

Pumicestone Passage and Catchment Action Plan 2013–2016



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Acknowledgements

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involved in the development of this document.

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Acknowledgements

We acknowledge the traditional custodians of the Pumicestone Passage and catchment, where we live, work and play, and their rich culture in which people and country are inseparable. These are the Jinibara People (determined native title holders for land that include the western mainland catchment) and the Kabi Kabi People (registered native title claimants for lands that include the remaining mainland and Bribie Island areas).

We also acknowledge and thank the many stakeholders who have contributed to this Action Plan, in particular, the community, industry, primary producer and government groups who have pledged their ongoing support (see following page). The Pumicestone Passage catchment supports the lifestyles and livelihoods of everyone involved in this planning process, and all stakeholders recognise that a cooperative approach is needed to protect it for the future.

Pledge of Support

This Pumicestone Passage and Catchment Action Plan 2013-2016 unites the valuable efforts of many partners who live, work and play in the Pumicestone catchment and recognise its regional and international importance.

We wholeheartedly support this plan and commit to working together with other partners to implement its actions and protect the unique environmental, social, cultural and economic values of the catchment and waterways.

Sunshine Coast Council

Moreton Bay Regional Council

Queensland Government

Australian Pineapples

**Bribie Island Environmental
Protection Association /
Moreton Bay Eco-Alliance**

**Caloundra Chamber of
Commerce and Industry**

**Coochin Creek
Bushland Group**

**Donnybrook
Progress Association**

**Glasshouse Country
Chamber of Commerce**

**Glasshouse Mountains
Advancement Network**

**Golden Beach
Progress Association**

Growcom

Healthy Waterways Ltd

HQPlantations Pty Ltd

Jinibara People

Kabi Kabi People

**Night Eyes Water
and Landcare**

**Pumicestone Region
Catchment Coordinating
Association**

**Queensland Chicken
Growers Association**

**Queensland Strawberry
Growers Association**

SEQ Catchments

Stockland

Sunfish

**Sunshine Coast
Environment Council**

**Take Action for
Pumicestone Passage**

**Toorbul
Progress Association**

Turf Queensland

**Urban Development
Institute of Australia**

Unitywater

**University of the
Sunshine Coast**

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Executive Summary

The Pumicestone Passage is a tidal waterway between Bribie Island and the mainland, winding 45 kilometres from Caloundra in the north to Deception Bay in the south. The Passage has extensive mangrove forests, seagrass meadows and inter-tidal sandbars and mudflats, which provide valuable habitat for fish, dugong, turtles, crabs, oysters, juvenile prawns and a wide variety of local and migratory waders and shorebirds. It also provides a wide range of water-based recreational activities that support local lifestyles and tourism.

The 784 sq km catchment includes major forestry plantations and other primary production, including pineapples, strawberries, turf and tree cropping; a population of 61,000 people in urban areas of Caloundra, Bribie Island and several hinterland towns (based on 2011 census data); and protected bushland areas, including national park reserves around the iconic Glass House Mountains and on Bribie Island.



This document is an Action Plan for the Pumicestone Passage and its catchment, featuring specific actions to be implemented from 2013–2016 by a number of government, community, industry and primary producer groups. The actions address five key management challenges identified by stakeholders, which represent the primary objectives of this plan:

1. Reverse declining water quality;
2. Protect and rehabilitate wildlife habitat areas and corridors;
3. Minimise impacts from population growth and demand;

4. Preserve and improve social and cultural values; and
5. Preserve and improve economic values.

Development and implementation of this plan progresses the environmental policy and management strategies of its joint authors, in particular, the Sunshine Coast Waterways and Coastal Management Strategy (Sunshine Coast Council) and Moreton Bay Regional Council's Total Water Cycle Management Strategy. The plan is also written with and on behalf of the many other government, community and industry stakeholders who have supported its development and committed to support its implementation.

This Action Plan was developed using a highly collaborative community governance approach, which involved the following key steps:

- review background information, including previous plans and scientific information;
- establish a diverse stakeholder group to represent the many interests across the catchment;
- identify critical current issues and potential management actions to address those issues; and
- determine a final set of achievable and committed actions to address the key issues.

Acting now to protect or improve the condition of the Pumicestone Passage catchment and waterways is a regional priority, given their very high ecological, social and cultural and economic values, and the significant management challenges in the catchment. The management context is complex, involving local, state, national and international interests, legislation and responsibilities. However, there is a high level of knowledge and collaboration to build upon, which has been developed through planning and management initiatives over several decades.

By implementing this Action Plan, partners aim to make meaningful progress towards protecting the high values of the Pumicestone Passage and its catchment and to consolidate a platform for effective ongoing management.

1 About this Action Plan

This section (1) summarises what the plan is and what it hopes to achieve. Section 2 sets out the physical and management context for the plan, Sections 3 and 4 outline the important values and key local management challenges and Section 5 features the proposed actions.

In addition, a catchment timeline running along the page footers of the document provides a sense of the historical richness and diverse characteristics of the catchment, and a more comprehensive timeline is presented in Appendix 1. This Action Plan has been developed in the understanding that it is one link in a long chain of human use, planning and on-ground management in the catchment.

The list of proposed actions in Section 5 is the heart of this document. Forty-one actions are identified for implementation through the cooperative resources of a range of community, industry, primary producer and government stakeholder groups, subject to annual budget allocations and review. The Action Plan aims to make progress towards addressing key issues in the catchment and to build a platform for more success in the future.

Sunshine Coast Council and Moreton Bay Regional Council are the authors of this Action Plan, on behalf of the many stakeholders listed in the Pledge of Support. Development and implementation of the plan progresses outcomes from the environmental policy direction of the two councils (see Section 2.2) and their partner organisations. Both councils recognise the importance of advocating to other stakeholders for ongoing investment of resources into achieving the objectives of this Action Plan.

Both councils also recognise the central role of partnerships. Given the complex management arrangements and diverse pressures affecting the Passage and its catchment (see Section 2.4), maintaining a strong network of partnerships between government, industry, primary producer and

community stakeholders is the best way to make meaningful progress towards catchment objectives. Through partnerships, we achieve a better collective outcome than could be achieved by the same organisations working on their own.



1.1 Scope

The scope for this Action Plan covers a wide range of waterway and catchment management issues, such as surface and groundwater quality, in-stream and riparian habitat and aquatic ecosystem health, economic and social benefits from waterways, and the full range of natural and human pressures that can impact upon these characteristics.

Coastal processes, such as an expected breakthrough on northern Bribie Island, have the potential to impact on the current dynamics and the ecological, social and economic values of the Passage and foreshore. These changes may necessitate a change in future management practices. However, coastal issues are being addressed through other Council planning processes and are not included in the scope of this document.

1.2 Vision and objectives

The stakeholder vision for the Pumicestone Passage and its catchment is that:

The Pumicestone Passage catchment and waterways will be healthy, resilient and well-maintained natural systems that sustain biodiversity and the livelihoods and lifestyles of residents and visitors.

By implementing this Action Plan, stakeholders aim to make progress towards achieving the vision.

The primary objectives of the plan correspond to five key management challenges identified for the catchment (see Section 4):

1. Reverse declining water quality;
2. Protect and rehabilitate wildlife habitat areas and corridors;
3. Minimise impacts from population growth and demand;
4. Preserve and improve social and cultural values; and
5. Preserve and improve economic values.

The following supporting objectives have been adopted to facilitate achievement of the primary objectives:

- engender a collective vision for the catchment amongst stakeholders and a shared understanding of local values, issues and management priorities;
- build strong partnerships between diverse stakeholders to facilitate better waterway management within and outside the scope of the plan;
- plan a significant but achievable body of work to implement in a relatively short time;
- build a positive culture and sense of progress on catchment issues, while also setting a foundation for further achievements in the medium to long term; and
- attract greater interest and investment in catchment management as time goes on, from existing and new stakeholders.

The vision and objectives of the plan align with the policy and strategic direction of its two author Councils, including the Sunshine Coast Waterways and Coastal Management Strategy and Moreton Bay Regional Council's Community Plan, Total Water Cycle Management Plan and Green Infrastructure Strategy (see Section 2.4).



Pre 1770 — The first inhabitants of the Pumicestone Passage catchment were the Jinibara and Kabi Kabi peoples, who have been in the region for over 30,000 years. The waters and intertidal areas of the Pumicestone Passage provided them abundant fish, dugong, turtle, oysters and other shellfish and the swamps and lakes were habitats for numerous bird, reptile, mammal and plant species used for food and other purposes. Shell midden sites and indigenous fish traps along the Pumicestone Passage show that food was harvested and eaten at consistent gathering places over thousands of years.

1770 — Captain James Cook named Glass House Bay because the background peaks reminded him of the glass houses of England. He suggested that later explorers search for a river flowing into Glass House Bay.

1.3 Development of the plan

This Action Plan was developed using a community governance approach. This highly collaborative process was necessary to accommodate the diverse values and uses across the catchment, as well as the complex management and legislative context.

A stakeholder group was established with a representative from government, community, industry and primary producer groups that represented the diverse interests across the catchment. The stakeholder group, through six workshops and out-of-session collaboration, was primarily responsible for identifying key waterway management issues and appropriate and achievable management responses. The steps in development of the plan are outlined in Figure 1.

The plan includes actions to be completed over three financial years (2013–2016), and it is envisaged that an implementation group would be established to oversee and review progress against the plan each year, and that a new action plan would be developed and implemented for 2016 and beyond.



Figure 1. Process for developing the Action Plan

1799 — Lieutenant Matthew Flinders was sent from Sydney Town to explore Lt Cook's Glass House Bay in search of a large river. He anchored at the Southern end of the Pumicestone Passage and proceeded to explore by boat and on foot. After having an altercation with Bribie Island natives, the area became known as Point Skirmish. Believing it was a river, Flinders named the narrow strait between Bribie Island and the mainland the Pumicestone River, due to the vast amounts of Pumicestone scattered along the shoreline.

2 Background

2.1 The Pumicestone Passage catchment

The total area of the Pumicestone Passage and its catchment is 784 sq km. The mainland catchment makes up most of the area (588 sq km). It drains eastward from the D’Aguilar Range via Bells, Mellum, Coochin,

Tibrogargan, Hussey, Elimbah and Ningi Creeks and other minor streams (Figure 2). Most of Bribie Island, which has a total area of 148 km², drains into the Passage. The most notable creek is Westaways Creek, which drains northwards from the centre of the island.

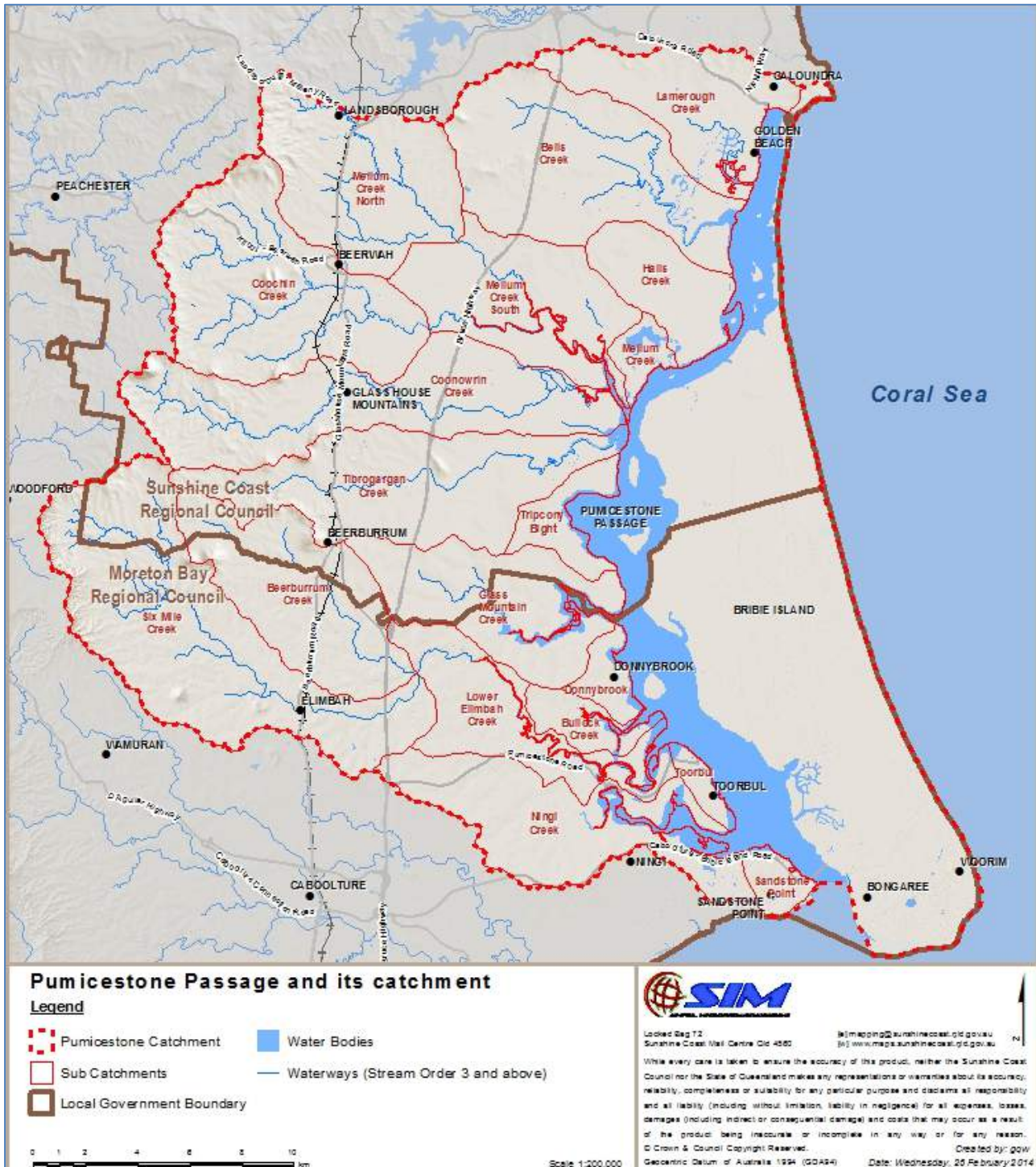


Figure 2. Pumicestone Passage and its catchment

2.2 Formation of the landscape

The dominant bedrock across most of the catchment is the relatively infertile Landsborough Sandstone. This was formed by riverine weathering of more ancient rocks to the west, accumulation and compression of the weathered sands, gravels and muds in the ancient Nambour Basin (about 210–180 million years ago), then consolidation of those massive deposits of sedimentary material, hundreds of metres thick, under marine conditions when sea levels rose to much higher levels than they are today (Cox et al, 2000; Willmott, 2007).

