6.0 Foreshore Recreational Assets and Facilities

6.1 Background

Associated with the development of the estuary foreshore has been the construction of foreshore recreational assets such as boat ramps, wharves, jetties, dinghy storage areas and foreshore parks. As the region has moved away from its industrial past, the foreshore has been reclaimed for recreational uses with considerable investment at both the state and local government levels.

The foreshore facilities are utilised in two distinct ways;

- Recreational boating purposes such as vessel launching/retrieval, temporary mooring and storage (facilities).
- Foreshore recreational activities such as walking, jogging, fishing, family gatherings and picnics undertaken in foreshore parks.

The types of facilities and foreshore parks present within the study area, associated issues and the inspection and condition assessment methodology are presented herein. The results of the condition assessment were used to prioritise each facility, by LGA and for the entire study area.

6.2 Scope

A detailed field assessment of the entire foreshore study area was undertaken to:

- Visually assess the location and condition of all major foreshore recreational assets and facilities such as boat ramps, wharves, jetties, dinghy storage areas (formal and informal) and associated significant foreshore parks and their infrastructure;
- Determine requirements for maintenance / upgrading / removal of facilities; and
- Prioritise those facilities (for both for the whole estuary and for each LGA) that need maintenance / upgrading and/or identify where new infrastructure should be installed.

6.3 Condition Assessment

6.3.1 Inspection Methodology

Visual inspections of all public foreshore recreational assets within the study area were undertaken in August and September 2009. Most of the inspections were carried out by boat. Where boat access was not possible, inspections were undertaken from the shore. Inspections were carried out between mid and low tides to ensure most of the structures components were visible.

A naming convention was derived based on the LGA in which the facility was located and a sequential numbering system assigned from east to west along the LGA foreshore. Facilities were denoted by the letter “F” within the naming convention, as follows:

- Auburn: AUB_F
- Canada Bay: CAN_F
- Hunters Hill: HUN_F
- Leichhardt: LEI_F
- Ryde: RYD_F
- SOPA: SOPA_F

Note: *Field investigative methods were tailored to assess facilities that typically related to recreational boating as guided by the project’s scope of works (i.e. jetties, pontoons, boat ramps, formal and informal dinghy storage). As there is no public access by boat on the river upstream of Silverwater Bridge, no foreshore recreational facilities were recorded for Parramatta LGA during field investigations.*

An illustration of this naming convention is presented in Figure 6-1 showing the Kissing Point Bay foreshore located within the Ryde LGA.

Figure 6-1. Illustration of naming convention for recreational facilities

6.3.2 Inspection Procedure

While undertaking the facility inspections the following information was noted:

- The date, time, location (GPS coordinates) and tide level at the time of inspection;
- The type of facility, its function and a description of the area beyond and adjacent;
- The condition of the facility from an engineering perspective (refer Table 6-1);
- Any other general observations or issues regarding the facility, including potential safety hazards; and
- Representative site photographs for each discrete facility were taken.

Table 6-1. Facility condition categories

Facility Condition	Description	Score
Excellent:	• Facility is new • No defects observed	1
Good:	• Minor defects observed • Generally good condition • Facility is functioning as intended	4
Poor:	• Major defects observed • Structure will fail without remedial action • Reduced functionality	8
Failed:	• Major defects observed • Facility is no longer functioning as intended • Facility is about to collapse or has collapsed	10

6.4 Types of Facilities and Assets

6.4.1 Boat Ramps

Recreational boat ramps are present at many locations within the study area. All are constructed from concrete and many include diagonal or horizontal v-grooves for vehicle traction (Figure 6-2). Single, double and triple lane ramps are present and most facilities provide trailer parking on adjacent land. Temporary moorings are available at a number of boat ramps to aid in launching and retrieval of vessels.

