

Implementing Lake Macquarie's CZMP – the story so far

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Abstract

Lake Macquarie City Council commenced preparation of a new Coastal Zone Management Plan (CMZP) in 2010. After over 6 years of preparation, exhibition and review, the Lake Macquarie CZMP was certified and gazetted in late 2016.

The CZMP is unique due to its integrated approach, which combines a focus on both hazards and ecological health across the 3 landscapes of Lake Macquarie's coastal zone; being the open coast, estuary, and Swansea Channel (as detailed in Parts A, B & C of the Plan).

Priority actions to manage coastal hazards and improve ecological health within these 3 landscapes are documented in Part D of the Plan, a Four Year Action Plan (2015-2019). Of the 130 priority actions listed in the action plan, 65% have already commenced or been completed.

This paper discusses progress in implementing the Plan, including both successes and challenges encountered to date, including;

Key Successes

Over 90 on-ground works projects to improve foreshore stability, water quality, stream stability, and wetland and dune ecosystem health have been completed since 2015. A 140% increase in Lake water clarity (measured at representative sites) has been recorded since 2002.

Council has been widely recognised for its leadership in adaption planning, with the Marks Point/Belmont South Local Adaptation Plan completed in 2016, and the preparation of the Pelican/Blacksmith Adaptation Plan currently underway.

Key Challenges

The collapse of the Pelican Marina complex in January 2016 was a significant coastal erosion event, which resulted in the loss of the marina buildings, a popular restaurant, a boat brokerage business, and a residential apartment. Swansea Channel's dynamic nature continues to pose a hazard to assets in the Pelican area. Responding to the ongoing erosion hazard will be a key challenge into the future.

Background to the Lake Macquarie Coastal Zone Management Plan (CZMP)

The City of Lake Macquarie is located in the Hunter region of New South Wales, approximately 120 km north of Sydney. The defining feature of the City is Lake Macquarie, which is one of the largest coastal estuaries in eastern Australia. The lake is connected to the ocean and open coast via Swansea Channel. The lake catchment includes residential, industrial, rural and natural areas, and is entirely located within the coastal zone.

The Lake Macquarie coastal zone is ecologically rich, physically dynamic and an attractive place to visit and settle. The natural environment includes the lake itself as well as beaches and open ocean to the east, and the Watagan mountain range to the west. These natural assets provide a quality lifestyle that is highly valued by the Lake Macquarie community (LMCC 2016). To maintain and improve the condition of the coastal zone, and manage the risk of coastal hazards to the people of the City, Council prepared an integrated CZMP for the open coast, the lake estuary and its tributaries, and the Swansea Channel (Figure 1).

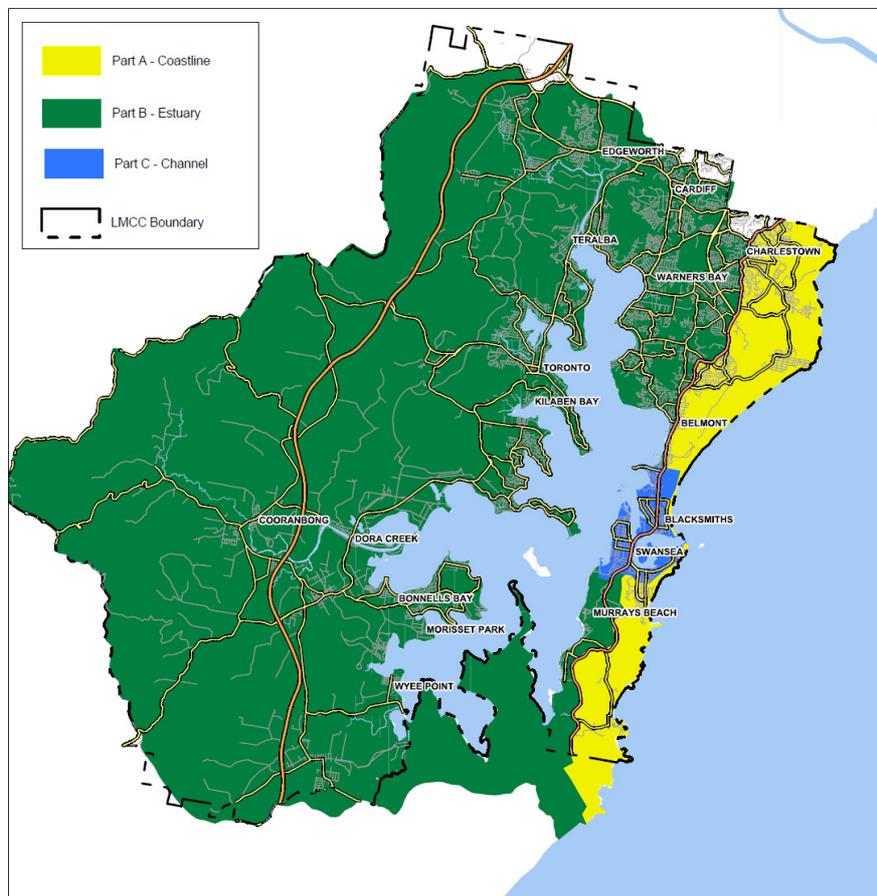


Figure 1 Map showing extent of Parts A, B & C of the CZMP

The vision for this CZMP, which reflects the community's aspirations described in the City of Lake Macquarie Community Plan 2014-2023, is:

'A resilient living coast and estuary provides for a liveable city and quality lifestyle. Caring for the environment equates to caring for our community'

The primary goal of the Lake Macquarie CZMP is to develop:

'Resilient coastal landscapes and communities.'