More recently, about 25 million years ago, numerous plugs of molten magma were forced up through the Landsborough Sandstone, filling volcanic vents or subsurface bulges. Those plugs are now exposed as the spectacular, steep-sided peaks of the Glass House Mountains, up to 556 metres high, which have resisted erosion while hundreds of metres of the surrounding sandstone rocks have been worn away (Mary Cairncross Scenic Reserve—Geological History).



The remaining surface geological features of the catchment are the result of depositional processes during our current Quaternary Period, from 2.6 million years to the present. Over this time, sea levels have cycled from more than 100 metres lower than present levels to present levels or marginally higher. During these cycles: alluvium has been deposited, consolidated and eroded along riverine drainage lines; Bribie Island has been formed by beach progradation (seaward expansion); and estuarine sediments have

been deposited in low-lying areas adjacent to the Pumicestone Passage (Cox et al, 2000).

2.3 Water in the catchment

When it rains, much of the water that falls on the catchment flows across the land surface into local streams and eventually into the Pumicestone Passage and the ocean. The remaining water infiltrates into groundwater reserves, which support a variety of terrestrial and aquatic groundwater dependent ecosystems (GDEs). Groundwater also remains intimately connected with surface waters; it drives the base flows of streams between rainfall events, and expresses in some areas as surface swamps and water bodies.



As part of Action HB01 of this plan (Section 5.3), The State Department of Environment and Heritage Protection has mapped GDEs across the Pumicestone Passage catchment, which are described and can be viewed at the Wetland Maps portal (<http://wetlandinfo.ehp.qld.gov.au/wetlands/facts-maps/get-mapping-help/wetland-maps/>).

The mapping shows that a variety of terrestrial ecosystems, swamps, lakes and riverine flowpaths and water bodies are supported by shallow groundwater reserves across the catchment, especially in alluvial deposits above the sandstone bedrock and coastal sand masses of Bribie Island.

1841 — At the Toorbul Point Bora Ground, 2,000 Aboriginal men, women and children gathered for social ceremonies, trade and exchanges.

2.4 The Pumicestone Passage

The Pumicestone Passage itself is a narrow, shallow passage, bordered by Bribie Island in the east and low-lying tidal flats and wallum heathland (which takes its name from the wallum banksia) of the coastal plain in the west (Figure 2). It is about 45 kilometres from end to end by boat and about 30 kilometres in a direct line, and at high tide it covers an area of 48 sq km, most of which is less than two metres deep. Large areas of melaleuca forest and heathland fringe the passage, while the estuary itself supports extensive saltmarshes, mangroves, seagrass and intertidal mudflats and channels.

The northern passage is influenced primarily by wave and tidal flushing from the ocean at Caloundra, while the southern passage is influenced primarily by tidal flushing from Moreton Bay. The southern entrance is wider, deeper and less obstructed than the northern entrance, so tidal flows in the south are greater and there is a net northern movement of water through the passage (IDC, 1982; Volume 2). In flood conditions, runoff from the tributary streams dominates the waters of the passage and outflows from the Caboolture River move into the passage from the south.

2.5 Land use

Present-day land use is 25% bushland, mostly in National Park areas around the Glass House Mountains and in the Bribie Island Recreation Area; 64% rural, including pine plantations and a range of horticultural activities; and 11% urban and residential uses¹, home to about 61,000 people (Appendix 2).



The Bruce Highway, which links Brisbane to the Sunshine Coast and further north, runs through the middle of the mainland catchment, while the major northern railway line and Beerburrum Road-Steven Irwin Way bisect the western catchment, also running south to north. Bribie Island Road and the Bribie Bridge link the southern mainland catchment to Bribie Island.

2.6 Policy and management context

The catchment straddles the southern part of the Sunshine Coast Council jurisdiction (Divisions 1 and 2) and the northern part of the Moreton Bay Regional Council jurisdiction (Divisions 1 and 12), with about 60 and 40 percent of the catchment area in those respective council areas. The Pumicestone Passage and its catchment also incorporate a range of different management areas and to Federal, State and local government legislation and planning instruments, making the overall management and policy context quite complex.

¹ Land use estimates were calculated from separate figures for Moreton Bay and Sunshine Coast Councils, based on a split of 40% and 60% respectively of the total catchment area. Figures for urban areas are based on the urban footprint in the 2009 SEQ Regional Plan, and

therefore incorporate proposed new urban areas such as Caloundra South.

2.6.1 Sunshine Coast Council policy framework

The Sunshine Coast Council's Corporate Plan 2009-2014 outlines eight themes that the organisation is pursuing to help achieve its vision to be "Australia's most sustainable region – vibrant, green, diverse" (Figure 3). Healthy waterways and coastal foreshores are identified as a priority and the subject of one of four key strategies under the Ecological Sustainability theme.

The Sunshine Coast Waterways and Coastal Management Strategy provides strategic direction and a framework for managing the Sunshine Coast's natural waterways, its constructed water bodies and its coastline, over the next 10 years (SCC, 2011). Catchment and estuary management plans (or action plans) are identified in the Strategy as key deliverables and the primary mechanism to progress strategic outcomes relating to natural waterways.

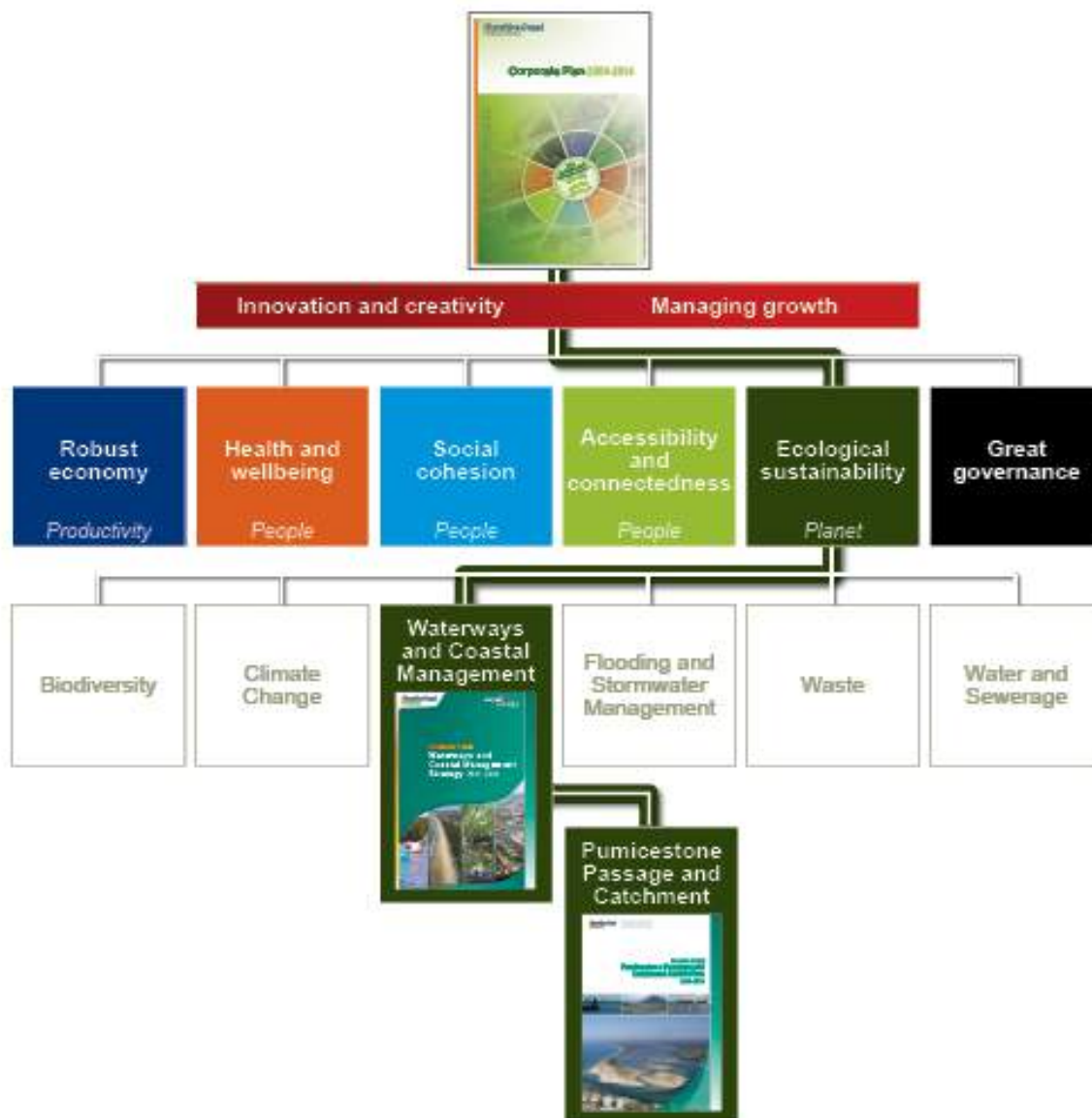


Figure 3. Position of catchment planning within Sunshine Coast Council's policy framework

1842 — A report by Andrew Petrie, Superintendent of Works for the Penal Settlement in Brisbane, discussed the local Aboriginal way of life and brought about the prohibition by Governor Sir George Gibbs of the entry of Europeans into the Bunya country and of cutting down Bunya pines. This act, published in the New South Wales Government gazette in April 1842, was to be known as the Bunya Proclamation.

2.6.2 Moreton Bay Regional Council policy framework

Part of the vision for the Moreton Bay region, as identified in the Moreton Bay Regional Council Community Plan 2011–2021, is to continue to give priority to the beauty and maintenance of the natural surrounds of the region. Under the banner of a healthy natural environment, the Community Plan targets the need for increasing the health and resilience of waterways and coastal areas.

To deliver on this target, Moreton Bay Regional Council (MBRC) is addressing the issue of catchment management, along with other aspects of the total water cycle, primarily under its Total Water Cycle Management Plan. Pumicestone Passage catchment actions identified through the total water cycle

planning process for the 2013–2016 period have been incorporated into this Action Plan.

MBRC is also planning for waterway health via its Green Infrastructure Strategy. Green infrastructure network mapping is being developed, and includes wetlands, shorebird habitat areas, fish habitat areas, and waterway and coastal corridors with associated buffers. The waterway areas and corridors mapping aims to ensure health and resilience of waterways and coastal areas to allow for the ongoing provision of ecosystem services such as improving water quality and protecting wildlife habitat and movement.

The position of the catchment action plan within the council's policy framework is summarised in Figure 4.



Figure 4. Moreton Bay Regional Council policy framework

1861 — Thomas Martin Tripcony and his wife Catherine selected their land, Cowie Bank, on the mainland side of the Passage, between Glass Mountain Creek and Hussey Creek. Thomas Tripcony was involved in the plentiful oyster trade of Moreton Bay.

