reserve at Toongabbie, ten years after creek restoration project was completed and regeneration commenced.

In 1993 Blacktown City Council constructed the Greystanes Creek Restoration Project over 1.2 km at a cost of \$2.6M, with financial help from the Trust, Holroyd Council and the State and Federal Governments. As an offset for having to remove a number of native trees, the Trust agreed to provide half the cost of maintenance of the reconstructed section of creek from 1994 on, with Blacktown and Holroyd Councils providing a quarter of the costs each. In the early years a common Plan of Management, backed up by a development Control Plan, for the creek corridor was prepared and adopted by Blacktown and Holroyd Councils – since Greystanes Creek here is the boundary between the two local government areas. A number of capital improvements were also carried out along this creek with support from local residents on the Greystanes Creek Management Committee.

For over a decade a bushland regenerator, Marie Costigan, was employed by Holroyd Council with the above funding to maintain the creek corridor, whilst progressively revegetating many bare areas along the creek with stands of native trees. This work has transformed the creek corridor, greatly improving its appearance and habitat values. When the Trust’s income ceased in December 2006 the two councils agreed to share the maintenance costs for the rest of that year and hopefully in future years.

Excelsior Reserve Bushland Regeneration	
North Rocks (Darling Mills Creek)	
Total Cost	\$737,579
Trust Contribution	\$737,579
Other Contributors	–
Year	1996 – present

In conjunction with the construction of the Loyalty Road flood-retarding basin in 1995/96, weeds were removed from the ten hectare, 100-year flood impoundment area and out to the Reserve boundary either side. Native species were then replanted in the treated area. The condition of the bushland has been greatly improved and the potential for weeds to spread has been reduced. Weed densities, estimated at over 80% before the treatment, were reduced to 10% at most. Subsequently, the treated area has been maintained by contractors to the Trust.



FIG 8-7 Regenerated bushland in Excelsior Reserve, upstream of Loyalty Road Basin wall.

The Trust’s last bush regeneration contract, with contractor Hills Bushcare, finished in July 2006, but the work has continued on a month to month basis, pending agreement on responsibility for ongoing maintenance with Baulkham Hills Shire Council, which is the reserve manager. Ongoing maintenance is required to control weeds because seasonal weed flushes, stormwater and birds continue to provide a constant source of weed seed.

Green Corridors Vegetation Management Strategy	
Entire Catchment	
Total Cost	\$1,367,208
Trust Contribution	\$1,367,208
Other Contributors	–
Year	1998 – 2006

The ‘Green Corridors’ Vegetation Management Strategy was developed by consultants Oculus for the Trust in 1998 and adopted by the Trust and the four local councils in 1999. It aimed to establish and maintain a network of ‘green corridors’ along catchment waterways. The Strategy bridged the gap between the earlier Sydney-wide ‘Green Web’ Strategy (also developed by Oculus) and



FIG 8-8 Trust staff inspecting bushland targeted for regeneration under the Green Corridors program.



FIG 8-9 Quarry Branch Bushcare Group, a local bushcare group whose work was supported by Green Corridors grants.





FIG 8-10 Natural regeneration at Lytton Reserve in Wentworthville, where riparian revegetation works were supported by Green Corridors grants.

vegetation management plans at the local government area or individual reserve scale. To help implement the Strategy the Trust committed a total of \$200,000 per year from mid 1999 to provide dollar-for-dollar grants of \$50,000 to each of the four local councils. Over seven years to mid 2006 these grants enabled work costing up to \$1.3M to be carried out along most catchment creeks.

Parramatta River Fishways	
Parramatta River – Four locations	
Total Cost	\$2M (indicative)
Trust Contribution	\$232,818
Parramatta Council contribution	\$1.477M (indicative)
Other Contributors	\$300,000 (indicative)
CSR, NSW Environmental Trust, NSW Dept of Primary Industries, Australian Government Recreational Fishing Trust	
Year	2002–2009

Since early colonial days a number of weirs across the Parramatta River have prevented fish moving from the estuary to the freshwater section, which some species require to breed. In 2001 the Trust had a specialist consultant prepare concept designs for fish ladders on the Charles Street and Marsden Street Weirs. In 2003 and 2004 Parramatta



FIG 8-11 Fishway at Charles Street Weir in Parramatta – first fishway constructed.

