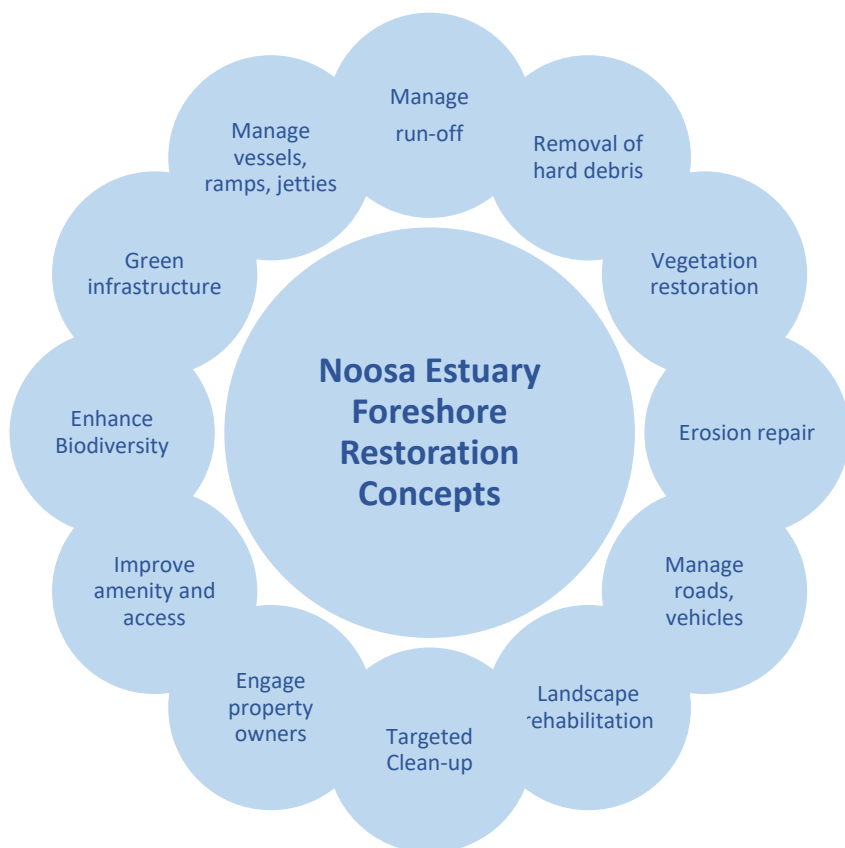


Noosa River Estuary

Assessment of Urban Land-Use Pressures

October 2022



ATTACHMENT I Main Features and Pressures in each Section

Noosa North Shore
Tewantin
Doonella
Noosaville
Noosa Heads
Weyba Creek

ATTACHMENT II Preliminary Site Restoration Concepts

Site 1. Ferry Park – Moorindil Street
Site 2. Tewantin Riverside – Lakeside Park
Site 3. Tewantin & RSL Parks
Site 4. North Lake Doonella Foreshore
Site 5. Hilton Esplanade & Parade
Site 6. Lakes Resort – Goodchap Street Foreshore

APPENDICES

Methodology and Data Sources
References

Get your Wetlands

Noosa Integrated Catchment Association

NOOSA NORTH SHORE SECTION

Features

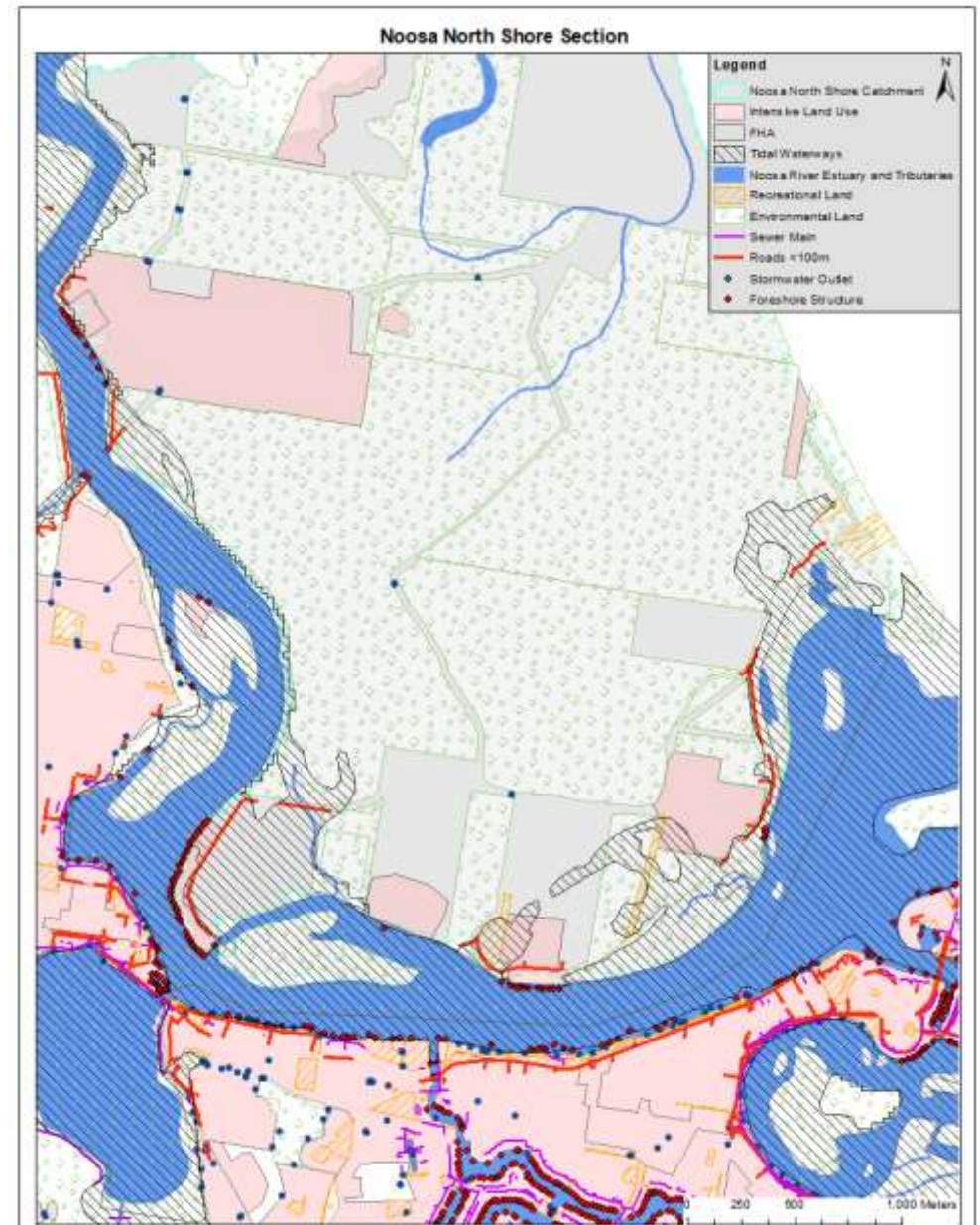
- Catchment area 1,215 hectares; diffuse drainage (no major creek) through numerous wetland areas, small drains and groundwater seepage
- Goat Island undeveloped low-lying tidal wetland; 2.4 km foreshore.
- Foreshore total length 10 km; 7 km not impacted by intensive land-use, with >100m wetland buffer
- 8 km foreshore land in designated environmental reserve
- 11.7 km (98%) of littoral zone designated Fish Habitat Area.

Main Pressures

- 2.1 km (18%) of foreshore habitat directly impacted intensive land-use (residential property, roadway); with 64 adjacent jetty structures. A further 0.5 km of foreshore is impacted by ILU within 100 metres.
- Roadway directly on the shore at 7 sites.
- 0.6 km (6%) of the foreshore designated ER is affected by adjacent ILU (<50m buffer). 1.2 km (10%) of the FHA is immediately adjacent to ILU.
- No public stormwater drainage structures on foreshore.
- Small number of SWD channel run-off from public roadways into adjacent wetlands.
- Individual properties discharge run-off directly into river/ shore or adjacent wetland.
- No mains sewer network on Noosa North Shore

Priority Sites for Restoration:

- #1: Maximilian Dr Ferry Foreshore
- #2: Frying Pan Foreshore



TEWANTIN SECTION

Features

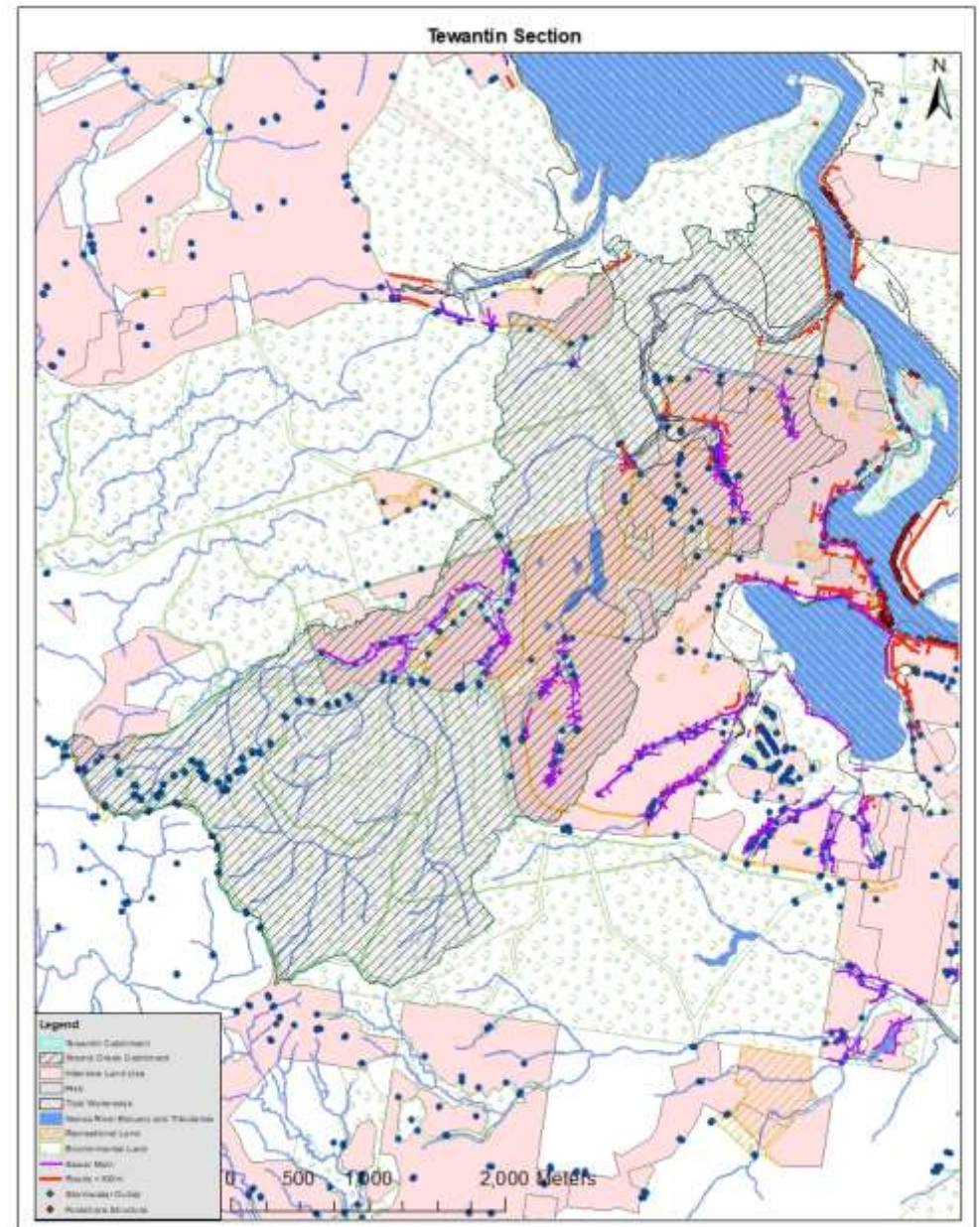
- Extensive catchment area (1,360ha) dominated by Wooroi Ck basin (1,248ha)
- Wooroi Creek one of just 5 major tributary creeks draining into central Estuary; becomes significant tidal channel joining River at Ferry Pk.
- 3.3 km Foreshore (Ferry Park to Marina), relatively narrow riparian zone with limited drainage from land.
- Makepeace Island (foreshore 1.7 km) and Sheep Island (foreshore 1.9 km) closely facing foreshore across mangrove-lined channels

Main Pressures

- 98% (3.2 km) Tewartin foreshore impacted by urban land-use (buildings, roads, parks); either directly on foreshore (1.6 km, 48%) or in close proximity (<100 m to the water's edge).
- 15 SW drain outfalls, 20 jetties/ ramps (and Marina) built on foreshore or shoreline.
- Recreation parks occupy 0.3 km (9%) of foreshore.
- Sewer lines (<50m from water edge) are along 2.3 km (70%) of foreshore.
- Roadways extend to shoreline at 10 sites.
- 1.8 km (55%) foreshore land is Env. reserve; with 1 km (54%) ULU encroachment (<50m)
- FHA extends along 2 km (63%) littoral zone; ULU adjacent to 0.6 km (29%).
- Wooroi Creek catchment area includes significant urban land-use (34%, over 400 ha) inc. Tewartin GolfCourse.
- All urban run-off channelled via SW outfalls (36) into freshwater wetlands and Wooroi Creek drainage.
- Wooroi Creek tidal reach (3.4km length) lightly impacted: sewer pipelines along 0.7km (19%); no jetty structures; 2.6 km (74%) buffered from ULU by >100m wetland habitat; 3.2km (92%) of tidal reach designated environmental reserve and 2.8 km (82%) is FHA.
- Wooroi Creek mouth into main river at Moorindil Street significantly affected by NNS Ferry ramps, road reserve, recreation area, river access and structures.

Priority Sites for Restoration:

- #3: Moorindil Street – Ferry Park Foreshore – Wooroi Creek
- #4: Lakeside Park – Tewartin Esplanade – Sheep Island Foreshore
- #5: RSL and Tewartin Parks
- + Wooroi Creek Catchment Area



DOONELLA SECTION

Features

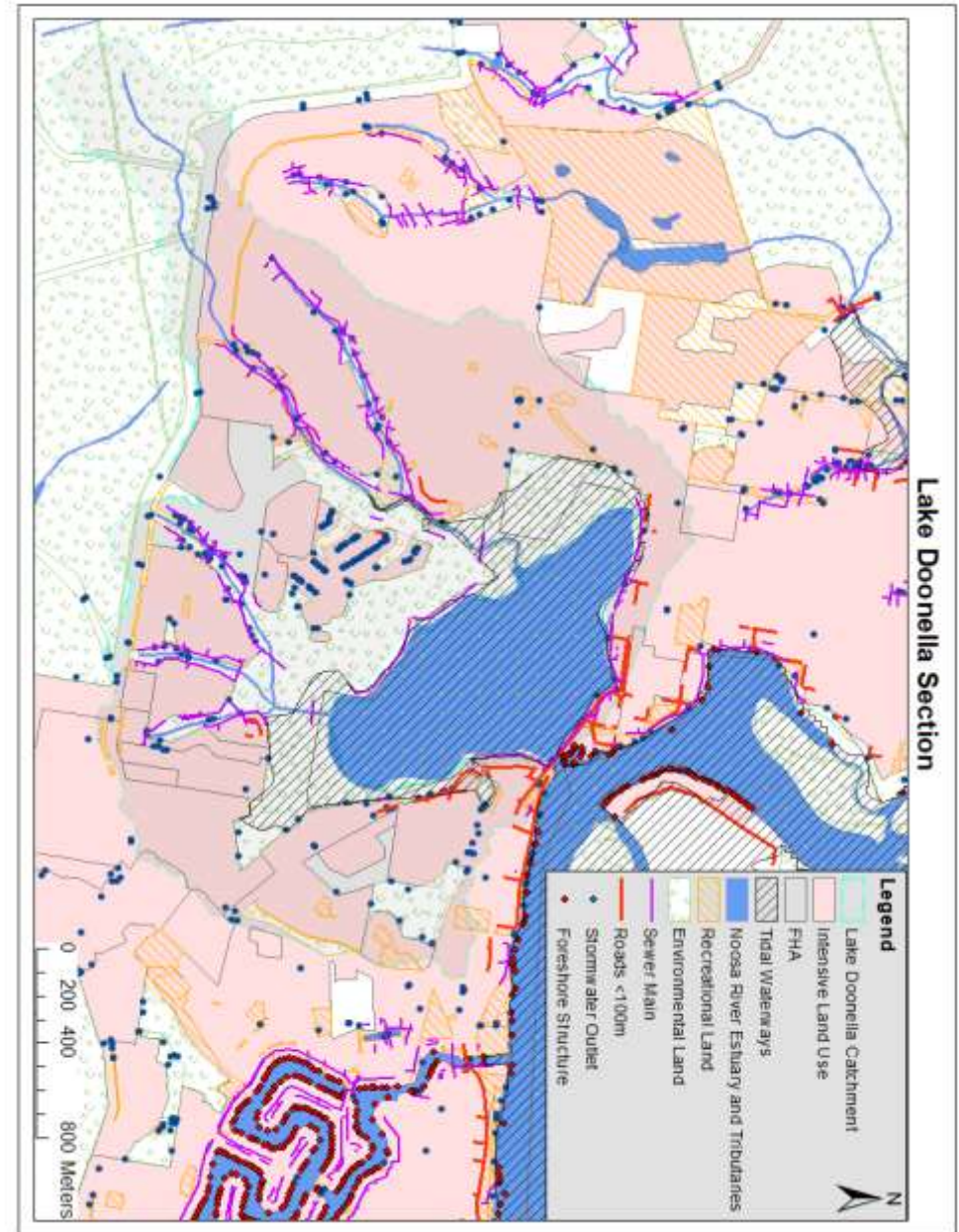
- Shallow tidal lake (124 ha), connected to main estuary via narrow channel under Doonella Bridge
- Extensive drainage basin (460 ha) surrounding the lake, includes 190 ha freshwater catchment draining into Cranks Creek; numerous small catchment areas around east, south and west sides of lake.
- Lake foreshore over 5 km in length (incl. 0.9 km Cranks Creek tidal reach)
- Tidal foreshore width varies (<50 m to >300 m); estimated area 80 ha dense salt- and freshwater wetland habitats.
- 3 km (75%) lake foreshore land designated environmental reserve; 0.7 km (>20% of reserve foreshore) with adjacent ULU (<50m buffer).
- 100% lake foreshore designated FHA. 0.8 km; 20% of FHA immediately adjacent to ILU.