2.6.3 Legislation and management areas

Management of the Pumicestone Passage and its catchment is subject to Federal, State and local government legislation and planning instruments that address environmental protection, agricultural, fishery and forestry activities and urban planning and development. More information on the relevant legislation and roles and responsibilities of government agencies with respect to waterways and catchment management is provided in the Sunshine Coast Waterways and Coastal Management Strategy.

In terms of land management, Economic Development Queensland, a business unit of

the State Government, is responsible for strategic planning in the major urban expansion area of Caloundra South, which is owned by Stockland. The State also manages the Glasshouse Mountains National Park, with its National Heritage-listed values and associated responsibilities, as well as other national park areas including the Bribie Island Recreational Area. HQPlantations manages large areas (about a third of the total land catchment), which it leases from the State for commercial forestry purposes (Figure 5). The remainder of the catchment is owned and managed as private urban or rural freehold properties.

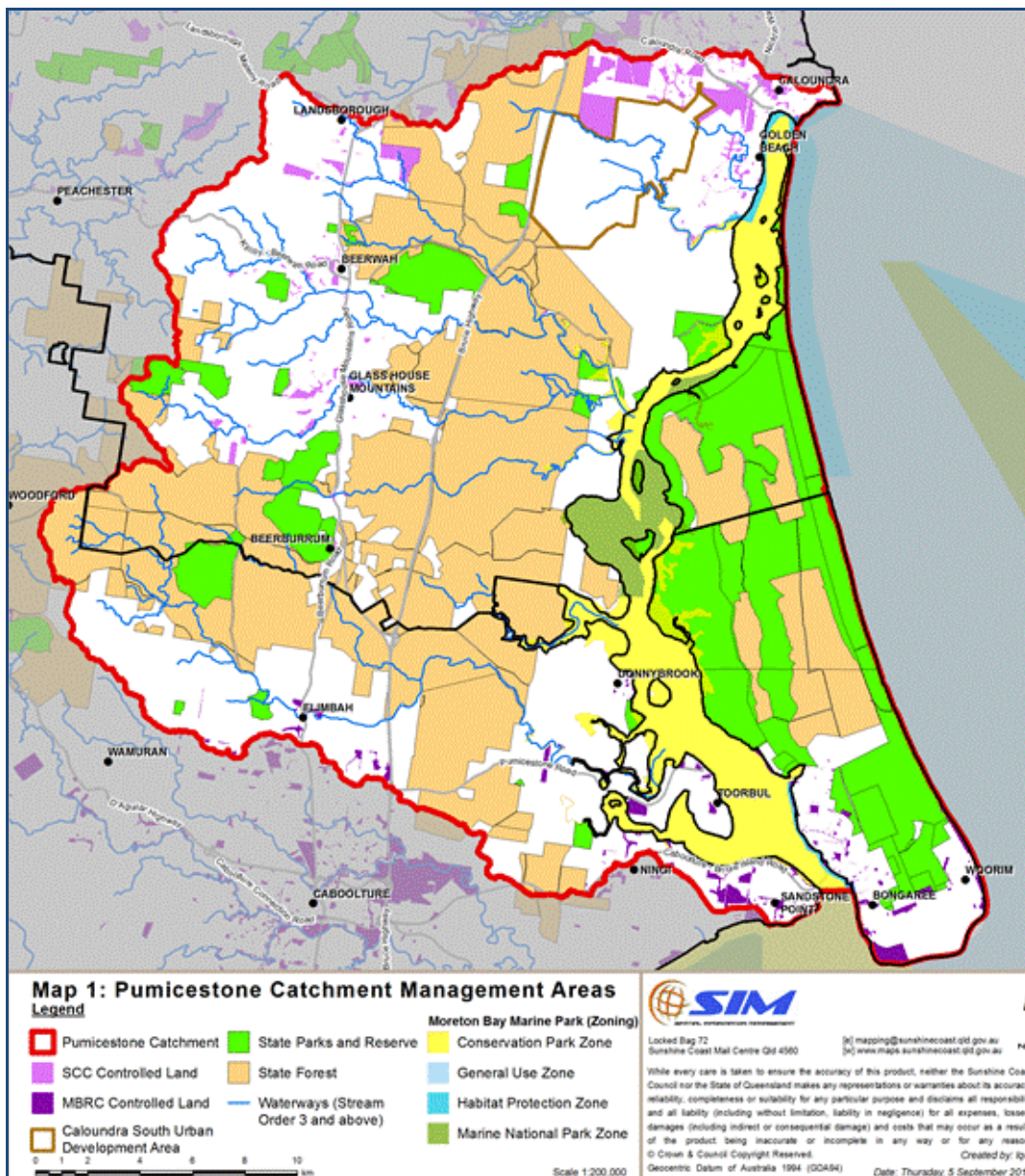


Figure 5. Land management areas in the Pumicestone Passage catchment

Further to these land-based responsibilities, the Pumicestone Passage itself is a wetland of international significance under the Ramsar convention (UN, 1971), with associated management responsibilities for landowners and state and federal governments (SEWPAC, undated;

<http://www.environment.gov.au/water/publications/environmental/wetlands/roles-responsibilities-factsheet.html>). The passage is also a Marine Park, Fish Habitat Area and High Ecological Value area under State legislation, each with associated regulations and management implications.

2.7 Previous studies and planning

The very high ecological, social and cultural and economic values of the Pumicestone Passage, combined with the diversity and intensification of land uses across its catchment, have resulted in it being the focus of several major catchment management studies and planning initiatives. These have targeted a range of catchment and water quality (surface water and groundwater) issues since the 1970s, and have included:

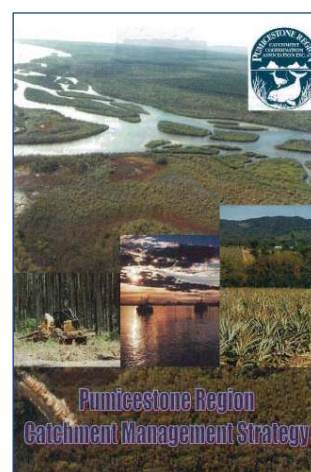
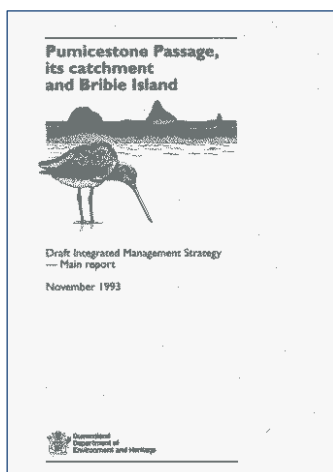
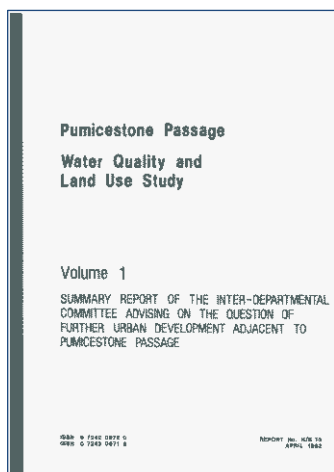
- Pumicestone Passage Water Quality and Land Use Study (State Government) (IDC, 1982);
- Pumicestone Passage, its catchment and Bribie Island—Integrated Management Strategy (State Government) (Willing and Partners/DEH, 1993; DEH et al., 1992–93);
- Pumicestone Passage and Deception Bay Catchment Conference—Science informing catchment management (multiple partners) (2000);

- Pumicestone Region Catchment Management Strategy (multiple partners) (PRCCA and DNR, 2000);
- What we know about the Pumicestone—Current science of the Pumicestone Passage (forum with multiple partners) (SEQC, 2011).

These catchment-specific studies and strategies have common themes, including the documentation of water quality issues and land use impacts based on scientific information; and formulating management responses to those and other issues resulting from diverse and competing land uses.

In addition, local partners have contributed in recent years to two key regional planning documents relating to natural resource management—the Northern Catchments Action Plan of the South East Queensland Healthy Waterways Strategy 2007–2012—(Healthy Waterways, 2007) and the South East Queensland Natural Resource Management Plan 2009–31 (DERM, 2009; implementation is ongoing).

All of these planning initiatives and their implementation have been the collective efforts of diverse interest groups, including state and local governments, natural resource management organisations, catchment groups and a range of industry groups. In the preparation of this Action Plan for the Pumicestone Passage catchment, we have endeavoured to ensure that its aims, strategies and actions draw upon the preceding local and regional planning initiatives, as well all available scientific evidence.





1877 —John Douglas, Premier of Queensland, formed a settlement for Aboriginal people at Whitepatch on Bribie Island, as a result of concerns for the well-being of the native Aboriginal people of the Moreton Bay area. They assembled a group of 50 people at the mission and the government provided nets and a fishing boat in the hope of initiating a thriving commercial activity. Tom Petrie was an organising patron and would visit and oversee the mission each month.

1880 —James Campbell & Sons built a sawmill at Coochin Creek, about 6 kilometres upstream from the Pumicestone Passage, far enough up the creek to enable them to draw fresh water for the mill's boiler. This place was called Campbellville, and supported a school, a cemetery and a store. Campbells had a special shallow draft steamer built called the *Mavis*, to transport timber and goods to and from Brisbane. Campbellville no longer exists and only a few traces of a once thriving town can now be found.

3 Waterway and catchment values

3.1 Ecological values

The Pumicestone Passage is one of the few barrier estuaries in Australia (DEH, 1992-93), providing a rare combination of calm, mostly marine waters, extensive inter-tidal areas and a diverse range of habitat zones, including mangroves, mud flats, coastal dunes and seagrass meadows.

The Passage supports diverse wildlife including turtles, dugong in southern areas, seabirds and shorebirds, fish, crabs, oysters and juvenile prawns. The passage is listed under the Convention on Wetlands of International Importance (UN, 1987) as an important site for migratory birds, and most of the passage and its associated tidal creeks are within a conservation zone of the Moreton Bay Marine Park, recognising the area's high amenity, cultural and ecological values.

The catchment areas on the mainland and Bribie Island also feature diverse wildlife, particularly within national park areas of the Glass House Mountains and Bribie Island and along the numerous vegetated creek lines. Eastern grey kangaroos are the largest of the many mammals commonly present. There is also diverse birdlife, including the migratory waders that visit the Pumicestone Passage every summer and a variety of rainforest birds. Reptiles include the venomous Red-bellied Black Snake and the non-venomous Carpet Python, as well as lace monitors and a wide range of skinks, including blue tongue lizards. A wide range of frogs is also found, including the endangered wallum froglet (Queensland by Degrees—Royal Geographic Society of Queensland; <http://www.rgsq.org.au/27-153c>).



The Tripcony Bight Protection Zone, a 5.7 sq km reserve in the central part of the Passage that was gazetted in 1997 as part of the Moreton Bay Marine Park, has particularly high ecological value and is protected from all forms of collecting. The Pumicestone Passage is recognised as one of the most significant recreational fisheries habitats in Queensland, and much of its channel and lower tributaries form part of a State-declared Fish Habitat Area (<http://www.nprsr.qld.gov.au/managing/area-summaries/pumicestone.html>).

1893 — During February, the meteorologist Indigo Jones of Crohamhurst near Peachester recorded Australia's highest rainfall within a 24 hour period, 36 inches, which when combined with the other wet days in that period, amounted to 78 inches of rain in one month and resulted in the *Great 1893 Flood* that caused chaos in Brisbane.

3.2 Social and cultural values

The first inhabitants of the catchment were the Jinibara People (determined native title holders for lands that include the western mainland catchment) and the Kabi Kabi People (registered native title claimants for lands that include the remaining mainland and Bribie Island areas). To this day, these Traditional Owners maintain an intimate connection to and understanding of their natural surroundings and adhere to traditional laws and customs. Many present-day towns and mountains, creeks and other natural features retain their original, indigenous names.



In more recent times, the area has been explored, cultivated and transformed by non-Aboriginal settlers, contributing to the pattern of transport routes, settlements and unique cultural landmarks that characterise the modern-day catchment. For example, the following are listed in the Queensland Heritage Register: Bankfoot House, Caloundra Lighthouses and the former Landsborough Shire Council Chambers (local history); Beerburrum's Anzac memorial trees, Bribie Island Fortifications and the Landsborough air raid shelter (war-time memorials); and Kings Beach bathing pavilion and Tripcony Hibiscus Caravan Park (Caloundra's seaside tourism heritage).

The present-day population living within the Pumicestone Passage catchment is about 61,000 people (see Appendix 2). Major urban centres include southern Caloundra in the north (23,000 people); the western hinterland

towns of Elimbah, Beerburrum, Glass House Mountains and eastern Landsborough (16,000 people); and several urban localities on southern Bribie Island (17,000 people). The catchment also features an important inter-urban break between Caboolture and Caloundra.