The CZMP comprises:

- Part A - for the Coastline
- Part B - for the Estuary
- Part C – for Swansea Channel
- Part D – Four-Year Action Plan

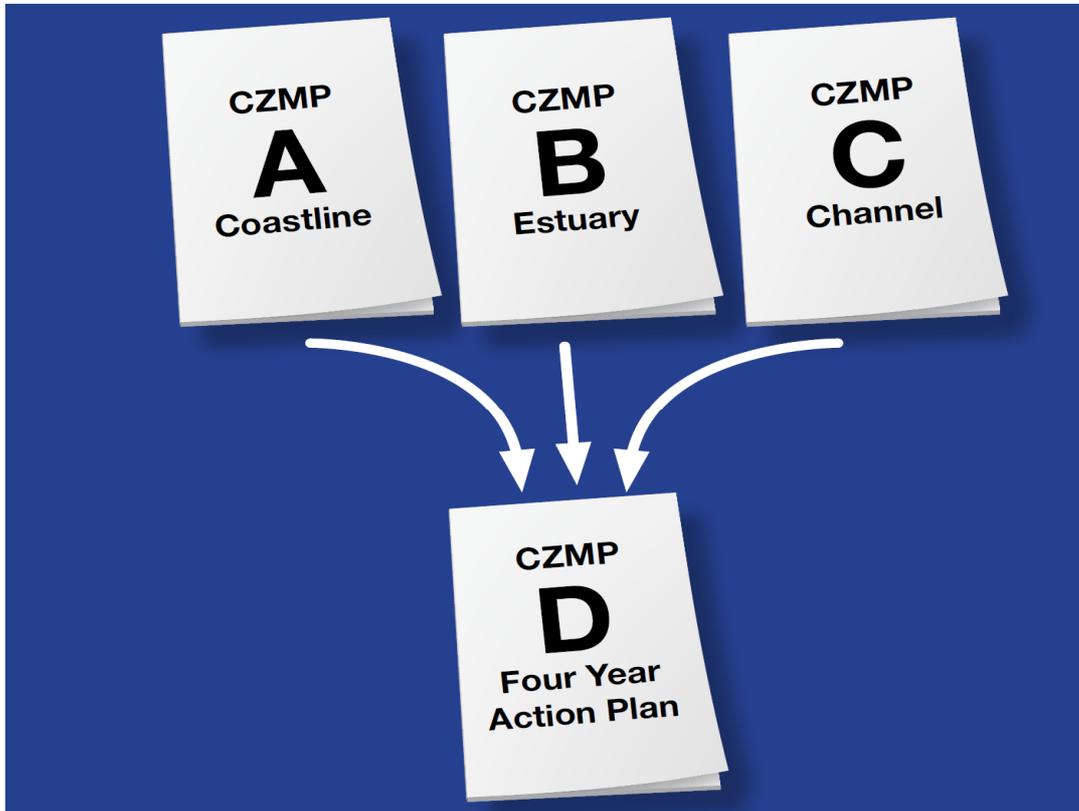


Figure 2 Composition of the CZMP

The four-part CZMP is supported by the:

- Coastline Options Assessment;
- Coastline Hazard and Risk Assessment;
- Lake Waterway Flood Study;
- Lake Waterway Floodplain Risk Management Study and Plan;
- Swansea Channel Hazard and Risk Assessment; and
- Community Consultation Report.

In preparing the CZMP, a key focus for Council staff was to provide for integrated management of the coastal zone within the City of Lake Macquarie. The CZMP is somewhat unique due to its integrated approach, which combines a focus on both hazards and ecological health across the 3 landscapes of Lake Macquarie's coastal zone; being the open coast, estuary, and Swansea Channel.

To achieve this integration, key aspects of the CZMP are:

- To build a management bridge between coastline, lake and foreshore policies and local people, so that looking after the coast (a nationally significant natural and social asset) is central to everyone's lives.
- To identify collaborative partnerships (across levels of government, between local Councils and with private sector and community organisations) to streamline and align implementation of coastal management actions.

- To allow all stakeholders to achieve the best outcomes for a healthy coastal zone in an established and growing urban and recreational context.
- To provide a clear pathway for the delivery of coastal management actions, monitoring and review of performance.
- To create the conditions that support resilient natural systems and a resilient coastal community.

Further to the issue of integration, linkages with local government’s Integrated Planning and Reporting Framework (IP&R) were considered essential for the Plan. Council has attempted to embed these linkages within the CZMP, as well as document these interrelationships within Council’s Community Strategic Plan (10 year), 4 year Delivery Program and 1 year Operational Plans.



Figure 3 Links between the CZMP within Integrated Planning and Reporting framework

Following an extensive period of drafting, consultation and public exhibition (which commenced in 2010), the CZMP was submitted to the Minister for Certification in March 2015.

In August 2016, Council received advice from the then Minister of Planning and Environment, Rob Stokes, that the CZMP had been certified under section 55G(3) of the Coastal Protection Act 1979. In his letter, Minister Stokes commented: *“I commend Lake Macquarie City Council for preparing such a comprehensive, practical CZMP covering the whole of the open coastline, Swansea Channel and the Lake Macquarie estuary, providing a straightforward approach to adaptively managing identified coastal hazards and risks into the future. I am pleased that the accompanying Four Year Action Plan 2015-2019 has been designed to integrate directly into council's Integrated Planning and Reporting Framework and note the extensive consultation with the local community and relevant government agencies in developing the plan”.* (Minister Rob Stokes) 5 August 2016

The Plan was gazetted in the *NSW Government Gazette* on 30 September 2016, concluding a period of preparation spanning almost 7 years, and representing countless hours of staff resources.

Summary of Actions and Status

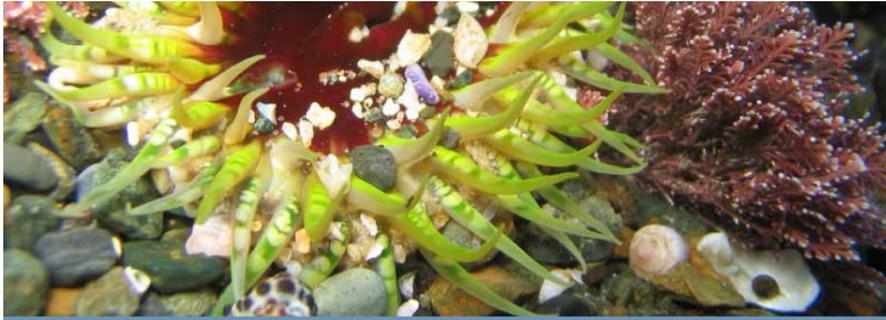
There are a range of asset owners with management responsibilities under the CZMP. The Four Year Action Plan (Part D of the CZMP) outlines 130 priority actions with responsibility assigned to Council and a range of other stakeholders (predominantly State Government agencies). The actions identified for implementation were planned in consultation with community and agency stakeholders, and consider coastal hazards, social wellbeing and ecological health, compatible with preserving the highly valued lifestyle of the people of Lake Macquarie.