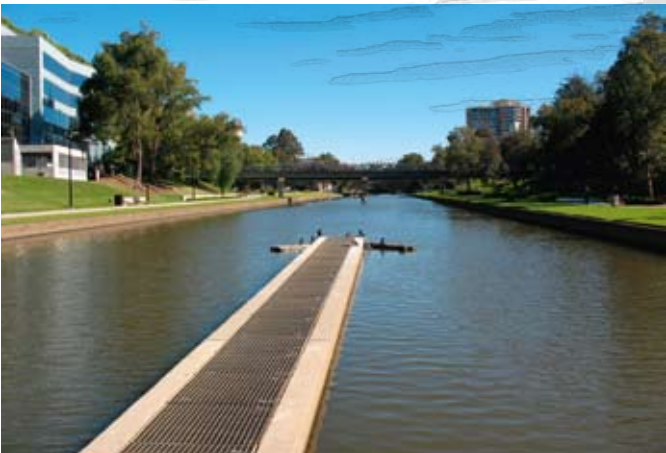


FIG 8-12 Looking upstream along covered fishway from Charles Street Weir at Parramatta

City Council, with Trust funding support, had other consultants prepare designs and cost estimates for fishways on all four weirs – the above two plus the upper Parramatta Park and Kiosk weirs. Detailed designs were completed in late 2004. Vertical slot fishways at the Charles Street and Kiosk Weirs were constructed in 2006/07. There were delays in selecting a contractor, but the Marsden Street fishway was constructed in early 2009. The final fishway at the Upper Parramatta Park Weir has been designed and granted development consent, but will need to be redesigned to reduce its cost. Total cost of the fishways to date is around \$1.6M.

Greener Schools and Small Community Group Grants	
Entire Catchment	
Total Cost	\$110,052
Trust Contribution	\$80,052
Other Contributors	Department of Land and Water Conservation \$30,000
Year	2003 – 2006

Initially using a State Government grant and then its own funds, from 2002/03 the Trust provided small grants totalling \$30,000 per year to schools and community groups. It was realised that such groups often only require small amounts, from a few hundred to a



FIG 8-13 The Hills Sports High School Students after working on their Green Corridors project.

few thousand dollars, to allow them to undertake weed control or bush regeneration activities consistent with the Green Corridors Vegetation Management Strategy. Providing small grants quickly, avoided the often lengthy delays and form-filling associated with most government grant schemes. It allowed the schools and community groups to get started straight away.

River Heritage Walk	
Northern Bank of Parramatta River, O’Connell to Marsden Sts, Parramatta	
Total Cost	\$639,000 (approx)
Trust Contribution	\$200,000
Other Contributors (NSW Dept of Planning)	\$439,000 – (\$204,000 S1 & \$235,212 S2)
Year	2004–08

The northern bank of the Parramatta River, between Marsden and O’Connell Streets at Parramatta, had long been overgrown with weeds and a venue for anti-social behaviour. Responding to the concerns of local residents the Trust arranged for the area to be cleared of weeds and rubbish in early 2004, and then maintained, by Periodic Detention Centre workers. Subsequently, with the councils, the Trust devised a River Heritage Walk concept of a network of pedestrian and cycle paths along the main catchment creeks, linking Parramatta, Blacktown, Merrylands and Baulkham Hills; with its Stage 1 along the Parramatta River, from Marsden to O’Connell Streets.

Despite many delays due to heritage issues the Trust completed a path through this section of creek bank, as well as a canoe launching facility nearby, in January 2007. This work was funded by the Trust and a \$204,000 Sharing Sydney Harbour Access Program grant.

A further grant of \$235,212 was later received, which is allowing the Trust to extend the path under the O’Connell Street Bridge and to prepare a foreshore access study for the next stage of the River Heritage Walk upstream past Parramatta Stadium.