Main Pressures

- Intensive urban land-use along 0.8 km (20%) of Doonella foreshore (<10 m to water's edge); on north and east sides.
- Encroachment from residential development and roadways <100 m from water's edge along additional 1.2 km (30%) lake foreshore
- SW drain outfalls at 17 foreshore sites.
- Main sewer pipelines along 3.7 km (90%) of lake shoreline, <50 m from water's edge
- 2 foreshore jetty structures
- Cranks Creek catchment includes 114 ha (60%) urban land-use; all run-off channelled into creek wetlands margins.

Priority Sites for Restoration:

- #6: North Lake Doonella Foreshore
- #7: Lake Doonella Bushland Reserve – Lakes Resort Foreshore
- #8: Cranks Creek Riparian - Esplanade
- + Cranks Creek Catchment Area



NOOSAVILLE SECTION

Features

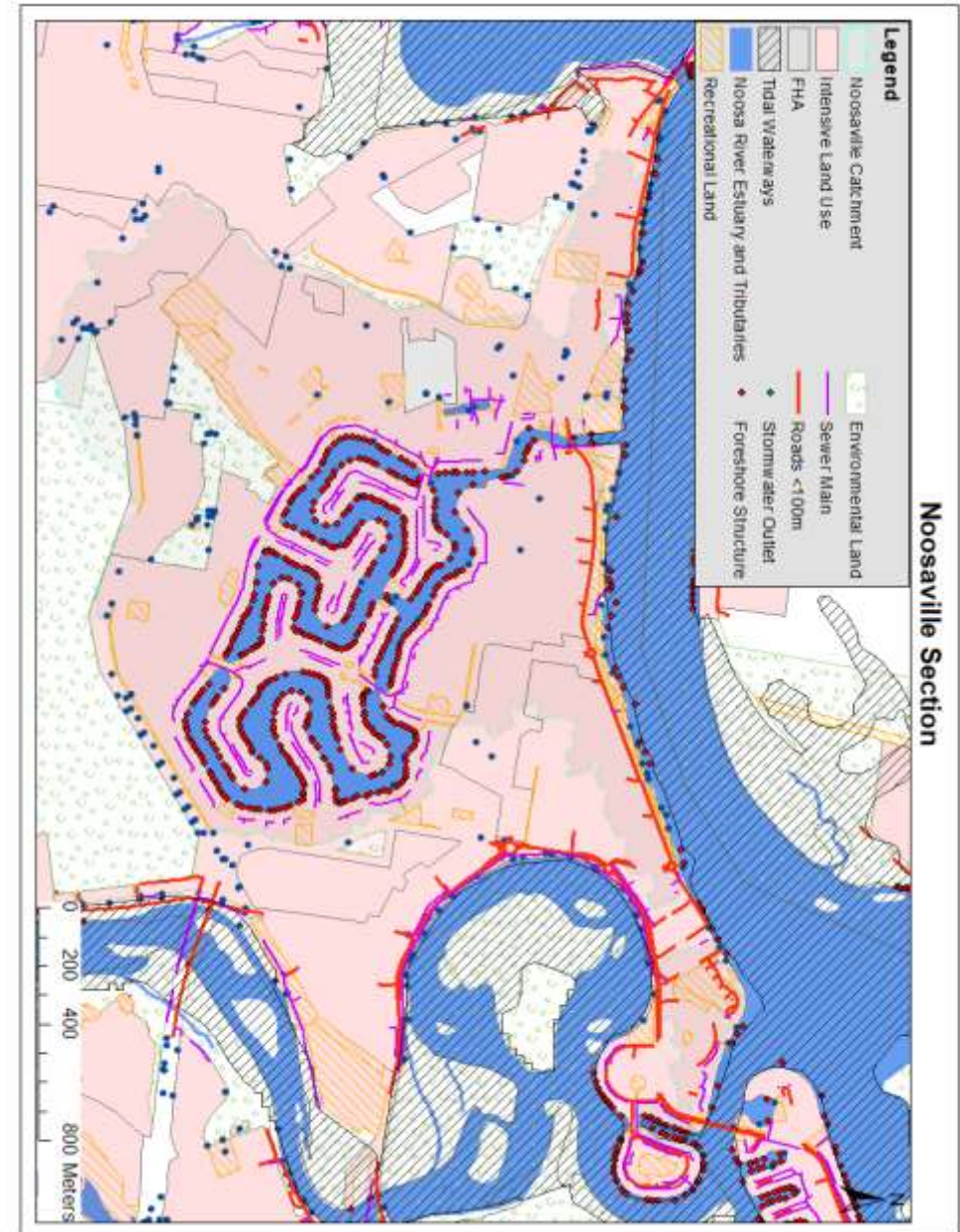
- 4km of tidal foreshore; plus 12.6km Noosa Waters constructed foreshore.
- Drainage basin 330ha: encompasses Noosa Waters canal estate and its catchment, incl. Shorehaven bushland park.

Main Pressures

- Most intensely developed section of the central Estuary: residential and commercial land-use occupies over 254ha (77%) of drainage basin; and 3.7km (94%) of the immediate Noosaville foreshore (<10m of the water edge); as well as along 100% of the Noosa Waters foreshore.
- Roadways (<100m from water's edge) occupy 3.1km (80%) of Noosaville foreshore; and 12.1km (97%) of Noosa Waters foreshores.
- All run-off is channelled and drained via the SW system onto the main river foreshore (42 SWD structures) or via Noosa Waters foreshore (23 SWD mapped).
- Recreation areas along 3.1km (78%) of Noosaville foreshore; and along 1.3km (11%) of Noosa Waters foreshore.
- 0.9km (22%) of Noosaville foreshore and 12km (94%) of Noosa Waters foreshore are impacted by sewer pipelines (<50m from water's edge).
- 47 waterway structures (jetties, ramps) built along Noosaville foreshore; 454 recorded in Noosa Waters.
- No foreshore or littoral zone designated environmental reserve or FHA.

Priority Sites for Restoration:

- #9: Hilton Esplanade Foreshore
- #10: Chaplin's Park Foreshore
- #11: Lion's Park (part) Foreshore



NOOSA HEADS SECTION

Features

- Noosa Spit and Woods - 4.2km foreshore
- Hayes Island - 5.6km foreshore
- 3.8km (90%) of The Spit and Woods foreshore land designated environmental reserve; (zero on Hayes Island).
- None of the littoral zone is FHA.

Main Pressures

- 1km (22%) of The Spit foreshore is ULU <10 m from water's edge; 1.7km (40%) ULU <100m from water's edge.
- 8 SW drains on foreshore. Sewer pipeline along 0.85km (20%).
- Recreation parkland occupies 0.7km (18%).
- Hayes Island foreshore and littoral zone are "reclaimed" land with little remaining ecological value: 100% of foreshore is developed ULU <10 m from water's edge; 0.6 km (10%) of foreshore is recreation area
- 18 SW drain structures + 197 jetties on foreshore.
- Roadways <100m from water's edge along 5.6km (100%) of foreshore.
- Sewer pipelines <50m from water's edge along 4.6km (83%) of foreshore.