The Pumicestone Passage is very popular for recreational fishers and is Queensland's only recreational-only fishing area (commercial fishing was banned in 1995). The passage and its catchment also provide unique opportunities for swimming, powered and non-powered boating, hiking, picnicking and appreciation of the stunning natural views, which enhance the lifestyles of locals and visitors. A key feature is the iconic Glasshouse Mountains, included on the



National Heritage List for their scenic, artistic, geological and indigenous cultural heritage values.

The catchment features have also provided a focal point for numerous land- and water-based recreational clubs, as well as catchment or locality groups such as the Bribie Island Environmental Protection Association, Coochin Creek Bushland Group, Glasshouse Mountains Advancement Network, Golden Beach Progress Association, Night Eyes Water and Landcare, Pumicestone Region Catchment Coordinating Association and Take Action for Pumicestone Passage. These networks enhance the social fabric and sense of place of the Pumicestone Passage catchment community.

1901 — A Fish Cannery, producing Anchor Brand tinned fish, was built by Mr Charles Godwin at Toorbul Point on Bribie Island. The factory was later moved to the northern end of the island, close to today's Lion's Park. The Godwin children used to row across the Passage to the Golden Beach area then walk to Caloundra to attend school.

3.3 Economic values

The diverse recreational opportunities offered by the passage and its catchment attract many local, interstate and international visitors each year. As an indication, there were 26,000 international visitors and 420,000 domestic overnight visitors to the Southern Sunshine Coast tourism region, which would roughly equate to visitors in the Pumicestone Passage catchment, in the 2012-13 year (SCDL, 2013).

These visitors contribute directly to local tourism enterprises such as Australia Zoo, boat hire and tour businesses and fishing retailers (recreational fishers in the Pumicestone region are estimated to spend \$8 million per year on fishing associated items, and considerably more when taking into account accommodation and capital expenses such as boat and trailer purchases; Murphy, 2000). Visitors also contribute through patronage of local retail, food and accommodation outlets, especially in the large waterfront settlements of Caloundra and Bribie Island. Based on southern Sunshine Coast visitor numbers, the total contribution from tourism in the Pumicestone Passage catchment in 2012-13 was probably more than \$300 million (SCDL, 2013²).

The Pumicestone Passage catchment also supports significant and diverse agricultural production, with major industries including poultry, strawberries, pineapples, turf, nurseries and macadamias. The total annual value of



² 10-15% of \$2.7 billion for the combined Sunshine Coast and Cooloola region (based on domestic overnight and international sub-regional visitor figures)

agricultural production in 2010–11 was about \$260 million (ABS, 2012³). The passage itself supports oyster leases and is one of the most significant recreational fisheries in Queensland (<http://www.nprsr.qld.gov.au/managing/area-summaries/pumicestone.html>).

The Beerburum forestry estate spreads across 230 square kilometres (about a third of the catchment) and is leased from the State by HQPlantations for commercial forestry purposes. Most of the forests are soft-wood, exotic pine plantations, grown for sawn timber that supports the region's construction industry. Forestry has been a successful land use in the catchment since 1928, making use of land that is marginal for farming. In the mid-2000s, the estate was valued at \$108 million dollars⁴.



The urban centres of Caloundra, Bribie Island and the hinterland railway towns are also important economic hubs within the catchment, each represented by a local Chamber of Commerce. These centres provide commercial, industrial and social services for the surrounding urban and rural communities.

³ This estimate is a sum of total gross values for the following Statistical Level 2 Areas: Beachmere-Sandstone Point, Wamuran, Elimbah, Glass House Mountains, Beerwah, Landsborough, Caloundra-West and Caloundra-Kings Beach

⁴ Information on the Beerburum forestry estate is from interpretive signs at the Wild Horse Mountain lookout

4 Local management challenges

The critical inputs in the determination of catchment issues were:

- the Pumicestone Region Catchment Management Strategy 2000;
- results from local water quality and ecological monitoring and scientific investigations;
- the Sunshine Coast Waterways and Coastal Management Strategy (incorporating community feedback from the Our Place, Our Future consultation process);
- MBRC's Total Water Cycle Management Plan; and
- stakeholder workshops.

From these sources, five broad challenges emerged for the management of Pumicestone Passage and its catchment. (Each challenge is a desired positive response to an identified issue or group of issues):

1. Reverse declining water quality;
2. Protect and rehabilitate wildlife habitat areas and corridors;
3. Minimise impacts from population growth and demand;
4. Preserve and improve social and cultural values; and
5. Preserve and improve economic values.

The five challenges are outlined in the following sections. They provide the basis for the management framework for this Action Plan (Section 5.1) and a suite of proposed actions was developed to address each challenge (Section 5.3).

4.1 Halt and reverse declining water quality

Water quality has been measured in the Pumicestone Passage through various programs and studies over more than 30 years, and has been shown to be declining over that period.

Poor water quality in turn affects aquatic plants and animals. For example, water-borne sediment causes siltation and smothering of seagrass, which in turn reduces feeding opportunities for turtles and dugong; high nutrient concentrations promote blooms of nuisance algae; and contaminated water has been linked to declining populations of oysters and other shellfish (Diggles, B., c.2011). Contaminated water run-off can also cause increased health risks to swimmers, other recreational-water users and people who eat oysters and other shellfish harvested in the Passage.



It is therefore a critical challenge for this Action Plan to halt and reverse the declining trend and secure good water quality in the Passage to underpin its high ecological, social and cultural and economic values.

1903 – A large auction of five-acre pineapple farmlets was held on the railway line near Glass House Mountain Railway Station. Pineapples and small crops continue to be the principal agricultural crops in the area.

1909 – A worm infestation crippled the once lucrative oyster trade, destroying practically all of the oysters. Up until this time, Pumicestone Passage oysters were reputed as being some of the best in the world. Siltation caused by logging in the upper reaches of the creeks that emptied into the Passage may have brought about the proliferation of the mud worm and the demise of the oyster industry.

4.1.1 Evidence of declining water quality

Previous catchment studies and the current regional Ecosystem Health Monitoring Program have shown that water quality and ecological health in the Pumicestone Passage is declining.

In the early 1980s, the Queensland Government published the Pumicestone Passage Water Quality and Land Use Study (IDC, 1982). As part of this study, more than 30 sites were monitored in the Pumicestone Passage and its tributaries on a monthly basis from 1978–80, to establish baseline water quality data for population and land use planning in the catchment.

Water quality was assessed again a decade later, based on monitoring conducted from 1991–92, in support of an Integrated Management Strategy commissioned by the Queensland Government

(DEH, 1992–93). This repeat survey showed notable declines in water quality, including increased concentrations of algae, increased turbidity and increased inorganic nitrogen in the Pumicestone Passage.

Since 1993, the State has monitored water quality in the Pumicestone Passage on a monthly basis, and since 2000 it has been assessed as part of the ongoing regional Ecosystem Health Monitoring Program (EHMP), which is coordinated by the Healthy Waterways Network. The program monitors a range of water quality, physical and biological indicators and combines the information into annual ecosystem health report card scores (<http://www.healthywaterways.org/home1.aspx>)

Results from the Ecosystem Health Monitoring Program are compared to Water Quality Objectives in Schedule 1 of the *Environmental Protection (Water) Policy 2009*. These objectives are the prescribed long-term water quality targets for the Pumicestone Passage and its tributaries.

Further to the water quality declines observed from the 1980s to the 1990s, the EHMP grades for the Pumicestone Passage, which are driven largely by water quality results, have declined since the program commenced, culminating in the first “poor” (D+) rating in 2010 (see Figure 6).

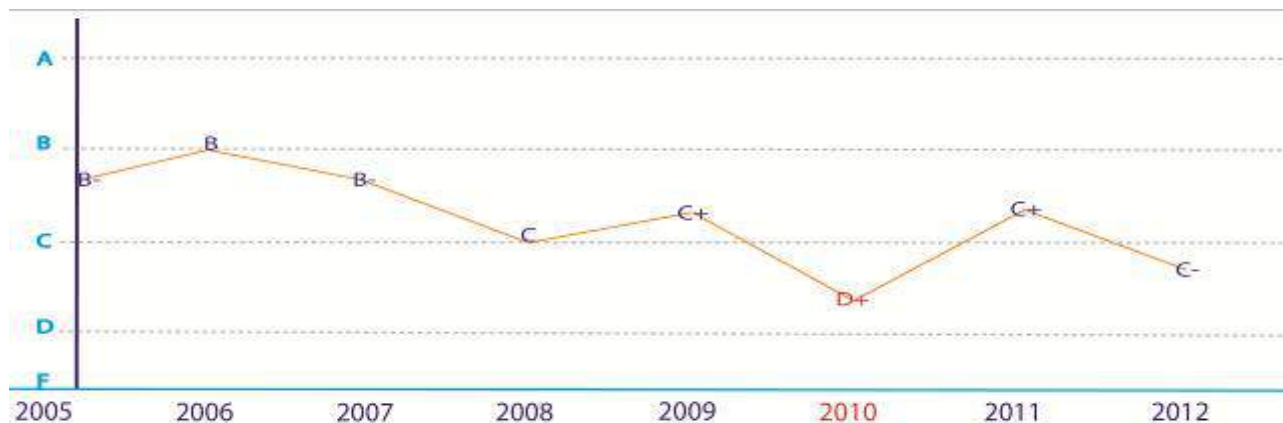


Figure 6. Annual ecosystem health report card grades for the Pumicestone Passage

In 2011, the Pumicestone Passage Technical Working Group (PPTWG) was established to investigate the causes of the declining grades in the Passage. The group found that the key driver of declining water quality was increasing inorganic nitrogen coming from the predominantly-agricultural upper Coochin Creek subcatchment (PPTWG, 2011). The group also concluded that on-site sewage systems

(septics), forestry, urban sewerage and the proposed Caloundra South urban development could be significant sources of water quality impacts if they were not managed appropriately.

Later in 2011, a Pumicestone Science Forum was held, with participation from a wide range of community, industry, natural resource management and government agencies.

This forum showcased important scientific and management programs relevant to the health of the Pumicestone Passage and its catchment and concluded, through a joint statement of participants:

“In 2011, we know enough about the Pumicestone Passage to act now to protect and enhance its irreplaceable natural values.

Whilst we will continue to invest in collaborative research to further our understanding, we will move forward collectively as a matter of urgency to plan and manage the Pumicestone catchment to accelerate the necessary reduction of the catchment inputs of nutrients and sediments.

This requires us all to take responsibility through strong partnerships that support clear science communication, well-informed community action, evidence-based and integrated planning and management, encouragement of strong political will and dedicated investment for catchment management.”

4.2 Protect and rehabilitate wildlife habitat areas and corridors

Only about 30% of the original vegetation on the mainland remains, and there are at least 65 endangered, vulnerable or near-threatened plant and animal species across the catchment.

Large, vegetated habitat areas, and connecting habitat corridors between them, are critical to preserve biodiversity—the plants and animals that are central to a region’s environmental

values. However, much of the Pumicestone Passage catchment’s original vegetation has been cleared over the past 150 years and many of the catchment’s remaining vegetation communities and plant and animal species are under threat.

4.2.1 Evidence of habitat and species under threat

- The Pumicestone mainland catchment has 34 Regional Ecosystem (RE) community types in both the northern and southern areas, but about 70% of their combined pre-European extent has been cleared (74% in the northern area (Figure 7); 68% in the southern area). Coastal foredune communities have been lost totally from the catchment (they were originally found along the Golden Beach foreshore in the north), and almost all of the scribbly gum-dominated RE 12.5.3 has been lost (90% in the north; 81% in the south).
- Bribie Island has 16 regional ecosystem types in the north and 17 in the south, with about 40 percent of the combined pre-European extent cleared in both areas.
- The Pumicestone Passage catchment has two eucalypt REs and one rainforest RE that are endangered at the state level, and 12 other REs that are of concern. The mainland and Bribie Island also contain areas of lowland rainforest of subtropical Australia (LRS), a community that is critically endangered at the national level. Most of the remaining LRS is confined to narrow and fragmented creek buffers, which adds to the importance of protecting and restoring riparian vegetation across the catchment.

1963 — The Bribie Island Bridge was opened. It was operated as a toll bridge until 22 March 1975, when the last 50c toll was collected.

1933 — The Queensland Government sponsored plantings of slash pine about ten kilometres from Beerburum Township.