These 130 actions are arranged into seven key themes. Council recognises that a suite of actions is more likely to solve a problem than reliance on only one action, and that different policy mechanisms are complementary when aligned. Important types of mechanisms employed within the plan include:

- Planning controls contained in the LEP and DCP and other regulatory or policy mechanisms such as plans of management for specific areas of public or private land;
- Service delivery, such as public works programs, public land management, training and awareness programs;
- Collaborative partnerships and research focused actions.

A summary of each of these 7 themes is provided in the figures below, including the objectives for each theme, and a summary of the number of actions it contains, the estimated cost of these actions (excluding internal staff resources). The status of actions (percentage complete, commenced, or not commenced) at October 2017 is also provided below.





Theme 2 Actions for a healthy coastal zone - protecting biodiversity and ecological resilience

Objectives for Theme 2:

- Maintain or enhance the condition of coastal and estuarine ecological communities in the context of sea level rise
- Maintain or enhance the connectivity of coastal habitats
- Reduce threats from invasive species, pollution and rubbish dumping
- Control catchment inputs to sensitive receiving waters, including stormwater runoff and licensed discharges
- Manage creek bank (riparian) and foreshore vegetation
- Protect sea grass beds
- Protect wetlands

34 Actions

Estimated Cost \$0.7m

Complete 7

Commenced 7

Commenced 11 /ongoing

Not Commenced 13



Theme 3 Actions for sustainable community access, use and value

Objectives for Theme 3:

- To build the resilience of the coastal landscape by managing lands sustainably
- To provide a safe, functional and attractive network of coastal pathways
- To provide for ongoing safe recreational use of Lake Macquarie beaches
- To maintain the community benefits of surf club assets along the coast, particularly surf club buildings
- An active and healthy community that enjoys access to the lake and its foreshores
- Cost effective, well designed foreshore and recreation infrastructure
- An adaptive foreshore management mind-set across the community
- Community involvement in planning for recreational facilities
- Community-wide understanding of the economic value of lake based tourism and consensus about appropriate growth in lake based tourism
- Acceptance amongst lake users that protecting the natural and cultural values of some locations constrains use

14 Actions

Estimated Cost \$0.5m

Complete 7

Commenced 2

Commenced 2 /ongoing

Not Commenced 3



Theme 4 Improve Council's focus and capacity to manage coastal values

Objectives for Theme 4:

- To align Council internal structure, resources and investment with the current and future challenges and opportunities that are offered by coastline and estuarine issues

11 Actions

Estimated Cost \$100K

Complete	3
Commenced	0
Commenced /ongoing	8
Not Commenced	0



Theme 5 Strong governance and supportive partnerships

Objectives for Theme 5:

- To enhance alignment of objectives and management strategies across land tenures
- To improve the efficiency or resource use
- To share information and encourage collaboration for a healthy and accessible coast
- To raise community awareness of coastal zone management issues and the rationale for adaptive responses
- To build community skills and capacity in managing the coastal zone
- To provide a clear management framework for community projects
- Have clear definitions of responsibility and accountability so Council, agencies and community can work collaboratively.

13 Actions

Estimated Cost \$80K

Complete	2
Commenced	0
Commenced /ongoing	5
Not Commenced	6



Theme 6

Actions for Communication and Collaboration

Objectives for Theme 6:

- Raise the profile of the coastal zone and communicate its history and value
- For all decision makers to have appropriate knowledge to balance ecological and community values
- For residents, ratepayers and waterway users to demonstrate behaviours consistent with stewardship of healthy coastal systems
- To have healthy estuarine systems and functions as a design criterion for all new development and infrastructure
- For residents, ratepayers and waterway users to have access to information that meets their needs, so they can make informed decisions about aspects of their lifestyle that have the potential to affect the health of the coastal zone
- For Councilors to own solutions that are good for the coastal environment and good for the community
- For residents, ratepayers and visitors to have access to places and information which showcase the Awabakal and historic heritage values of the Lake Macquarie Coastal landscape
- To have a transparent and accessible process for ratepayers and residents to contribute to objectives and decisions about the future of the lake.

13 Actions

Internal resourcing

Complete	1
Commenced	0
Commenced /ongoing	6
Not Commenced	6



Theme 7

Knowledge and adaptation, managing uncertainty

Objectives for Theme 7:

- Establish a flexible adaptive management framework
- To have ongoing collaborative collection and publication of information about the condition and use of the Lake Macquarie coast, lake and Swansea Channel.

13 Actions

Estimated Cost \$350K

Complete	0
Commenced	0
Commenced /ongoing	7
Not Commenced	6

Overall, Council has made significant progress in implementing the 130 priority actions identified in the plan. In the 14 months since the plan was gazetted (2.5 years since Council submitted the plan for certification) 65% of the priority actions have either been completed or commenced.