FIG 8-14 Cr Maureen Walsh (Parramatta City Council) and granddaughter meet Trust staff at cleared river bank site for the River Heritage Walk.

Waterways Restoration Program	
Entire Catchment	
Total Cost	\$237,000
Trust Contribution	\$237,000
Other Contributors	\$237,000 in kind contribution by councils
Year	2005–07

When Robert Wilson reviewed the Trust for the Minister in 2002 he recommended that the Trust adopt ‘river health’ as its overarching goal that integrates all its other goals. This idea was adopted by the Trust and its 2003-07 Corporate Plan provided for the establishment of a Waterways Restoration Program.

In 2004 the Trust had University of Technology Sydney researchers, Simon Beecham and Alison Dunphy, assess the health of four representative catchment creeks and identify and cost capital works and maintenance required to restore or rehabilitate the creeks. Extrapolated to all catchment creeks, the total cost would be \$15M – \$7M for capital improvements and \$8M for maintenance. In March 2005 the Trust agreed to implement the Waterways Restoration Program over 12 years with support from the local councils. It pledged \$1M per year in grants to meet that goal.

During 2005-06 the Trust was able to help fund several important creek improvement projects by the councils – rehabilitation master plans for Quarry Branch Creek (Parramatta Council), upper Toongabbie Creek (Baulkham Hills), Blacktown Creek (Blacktown) and Finlayson’s Creek (Holroyd). As well, on-ground demonstration works were completed along Quarry Branch Creek (Parramatta Council) and lower Darling Mills Creek (Baulkham Hills). However, when the Trust’s income ceased in December 2006, the program had to be abandoned.



FIG 8-16 Trustee Cr David Bentham and resident, Eric Nowland, inspect completed creek regeneration works along Darling Mills Creek near Speers Road, North Rocks – 2005.



9

Community Education,  
Involvement and  
Marketing

1989 Situation

No sense of belonging to a 'catchment community'. Very few local residents realised that they lived in a catchment or that actions in upstream areas could impact on water quality and quantity further downstream. Residents had no access to information/education on natural resources and hazard issues in the catchment. Few opportunities or encouragement, and no technical or financial support provided for community groups wanting to improve their local bushland or creek. Community not consulted about flood mitigation or projects affecting their area.

Current Position

Techniques employed by the Trust to involve the local community have included community representation on project steering committees, public meetings, small-scale and on-site meetings, inspections, focus groups, surveys, newsletters, newspaper articles, advertisements, public exhibitions and signs.

Notable examples include

- displays at the Western Sydney Water Festival, Baulkham Hills Shire Council Bushland Day, Cumberland State Forest Fair, Sydney Harbour Week and Back to Little Coogee day at Parramatta Park.
- Lake Parramatta Open Day in March each year between 1999 and 2005 incorporating the Swim Towards 2005 campaign.
- the Freshwater Festival with Parramatta City Council in 2006, which was to include the re-introduction of permitted swimming in Lake Parramatta.
- Trust sponsorship of the environment category in the Cumberland Press' Community Business Awards in 2003.
- World Environment Day celebrations at schools in the catchment.
- Trust sponsorship of the 'Urban Waterway Restoration' category in the Local Government Association of New South Wales Excellence in Environment Awards.
- displays and a community catchment tour attended by 60 residents as part of National Water Week in 2005.
- establishment and co-sponsorship, with local councils, of the Regional Environment Awards.
- production and distribution of Streamline, a newsletter delivered to all 92,500 homes in the catchment outlining the Trust's activities and projects. It has been issued approximately four times per year and was designed to give information on Trust projects and activities to councillors, MP's, community groups and Waterwatch teachers. The style was revised in 2005 to

give residents a more informative, interesting and readable publication and better promote the Trust.

A series of fact sheets on Trust activities and projects were created and the Trust's web page was used to facilitate access to information. Cost effective ways to gauge community attitudes and refine Trust programs were developed and community support was built for actions to implement the catchment's water quality and vegetation management plans.