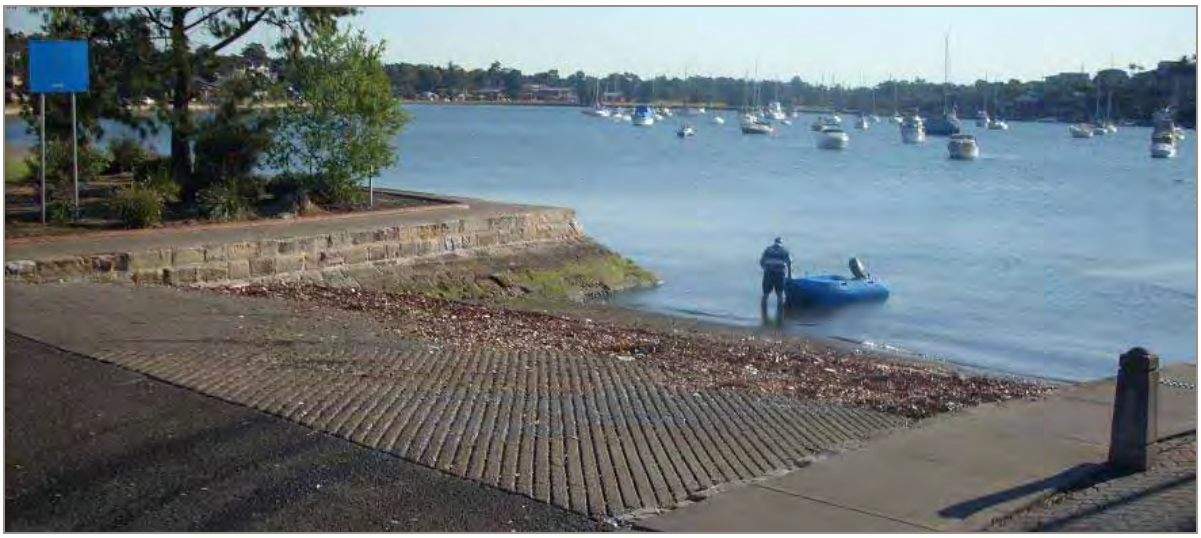

Figure 6-2. Public boat ramp with v-groove detail for vehicle traction

6.4.2 Temporary Mooring Facilities

Temporary mooring facilities are provided at a number of locations within the study area. Typically, facilities are relatively new and include a timber jetty/landing with an aluminium gangway and a concrete floating pontoon supported by wrapped steel piles (Figure 6-3). Steel cleats are provided on the floating pontoons for mooring lines. These facilities have been constructed adjacent to boat ramps to aid in launching and retrieval of vessels and also close to key foreshore assets such as parks and cafes to provide waterside access. The facilities are also popular fishing platforms.

Figure 6-3. Temporary mooring facility with timber landing, aluminium gangway and concrete floating pontoon

6.4.3 Wharves, Jetties and Landings

Wharves, jetties and landings within the study area typically are constructed from timber, with timber decking, beams, headstocks and piles (Figure 6-4). Many include sea stairs with landings at multiple levels providing access from the water for the full tidal range. A number of old commercial/industrial structures have been converted to recreational facilities with public furniture such as benches, umbrellas and shade cloths installed.

Figure 6-4. Timber landings in Homebush Bay

6.4.4 Informal and Formal Dinghy Storage

Both informal and formal dinghy storage areas are prevalent downstream of Silverwater Bridge. Dinghies are used by the public to access larger recreational vessels on swing moorings offshore. The bulk of the dinghies within the study area are stored informally with vessels tethered to trees, signs, handrails and shackles on rocks shelves and walls (Figure 6-5a). Formal structures consist of steel or timber frames in which dinghies are stacked and secured with chains and padlocks (Figure 6-5b).

(a)

(b)

Figure 6-5. Informal (a) and formal (b) dinghy storage facilities

Generally, no formal access or launching/retrieval facilities are present and at many locations vessels must be launched / retrieved over mossy rock shelves creating a potential hazard for users. At some locations ad-hoc groynes, wharves and ramps have been constructed in an attempt to facilitate water access.

6.4.5 Public Lookouts

Consistent with the movement away from industrial land uses along the foreshore and providing public access and amenity, numerous public lookout structures are present within the study area. Generally, these structures are constructed from steel (Figure 6-6a) or timber (Figure 6-6b) and are located above existing seawalls or natural foreshore.

(a)

(b)

Figure 6-6. (a) Steel lookout structure atop seawall, and (b)timber boardwalk and lookout structure above natural foreshore

6.4.6 Public Swimming Baths

Public swimming baths are present in the eastern region of the study area. Generally, timber piles form the seaward extent of the baths with netting suspended between the piles and the foreshore providing a safe swimming enclosure (Figure 6-7). Public amenities and recreational parklands are usually present landward of the baths.