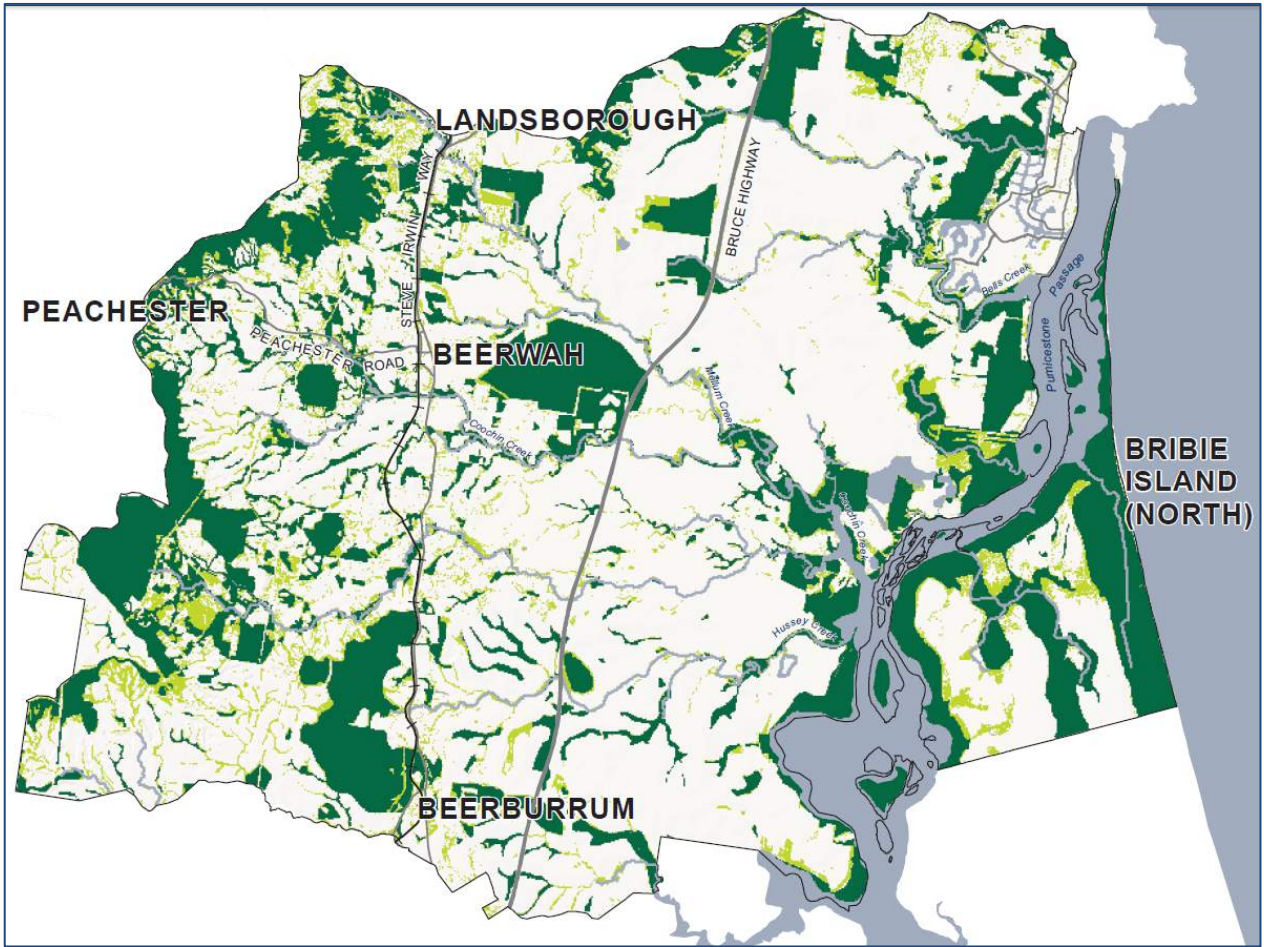


Figure 7. Remaining natural vegetation in the northern Pumicestone Passage catchment. Dark green areas are derived from the State's remnant Regional Ecosystems vegetation mapping. Light green areas are additional fine-scale (non-remnant) vegetation areas mapped by Sunshine Coast Council

- The remaining northern mainland catchment and Bribie Island habitat areas host 65 state- or nationally-listed endangered, vulnerable and near threatened species, including 30 plants, 16 birds, 7 mammals, 6 amphibians, 3 reptiles, 2 fish and 1 invertebrate species. The southern mainland catchment has 37 priority species under MBRC's Priority Species Report (MBRC, 2011).
- Only about a third of the remaining vegetated habitat across the catchment is protected (for example, within national parks), 36% in the northern area and 30% in the southern area.

4.2.2 Applying strategic approaches to improve biodiversity

The challenge for partners in this Action Plan is to reconnect habitats across the catchment and restore the long term viability of its vegetation communities and plant and animal species. To achieve this, it is necessary to protect and restore areas of the remaining vegetation network in a strategic way that maximises the benefit to overall biodiversity. This will also achieve water quality benefits by restoring natural catchment and riparian stormwater filtering processes.

1982 — The Queensland Government published the *Pumicestone Passage Water Quality and Land Use Study*, following investigations into water quality, circulation and pollutant transport and biological resources of the Passage. The main driver for this report was concern about impacts on water quality from urban development.

For Sunshine Coast Council, a key strategy proposed for protecting and enhancing biodiversity is the use of a landscape ecology approach to conservation and rehabilitation. This involves identifying and categorising the region's biodiversity assets into broad spatial landscape elements, which are described as core habitat areas and connecting habitat areas (Figure 8; from SCC, 2010), and enhancing the linkages and wildlife movement between them.

For Moreton Bay Regional Council, a key strategy is its Green Infrastructure network planning approach, which aims to keep all environmental / green assets connected across both the urban and rural landscapes. The green infrastructure network is used to value environmental assets and provide solutions to address environmental impacts associated with land use change, as well as to enhance urban design, create a sense of place, allow for meaningful connections between people and nature, and secure the provision of ecosystem services (the goods and services provided by

ecosystems that benefit, sustain and support the well-being of people) to the community.

In practice in the Pumicestone Passage catchment, both approaches could involve projects to conserve existing vegetated habitat areas along the Passage itself and in the numerous small national parks in the upper catchment, as well as revegetating strategic linkages between these areas. The best linkages are likely to be along creek lines, and revegetating these creeks would provide additional biological, physical and water quality benefits.

The State Government is currently developing a wetland management plan for the catchment, which will provide principles, concepts, procedures and methods for designing and implementing wetland rehabilitation activities. This plan will support the planning of specific projects in line with the strategic approaches of both councils and other natural resource managers.



Figure 8. Key elements of a landscape ecology approach to biodiversity protection

1993 – The Queensland Government published a draft Integrated Management Strategy for Pumicestone Passage, its catchment and Bribie Island, including several component studies and recommended strategies for long-term protection of the Passage and its catchment.

4.3 Minimise impacts from population growth and demand

The human population within the Pumicestone Passage catchment has more than doubled in 30 years and is expected to continue to increase at a similar rate. Careful development controls are needed to avoid significant impacts on water quality and habitat condition.

The human population in the Pumicestone Passage catchment has increased significantly in recent decades; for example, it has more than doubled in 30 years from about 30,000 in 1991 (Abal et al., 2002) to about 61,000 in 2011 (see Appendix 2). This urban expansion has occurred predominantly in the southern suburbs of Caloundra, on Bribie Island and in the hinterland towns along the railway.

The increasing trend in population is expected to continue in coming decades, with about 45,000 additional residents expected in the catchment by 2031⁵. The population increase would include early stages of the Caloundra South development, which on its own is predicted to accommodate 46,000 people when complete. The Caloundra South developer, Stockland, has committed to minimise impacts through a range of environmental management initiatives, many of which are set out in its Caloundra South Public Environment Report (Stockland, 2012-13).

Potential impacts to the Pumicestone Passage and its tributaries from ongoing urban growth include:

- Sediment run-off, further loss of vegetated habitat areas and effects on groundwater from construction-phase activities such as clearing and earthworks;
- Ongoing nutrient, sediment and other contaminant run-off, and larger volumes and higher stormwater flow velocities, from the new urban areas when developed; and
- Increasing demand for recreational activities in and on the waterways, with flow-on impacts on sensitive ecological areas and existing social and cultural and economic values.

The challenge for partners in this plan is to ensure that impacts on the Pumicestone Passage and its tributaries from any proposed developments are assessed and managed with consideration of the local environmental values, focusing on maintaining water quality, habitat linkages and flows.

Determining the future population in areas such as the Pumicestone Passage catchment is a key component of regional planning by the State Government, and is outside the scope of this Action Plan. However, the outcomes of growth and population planning are critical to the success of this plan, as partners can only achieve its objectives if population growth is managed within sustainable limits. This reinforces the need for ongoing collaboration between government, industry and the community, in order to achieve catchment management goals in the context of diverse and potentially-competing interests.

1993 — Pumicestone Passage was declared as part of the Moreton Bay Marine Park. The Passage includes two Marine National Park Zone areas, at Tripcony Bight and Westaway Creek, and the rest of it is zoned Conservation Park.

⁵ This estimate is based on Queensland Government projections by major statistical areas (SA2) that are wholly or partly within the catchment, excluding sub-areas of Landsborough, Palmview and other areas north of Caloundra Road.

4.4 Preserve and improve social and cultural values

The Pumicestone Passage and its catchment provide an enviable variety of nature-based recreational opportunities, geographical focal areas for local social groups and rich cultural heritage experiences (see Section 3.2). The challenge is to promote these opportunities and values, while at the same time minimising any impacts of activities on each other and on the natural environment that underpins them.



Specific local issues (or opportunities) identified by the stakeholder workshops included:

- inappropriate recreational activities in some land and waterway areas;
- littering and illegal dumping in forestry areas;
- dust, noise, odour and other amenity impacts in the vicinity of regulated activities such as poultry farms, local airfields and quarries;
- potential to improve communication between different primary producer groups; and
- potential to better promote catchment and waterway values, issues and management.

4.5 Preserve and improve economic values

The broad challenge is to support a variety of successful industries within the catchment, including tourism, commercial and retail, forestry and primary production (see Section 3.3), while at the same time minimising any impacts of activities on each other and on the natural environment.

Specific local issues (or opportunities) identified by the stakeholder workshops included:

- Developing and applying practices in rural areas that protect water quality while maintaining high production;
- Potential to better promote locally-grown produce;
- Potential to investigate and promote more sustainable tourism enterprises.



1994 — The four national parks gazetted in 1954 were amalgamated to become Glass House Mountains National Park, with an area of 692 hectares. In that same year, three environmental parks were also added to the national park: Mount Saddleback, Mount Miketebumulgrai and Blue Gum Creek. Coochin Hills was added the following year.

5 Management actions

5.1 Management framework and themes

A framework with five management themes was adopted for this Action Plan (Figure 9). Each theme incorporates actions to address one of the key local challenges outlined in Sections 4.1–4.5:

- Reverse declining water quality;
- Protect and rehabilitate wildlife habitat areas and corridors;
- Minimise impacts from population growth and demand;
- Preserve and improve social and cultural values; and
- Preserve and improve economic values.

Water quality and habitat and biodiversity are key themes in the framework, because there is strong evidence for catchment-scale declines in these attributes. In addition, they can most readily be addressed through coordinated and catchment-specific action, and improving these attributes contributes in turn to protecting the economic values and social and cultural values of the catchment. The sustainability and

planning theme supports the four other themes, in particular, through planning to minimise impacts from new urban developments in the catchment.

Many “win-win” actions in this plan contribute to more than one management theme. For example, actions that improve water quality and habitat will also improve the social and economic values (recreational and tourism) in the Passage. Similarly, actions to address rural run-off have been chosen to provide complementary benefits to farm productivity.

5.2 Existing projects and activities

Many community, industry and government groups are conducting projects or ongoing activities that contribute to the protection or improvement of the passage and its catchment, which complement and support the actions in this plan. Existing management activities that support the objectives of this Action Plan are summarised in Appendix 3.

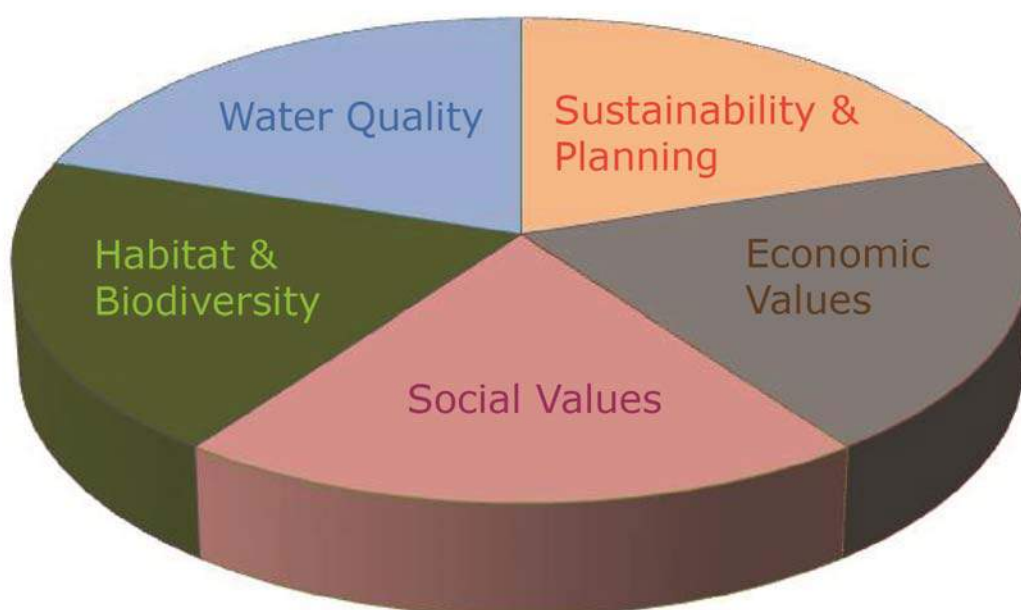


Figure 9. Pumicestone Passage catchment management themes

5.3 Proposed actions under this Action Plan

The actions listed in this plan were identified by stakeholders as achievable responses to the five key management challenges for the Pumicestone Passage catchment. They are new actions, or activities that have been re-focused in the Pumicestone Passage catchment to better address the specific issues within those broader challenges.