Community Consultation	
Entire Catchment	
Total Cost	\$1,828,000 (approx)
Trust Contribution	\$1,828,000 (approx)
Other Contributors	–
Year	1989 – 2006

Since 1989 there has been growing recognition of the importance of community consultation at all stages of a project. The Trust has sought to involve the local community by means of community representation on project steering committees, public meetings, small-scale and on-site meetings, inspections, focus groups, surveys, newsletters, newspaper articles, advertisements, public exhibitions and signs.

To gauge community attitudes and the effectiveness of Trust education and marketing activities, from 2000 to 2004 the Trust had Owl Marketing and Research conduct telephone surveys of a sample of catchment households with the same demographic profile as the whole catchment. In all of the surveys water pollution in creeks and lakes was the most important local environmental issue, although roads and traffic was the most important issue overall. Awareness of the Trust remained steady at around 42%.

FACTS: Causes of poor water quality		
Issue	Source(s)	Associated Problems in Creeks
Sewage Pollution	<ul style="list-style-type: none"><li>• sewer overflows</li><li>• leakage from mains and private sewer lines</li></ul>	<ul style="list-style-type: none"><li>• pathogens including bacteria (eg. E. coli) and protozoa (eg. Cryptosporidium and Giardia) may be released into creeks, posing a risk to human and animal health</li><li>• nutrients</li><li>• chemicals such as detergents</li><li>• an increase in total dissolved solids, including salt</li><li>• endocrine disrupting chemicals (EDCs) may be released in sewage, with the potential to affect important functions in the human body</li></ul>
Oil, grease and other chemicals	<ul style="list-style-type: none"><li>• industry</li><li>• motor vehicles</li><li>• poor disposal of domestic wastes</li></ul>	<ul style="list-style-type: none"><li>• toxic to aquatic life, destroys food chain</li><li>• kills plants and animals</li><li>• chemicals take a long time to break down</li></ul>
Nutrients	<ul style="list-style-type: none"><li>• fertilizer run-off</li><li>• sewer overflows</li><li>• stormwater</li></ul>	<ul style="list-style-type: none"><li>• increased growth of algae and weeds leading to low oxygen levels</li><li>• changes to food chain</li></ul>
Detergents	<ul style="list-style-type: none"><li>• car washing</li><li>• sewer overflows</li><li>• stormwater run-off</li></ul>	<ul style="list-style-type: none"><li>• harmful to aquatic life</li><li>• adds nutrients</li><li>• increases turbidity of water</li></ul>
Litter and rubbish	<ul style="list-style-type: none"><li>• shopping centres</li><li>• domestic waste</li><li>• illegal dumping</li><li>• wind</li><li>• stormwater run-off</li><li>• roads</li></ul>	<ul style="list-style-type: none"><li>• unsightly</li><li>• adds chemicals to creeks</li><li>• harmful to animals</li><li>• encourages weed growth</li></ul>
Weeds	<ul style="list-style-type: none"><li>• dumped rubbish</li><li>• upstream infestations</li><li>• birds and wind</li><li>• stormwater</li></ul>	<ul style="list-style-type: none"><li>• loss of native flora and fauna</li><li>• changed nutrient cycling</li><li>• changed light conditions</li><li>• changed stream dynamics and sedimentation</li></ul>
Sediment	<ul style="list-style-type: none"><li>• development sites</li><li>• erosion</li><li>• stormwater run-off</li></ul>	<ul style="list-style-type: none"><li>• increased turbidity</li><li>• in-filling of creek pools</li><li>• weed growth</li></ul>

FIG 9-1 Fact sheet on the Trust web page



FIG 9-2 Display at Lake Parramatta Open Day in March 2003.



Streamline	
Entire Catchment	
Total Cost	\$640,000 (approx)
Trust Contribution	\$640,000
Other Contributors	—
Year	1990 – 2006

Streamline was the newsletter delivered to all homes in the catchment, up to four times each year, outlining the Trust's activities and projects. The number of households grew over the 16 years from 80,000 to 92,500. Over that time there were 44 issues produced and distributed. Its last few editions were in a full colour tabloid size format that attracted many favourable comments.