Figure 6-7. Swimming baths showing timber piles and netting

6.5 Facility Management

6.5.1 Degradation and Maintenance

Recreational facilities are prone to deterioration over time due to the chemically and physically dynamic environment in which they are located. In contrast with statically stable seawalls, facilities such as floating pontoons, wharves, jetties *inter alia* are themselves in constant flux due to hydrodynamic and climate influences, putting stress on the structural members and their connections.

An essential component of facility management is continued monitoring and maintenance to ensure that structures remain serviceable. Regular inspection of structures permits early detection allowing the implementation of economic maintenance measures (AS4997-2005).

During field investigations for this study, maintenance measures such as the replacement of individual components, replacement of corroded connections and removal of marine fouling were observed. It was also evident that in some cases no regular inspections or maintenance has been carried out as structures are in a poor condition with considerable deterioration observed.

6.5.2 Failure Mechanisms

Deterioration of recreational foreshore facilities is primarily due to failures of the components that form the structure rather than a general deterioration of the entire structure, as may be in the case of seawalls. Subsequently, it is the material properties of the components that determine the vulnerability and rate of deterioration and, ultimately, structural integrity.

The failure mechanisms that are prevalent for the key materials used to construct recreational facilities within the study area include:

- **Concrete** – Concrete is used for floating pontoons, boat ramps, footings, piles and decking. The durability of concrete structures relies on the condition of the steel reinforcement. If the steel reinforcement is exposed, due to cracking, inadequate concrete cover or chloride ingress, particular in the splash zone, corrosion will occur. Ultimately, this will necessitate reconstruction of the affected elements or replacement of the entire structure.
- **Timber** – Timber is used widely within the study area for piles, beams, headstocks, decking, handrails and fenders. Deterioration of timber occurs due to mechanical degradation, rot or attack by living organisms (fungi, termites and marine borers). Additionally, natural shrinkage of the timber results in the need to tighten bolted connections. Individual timber members usually can be replaced as required. However, without an appropriate inspection and maintenance program, a number of timber components may deteriorate to an extent that causes failure of the entire structure.
- **Steel** – Steel is used for piles, gangways, handrails, cleats, reinforcement, public furniture and connecting elements such as bolts. Corrosion is the main cause of steel deterioration and is exacerbated by physical processes within the splash zone. Several methods are available to protect steel elements including; corrosion resistant elements (stainless steel), wrapping of steel elements (particularly piles) with corrosion inhibiting fabrics, painting or coating members with inert substances, cathodic protection or by allowing for a specified corrosion rate within the design. Replacement of all steel elements is required periodically.

6.5.3 Indicative Replacement, Maintenance and Installation Costs

Replacement and maintenance costs are dependent on several factors, including:

- The type and intended function of the facility
- The extent of degradation
- Materials required, material availability and whether existing materials can be reused
- Site access
- Hydrodynamic conditions
- The ground conditions at the site

Consequently, the cost to replace and/or repair degraded facilities and the frequency at which maintenance must be undertaken is highly variable. Considerations to repair, or replace, degraded facilities require site-specific input from relevant stakeholders. The cost and impetus for installing formal facilities *in lieu* of the current informal arrangements also require consideration from relevant stakeholders.

6.6 Condition Assessment

6.6.1 Summary

A total of 84 facilities were assessed visually[8], of these facilities over half were in good or excellent condition (i.e. 49 good, and 14 excellent). Eight facilities were found to have some form of major defect and 13 facilities were categorised as in poor condition (Table 6-2).

Table 6-2. Foreshore facilities assessed in the study area

LGA	Excellent	Good	Poor	Failed	Total
Auburn	1	3	2	3	**9**
Canada Bay	2	20	5	1	**28**
Hunters Hill	3	11	1	1	**16**
Leichhardt	3	6		1	**10**
Ryde	4	7	4	2	**17**
SOPA	1	2	1		**4**
Total	**14**	**49**	**13**	**8**	**84**

6.6.2 Foreshore Parks and Reserves

There are over 80 foreshore parks or reserves located in the study area, which collectively contribute over 600 hectares of waterfront land available for public use[9]. Cardno, Lawson and Treloar (2008) identified the following major foreshore parks in the study area:

- Sydney Olympic Park (Auburn LGA);
- George Kendall Riverside Park (Parramatta LGA);
- Meadowbank Park (Ryde LGA);
- Cabarita Park (Canada Bay LGA);
- Kissing Point Park (Ryde LGA); and
- Putney Park (Ryde LGA).