WEYBA CREEK SECTION

Features

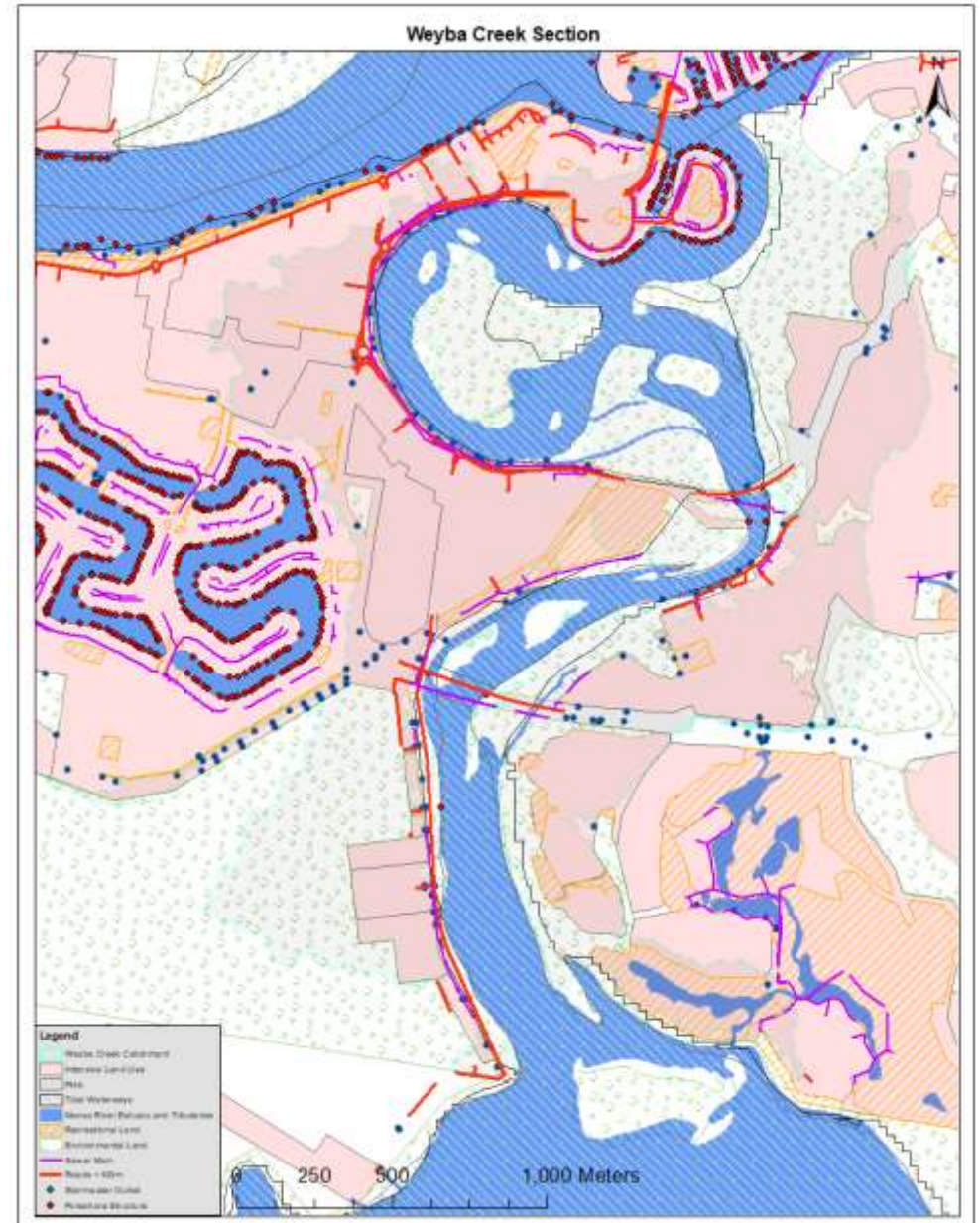
- Shallow tidal waterway (160 ha) runs from Lake Weyba to join main estuary at Noosa Sound, approximately 7km long and up to 250m wide with numerous sand-mud banks and islands.
- Local catchment basin over 325ha.
- Weyba Creek eastern foreshore extends 6km; 3.9km (66%) largely free from urban land-use (with >100 m buffer).
- 5.8km (98%) designated environmental reserve; 1.1km (20%) of reserve impacted by ULU <50m from water's edge. 5.9km (100%) designated FHA; less than 50m immediately adjacent to urban land-use.
- The western foreshore is 6.2km; only 1km (17%) partially buffered from ULU (>100 m).
- 3.4km (54%) designated environmental reserve; 0.8km (25%) impacted by urban land-use <50m.
- 5.5km (87%) designated FHA; with ULU immediately adjacent along 3.5km (64%).

Main Pressures

- 180ha (55%) of catchment area is developed Urban Land-Use.
- 5.2km (83%) of western foreshore has ULU <100m from water's edge; includes 3.5km (56%) ULU directly on shore (<10m).
- Recreation area along 0.4km (6%) foreshore.
- Roadway (<100 m from water's edge) developed along 5km (80%) of foreshore.
- Sewer pipelines along 6 km (94%) of foreshore (<50 m from water's edge)
- 75 SW drains; 29 jetty structures along foreshore.
- Eastern foreshore comparatively undeveloped: ILU <100 m from water's edge along 2km (34%) of foreshore; and <10 m along just 38m (1%).
- No recreation area mapped on eastern foreshore.
- Noosa Springs development and golfcourse collect significant urban run-off and drain into southern end of Weyba Ck.
- Roadway (<100 m from water's edge) along 0.5km (10%) of foreshore.
- Sewer pipelines (<50 m) along 1.3km (22%).
- 11 SW drain outfalls; 4 jetty structures along foreshore.

Priority Sites for Restoration:

- #12 Weyba Creek Park-Esplanade
- + Noosa Springs Catchment



Site 1. Ferry Park – Moorindil Street

THE SITE

The land is primarily Road Reserve with adjacent Bushland Reserve, National Park and private residential land.

SIGNIFICANCE

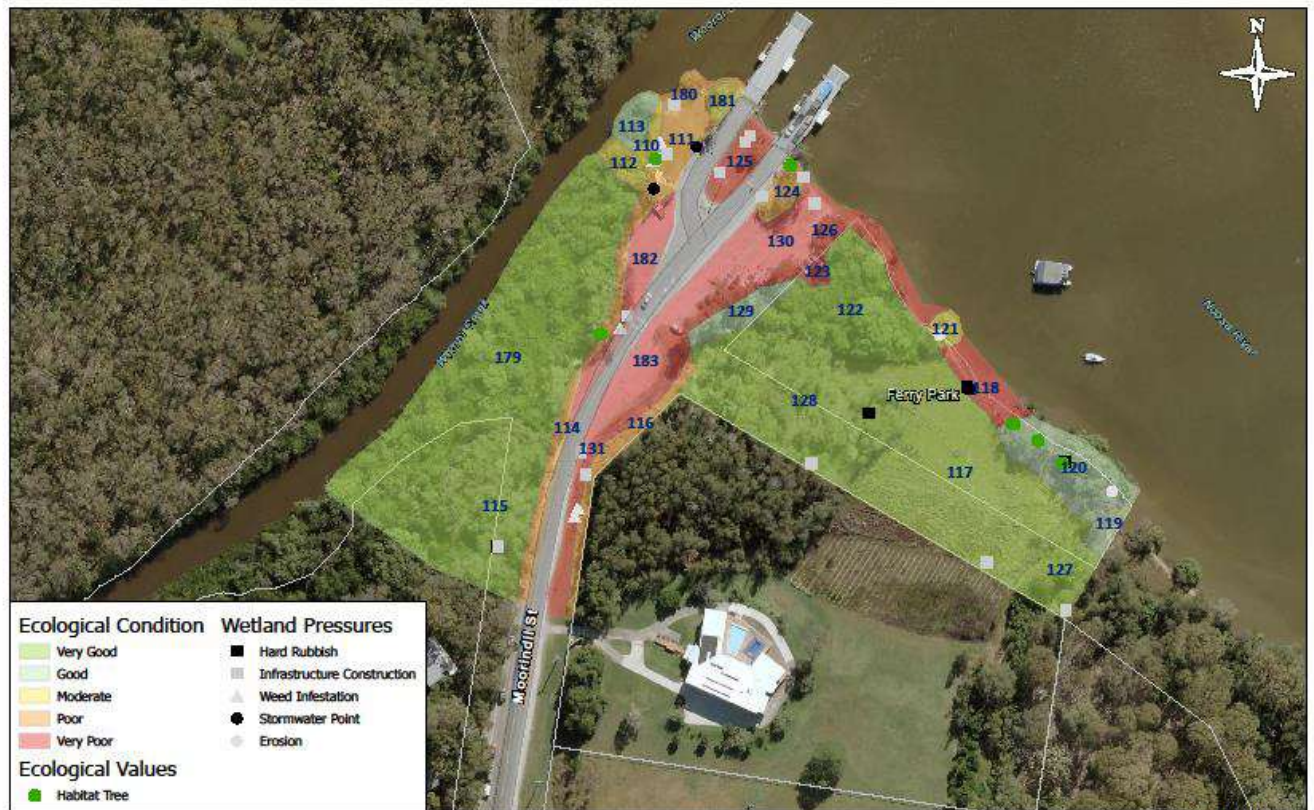
- Main gateway and car ferry access to North Shore
- Adjacent QPWS visitor centre and amenities
- Attractive riverside park setting adjoining significant littoral and riparian wetlands
- Only significant access point to River and foreshore between Tewantin boatramp and Lake Cooroibah.
- Only access point to Wooroi Creek, the only significant tributary creek into the central estuary.

MANAGEMENT ISSUES

- Degraded road margins and uncontrolled run-off
- Degraded wetland vegetation and invasive weeds.
- Degraded foreshore with old drains and structures; soil erosion, beach erosion
- Vehicle and trailer parking encroachment into wetland
- Sub-standard and unattractive infrastructure
- Excessive unattractive signage
- Limited pedestrian access along foreshore.

RESTORATION CONCEPT

1. Demarcate edges to roadway, boat ramp and parking.
2. Close vehicle access on north side of current tarmac.
3. Construct gravel vehicle access to new small boat ramp (corduroy surface) across existing erosion beach
4. Construct new parking area along Moorindil St >80m back from road end/ ferry ramp.
5. Divert all road run-off into retention basin wetlands; close and rehabilitate existing drains.