As well as the stakeholder workshops, the following sources were considered when determining desired actions to address the key issues and challenges:

- the Pumicestone Region Catchment Management Strategy 2000;
- findings from local monitoring and science, in particular, the investigations of the Pumicestone Passage Technical Working Group;
- the Sunshine Coast Waterways and Coastal Management Strategy; and
- MBRC's Total Water Cycle Management Plan.

Proposed stakeholder actions in the Pumicestone Passage catchment from 2013–2016 are listed in Table 1, which is the core of this Action Plan. The delivery of these actions will contribute to protecting and improving the environmental, social and economic values of the Pumicestone Passage and its catchment.

Further to the actions in Table 1, a number of additional actions were identified by stakeholders that would be beneficial but could

not be funded or resourced at the current time (see Appendix 4). These and other potential actions will be re-assessed during the implementation and review of the plan.

5.4 Implementation and review

Implementation of individual actions is the responsibility of the lead and other partners listed in Table 1. Over the implementation period of the Action Plan, it is proposed that a stakeholder implementation group would meet regularly and would:

- advocate for implementation of the actions;
- identify emerging management priorities;
- conduct regular reviews of progress; and
- provide regular communication and updates on projects and strategic issues to the broader stakeholder group.

It is envisaged that the full stakeholder planning group would then be reconvened in three years to prepare a follow-on action plan to build on the foundation established by this current plan.



2000 — The Pumicestone Region Catchment Management Strategy was published by the Pumicestone Region Catchment Coordination Association, in partnership with the State and local governments. This Strategy built on the previous integrated management strategy from 1993.

Table 1. Proposed actions for the Pumicestone Passage and its catchment (2013–16), listed by management theme

- Proposed partners, funding sources and expected completion years are indicative only as all actions are subject to availability of funding and resources as determined in year to year budgetary processes of lead and contributing partner organisations.
- BIEPA** = Bribe Island Environmental Protection Association; **DAFF** = Dept of Agriculture, Fisheries & Forestry; **DEHP** = Dept of Environment & Heritage Protection; **DSITIA** = Dept of Science, Information Technology, Innovation & the Arts; **HAL** = Horticulture Australia Ltd; **HQP** = HQPlantations; **HWN** = Healthy Waterways Network; **MBRC**= Moreton Bay Regional Council; **PRCCA** = Pumicestone Region Catchment Coordinating Committee; **SEQC** = SEQ Catchments; **SCC** = Sunshine Coast Council; **SCEC** = Sunshine Coast Environment Council; **SEQC** = SEQ Catchments; **WCA** = Wetland Care Australia

Proposed action	Lead partner	Other partners	Expected completion
Water Quality			
WQ01—Develop, validate and promote tools and techniques for best practice nitrogen and stormwater management to improve water quality and agricultural productivity	DAFF	DEHP; Local growers; HAL; Australian Government; PRCCA	2014-16
WQ02—Trial new fertiliser technologies for pineapples, strawberries and ginger to reduce nitrous oxide emissions	DAFF	DEHP; Local growers; Australian Govt	2014-16
WQ03—Conduct an audit and compliance program for State-managed Environmentally Relevant Activities in the Pumicestone catchment	DEHP		2013-14
WQ04—Prepare a formal science statement summarising water quality issues and preferred management strategies based on previous science and investigations	DSITIA	DAFF; SCC; MBRC	2013-14
WQ05—Review water quality data from historical and contemporary monitoring programs, along with land use changes, to assess links between land use practices and water quality	DSITIA	MBRC; SCC; DAFF; Local growers	2013-14
WQ06—Establish a working group to review current urban erosion and sediment control programs and advocate for a consistent and effective approach across the Pumicestone catchment	HWN	MBRC; SCC; Stockland	2014-16

Proposed action	Lead partner	Other partners	Expected completion
WQ07—Use updated catchment and receiving water models to assess impacts on Pumicestone Passage water quality from population growth and other land use and management scenarios	HWN	DSITIA; SCC; MBRC; BIEPA; BMT WBM; Stockland; SCEC	2014-16
WQ08—Conduct a local water quality monitoring program in the Six Mile-Elimbah and Ningi Creek subcatchments to identify hotspot property clusters and land uses	MBRC	-	2013-14 ⁶
WQ09—Review relevant literature to identify the nutrient distribution associated with land use in the Ningi and Elimbah Creek subcatchments	MBRC	-	2013-14
WQ10—Conduct a local water quality monitoring program in the Coochin Creek subcatchment to identify hotspot property clusters and land uses	SCC	-	2013-14 ⁶
WQ11—Develop detailed concept plans for stormwater quality treatment infrastructure in Golden Beach under SCC's Priority Infrastructure Plan	SCC	-	2013-14
WQ12—Implement stormwater improvement infrastructure and riparian rehabilitation projects in the Caloundra area under SCC's Priority Infrastructure Plan	SCC	-	2014-16
WQ13—Construct a sub-surface cut-off wall and re-profile the western batter at the Caloundra Landfill to ensure ongoing protection of downstream water quality	SCC	-	2013-14
WQ14—Construct a high efficiency sediment basin to treat site stormwater at the Caloundra Landfill and minimise impacts on downstream water quality	SCC	-	2013-14
WQ15—Undertake an analysis of unsealed roads and crossings across the catchment to determine priority roads for remediation to improve water quality	SCC	HQP	2014-16
WQ16—Undertake an internal education and extension program on erosion and sediment control to minimise water quality impacts from on-ground works within the Pumicestone catchment	SCC		2014-16
WQ17—Undertake a program to detect and rectify sewerage inflow and infiltration sources in the Golden Beach area	Unitywater	-	2013-14

⁶ This early implementation action was completed in the 2012–13 year but has been included in the nominal 2013–16 timeframe of the plan, as it directly resulted from the planning process.

Proposed action	Lead partner	Other partners	Expected completion
WQ18—Undertake programs to detect and rectify sewerage inflow and infiltration sources in the Pelican Waters, Caloundra, Little Mountain, Ningi and Bribie Island areas	Unitywater	-	2014-16
Habitat and biodiversity			
HB01—Undertake and promote pilot wetland restoration works to progress the Pumicestone wetland rehabilitation plan	DEHP	SEQC; Landowners	2013-14 ⁶
HB02—Implement a wetland rehabilitation program under the Pumicestone wetland rehabilitation plan	DEHP	SEQC; Landowners; Stockland	2014-16
HB03—Undertake mapping and web-based reporting of groundwater dependent ecosystems and hydrological processes using the "walking the landscape" method	DSITIA	DEHP	2013-14
HB04—Develop a wetland rehabilitation plan for the entire Pumicestone catchment that accommodates planned and new projects by different organisations	DSITIA	DEHP; SCC; MBRC; SEQC; HQP; Stockland; SCEC	2013-14
HB05—Plan and implement a large-scale riparian rehabilitation program in a Sunshine Coast biodiversity focus area within the Pumicestone catchment	SCC	Landowners; DEHP; SEQC; HWN	2014-16
HB06—Develop a strategy and identify key projects to conserve and rehabilitate high-value terrestrial, riparian and in-stream fish habitat areas across the catchment	SEQC	MBRC; SCC; DEHP; DAFF; HQP; BIEPA	2014-16
HB07—Undertake a riparian restoration and management demonstration project in forestry buffers within the Glass Mountain Creek subcatchment	WCA	HQP; Federal government	2013-14 ⁶
Planning and sustainability			
PS01—Establish quantitative targets for water quality, biodiversity corridors and social and economic values to assess the success of catchment management actions	HWN	DSITIA; MBRC; SCC	2013-14
PS02—Undertake a targeted audit program for the Caloundra South development to benchmark water sensitive urban design planning and maintenance outcomes	HWN	DEHP; SCC; Stockland; SCEC	2014-16
PS03—Incorporate the ecosystem services framework and ecosystem function mapping into MBRC's new planning scheme	MBRC	-	2014-16
PS04—Develop factsheets and website information that support sustainable development outcomes required by council planning schemes	MBRC	HWN; SCEC; Stockland; SCC	2014-16
PS05—Investigate non-planning scheme options to incorporate the ecosystem services framework and ecosystem function mapping into catchment planning and management	SEQC	MBRC	2014-16
PS06—Conduct ecosystem function mapping in the SCC area of the Pumicestone catchment; Combine results with MBRC's data into a single layer for the whole catchment	SEQC	SCC	2014-16

Proposed action	Lead partner	Other partners	Expected completion
PS07—Establish an ongoing aquatic ecology monitoring program in Bells Creek and annual environmental reporting to assess the effectiveness of environmental management measures for the Caloundra South development	Stockland	Night Eyes; SCC; SCEC; SEQC; HWN; DEHP	2013-14
PS08—Promote the best practice water quality treatment, conservation and rehabilitation measures proposed for the Caloundra South development as a model for other developments in the Pumicestone Passage catchment	Stockland	HWN; SCC; SCEC	2014-16
Social and cultural values			
SC01—Undertake a trial program of surveillance and compliance to reduce litter and illegal dumping in forestry and adjacent areas	DEHP	HQP; SCC	2013-14 ⁶
SC02—Undertake an awareness and education campaign to reduce illegal dumping in forestry and adjacent areas using a community based social marketing approach	DEHP	HQP; SCC	2014-16
SC03—Prepare a Visitor Management Plan to address inappropriate land-based recreation in forestry and adjacent areas	HQP	DEHP	2013-14
SC04—Implement a communication strategy for the Pumicestone catchment plan that promotes ownership of catchment issues and management responses by the broader community	Implementation Committee	Pumicestone Catchment Network	2014-16
SC05—Host an event to improve collaboration in catchment management through understanding and knowledge	SEQC	SCC; MBRC; Stockland; SCEC	2013-14
Economic values			
EV01—Develop integrated pest management systems for the pineapple industry and demonstrate IPM approaches in the Pumicestone catchment	DAFF	Local growers; HAL	2014-16
EV02—Facilitate local pineapple industry adaptation to market changes	DAFF	Local growers; HAL	2014-16
EV03—Identify opportunities for the sustainable development and promotion of Pumicestone catchment produce as part of the region's diverse agricultural offer	SCC	Local growers; Markets	2014-16

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Appendix 1. Notable events in the history of the Pumicestone Passage and its catchment

The following timeline is not a comprehensive history, but includes a number of important or interesting events that have helped shape the land use pattern and cultural identity of the Pumicestone Passage catchment today.

The following are the main sources of information in the timeline:

- *Timeline of the Caloundra district and Chronological list of events in the history of Caloundra* (compiled by Amanda Wilson for Caloundra City Libraries); and
- *Bribie Island* (a book by Thomas Welsby).