Other significant foreshore parks in the study area include: Riverglade Reserve (Hunters Hill LGA); Leichhardt Park (Leichhardt LGA); and Eric Primrose Reserve (Parramatta LGA). Table 6-3 lists the extent of foreshore parks or reserves for each LGA. All foreshore parks or reserves that have direct water frontage in the study area are discussed further within individual LGA management summaries (Section 9.0).

[8] The condition assessment has been made solely on visual inspections. A more detailed inspection would be required to report on the structural integrity of the facilities.

[9] These figures exclude those parks or reserves that do not have absolute waterfrontage, for example, Timbrell Park, Five Dock, which is separated from Iron Cove Bay by Henley Marine Drive.

Table 6-3 Foreshore Parks and Reserves within the study area

LGA	Area (ha)
Auburn (including Sydney Olympic Park)	419.6
Canada Bay	53.5
Hunters Hill	40.7
Leichhardt	23.2
Parramatta	46.9
Ryde	54.6
Total area of foreshore 'waterfront' reserves	**638.5**

6.6.3 Potential Impacts from Foreshore Reserve Management

Management issues associated with foreshore parks and reserves include the following:

- Mowing

Mowing of foreshore parks may inadvertently or deliberately encroach into native vegetation areas. Lawn clippings are also commonly dumped into bushland, saltmarsh and mangrove areas.

- Vandalism

Deliberate lopping of tree limbs or poisoning of mangrove and other canopy species commonly occurs around Sydney Harbour where such growth impinges on residential views. In addition to direct vandalism of vegetation, educational signage is often vandalised.

- Trampling

Informal access trails through saltmarsh, mangrove and mudflat habitats cause direct damage to native species, some of which are highly sensitive to physical impacts and very slow to recover. Impacts include the isolation and reduction in size of many of the vegetative communities, and typical edge effects that decrease a community's resilience to weed infestation.

To counter these impacts, educational programs, fencing, or other form of physical edging to protect native vegetation should be undertaken.

- Installation of educational signage to point out the attributes of each community (for example Figure 6-8) which will serve to build a sense of community responsibility;
- Fencing off or relocation of informal tracks. Alternatively, replacement with raised boardwalks reduces the impact and increases education value and social amenity of ecological communities;
- Education programs for park maintenance staff to ensure that mowing of native vegetation is avoided.

Figure 6-8 Example of educational signage.

6.6.4 Dinghy Storage

One of the most prominent issues associated with boating foreshore facilities is the lack of formal dinghy storage facilities. Dinghies are scattered along the foreshore, leaning against walls, rock shelves and trees. Informal access to these locations often results in the degradation of foreshore vegetation. Areas of both formal and informal dinghy storage were assessed during field investigations for this study. Table 6-4 provides examples of public improvisations where formal dinghy storage is not provided. Further locations where formalised dinghy storage is required are detailed in LGA management summaries (Section 9.0).

Table 6-4. Informal dinghy storage areas

Waterway	LGA	Description	Reference location
Iron Cove Bay	Canada Bay	Abandoned structure used for dinghy storage (ie. Dinghy's tethered to old timber wharf and sea stairs).	CAN_F03
Abbotsford Bay	Canada Bay	Informal dinghy storage along rocky shoreline with vessels tethered to old steel fence.	CAN_F11
River South	Canada Bay	Informal dinghy storage with vessels tethered to trees and timber atop a rocky shoreline at the end of Drummoyne Avenue.	CAN_F05
River North	Hunters Hill	Dinghies are tethered to a timber landing structure and trees on foreshore.	HUN_F02
River North	Ryde	Informal dinghy storage associated with steel safety rail of Sydney Water pumping station.	RYD_F03
Five Dock Bay	Canada Bay	Informal dinghy storage along sandy/rocky shoreline with vessels tethered to connections in cliff.	CAN_F10
Morrisons Bay	Ryde	Informal dinghy storage within public reserve with dinghies tethered to private timber paling fence and trees.	RYD_F07

6.7 Sea Level Rise

Sea level rise benchmarks adopted by NSW government imply that some facilities may be overtopped or inundated more frequently as the extreme elevated water level events of today will become relatively common water levels by 2100 (Watson and Frazer 2009).

Fixed facilities such as jetties, wharves and boardwalks are particularly vulnerable to sea level rise and frequent overtopping would limit the availability of these structures for recreational activities. Facilities protected by vulnerable seawalls due to low crest levels would also be at a higher risk of inundation. This may include boat trailer parking facilities which are located generally adjacent to boat ramps. Increased maintenance may also be required as a greater proportion of the structure becomes exposed to the splash zone.