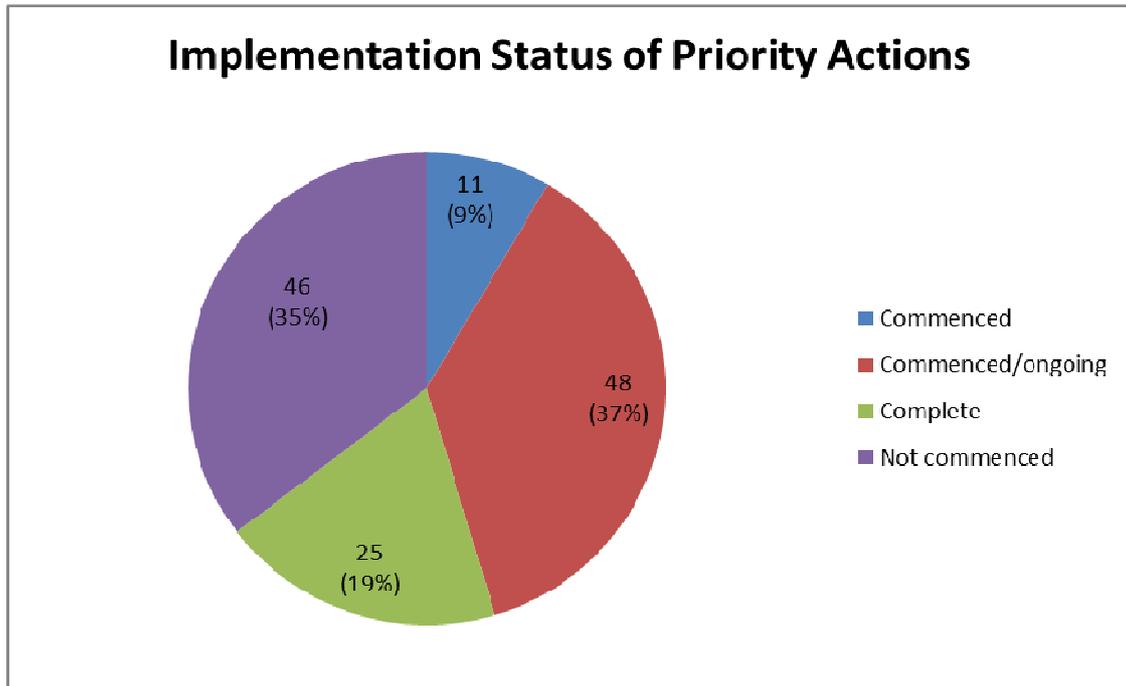


Figure 4 Implementation Status of Priority CZMP Actions

The relatively small number of actions that have been 'completed' (25 actions), is due to the ongoing nature of many of the actions contained in the plan. Many of these actions will continue as 'ongoing' for the foreseeable future. Examples of these 'ongoing' actions include monitoring, compliance, engagement as well as actions to continue to deliver on-ground environmental improvement works programs.

Key Successes

Since commencing implementation of the Plan in 2015, Council has achieved some meaningful successes. Summaries of some of significant and innovative successes are provided below:

Local Adaptation Planning

One of the key recommendations of the CZMP was for Council to prepare Local Adaption Plans (LAPs) for communities that are vulnerable to coastal hazards. The various hazard studies that supported the CZMP identify significant risks to communities including Marks Point, Belmont South, Blacksmiths, Pelican and Swansea, due to a range of coastal hazards, especially increased inundation under future sea level rise scenarios. Council believes that many of the adaptation assessments and decisions that are required to be made for the long-term resilience of these communities need to be made at a local (or neighbourhood) level, hence the focus on the preparation of local adaptation plans.

Council is also aware of the crucial need to engage effectively with local communities throughout the preparation of these plans. Hence, a large focus of the preparation of these plans has been on effective engagement with local communities (as described in the figure below).

Community Engagement Framework for Local Adaptation Planning

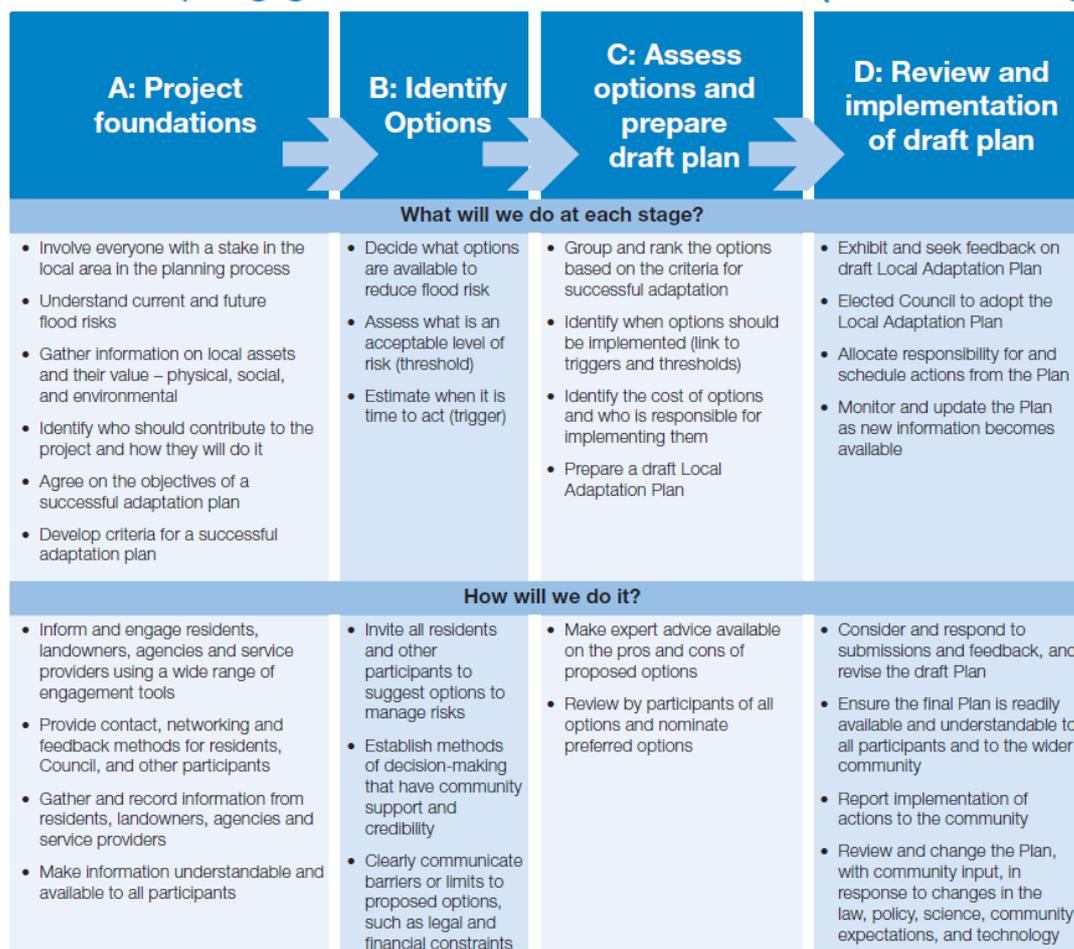


Figure 5 Community Engagement Framework for Local Adaptation Planning (LMCC 2013)