Year	Event
Pre 1770	The first inhabitants of the Pumicestone Passage catchment were the Jinibara and Kabi Kabi peoples, who have been in the region for more than 30,000 years. The waters of the Pumicestone Passage provided abundant fish, dugong and turtle. Large quantities of oysters and other shellfish were available in the intertidal zone and the swamps and lakes were habitats for numerous bird, reptile, mammal and plant species used for food and other purposes. Midden sites along the Pumicestone Passage, typically dominated by shells, show that food was harvested and eaten at consistent gathering places over thousands of years. The catchment and waterways also provided many other services. For example, a site on Rocky Creek near Landsborough features many grinding grooves used to sharpen axes and other tools; and the eastern beach of Bribie Island and trails through the Glass House Mountains provided pathways to neighbouring areas, for example, for groups travelling to the hinterland Bunya Festivals.
1770	On 17 May 1770, Captain James Cook named Glass House Bay because the background peaks reminded him of the glass houses of England. He suggested that later explorers search for a river flowing into Glass House Bay.
1799	Lieutenant Matthew Flinders, on board the sloop <i>Norfolk</i> , was sent from Port Jackson, Sydney Town, to explore Lt Cook's Glass House Bay (which was later renamed to Deception Bay) in search of a large river. Matthew Flinders anchored at the southern end of the Pumicestone Passage and proceeded to explore by boat and on foot. After having an altercation with the Bribie Island natives, the area became known as Point Skirmish. Flinders named the narrow strait between Bribie Island and the mainland the <i>Pumicestone River</i> , due to the vast amounts of Pumicestone scattered along the shoreline. At the time it was believed the Passage was a river.
1822	John Bingle in the colonial cutter <i>Sally</i> was sent from Sydney in search of a river believed to enter the sea somewhere north of Port Macquarie. Arriving at Point Skirmish on 6 March, Bingle took a boat party up the Passage and threaded his way through the mangroves and sand banks until he sighted the bar at Caloundra. This proved that the waterway was indeed a Passage, not a river as Flinders believed.
1841	At the Toorbul Point Bora Ground, 2000 Aboriginal men, women and children gathered for social ceremonies, trade and exchanges.
1841	Observations from the Journal of the Reverend Christopher Eipper, Missionary to the Aborigines at Moreton Bay 1841: <i>In August 1841 the Turrbal people took the initiative in getting Eipper and Wagner to visit an initiation ceremony. The two missionaries, 'were under the guidance of three natives, Wunkermany and the two brothers, Wogann', accompanied by a group of women. They were led along 'roads' and 'paths', shown where to camp, where to bury provisions, and advised how much of their food to share at different encounters. The Turrbal men were clearly in charge of this expedition. The meeting a few hours north of Toorbul was used by the various groups gathered, from Humpy Bong, Toorbul, Bunya and Yarun Island (Bribie), to undertake diplomatic talks about the possibility of establishing a settlement in their respective countries.</i>
1842	A report by Andrew Petrie, Superintendent of Works for the Penal Settlement in Brisbane, discussed the local Aboriginal way of life and brought about the prohibition by Governor Sir George Gibbs of the entry of Europeans into the Bunya country and of cutting down Bunya pines. This act, published in the New South Wales Government gazette in April 1842, was to be known as the Bunya Proclamation.

Year	Event
1861	The first census was taken in Queensland in April. The population was recorded as 30,059. (http://www.oesr.qld.gov.au/products/publications/census-colony-qld/index.php)
1861	Thomas Martin Tripcony and his wife Catherine selected their land, <i>Cowie Bank</i> , on the mainland side of the Passage, between Glass Mountain Creek and Hussey Creek. Thomas Tripcony was involved in the plentiful oyster trade of Moreton Bay.
1864	Durundur settler Alexander Archer rowed from Brisbane up the Passage and back. He returned to Brisbane recounting descriptive stories of the beauty of the area. Archer wrote, ' <i>This place is called Calowndra. It would make a capital sea bathing place, as there are beautiful sites for houses and there is good garden soil, but it is too far from Brisbane to be much frequented for such purposes for many years to come.</i> '
1868	After gold was found at Gympie the previous year, Cobb and Co coaches established a regular service on the Brisbane–Gympie run, which took two full days' travelling time. A Cobb and Co staging post was set up at Bankfoot House in Glass House Mountains, which was owned by William and Mary Grigor. The Cobb & Co coaches would stop at Bankfoot House for lunch on both legs of the journey.
1875	A deed was issued to Robert Bulcock, on 8 November 1875, when he purchased 277 acres. Bulcock built a house on a knoll facing the Passage and the beach that now bears his name, in 1878, which he called <i>The Homestead</i> . It is interesting to note that this area on early maps was referred to as <i>Deep Water Point</i> , where the sands built up to form what was later called <i>Happy Valley</i> . Bulcock was the Member for Enoggera at the time and used his Caloundra house as a retreat from the political world. Bulcock's land included the area which is now Caloundra Township.
1877	In June, John Douglas, Premier of Queensland, formed a settlement for Aboriginal people at Whitepatch on Bribie Island, as a result of concerns for the well-being of the native Aboriginal people of the Moreton Bay area. They assembled a group of 50 people at the mission and the government provided nets and a fishing boat in the hope of initiating a thriving commercial activity. Tom Petrie was an organising patron and would visit and oversee the mission each month.
1879	The mission was disbanded by the incoming Palmer Ministry and those remaining at the camp were moved to either Humpy Bong or Barambah. A fringe camp was formed on the mainland shores, near the Tripcony family's home, Cowie Bank, by those Aborigines who escaped removal from the island by the authorities. Several Aboriginal graves from this era are located near where Cowie Bank stood.
1879	Thomas Tripcony commissioned the first survey and beaconing of Pumicestone Passage by the crew of the <i>Shadow</i> in September.
1879	The Government of the time issued a license to anyone for a fee of ten shillings for 12 months, which allowed the holder to cut cedar anywhere, with the result that a lot of timber was felled and cut into lengths, but never shifted, due to the absence of roads at the time. It was also a practice of the timber getters to drop the logs across creeks, so that the timber would be washed down stream in the following wet season and collected from the mouths of creeks and rivers, such as the well-known rafting grounds at the junction of Mellum and Coochin Creeks.
1880	James Campbell & Sons built a sawmill at Coochin Creek, approximately 6.4km upstream from the Pumicestone Passage, having gone far enough up the creek to enable them to draw fresh water for the mill's boiler. This place was called Campbellville, and supported a school, a cemetery and a store. Campbells had a special shallow draft steamer built called the <i>Mavis</i> , to transport timber and goods to and from Brisbane. Campbellville no longer exists and only a few traces of a once thriving town can now be found.
1881	William Landsborough took up land in the area now known as Golden Beach and called his property <i>Loch Lamerough</i> . The township of Mellum Creek was renamed to Landsborough to honour the well-known explorer.
1884	Maria Landsborough, second wife of William Landsborough, planted fig trees by the Passage. One of these still survives to this day on Landsborough Parade.
1893	During February, the meteorologist Indigo Jones of Crohamhurst near Peachester recorded Australia's highest rainfall within a 24 hour period, 35.71 inches, which when combined with the other wet days in that period, amounted to 78 inches of rain in one month and resulted in the Great 1893 Flood that caused chaos in Brisbane.
1900	The Telegraph Line that was opened in 1884 was reintroduced to Caloundra from Caboolture. (Reference: Erica Riis)

Year	Event
1901	A Fish Cannery, producing Anchor Brand tinned fish, was built by Mr Charles Godwin on Bribie Island, on the bay side of Toorbul Point at a place then known as <i>Godwin's Gutter</i> . The factory was later moved to the <i>Factory Gutter</i> at the northern end of Bribie Island, which is close to the spot known today as Lion's Park. The Godwin children used to row across the Passage to the Golden Beach area, then walk to Caloundra, to attend school.
1903	A large auction of 5-acre pineapple farmlets was held on the railway line near Glass House Mountain Railway Station. Pineapples and small crops continue to be the principal agricultural crops in the area. <i>Travel Routes, Forest Towns and Settlements</i> , by Judith Powell)
1907	The Maloney Brothers Lighthouse Brand fish cannery opened on the northern tip of Bribie Island. (Reference: Sunshine Coast Daily; 7 May 1995)
1909	A worm infestation in the Pumicestone Passage oyster banks crippled the once lucrative oyster trade, destroying practically all of the oysters. Up until this time, the Moreton Bay Oyster Company had a number of boats working in the area, with Pumicestone Passage oysters being reputed as being some of the best in the world. The foreshores of Toorbul, Bribie Island and the upper reaches of the Passage were richly abundant with oysters and many thousands of bags of oysters were sent to Brisbane and the southern states. Siltation caused by logging in the upper reaches of the creeks and rivers which emptied into the Passage may have brought about the proliferation of the mud worm and the demise of the oyster industry.
1913	Andrew Tripcony started a boat connection run from Caloundra three times a week to meet the S.S. <i>Koopa</i> at Bongaree, Bribie Island which he ran until 1923.
1916	The Governor of Queensland, Major Sir Hamilton Goold-Adams, and his wife, visited Beerburrum to inaugurate the Beerburrum Soldiers' Settlement. They arrived by special train with T. J Ryan, the Labor Premier of Queensland. The governor's wife drew marbles to allocate the first farm plots of 20 to 40 acres (8 to 16 hectares) The Soldier Settlers Scheme was designed to give repatriated soldiers an opportunity to start a small farm and assist to populate areas where growth was encouraged.
1917	Andrew Tripcony constructed a section of rock retaining wall in front of his <i>Black Flat</i> property in Caloundra. It was extended about 15 years later by the Landsborough Shire Council towards Bulcock Beach. (reference: Erica Riis)
1918	Experimental farming of sheep at the Beerburrum Soldier Settlement failed due to dingoes attacking the sheep.
1924	A forestry experimental station was established at Beerwah to trial soft wood species from the United States of America.
1928	The Golden Beach Estate was subdivided for housing from land located on Black Flat. The name was selected because of the golden blooms of the wattles and other native plants which flowered abundantly in the Wallum country.
1930	In the context of poor economic times and marginal land for crop farming, the Beerburrum Soldiers' Settlement failed. It was the largest scheme of its kind in Australia.
1931	A two metre tidal wave hit Bribie Island. The surge was said to have come from the passage side. (Reference: Tom MacBride & Marjorie Campbell Nee Gosling, daughter of the Bribie Island lighthouse keeper; See LS Photographic Collection, Bribie Island - P89359)
1932	The Minister for Agriculture, Mr Bullock, introduced a Tobacco Settlement Scheme in an attempt to create work for unemployed farmers on the abandoned pineapple farms at Beerburrum.
1933	The Queensland Government sponsored plantings of slash pine about 10km from Beerburrum Township.
1940	Work on building Fort Bribie started. The fort became fully operational in 1941.
1946	The real estate agent Roy Henzell purchased William Landsborough's <i>Portion 27</i> , much of which he sold (some 2372 acres or 960 hectares) to cover unpaid rates. Today, the area purchased encompasses Golden Beach and Pelican Waters.
1952	The Wildhorse Mountain Fire Tower was built near Glass House Mountains.
1954	The Glass House Mountains were gazetted as four separate national park land parcels that included the four major peaks: Mount Ngungun, Mount Beerwah, Mount Tibrogargan and Mount Coonowrin.
1960	A distinctive kerosene taint began to affect the mullet fishing industry in Moreton Bay and the

Year	Event
	Passage. This severely disrupted commercial fishing for the next 15 years, until pollution flowing into Moreton Bay was reduced and the kerosene taint diminished.
1963	The Bribie Island Bridge was opened. It was operated as a toll bridge until 22 March 1975, when the last 50c toll was collected.
1969	Kathleen McArthur campaigns strongly for the preservation of Pumicestone Passage and the remnant of coastal heath land on the northern bank of Currimundi Creek.
1970	Bob and Lyn Irwin purchased a block of just less than two hectares near Beerwah.
1970s-80s	Major canal estates were developed on Bribie Island.
1981	The container ship, <i>Anro Asia</i> , ran aground on the Northern tip of Bribie Island.
1982	The Queensland Government published the Pumicestone Passage Water Quality and Land Use Study, following investigations into water quality, circulation and pollutant transport and biological resources of the Passage. The main driver for this report was concern about impacts on water quality from urban development.
1983	The <i>Pumicestone Passage Fish Habitat Reserve</i> (HR 6 plan number 015-006) and the <i>Bribie Island Wetland Reserve</i> (plan number 033-016) were gazetted under the Fisheries Act.
1987	Caloundra City Council was assigned <i>city</i> status.
1992	Caloundra City Council commenced aerial spraying of mosquitoes in Pumicestone Passage catchment areas.
1993	The Queensland Government published a draft Integrated Management Strategy for Pumicestone Passage, its catchment and Bribie Island, including several component studies and recommended strategies for long-term protection of the Passage and its catchment.
1993	Pumicestone Passage was declared as part of the Moreton Bay Marine Park. The Passage includes two Marine National Park Zone areas, at Tripcony Bight and Westaway Creek, and the rest of it is zoned Conservation Park.
1993	Pumicestone Passage was listed, as part of the broader Moreton Bay wetland, as a <i>Wetland of International Significance</i> under the Ramsar Convention, recognising its importance as a stop-over for migratory birds.
1994	Bush fires raged on the northern end of Bribie Island over a number of days in November. A fire threatened the Golden Beach State School on 5 November and fires burnt uncontrollably in the Glass House Mountains, Beerburum, Peachester, Mount Mellum and Bald Knob areas, with the loss of houses and sheds. Fires engulfed Mt Beerwah and Mt Tibrogargan.
1994	The four national parks gazetted in 1954 were amalgamated to become Glass House Mountains National Park, with an area of 692 hectares. In that same year, three environmental parks were also added to the national park: Mount Saddleback, Mount Miketebumulgrai and Blue Gum Creek. Coochin Hills was added the following year.
1997	The Pumicestone Region Catchment Coordination Association was incorporated under the Queensland Government's Integrated Catchment Management Program.
2000	A large outbreak of the cyanobacterium <i>Lyngbya Majuscula</i> was observed and persisted for several months in Deception Bay and the southern waters of Pumicestone Passage. In response, major investigations were launched to determine the main causes and potential management responses.
2000	The Pumicestone Region Catchment Management Strategy was published by the Pumicestone Region Catchment Coordination Association, in partnership with the State and local governments. This Strategy built on the previous integrated management strategy from 1993.
2000	The <i>Pumicestone Passage and Deception Bay Catchment Conference—Science Informing Catchment Management</i> was held, which brought together scientific information on the surface and groundwater systems, biological processes and planning and management studies.