The design of new recreational facilities and repair of existing facilities should consider the specified sea level rise benchmarks and include adaption principles. In many cases this approach has been adopted already with jetties and temporary mooring facilities moving away from fixed structures to floating pontoons with hinged gangways. Dinghy storage facilities should be designed to be mobile or placed at a level that includes an adequate freeboard ensuring inundation does not occur.

In January 2009, a high tide of 2.05m was predicted for the NSW coast. Although the tide did not reach the predicted level, a level of 1.96m above chart datum was recorded at Fort Denison. This level is only exceeded on a few occasions every year. However, this high tide level will become a more frequent event with rising sea level.

DECCW facilitated a photographic record of the tide throughout NSW (January 2009). Photographs taken at Darling St Ferry Wharf in Balmain (Figure 6-9a) and Darling Harbour (Figure 6-9b), indicated the vulnerability of fixed facilities to inundation at high tide levels.

(a)

(b)

Figure 6-9 Inundation of the Darling Street ferry wharf, Balmain (a) and a Darling Harbour timber landing facility (b) (Watson and Frazer 2009)

Cardno Lawson and Treloar (2008) identified the potential loss of foreshore space due to predicted sea level rise as a major concern for several LGAs. This is largely due to foreshore open spaces forming the majority of the available open space for recreation within some LGAs in the study area. Already a number of foreshore parks are inundated during spring high tides, for example: Kissing Point Park (Figure 6.10a) and Riverglade Reserve (Figure 6.10b).

(a)

(b)

Figure 6-10 (a) Inundation of car park at Kissing Point Park, and (b) Riverglade Reserve, Tarban Creek (Watson and Frazer 2009)

6.8 High Priority Foreshore Facilities

6.8.1 Environmentally Friendly Structures

Any requirement to maintain or replace existing facilities or construct new facilities provides an opportunity to create intertidal habitat. The design and construction of fish-friendly structures is an emerging field, with new research and information progressively becoming available. Guidelines prepared by the Queensland Department of Primary Industries (Derbyshire, 2006) provide a comprehensive range of techniques for consideration when planning for repairs or replacement of foreshore facilities.

In addition to environmentally friendly seawall treatments prescribed by Wiecek (2009) environmentally friendly marine structures include artificial fish habitat modules (e.g. reef balls), substrate modifications or structures that may be affixed to existing marine structures, seagrass-friendly moorings, mesh decking of jetties to allow sunlight penetration. Examples of fish friendly structures adopted from Derbyshire (2006) are illustrated in Figures 6-9, and 6-10.

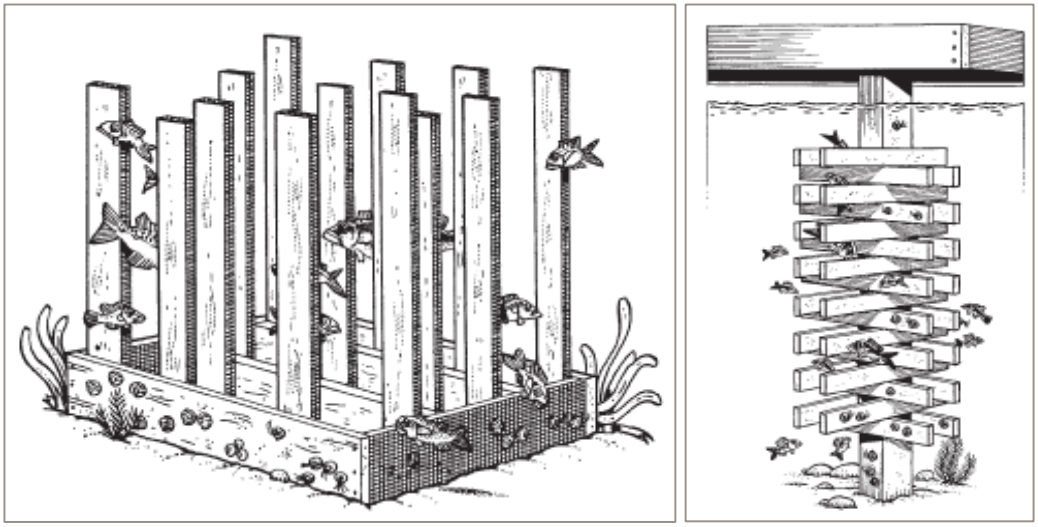

Figure 6-11. (left) stake beds, (right) pylon with cross pieces, and (right) stake beds attached to jetty (Derbyshire 2006)