Noosa Integrated Catchment Assn. Inc.
Spatial Reference Name: WGS 1984 Web Mercator Auxiliary Sphere

Foreshore Management Considerations Ferry Park

6. Clean-up entire foreshore – old structures, debris, weeds, including shore and adjacent sub-tidal
7. Rehabilitate and plant 50m buffer to Wooroi Creek and Ferry Park edges
8. Develop riverside nature trail – for walking and kayak (i) from Ferry Park to Tewantin centre; (ii) along Wooroi Creek and through Moorindil Reserve; rehabilitate existing foreshore damage.
9. Engage residential property owner in edge treatment along wetland: property boundary.

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Site 2. Tewantin riverside & Lakeside Park

THE SITE

State-owned, Council managed tidal foreshore land. Above HWM is mixture of Parkland (Lakeside), Road Reserve and private properties; no foreshore esplanade buffers.

SIGNIFICANCE

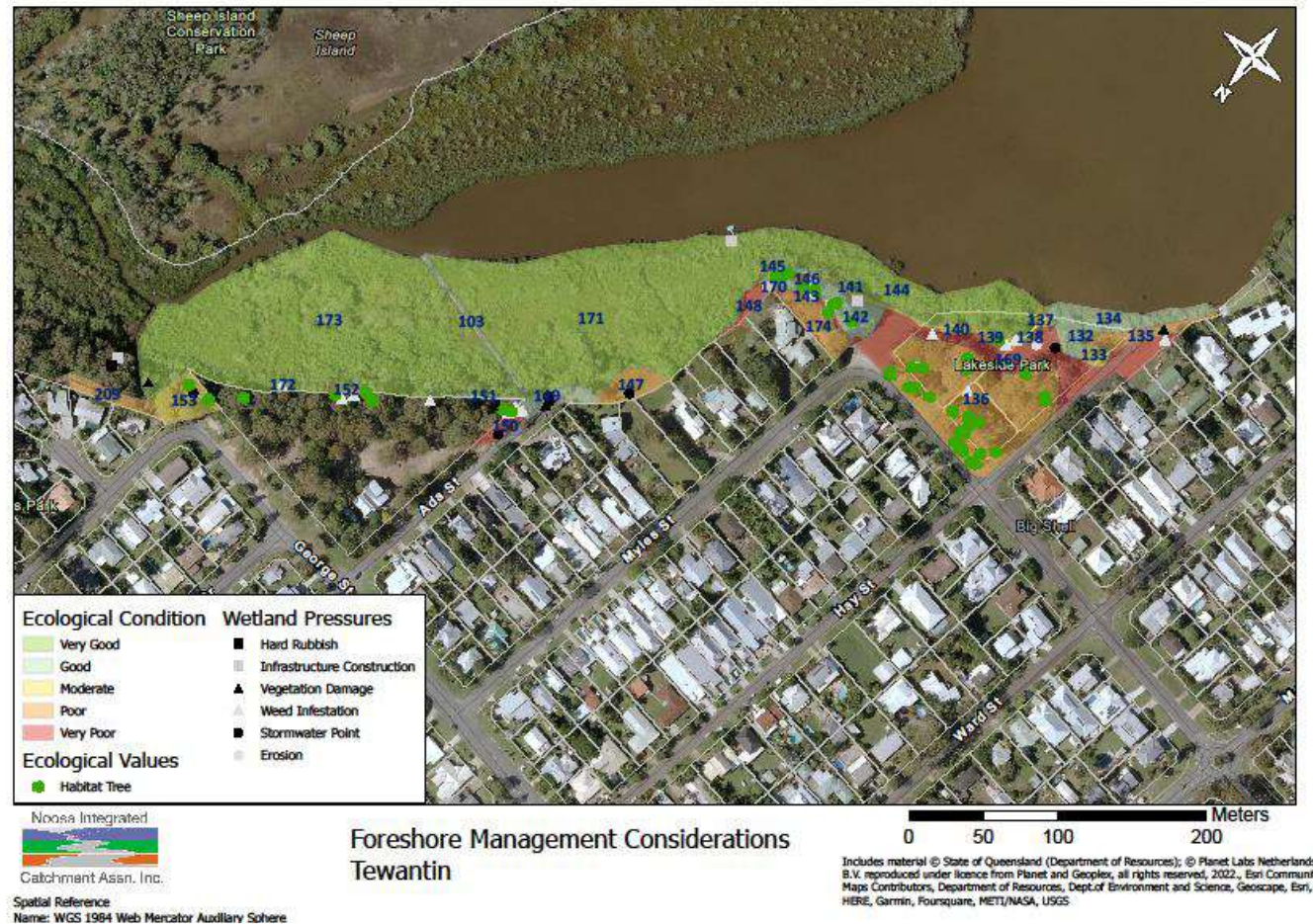
- Significant riverside wetlands; extensive mangroves, marsh, woodlands and habitat trees.
- Cultural features – midden, remains of fishing huts, derelict boardwalks.

MANAGEMENT ISSUES

- 4 Road Reserve extensions onto foreshore (Hay, Gympie, Ada, George Streets) - vegetation clearing, ground in-fill, rubbish dumping, weeds.
- Stormwater drain outfalls and contaminated run-off directly into wetlands or to water's edge.
- Long-term weed infestations from vegetation clearing and SWDs.
- Encroachment and intrusions from residential properties (on Hay, Gympie, Myles, Ada, George Streets) - fences, mowing, debris, weeds, pets, access.
- Sewer main on foreshore; debris and weed spraying round manhole structures. Occasional overflow raw sewage into wetland/ River.
- No provision for public access/ enjoyment of riverside wetlands.

RESTORATION CONCEPT

1. Engage all residential property owners in edge protection along wetland : property boundary – retention of run-off, weed clearing, fence removal, debris removal, pet control; resilient edge planting.
2. Clean-up old structures, infill, debris, garden waste, long-term weed infestations.
3. Convert SWD structures into functional littoral wetlands (enhanced Retention Basins).
4. Demarcate and develop riverside walking track nature trail from George Street (and north to Ferry Park) to Lakeside Park, Crank Street (and future extension south to Ward Park). Develop track access links at Crank St, Lakeside Park, Ada St, George St.



5. Construct River viewpoint at converted & rehabilitated sewer manhole site (north end Lakeside Park)
6. Develop kayak river access (timber ramp/ boardwalk) at Lakeside Park – converted-rehabilitated SWD.
7. Establish nursery and pilot gardens site for wetland plants incl. mangroves; adjacent to rehabilitated SWD.
8. Landscape and plant Lakeside Park and ends of Road Reserves with foreshore woodland-wetland native species; resilient littoral edge planting; habitat enhancements for wetland plants, amphibians, birds, insects.

Site 3. Tewantin and RSL Parks

THE SITE

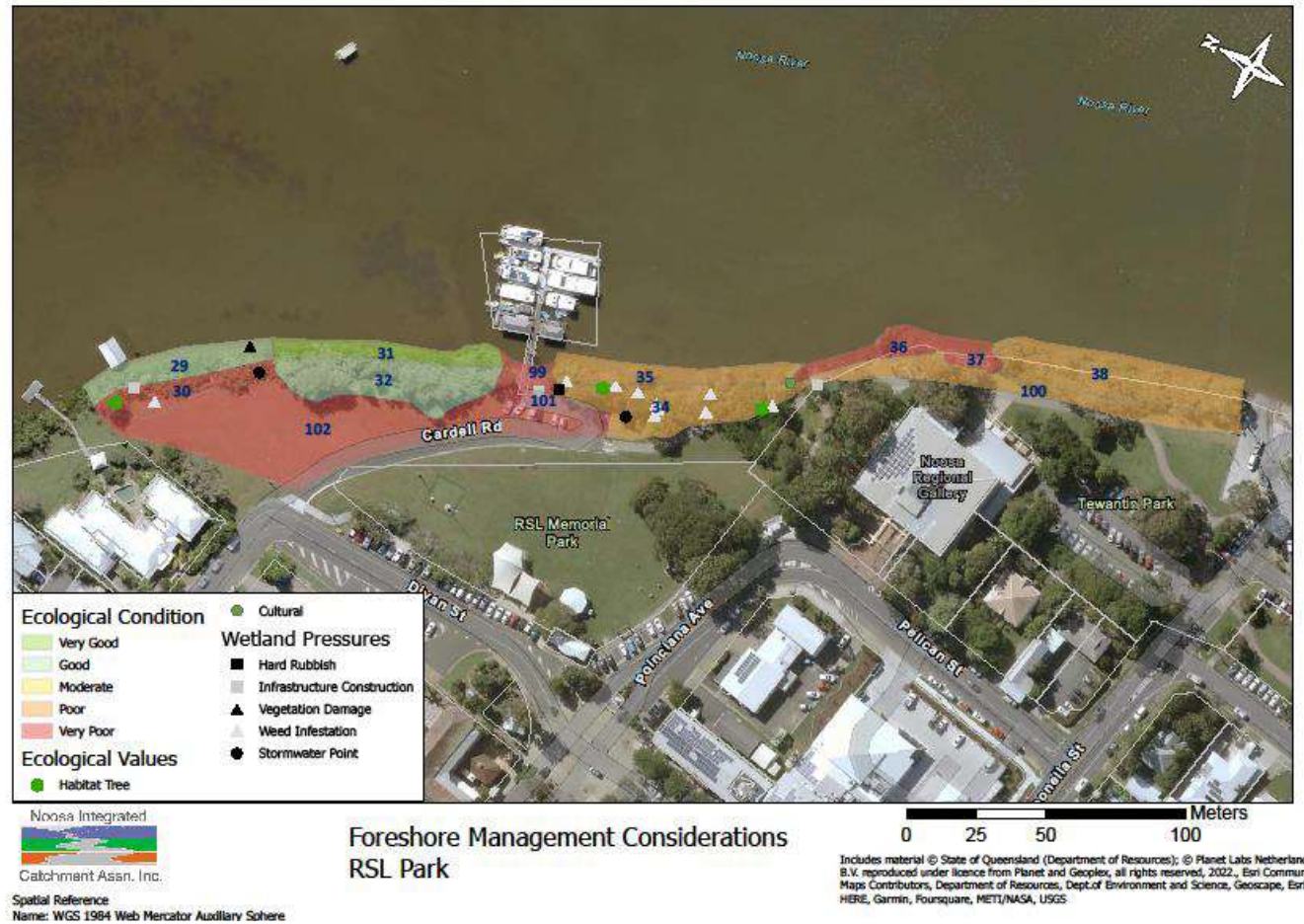
Council Parkland and Road Reserve, extending to Tewantin boat ramp and carpark. Noosa Council Chambers, Regional Gallery, car parking and landscaping at centre of site.