To date, the *Marks Point and Belmont South Local Adaptation Plan 2016* has been completed. Preparation of the *Pelican Blacksmiths Adaptation Plan* commenced in 2016 and is well advanced. Planning is also underway for the commencement of a Local Adaptation Plan for Swansea. Council's adaptation planning process has been the subject of numerous papers and presentations, and has received a number of national and international awards for planning, innovation and community engagement.

On-ground works

Prior to the completion of the CZMP, Council had a well-established program of implementing on-ground environmental improvement project, primarily focussed on improving Lake water quality. Since completing the Plan, Council has continued to deliver works programs aimed at improving the health of the Lake Macquarie estuary. It has also expanded the focus of these works project and now undertakes additional projects aimed at coastal dune resilience and illegal dumping deterrence. Since the 2014/2015 financial year, 95 on-ground environmental improvement projects have been completed, valued at approximately \$2.5 million (note: the NSW Coast and Estuary program provided matching funds for many of these projects). These projects include the installation of stormwater quality improvement devices, stabilisation of erosion foreshore and streambank areas, littoral and riparian vegetation enhancements, rehabilitation of wetland and saltmarsh habitats, access controls (fencing and gates) to limit damage to natural areas and prevent illegal dumping, and works to improve the condition of coastal dunes. A summary of the outputs of the works, and a map showing their locations is provided below:

Activity	Outcome
Area Fenced	400 Ha
Area Primary Weeding	67 Ha
Area Land Rehabilitated	36 Ha
Catchment Area Treated (via SQIDs)	42.7 Ha
Foreshore improvement	678 Metres
Number of Plants Established	61,760 Number
Rehab followup maintenance	293 Ha
Riparian improvement	2520 Metres
Streambank Stabilisation	1,425 Metres
Wetland improvement	73.46 Ha

Figure 6 Summary of Outputs from On-ground Environmental Improvement Programs 2014-17

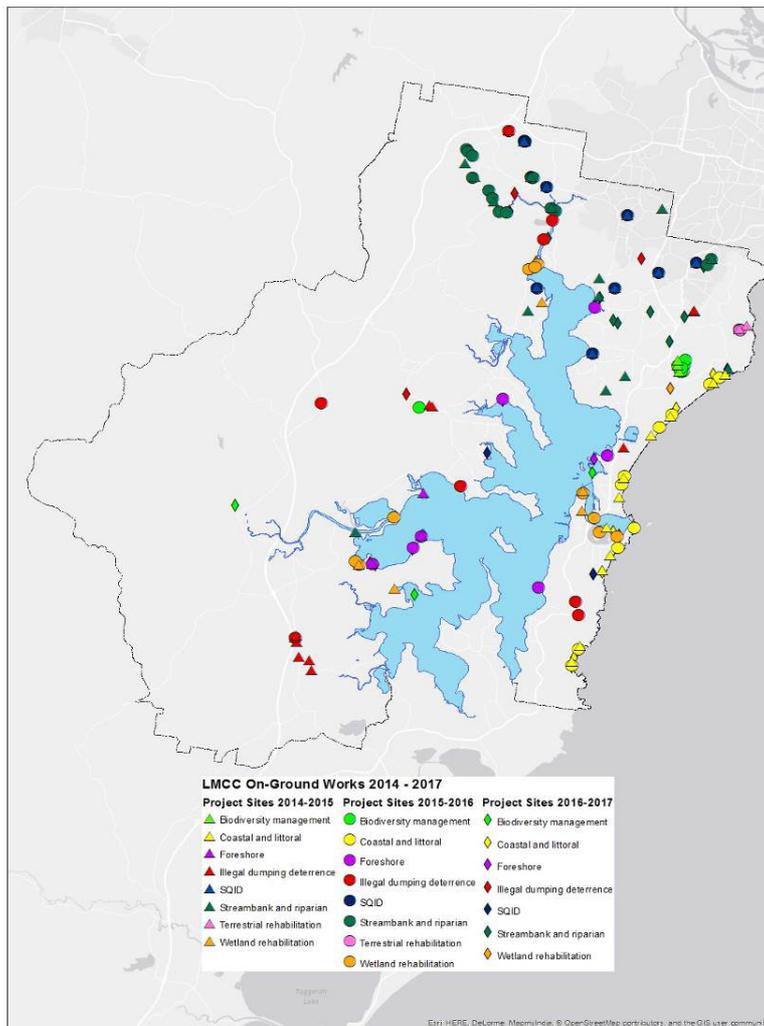


Figure 7 Map showing locations of On-ground Environmental Improvement Projects

Monitoring Results

A key focus of Part B (estuary) of the Plan is the aquatic health of the Lake Macquarie estuary. Improving estuary health has been a priority for Council for over 20 years, and the importance of continuing this approach was recognised in the Plan. Hence, a number of priority actions included in the CZMP have a water quality focus, across a variety of approaches (policy, planning, compliance and engagement). Ongoing monitoring of the health of the estuary is also a focus in the Plan to provide for good information on the state of the estuary, inform management actions, as well as providing for data to feed back to the local community and into the Statewide Estuary Monitoring Evaluation and Review program.