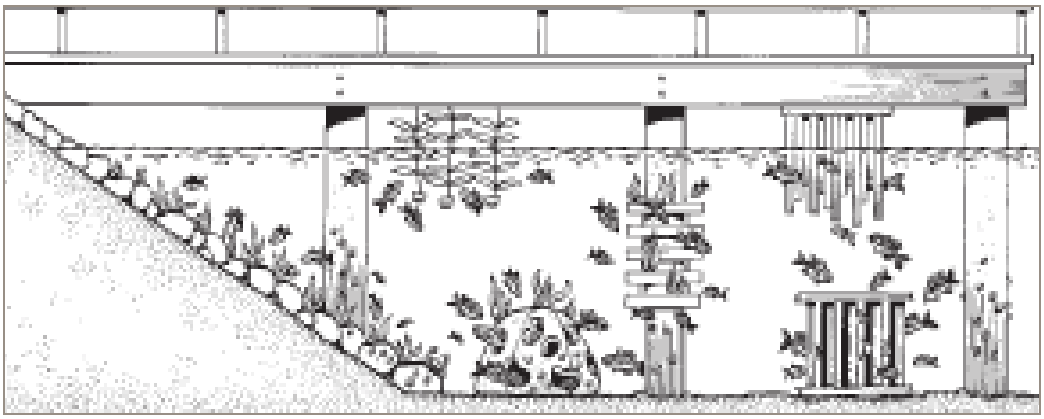

Figure 6-12. Concept of fish-friendly jetty (Derbyshire 2006)

Habitat creation options are also discussed, in the context of seawall repairs and replacement, in Section 4.8.1 and, in the context of seagrass habitat, in Section 7.4 of this study.

6.8.2 Prioritisation of Existing Facilities

In order to prioritise where replacement or repair of foreshore facilities should be undertaken, facilities found to be in poor condition, or to have some form of major defect, were further assessed to determine whether any assets, recreation or other public amenity would be affected in the absence of management intervention (i.e. if facility was not repaired or replaced, would any of these aspects be adversely impacted upon or potentially lost). The results are summarised in Table 6-5.

The location of foreshore facilities and reserves is shown on Figure 6.13, and all facilities are reported in LGA management summaries (Section 9.0) and relevant data provided within the project GIS database.

Table 6-5. Ranking of foreshore facilities in the study area

Priority	Asset Name	Waterway	LGA	Condition	High Usage	Access	Adjacent Parkland	Management Option
High	RYD_F08	Morrison Bay	Ryde	Failed	√	√	√	Formalised dinghy storage
High	AUB_F03	Homebush Bay	Auburn	Failed	√	√		Pier / Jetty
High	AUB_F05	Homebush Bay	Auburn	Failed	√	√		Pier / Jetty
High	LEI_F10	Iron Cove Bay	Leichhardt	Failed	√	√		Boat ramp
High	RYD_F07	Morrisons Bay	Ryde	Failed		√	√	Formalised dinghy storage
Medium	AUB_F02	Homebush Bay	Auburn	Poor	√	√		Pier / Jetty
Medium	AUB_F04	Homebush Bay	Auburn	Poor	√	√		Pier / Jetty
Medium	RYD_F16	River North	Ryde	Poor	√	√		Pier / Jetty
Medium	RYD_F17	River North	Ryde	Poor	√	√		Boat ramp
Medium	CAN_F10	Five Dock Bay	Canada Bay	Poor		√	√	Formalised dinghy storage
Medium	SOPA_F04	River South	SOPA	Poor	√	√		Viewing platform
Low-Medium	HUN_F02	River North	Hunters Hill	Poor			√	Formalised dinghy storage
Low-Medium	RYD_F03	River North	Ryde	Poor			√	Formalised dinghy storage
Low-Medium	AUB_F07	River South	Auburn	Failed				Viewing platform
Low-Medium	CAN_F03	Iron Cove Bay	Canada Bay	Failed				Pier / Jetty
Low-Medium	HUN_F14	River North	Hunters Hill	Failed				Formalised dinghy storage
Low	CAN_F11	Abbotsford Bay	Canada Bay	Poor				Formalised dinghy storage
Low	CAN_F16	Hen & Chicken Bay	Canada Bay	Poor				Boat ramp
Low	CAN_F28	River South	Canada Bay	Poor				Boat ramp
Low	CAN_F05	River South	Canada Bay	Poor				Formalised dinghy storage
Low	RYD_F05	River North	Ryde	Poor				Repair stairs