SIGNIFICANCE

- Prime riverside location in central Tewantin, with Tewantin foreshore and Sheep Island to the north, the main River channel extending to the east, and Lake Doonella and entrance to the south.
- Key foreshore-littoral site provides significant opportunity for pilot and demonstration of Living foreshore restoration and enhancement techniques.
- Littoral habitats in good (northern part) to poor condition (southern); new pilot oyster reef construction adjacent to degraded southern portion.
- Key site for access and enjoyment of information - education facilities re Noosa River and Biosphere; including Aboriginal and European use of river and wetlands.

MANAGEMENT ISSUES

- Shore degraded by edge encroachment, wave erosion, vegetation damage, weeds.
- Road/pathway along length of park and riverside blocking and channelling run-off.
- Unattractive landscape over most of Park land.
- Encroachment of Council & Gallery building and landscaping across most of riparian zone.
- SW drains destroy habitat, channel contaminated run-off into wetland and waterway, increase erosion.
- Vehicle parking directly on shoreline – habitat loss, ground erosion and run-off directly into waterway.
- Boat ramp washdown of boats, cars, trailers flushes contaminated run-off into waterway.
- Fish gutting station sends offal directly into waterway.
- Excessive, unattractive signage by multiple agencies.



Foreshore Management Considerations RSL Park

RESTORATION CONCEPT

1. Landscape and plant mown riverside area into attractive foreshore woodland-wetland landscape with strengthened littoral edge and habitat enhancements for wetland plants, amphibians, birds, insects.
2. Convert and re-landscape SW outfall structures into functional littoral wetlands with mangrove gardens.
3. Develop nature trail (bark/gravel surface) to restored foreshore woodland-wetlands.
4. Develop Living Foreshore information, viewpoint, signage and education materials.
5. Close and rehabilitate existing parking area on foreshore.
6. Remove washdown taps and fish cleaning facilities from boat ramp.
7. Redesign and install attractive interpretive information and signage at boat ramp.

Site 4. North Lake Doonella Foreshore

THE SITE

Council controlled foreshore land; 5 Road Reserves butt onto shore; residential properties extend onto foreshore.

SIGNIFICANCE

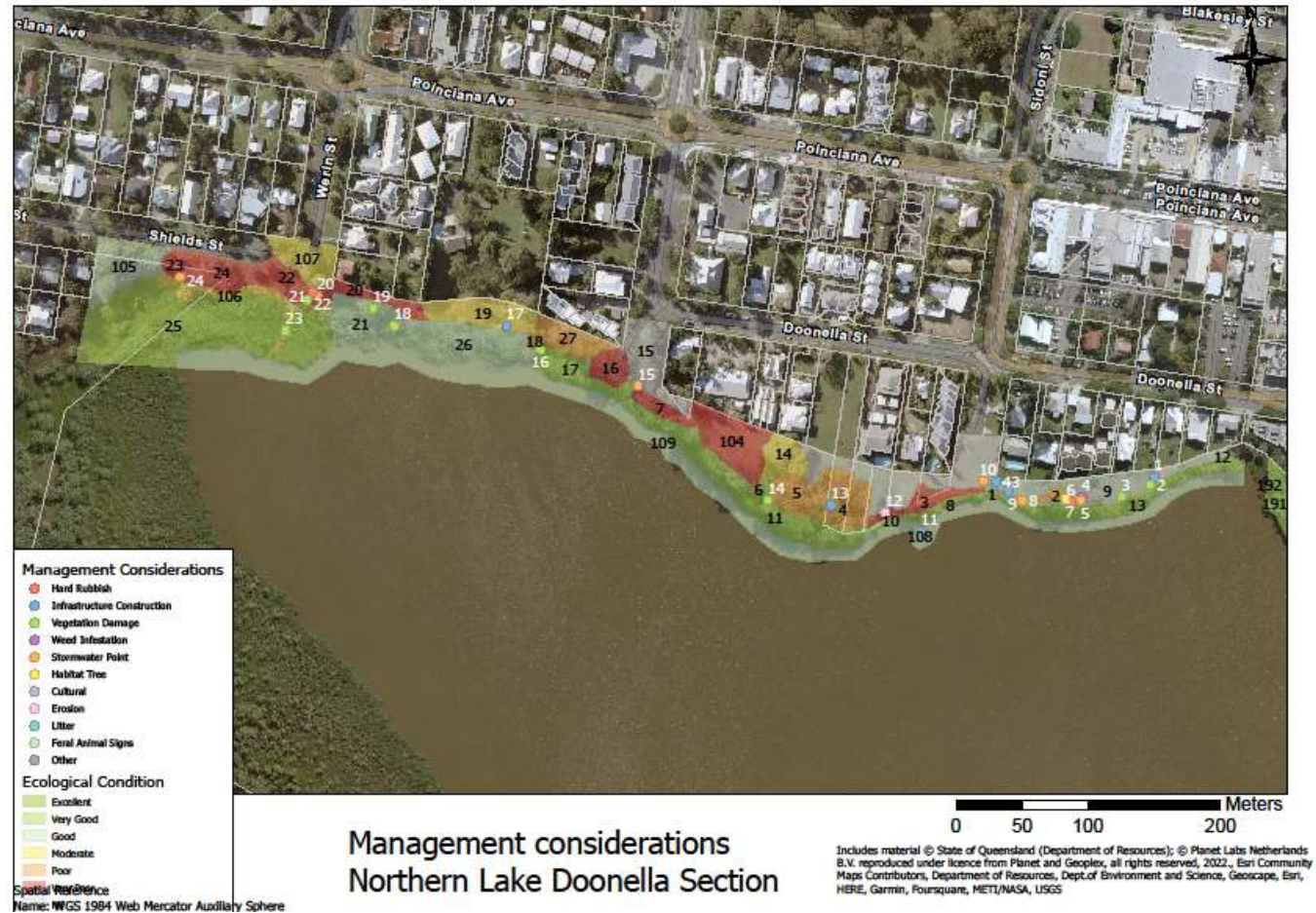
- Important northern shoreline of Lake Doonella; southern edge of Tewantin town centre.
- Prime opportunity for pilot-demonstration of living foreshore restoration, biodiversity and amenity enhancement; community access and engagement
- Significant fringing wetland and mangrove margin; adjacent Lake shallows with dense seagrass meadow. Fish Habitat Area.
- Connection (west) to ecologically important mangrove-marsh-woodland wetlands (designated Wetlands Refuge and FHA).

MANAGEMENT ISSUES

- Road Reserves extend across shore to water's edge.
- Urban run-off directly from Road Reserves into wetland.
- Encroachment, erosion, run-off from residential properties along extensive landward edge.
- Long-term weed infestations, vegetation damage, clearing, poisoning, littoral debris, rubbish.
- No foreshore conservation management or engagement of property owners in co-management.
- No public access or interpretive facilities to foreshore.

RESTORATION CONCEPT

1. Clean-up, landscape and replant severe degraded areas around SW outfalls from Road Reserves; create functional littoral wetlands
2. Engage all residential property owners in foreshore-wetland edge management – retention of run-off, weed clearing, fence removal, debris removal, pet control.
3. Plant strengthened wetland margins + habitat enhancements for fish amphibians, birds, insects.



4. Construct wetland walking track/ boardwalk + nature trail from Goodwin St to Memorial Ave/ Doonella Bridge.
5. Construct foreshore viewpoints/ hides (on foreshore Road Reserves – Werin, Moorindil, Sidoni Sts)
6. Develop information, signage materials.
7. Rehabilitate degraded shore and rock jetty construction at Sidoni St.
8. Construct kayak launch ramp.

Site 5: Hilton Esplanade & Parade

THE SITE

Council Road Reserve and Esplanade – Hilton Esplanade and across ‘parkland’ to Hilton Terrace . Private properties only on land side of Road Reserve-Esplanade.