Appendix 2. Estimated population within the Pumicestone Passage Catchment

Figures were derived from 2011 census data from the Australian Bureau of Statistics. Population figures for all or part of 10 Level 2 Statistical Areas were included, and where relevant, the finer-scale Level 1 Statistical Area populations that were included or excluded from each SA2 are listed.

Level 2 Statistical Areas	Level 1 Statistical Areas (2011 population)
Bribie Island 313011363: <i>2011 population = 17,045</i>	ALL: ⇒ 17,045
Beachmere-Sandstone Point 313011362: <i>2011 population = 13,486</i>	INCLUDES: 3136207 (230); 3136208 (461); 3136209 (362); 3136210 (309); 3136211 (337); 3136212 (275); 3136213 (333); 3136230 (498); 3136232 (336); 3136203 (908); 3136202 (310); 3136204 (0); 3136205 (416) ⇒ 4,775
Caboolture 313021365: <i>2011 population = 22,298</i>	NIL (<half of 3136521 (464))
Wamuran 313021369: <i>2011 population = 3,583</i>	INCLUDES: 3136908 (632) ⇒ 632
Elimbah 313021367: <i>2011 population = 3,722</i>	EXCLUDES: 3136709 (436); 3136703 (383); 3136708 (395); 3136707 (229); 3136705 (390); 3136706 (298) = 3,722 – 2,131 ⇒ 1,591
Glass House Mountains 316061441: <i>2011 population = 5,543</i>	ALL: ⇒ 5,543
Beerwah 316061439: <i>2011 population = 7,199</i>	EXCLUDES: 3143903 (311); 3143902 (491); 3143901 (455) = 7,199 – 1257 ⇒ 5,942
Landsborough 316061442: <i>2011 population = 9,487</i>	INCLUDES: 3144216 (446); 3144215 (417); 3144219 (262); 3144205 (462); 3144206 (325); 3144203 (321); 3144207 (287); 3144211 (0) ⇒ 2,520
Caloundra-West 316021420: <i>2011 population = 15,126</i>	INCLUDES: 3142009 (317); 3142007 (555); 3142008 (0); 3142030 (322); 3142020 (657); 3142019 (387); 3142018 (285); 3142013 (442); 3142011 (255); 3142010 (258); 3142031 (365); 3142012 (311); 3142029 (403); 3142017 (673); 3142014 (898); 3142028 (477); 3142015 (636); 3142016 (496) ⇒ 7,737
Golden Beach-Pelican Waters 316021421: <i>2011 population = 10,226</i>	ALL: ⇒ 10,226
Caloundra-Kings Beach 316021419: <i>2011 population = 6,084</i>	EXCLUDES: 3141915 (0); 3141902 (423); 3141901 (323) = 6,084 – 746 ⇒ 5,338
TOTAL CATCHMENT POPULATION	⇒ 61,349

Appendix 3. Existing activities that support the objectives of this Action Plan

The primary objectives of the *Pumicestone Passage and Catchment Action Plan 2013–16* are to:

- Reverse declining water quality;
- Protect and rehabilitate wildlife habitat areas and corridors;
- Minimise impacts from population growth and demand;
- Preserve and improve social and cultural values; and
- Preserve and improve economic values.

The actions listed in the plan make up a targeted three-year body of work that aims to progress these objectives. In addition, many groups undertake regular or ongoing activities that provide a crucial foundation for the new work in the plan. Some of those key activities are outlined below for the six sectors that contribute to management of the Pumicestone Passage and its catchment.

Sectors and organisations active in this catchment planning process	Activities contributing to objectives of this Action Plan
<p>Community</p> <ul style="list-style-type: none"> • Bribie Island Environmental Protection Association • Coochin Creek Bushland Group • Glasshouse Mountains Advancement Network • Golden Beach Progress Association • Jinibara Traditional People Aboriginal Corporation • Kabi Kabi People • Night Eyes Water and Land Care Group • Pumicestone Region Catchment Coordinating Association • Sunfish • Sunshine Coast Environment Council • Take Action for Pumicestone Passage 	<ul style="list-style-type: none"> • Monitor water quality, mangroves and seagrass in the Pumicestone Passage and tributaries • Advocate for protection of local environmental, social and cultural heritage values and provide local and technical input to government and natural resource managers on these matters • Undertake rehabilitation and maintenance of local riparian and bushland habitat areas • Maintain local parks and public open space areas including removal of litter • Provide education to the broader community on waterway and catchment values, issues and management
<p>Primary producers</p> <ul style="list-style-type: none"> • Agriculture Association (small crops) • Australian Pineapples • Strawberry industry • Turf industry • Woodlands Chickens • Queensland Chicken Growers Association 	<ul style="list-style-type: none"> • Develop, promote and implement best practice farming methods that are sensitive to the environment while still achieving high productivity outcomes
<p>Industry</p> <ul style="list-style-type: none"> • Caloundra Chamber of Commerce and Industry • Donnybrook Progress Association • Glasshouse Country Chamber of Commerce • Stockland • Toorbul Progress Association • Urban Development Institute of Australia • Unitywater • HQ Plantations 	<ul style="list-style-type: none"> • Recognise and promote waterway and catchment values that underpin local businesses and industries • Implement best practice planning and construction for new developments to protect catchment and waterway values • Maintain the sewerage network in urban areas to minimise spills and overflows of contaminants into local waterways • Implement best practice forestry methods to

Sectors and organisations active in this catchment planning process	Activities contributing to objectives of this Action Plan
	<p>minimise environmental impacts from plantation forestry activities including maintenance and rehabilitation of stream buffer areas</p> <ul style="list-style-type: none"> • Plan and manage public access areas within plantation areas to minimise impacts on natural and social values from recreational users and illegal dumping
<p>Natural resource management</p> <ul style="list-style-type: none"> • Healthy Waterways Network • SEQ Catchments 	<ul style="list-style-type: none"> • Coordinate and report on water quality and ecological monitoring of the Pumicestone Passage and catchment • Plan and set targets for natural resource management at regional and catchment scales • Support rural landowners to manage their land and activities so that natural values are protected • Develop and promote best practice methods for urban design and construction to protect waterway and catchment values • Provide regional planning, coordination and extension on natural resource management
<p>Local government</p> <ul style="list-style-type: none"> • Moreton Bay Regional Council • Sunshine Coast Council 	<ul style="list-style-type: none"> • Undertake and support monitoring of water quality, Lyngbya, seagrass, fish and birds in local waterways; and flora, fauna and fire risks in bushland areas • Undertake maintenance of constructed water bodies, canals and public open space along waterways and foreshores including removal of litter • Provide education to the community on waterway and catchment values, issues and management • Identify key habitat areas in the catchment and opportunities to conserve and connect them • Support landowners to conserve and rehabilitate riparian and bushland areas on their properties through Land for Wildlife, environmental grants, conservation agreements and the Nature Refuge Program • Undertake and support the community to undertake rehabilitation and maintenance of the councils' natural area estates • Plan, advocate for and manage a diverse public open space network including management of recreational impacts • Work towards best practice in council

Sectors and organisations active in this catchment planning process	Activities contributing to objectives of this Action Plan
	<p>infrastructure, waste and stormwater management to minimise environmental impacts</p> <ul style="list-style-type: none"> • Identify and promote sustainable local economic opportunities • Regulate devolved <i>environmentally relevant activities</i> to minimise pollution discharges and other impacts • Develop and administer planning schemes to plan broad patterns of development and protect local social and environmental features
<p>State Government</p> <ul style="list-style-type: none"> • Department of Agriculture, Fisheries & Forestry • Department of Environment & Heritage Protection • Department of National Parks, Recreation, Sport & Racing • Department of Science, Information Technology, Innovation & the Arts • Department of Transport and Main Roads⁷ 	<ul style="list-style-type: none"> • Undertake research and extension programs to develop and promote farming and forestry practices that minimise environmental impacts while maintaining productivity • Administer the <i>Pumicestone Passage Fish Habitat Area</i> and other fish habitats across the catchment to protect local and regional fisheries • Regulate <i>environmentally relevant activities</i> and respond to environmental nuisance and harm incidents • Support regional catchment management initiatives to improve catchment and waterway condition • Develop and promote policies, mapping and other tools to protect the condition and values of wetlands • Administer land and marine national parks and recreation areas to maintain a balance between local environmental, social and economic values • Provide leadership in the collection and management of scientific information on waterways and habitat areas to inform environmental management • Regulate on-water activities such as boating

⁷ While not active participants in this process, DTMR staff provide advice and services relevant to the Action Plan, in particular, regulation of on-water activities.

Appendix 4. Pumicestone Passage catchment actions for future consideration

The following actions were identified by stakeholders as desirable responses to identified management challenges, but were not feasible to implement or commit to at the current time. It is anticipated that the feasibility of these actions will be re-assessed during the implementation and review of the plan.

Actions for future consideration

Water quality

FC01—Estimate nutrient and sediment export loads per area and across the whole catchment for key land uses and Environmentally Relevant Activities

FC02—Develop key messages and undertake education of four-wheel-drive users to reduce their impacts on waterways in the Pumicestone catchment

FC03—Identify nitrogen sources in targeted Pumicestone subcatchments using methods trialled in the Caboolture River catchment

FC04—Undertake projects to reduce water quality impacts from unsealed roads at hotspot locations in conjunction with other water quality improvement measures

FC05—Develop and implement a response procedure and triggers from community waterways monitoring in the Pumicestone catchment to inform management agency investigation and action

FC06—Develop and facilitate the use of education tools to address primary producer run-off issues identified through science and monitoring actions

FC07—Undertake a pilot program of auditing and rectifying on-site sewage treatment facilities in the Coochin Creek subcatchment

Habitat and biodiversity

FC08—Assess the adequacy of current regulatory practices for on-water activities with respect to protecting migratory birds and fish stocks in the Pumicestone Passage

FC09—Review changes in seagrass distribution in Pumicestone Passage, likely causes and potential management responses

FC10—Investigate the feasibility of retrofitting major road crossings to improve fauna passage along identified high-priority corridors between core vegetation areas

FC11—Map waterway barriers and high-value fish habitats to identify high-priority barriers to remove

FC12—Remove waterway barriers in identified high-priority streams to improve continuity of high-value fish habitat areas

FC13—Undertake wetland rehabilitation projects in priority wetland areas of the Pumicestone coastal plain under the federal environment program

Planning and sustainability

FC14—Develop or review GIS land-use, Environmentally Relevant Activities, waterways and subcatchment layers for the entire Pumicestone catchment

Actions for future consideration

FC15—Implement a riparian rehabilitation program in the Bells Creek subcatchment within the Caloundra South development area

FC16—Implement measures such as retrofitting rainwater tanks to minimise water use across the Pumicestone catchment

FC17—Investigate the potential benefits, costs and feasibility of sewerage currently-unsewered urban areas in the catchment

Social and cultural values

FC18—Establish a rural communication group to coordinate discussion and action on rural issues within the Pumicestone catchment

FC19—Develop a Code of Conduct for Kitesurfing to minimise conflict and navigation issues at the Caloundra Bar

FC20—Undertake a review of on-water speed limits and restrictions for the Pumicestone Passage

FC21—Undertake a Heritage Study in the Glass House Mountains area to document key heritage elements and outline strategies to protect them

FC22—Prepare an on-water activities management plan to reduce current and future impacts from recreational activities on ecological and social values of the Pumicestone Passage and its tributaries

FC23—Investigate potential health risks associated with eating wild oysters harvested from Pumicestone Passage and its tributaries

FC24—Undertake an archaeological study of the former sawmill site in the Mellum Creek subcatchment and promote associated local heritage values

FC25—Develop summaries (eg factsheets) for major Pumicestone subcatchments and promote to increase local community and industry engagement in catchment management issues

FC26—Research and map culturally significant sites across the Pumicestone catchment

FC27—Document the history of the Pumicestone catchment, its cultural sites and travel routes

Economic values

FC28—Upgrade the, track interpretative materials and promotion of the tourist walk around the base of Mt Tibrogargan

FC29—Upgrade the track, interpretative materials and promotion of the tourist walk to the peak of Mt Ngungun

FC30—Plan and promote a food industry cluster in the Beerwah area to co-locate local food produce and service outlets



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