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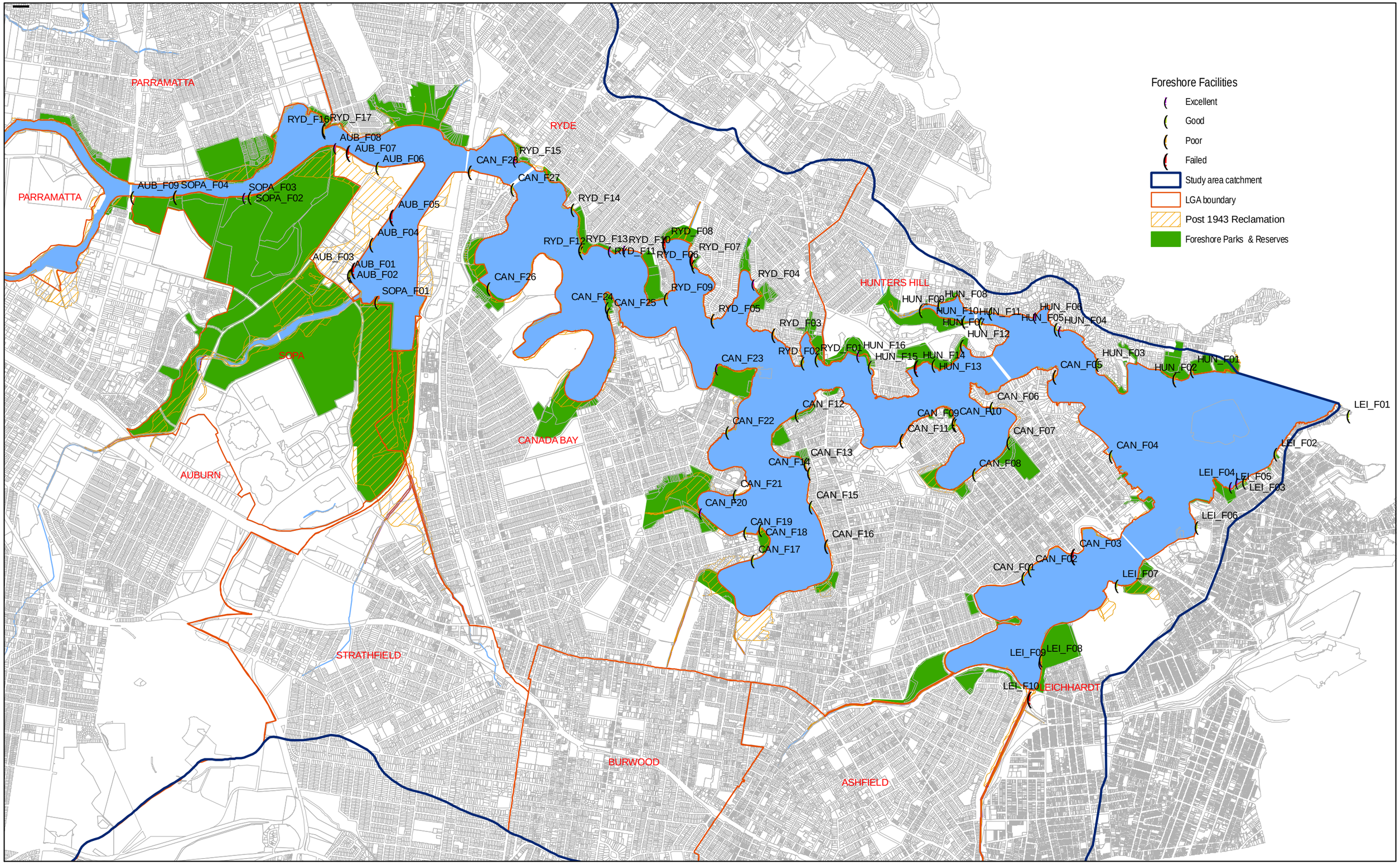

PARRAMATTA RIVER ESTUARY PROCESSES STUDY

FORESHORE RECREATIONAL FACILITIES & RESERVES

0 0.45 0.9 1.8 km

AUG 2010

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Fig. **6.13**