SIGNIFICANCE

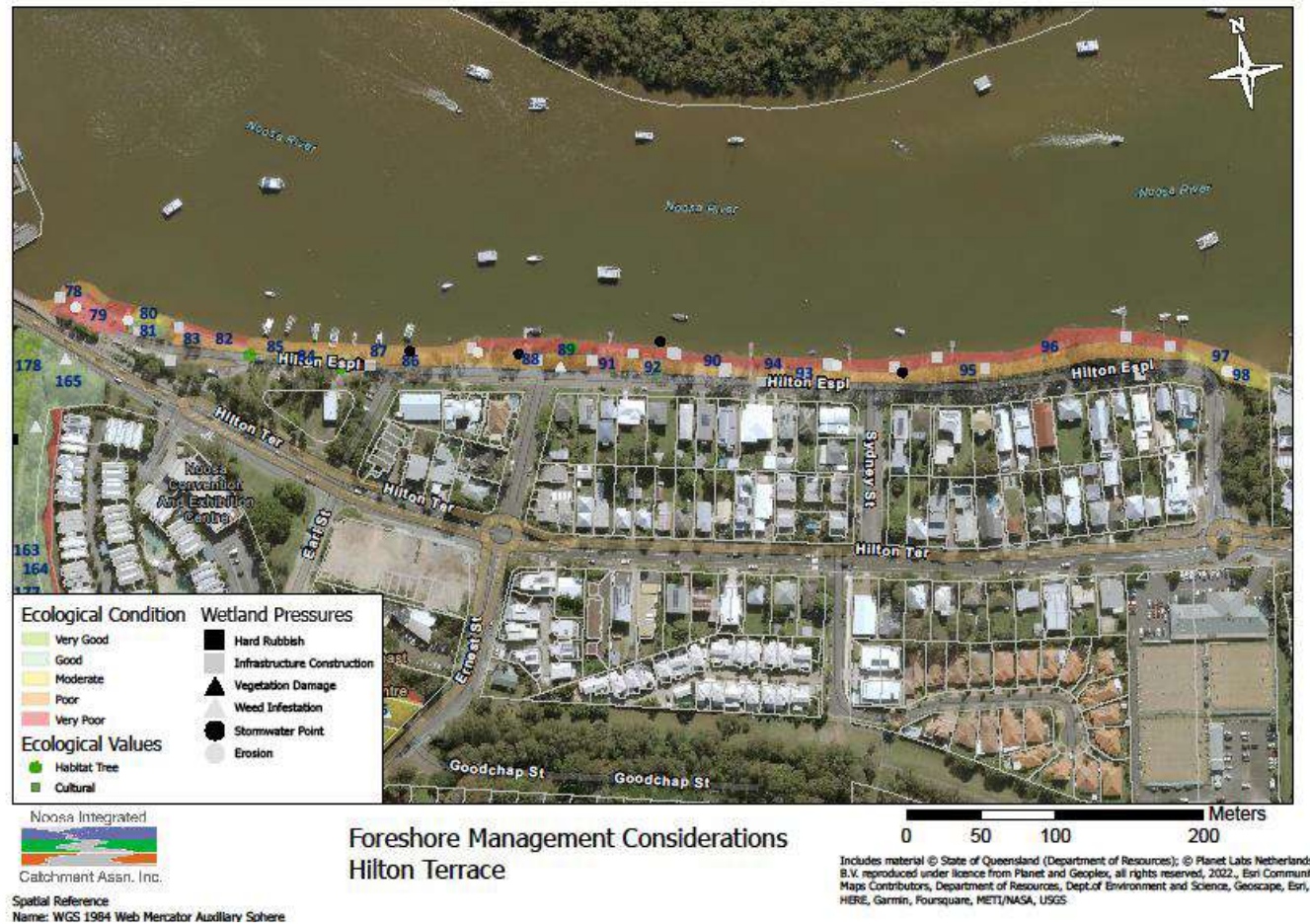
- Important stretch of ‘semi-natural’ foreshore and littoral zone, with no freehold property on foreshore; significant opportunity for improved management, foreshore restoration and enhancement.
- High amenity remnant riparian vegetation with mature habitat trees – blue gum, tuckeroo, sheoak, mangrove.
- Important foreshore buffer between main River channel and riverside properties.

MANAGEMENT ISSUES

- Severely degraded foreshore; extensive shore and foreshore erosion and vegetation loss:
- Eastern half of Esplanade is reinforced with major rock walling caused enhanced erosion both further along shore and to riverbed below.
- Western half of site highly degraded, with total vegetation loss and severe erosion, from misuse for boat launching-retrieval and vehicle & trailer turning/ parking.
- Large amount of shore debris, obsolete structures.
- SWD and jetty structures with reinforcing rock exacerbate severe shore and foreshore erosion.
- No mitigation of run-off from extensive hard surfaces and nearby properties.
- Large numbers of hard street/ park furniture, bins, signage, seats, tables directly on limited foreshore – destroy habitat, cause erosion, detract from amenity.
- Excessive beaching, tying and anchoring of vessels in shallows and on shoreline.
- Excessive roadway and parking encroachment and damage to foreshore.

RESTORATION CONCEPT

1. Designate Foreshore Reserve to replace road reserve and parkland. Landscape, re-surface and re-plant entire foreshore as functional habitat, incl. rehabilitation of Living Foreshore parkland across entire west end of road reserve and Fire Station surrounds.



2. Limit parking to landward side of surfaced roadways - Hilton Esplanade and side streets. Prohibit vehicle access beyond west end of private properties on Hilton Esplanade
3. Limit anchoring and landing to designated sites; prohibit all other beach land, anchoring and storage of vessels and associated items.
4. Install small boat/ kayak eco-design ramp and finger jetty.
5. Plant mangrove gardens at 3-4 sites along shoreline shallows adjacent to strengthened foreshore vegetation
6. Stop channel dredging within 100m of shoreline.
7. Install line of eco-moorings at 60m distance from shoreline
8. Plan for removal and non-replacement/ non-repair of all private jetties on foreshore.

Site 6. Lakes Resort, Goodchap St Foreshore

THE SITE

Largely road reserves, margins and shore extensions along Goodchap-Ernest, Earl Streets, Hilton Terrace-Memorial Avenue. Parts of Council reserve land; foreshore and grounds around Tait-Duke Cottage-Youturn, Lakes Resort and residential properties.

SIGNIFICANCE

- Prime lakeside and riverside locations close to Tewantin centre and Marina precinct.
- High ecological and amenity value wetlands; portions of FHA and wetland reserves
- Contiguous and vital connecting links between Lake Doonella wetlands, Wallace Park wetland and drain, west end Hilton Esplanade (adjacent Priority Sites 3, 4, 5)