Council has partnered with the Estuaries and Catchments Team of the NSW Office of Environment and Heritage (OEH) to facilitate effective ongoing monitoring of estuary health. This monitoring program includes a variety of parameters, including salinity temperature, nutrients, clarity, dissolved oxygen, chlorophyll-a, and seagrass depth range across a number of representative sites within the lake basin and inflowing tributaries (OEH 2013). Results are reported annually in Council's 'State of the Environment Report' (LMCC 2016). This program is designed to maintain a high level of scientific rigour, yet some of the simplest measures (such as the use of Secchi depth to measure water clarity) still provide valuable insights in to lake health, and provide for good comparisons with historic data.

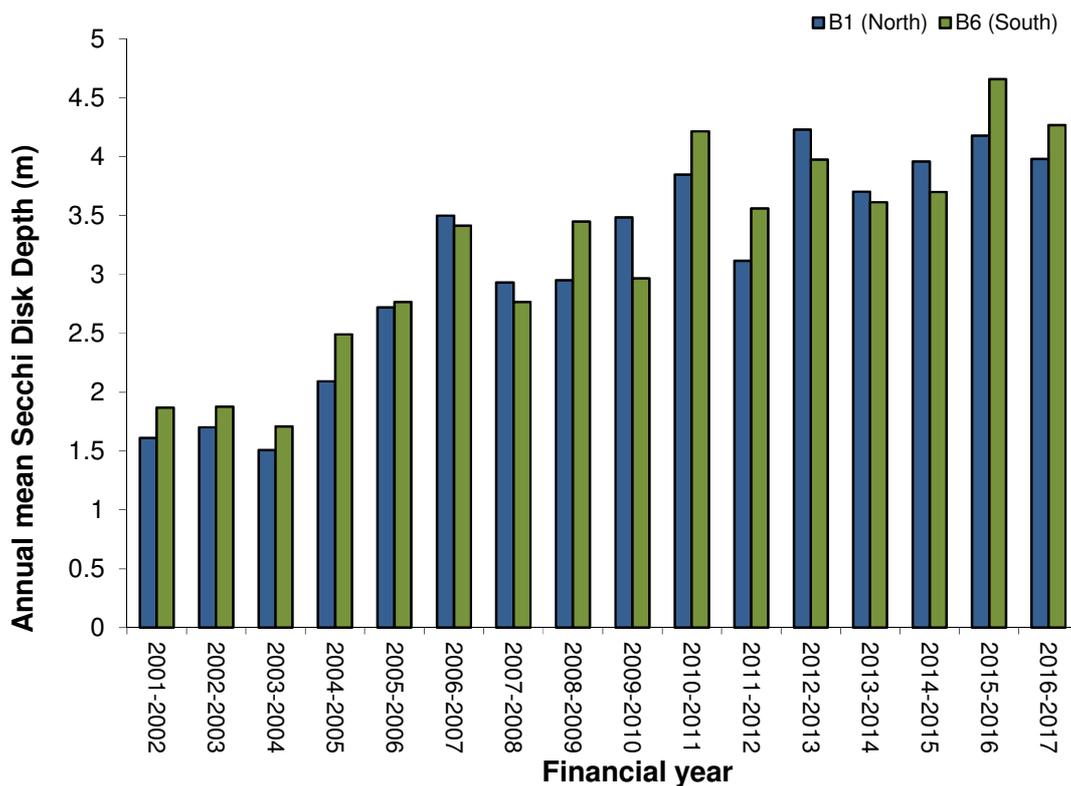


Figure 8 Annual mean water clarity (Secchi depth) at North and South Representative sites 2001/02 – 2016/17

The annual mean water quality clarity results for 2016-2017, show a continuing trend of good results, and improving water quality in most areas. Secchi depth is an indicator of water clarity determined by measuring the greatest water depth at which the disc can be read. The improvement in Secchi depth from 2001-2002 to 2016-2017 was approximately 140% (Figure 8).

At the commencement of monitoring the mean water depth was 1.74 metres and in 2016-2017 had improved to 4.13 metres.

These results demonstrate a significant and ongoing improvement in lake water clarity over 15 years. This improvement has been recognised by residents of the City, as Council often receives feedback from the community (including results from community satisfaction surveys) noting the improvements achieved in lake water quality.

Seacliff Stability Assessments in High Hazard Locations

Council undertook a cliff stability assessment for the Lake Macquarie coastline and mapped planning lines for cliff stability hazards as part of the CZMP. The CZMP recommended that detailed assessments of cliff stability be undertaken in higher hazard locations at Dudley, Redhead, Swansea Heads, Caves Beach and Catherine Hill Bay, as the citywide data did not provide for sufficient resolution to accurately describe the hazard extent at these locations.

With funding support of the NSW Coastal Management Program, an investigation was undertaken to assess the likely extent of seacliff recession (including an assessment of projected sea level rise of 0.4m by 2050 and 0.9m by 2100) and provide recommendations for setbacks from the seacliffs and planning controls for development or redevelopment.

Cardno Geotechnical was engaged to undertake this project, which utilised several innovative approaches. These included the use of an Unmanned Aerial Vehicles (UAVs) to assess areas of the cliff face that would be otherwise inaccessible. This data, combined with other geological information was used to describe rock fall hazard as well as past regression rates and frequency of landslide events.

As the project objective also included assessment of future cliff hazards resulting from increased sea levels, an approach needed to be developed to enable this assessment to occur. *“The general principle used in estimating future cliff regression rates for each period, has been to apply the maximum rate of erosion to the weakest rock mass that can be expected to be impacted by storm wave run-up, based on anticipated sea level rise, then to assess how that erosion at wave level will affect the identified failure mechanism(s) in the overlying rock sequence at that location”* (Cardno 2017). The project has provided Council with a much more accurate assessment of the geology and extent of hazards associated with coastal cliffs in the 5 high hazard locations. An example of the outputs from this project are provided in figure 9.