In addition, from 2003 onwards the Trust sent Key Moves, a one-page e-mail newsletter, to key decision-makers in the catchment (such as councillors, MPs, agency heads) within a few days of each Board meeting. It provided succinct and near-immediate advice on the most significant decisions taken by the Board.



FIG 9-2 Front page of May 2006 edition of Trust's newsletter Streamline.

Community Education	
Entire Catchment	
Total Cost	\$300,000 (indicative)
Trust Contribution	\$300,000 (indicative)
Other Contributors	—
Year	1990 – 2006



FIG 9-3 Crowd at Lake Parramatta Family Open Day, March 2005.

Each year the Trust conducted approximately ten catchment tours for school groups and community groups. These tours were designed to highlight common problems and issues the Trust was addressing and show the progress that had been made. The Trust also assisted up to fifty students with school assignments each year, provides displays at community fairs, and Trust staff gave talks to community groups throughout the year as required.

The Trust's web page contains general information about the Trust and a library that provides access to most of the Trust's strategy documents, including the Green Corridors Vegetation Management Strategy, Stormwater Management Plan and the Annual Reports.

Regional Environment Awards	
Entire Catchment	
Total Cost	\$140,000
Trust Contribution	\$120,000
Other Contributors	\$20,000 (councils)
Year	2001 – 2006



FIG 9-4 Minister for Western Sydney, the Hon Diane Beamer MP with 2003 Diamond Award winner 97 year-old Frank Samuel of Old Toongabbie, a 30 year bushcare veteran, and Mrs Samuel

For six years the Trust held an annual Regional Environment Awards in early June, as part of Western Sydney Environment Month. The awards were co-ordinated and funded by the Trust, with additional funding from the four local councils.

The awards recognised and rewarded individuals, community groups and schools that had achieved on-ground environmental improvements and increased awareness and knowledge of local environmental issues. In most years there were around 30 entries. Winners received certificates and cash awards that could only be used on future environmental projects; the best overall entry receiving the prestigious Diamond Award with its \$5,000 prize. The awards ceremony took place at Lachlan's Restaurant in Old Government House in Parramatta Park, generally with the Minister for Western Sydney and the four local mayors present to award the major awards.



# 10

## Conclusion

This report card shows that the Trust has achieved a great deal since 1989, in partnership with the four local councils (Blacktown, Holroyd, Parramatta and the Hills), other Government agencies and the community. The serious flood threat has been significantly reduced, while many groups of houses are still to be protected. The Trust's studies have enabled the councils to identify and prioritise mitigation strategies as funds become available. The groundwork has been laid – and a sound start made – to improve water quality in catchment streams and lakes, and to conserve and enhance our valuable bushland and forest areas.

The members and staff of the Trust are proud of what has been achieved. The objectives set in 1989 have been largely met and the Trust has proven to be an effective and innovative catchment management body. However the Upper Parramatta River Catchment Trust has ceased operating, except for some core activities arranged by staff of the Sydney Metropolitan Catchment Authority, and there is still much work that needs to be done. Unfinished tasks include:

- changes to council planning instruments to implement the Floodplain Management Plan
- full implementation of the revised OSD policy
- roll out of FloodSmart program to address growing complacency about flooding risks
- implementation of works or measures to protect the outstanding flood problem areas.

It is hoped that the four local councils in the catchment, along with the Sydney Metropolitan Catchment Management Authority and the Department of Environment, Climate Change and Water, will be able to complete those tasks and maintain the flood mitigation assets and services. Sydney Water has absorbed Waterwatch into its Streamwatch program. All the other Trust programs will need to be taken over and funded by the four local councils, or wound up.

It will take committed effort over many years to achieve the improvements the catchment community seeks. The Trust is hopeful that its catchment management work will be continued and its achievements sustained.

Whatever the outcome, the members and staff of the Trust are very appreciative of the strong support given by the catchment community during its period of operation.