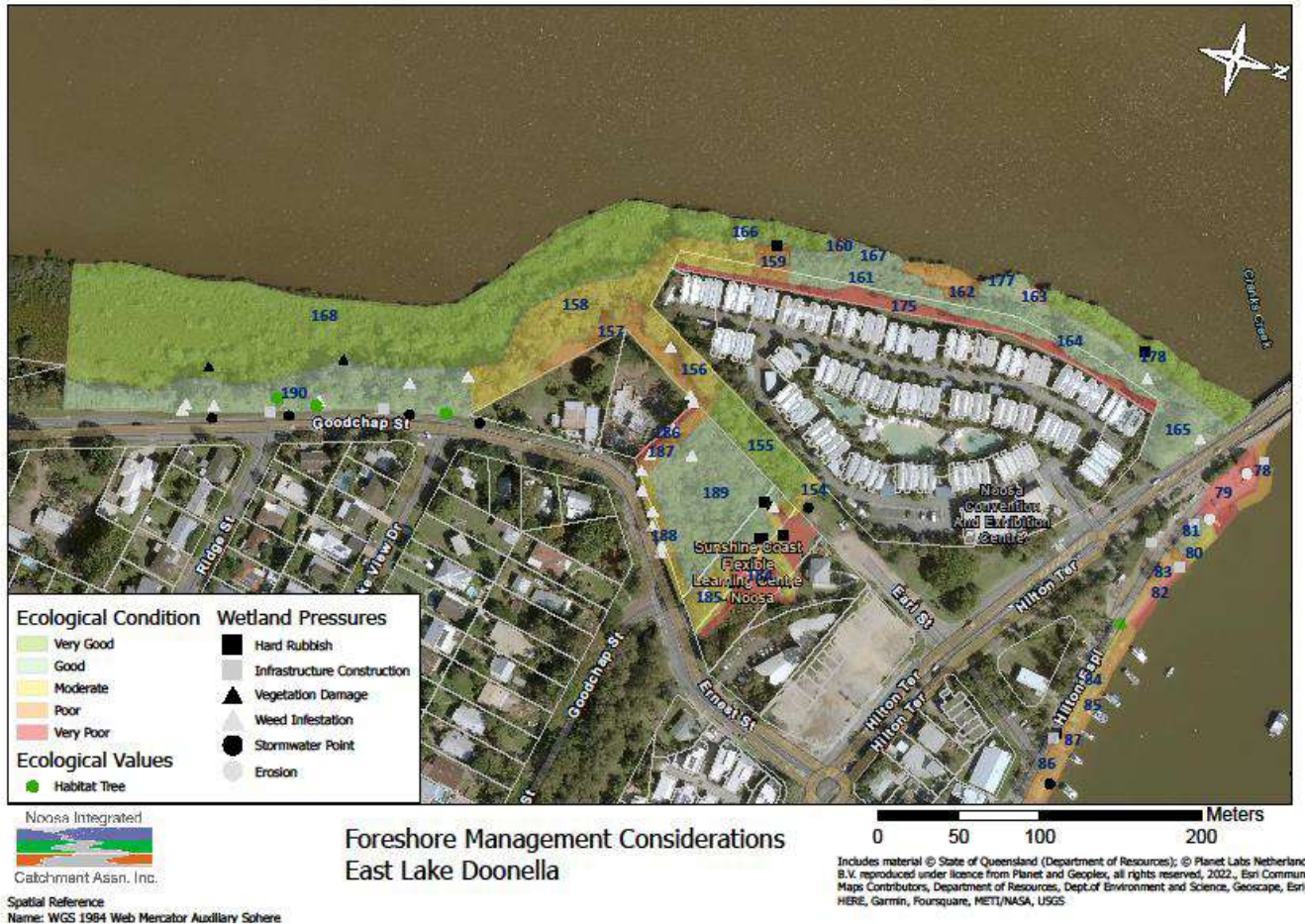
MANAGEMENT ISSUES

- Encroachment and edge degradation along road reserves and around each property - erosion, run-off, weed infestations, vegetation damage, clearing, littoral debris, obsolete structures.
- SWD structures and run-off, weed and litter directly into wetlands
- Illegal boat launch, storage and camp sites with damaged vegetation, debris.
- No foreshore or littoral conservation management.
- No engagement of property owners in co-management.
- No public access or provision of interpretive facilities.

RESTORATION CONCEPT

1. Designate Foreshore Reserve or special management area, adjacent to Hilton Esplanade designated area
2. Clean-up, landscape and replant degraded areas along Road Reserves including Earl Street- Lakes Resort to Goodchap Street
3. Convert SWD to series of functional wetlands.
4. Engage all residential property owners in foreshore-wetland edge management – retention of run-off, weed clearing, debris and litter removal and prevention.

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5. Rehabilitate degraded shore sites; plant strengthened wetland margins + habitat enhancements for fish amphibians, birds, insects.
6. Construct wetland walking track/ boardwalk + nature trail around Lake Doonella foreshore with information, signage materials.
7. Construct foreshore access/viewpoint/kayak launch on Lake Doonella (in front of Lakes Resort).

APPENDICES

Methodology

To systematically assess wetland pressures across the central Noosa Estuary and catchment, the study area was separated into six sections: Tewantin, Doonella, Noosa North Shore, Noosaville, Noosa Heads and Weyba Creek.

A range of wetland pressures, including intensive land use, roads, stormwater points, sewer infrastructure and foreshore infrastructure were identified and mapped, as well as factors providing environmental protection including fish habitat areas (FHAs) and foreshore areas with environmental land buffers.

The following quantitative section statistics and proxy measurements of pressures were used:

- i. **Section-sub catchments and Creek Basins:** Watersheds were delineated from the Digital Elevation Model (DEM) of Australia derived from a LiDAR 5 Metre Grid (Geoscience Australia 2022). Hydrology tools were applied in Esri ArcGIS to delineate the sub-section catchments and major creek basins.
- ii. **Tidal Waterways:** Tidal waterways were defined using the Queensland waterways for waterway barrier works spatial data layer (Department of Agriculture and Fisheries 2021). The tidal waterway areas and foreshore lengths for each foreshore section were calculated using Esri ArcGIS software.
- iii. **Proximity to intensive urban land use (ULU):** Intensive land uses were identified and classified based on the primary classes under the Australian Land Use and Management Classification Version 8 (ABARES 2016). Under the classification, intensive land uses are defined as “land subject to substantial modification, generally in association with closer residential settlement, commercial or industrial uses”. These intensive land uses are highly associated with increased pressure on wetlands, through direct destruction and replacement of wetlands, altered hydrology, nutrient, and contaminant inputs, as well as invasive weed, litter, and hard rubbish inputs (Newton et al. 2020).
- iv. The most recent Queensland land use mapping dataset for the Maroochy and Noosa catchments (Department of Environment and Science 2013) was used to calculate intensive land uses for each section, including buffer distances between ULU and wetlands habitat. This is based on Queensland Fisheries Guidelines for Fish Habitat Buffer Zones (Bavins et al. 2000), which recommends 100m buffer between developments and tidal lands, especially adjacent to Fish Habitat Areas (FHAs).
- v. **Roads:** Roads were identified using the Baseline Roads and Tracks dataset and buffered to within 100m of tidal waterways (State of Queensland Department of Resources 2021).
- vi. **Shoreline structures:** The locations of jetties, pontoons, bridges and boat ramps were mapped in Esri ArcGIS ArcMap. The high-resolution Queensland imagery web map service (Queensland Department of Natural Resources and Mines 2017) was used as a base map to locate and count the number of shoreline structures in each section.
- vii. **Stormwater points:** The locations and number of stormwater points for each foreshore section were identified using the Noosa Shire Council (Noosa Shire Council 2022b) and Sunshine Coast Regional Council (Sunshine Coast Council 2021b) stormwater infrastructure datasets.
- viii. **Sewer infrastructure:** The lengths of foreshores under pressure from sewer infrastructure were calculated for each foreshore section by clipping the UnityWater sewer infrastructure dataset (UnityWater 2019) to within 50m of foreshores, and then calculating the length of foreshore impacted by the sewer infrastructure.
- ix. **Recreation parks and recreational areas (including sports ground):** Public recreation parks and sports grounds are a prominent feature on parts of the foreshore of the lower Noosa River estuary. These areas involve clearing natural habitat, land form and earthworks, nutrient loads from fertilisers, pollutants from pesticides, poor weed and vegetation management. For this assessment, the length of foreshore affected by recreational areas on the foreshore (<10m from water edge) was measured. Recreation areas were identified and classified using the Noosa Openspace (Noosa Shire Council 2022a) and Sunshine Coast Council Openspace datasets (Sunshine Coast Council 2021a).
- x. **Environmental and conservation areas:** Designated environmental areas extend to the foreshore along parts of Noosa North Shore, Lake Weyba and Lake Cooroibah. In the more urbanised central estuary environmental areas are either absent or provide inadequate buffer (<50m) against intensive land use pressures. Environmental areas were identified and classified using the Noosa Openspace (Noosa Shire Council 2022a) and Sunshine Coast Council Openspace datasets (Sunshine Coast Council 2021a).
- xi. **Fish habitat areas:** A declared fish habitat area (FHA) is intended to protect against physical disturbance from intensive land or waterway use, while allowing legal fishing. The Queensland Fish Habitat Areas (FHA) shapefile (Department of Environment and Science 2018) was used in Esri ArcGIS ArcMap to calculate the length of shoreline/ littoral zone in each section designated as Noosa River Fish Habitat Area (FHA). The extent of urban land-use near the FHA was measured in each part of the estuary.

Dataset Name	Overview	Sources
Baseline roads and tracks - Queensland	Vector line dataset defining locations, names, classes of Queensland roads	(State of Queensland Department of Resources 2021)
Digital Elevation Model (DEM) of Australia derived from LiDAR 5 Metre Grid	LiDAR derived DEM raster dataset - used to delineate sub-catchment basins by applying watershed delineation tools in Esri ArcGIS ArcMap	(Geoscience Australia 2015)
Fish Habitat Areas - Queensland	Vector polygon dataset defining Qld Fish Habitat Areas (FHAs) - used to calculate length of shoreline declared FHA	(Department of Environment and Science 2018)
High-resolution Queensland imagery web map service	High resolution raster image used as base map for locating a range of on-ground features, including shoreline structures.	(Queensland Department of Natural Resources and Mines 2017)
Noosa Council Open Space	Open space vector dataset for Noosa Shire Council, capturing location of National Parks, State Forests, local environment reserves, recreation parks, sports grounds	(Noosa Shire Council 2022a)
Queensland land use mapping – Maroochy Noosa catchment	Land use vector dataset	(Department of Environment and Science 2013)
Queensland waterways for waterway barrier works - Tidal	Vector polygon dataset defining tidal waterway areas in Queensland - used to delineate tidal waterway extent.	(Department of Agriculture and Fisheries 2021).
Noosa Stormwater	Stormwater utilities across Noosa Shire Council region - used to identify locations of	(Noosa Shire Council 2022b)

	stormwater points along each foreshore section and catchment area	
Stormwater Sunshine Coast Council	Stormwater utilities across Sunshine Coast Council region - used to identify locations of stormwater points along each foreshore section and catchment area	(Sunshine Coast Council 2021b)
Sunshine Coast Council Open Space	Open space vector dataset for Sunshine Coast Regional Council, capturing location of National Parks, State Forests, local environment reserves, recreation parks and sports grounds.	(Sunshine Coast Council 2021a)
UnityWater Sewer Infrastructure	Unitywater sewer infrastructure - used to calculate lengths of foreshores impacted by sewer infrastructure.	(UnityWater 2019)

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