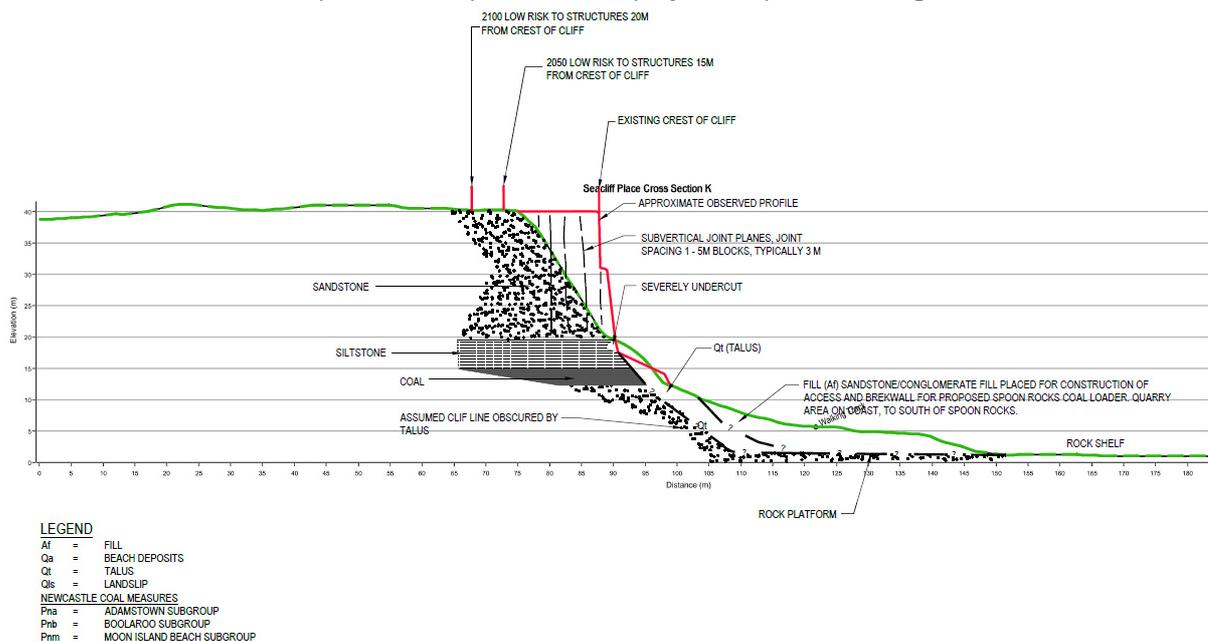


Figure 9 Seacliff Assessment (Caves Beach) showing and Future Risk Lines (Cardno 2017)

LiDAR

The coastal hazard and risk assessment that supports the CZMP utilises historic beach profile data as one of the key data sources for assessing beach erosion, recession and wave overtopping hazards. Whilst historical data is available (primarily based on photogrammetry), the CZMP recommended collection of more frequent beach profile data, predominantly as a tool to assess the potential for increased coastal hazards resulting from sea-level rise.

Traditional approaches to collect this data utilised either manual survey of profiles, (which can be relatively costly, and only identifies the profile at a limited number of locations), or photogrammetry data (which provides good accuracy and covers the whole beach extent, but is only available infrequently). In preference to these traditional approaches, Council has developed a partnership with the School of Aviation at the University of New South Wales (UNSW) to collect airborne Light Detection and Ranging (LiDAR) data on a frequent basis. This data is programmed to be collected 6 times per year (i.e., every 2 months) as well as following significant coastal erosion events.

An example of the outputs of this data collection is provided below (showing sand gain/loss at Caves Beach between 5/7/16 and 13/9/16). To date, Council has found this data to be extremely useful in identifying ongoing changes in beach morphology, and highly accurate when compared against surveyed benchmarks. Council has also found that this approach is providing data that is vastly superior to that previously gained through use of manual survey techniques, on a high frequency, and at comparable costs to a traditional survey approach.

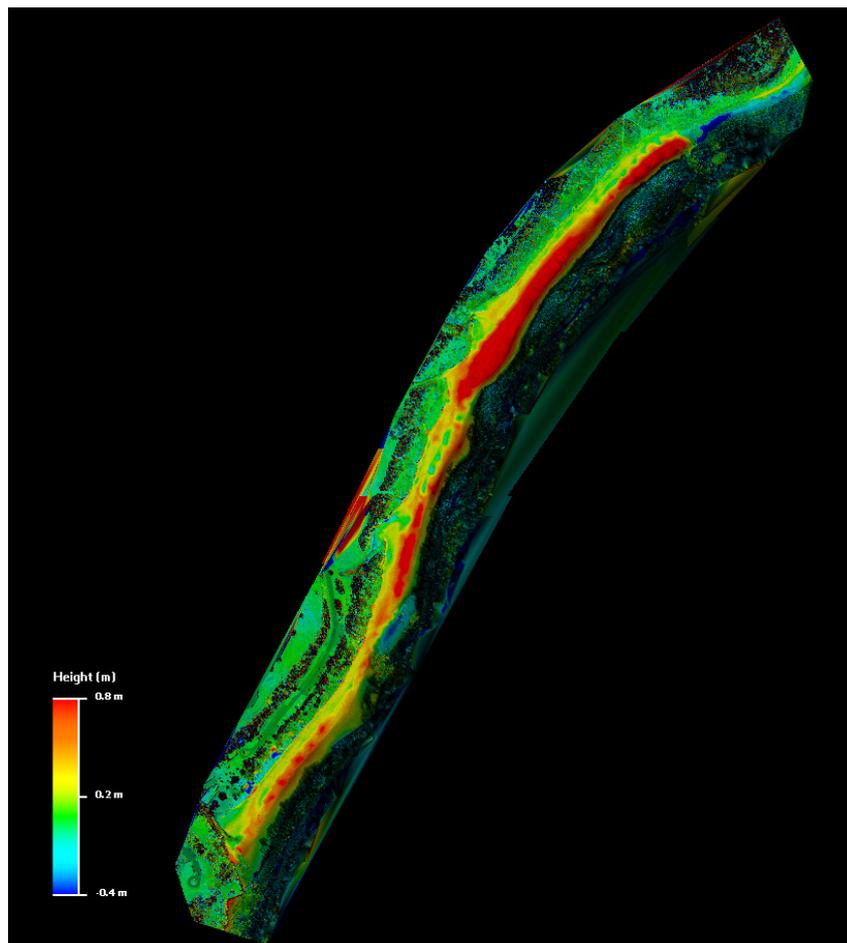


Figure 10 LiDAR Data showing Sand Gain/Loss at Caves Beach between 5/7/16 and 13/9/16 (UNSW 2017)

Key Challenges

Pelican foreshore (Swansea Channel)

The Pelican foreshore (located on the Northern side of Swansea Channel), contains some of NSW's most vulnerable assets at risk from coastal erosion. In January 2016, erosion resulted in sudden asset loss of the Pelican marina complex (including the marina buildings, a popular restaurant, a boat brokerage business, and a residential apartment). Refer to figures 11 and 12 below. Ongoing erosion is currently threatening essential emergency service facilities and recreational assets and if left unchecked, will threaten residential housing.

The cause of this erosion (ongoing migration of Swansea Channel) is well understood, and these assets were identified as being at either 'extreme' or 'high' risk (within the immediate timeframe) in the CZMP and supporting hazard studies. However, the sudden nature of the collapse resulted in one of the most significant losses of assets to coastal hazards experienced in NSW in recent times.



Figure 11 Photograph showing collapse of Pelican Marina complex (January 2015)
Photo by S Walpole

As a result of this incident, and the ongoing erosion risk that continues to threaten approximately 1km of the Pelican foreshore, Council and other agencies (particularly Crown lands – the owner of the Pelican Marina site) have devoted significant resources to erosion studies and concept designs for the area. Resultantly, the more strategic approach to the management of hazards along foreshores of Swansea Channel, which was intended in the CZMP, has not occurred as planned. The Pelican erosion issues have instead, become the focus of most action and resources within Council and other agencies.



Figure 12 Photograph showing Collapse of Pelican Marina complex (January 2015)
Photo by S Walpole

Coastal Reforms

Council has previously noted its support for the direction that the NSW Government has been pursuing with the coastal reforms process, and believe that the many components of these reforms compliment the Lake Macquarie CZMP. However, the stuttering (and sometime stalled) nature of these reforms has resulted in implications for Council for implementing some priority actions within the CZMP, particularly 'planning and development controls' actions.

At the time of receipt of certification advice from Minister Stokes for the Lake Macquarie CZMP (August 2016), all indications suggested that the finalisation of the NSW coastal reforms, particularly the commencement of the Coastal Management State Environmental Policy (SEPP), was imminent. As several of the planning and development control actions contained within the CZMP are likely to be impacted by these reforms, Council deferred undertaking these actions on the basis that finalisation of the coastal reforms was imminent, and a deferral would enable a more consistent approach between Council's requirements and those of the Coastal Management SEPP to be achieved.

The delays to finalisation of the reforms had a flow on effect, delaying Council undertaking a number of planning and development control actions, (such as updates to the Lake Macquarie Local Environment Plan and Development Control Plans). Additionally, if Council had been aware of the timeframe for the completion of the coastal reforms process, it would have approached the commencement of a number of planning and development control actions differently. Instead, Council has been dealing with ongoing uncertainty as to when the reforms program will be finalised.

Funding

Council has had good success in securing internal funding sources for CZMP implementation, and has had a good record in obtaining external grant funds. Council's longer-term budget framework provides funds for on-ground coastal zone improvement projects (approx. total \$800,000 p/a), as well as funding for non-works type projects (approx. total \$150,000 p/a) and

staff resources to manage these projects (typically 4-5 staff). The NSW Coast and Estuaries programs have provided matching funds for a number of projects (15 grants received since 2014/15) and Council staff have been grateful for the support provided by OEH to assist in delivering these projects.

However, one of the challenges faced in Council is that external funding programs tends to focus on the delivery of individual projects (or small groups of projects). The Lake Macquarie CZMP has a strong focus on integration, and a 'program' approach, yet funding sources tend to result in the delivery of numerous individual discrete 'projects', thus diminishing the effectiveness of the intended 'program' approach. This externally sourced project funding also tends to be short-term, and does not provide well for implementation of the CZMP over the long-term. Similarly, as Council uses its internal funding to 'match' these external grants, the limitations of the external funding sources have a flow on effect to Council's internal budgets.

We acknowledge that Council's size and resources mean that it is well placed compared to many other coastal councils. However, staff believe that more effective implementation of CZMP's could be achieved if external funding sources were available for longer funding terms, and able to be provided to support delivery at a 'program' level.

Conclusions

The Lake Macquarie CZMP has a strong emphasis on providing an integrated approach by combining a focus on both hazards and ecological health across the 3 landscapes of Lake Macquarie's coastal zone (open coast, estuary, and Swansea Channel). After over 6 years of preparation, exhibition and review, the Lake Macquarie CZMP was certified and gazetted in late 2016.

Council has made good progress in implementing the 130 priority actions identified in the plan. In the 14 months since the plan was gazetted (2.5 years since Council submitted the plan for certification) 65% of the priority actions have either been completed or commenced.

Key successes achieved to-date include:

- Completion of 95 on-ground works projects to improve foreshore stability, water quality, stream stability, and wetland and dune ecosystem health.
- An increase of 140% in Lake water clarity at representative sites has been recorded since 2002.
- The preparation of Local Adaptation Plans for vulnerable communities, with the Marks Point/Belmont South LAP completed in 2016, Pelican/Blacksmiths LAP progressing well, and Swansea LAP commencing soon.

However, CZMP implementation has highlighted a number of challenges, such as:

- The collapse of the Pelican Marina complex in January 2016 was a significant coastal erosion event, which has become the focus of significant resources, compared to the more strategic approach to the management of hazards along foreshores of Swansea Channel, which was intended in the CZMP.
- A stuttering (and sometime stalled) coastal reforms program has resulted in implications for Council for implementing planning actions within the CZMP.

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OEH 2013 *Assessing estuary ecosystem health: Sampling, data analysis and reporting protocols* <http://www.environment.nsw.gov.au/resources/soc/130125esthlthprot.pdf>

UNSW 2017 *School of Aviation of University of New South Wales LiDAR data for Caves Beach* (unpublished)