



WAVERLEY BEACHES COASTAL MANAGEMENT PROGRAM



STAGE 1 SCOPING STUDY

Erin Sellers Pty Ltd
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	Synopsis	This report was prepared in accordance with the NSW Coastal Management Manual and outlines the scope for completing Stages 2-4 of a Waverley Beaches CMP. The report is a supplement to and should be read in conjunction with the 2021 Eastern Beaches CMP Stage 1 Scoping Study.

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1 INTRODUCTION

1.1 Background

The coastline of the Waverley local government area (LGA) encompassing the beaches of Bondi, Bronte and Tamarama, is one of the most iconic in Australia. It is highly valued by the local community, Sydneysiders and international visitors for its scenic, recreational and environmental amenity.

Like all stretches of open coast, the Waverley coastline is subject to coastal hazards that can threaten beaches, public assets and private property. These include beach erosion, coastal inundation and coastal cliff and slope instability. These hazards will be exacerbated with projected climate change and associated sea level rise.

Waverley Council, which has primary responsibility for coastal management, has long been aware of these coastal hazards and has been proactive in managing them. For instance, Council completed a coastal risks and hazards vulnerability study (WorleyParsons 2011) and utilized the findings to develop a coastal risk management policy (Waverley Council 2012) that would allow development controls to be applied to affected properties.

With the introduction of the NSW Coastal Management Framework in the mid to late 2010s, Waverley Council committed to developing a coastal management program (CMP) as a longer-term, more coordinated strategy for managing the coastal zone. The framework calls for a staged approach to the development of CMPs in accordance with the requirements of the NSW Coastal Management Manual (OEH 2018a) and as shown in **Figure 1** below.

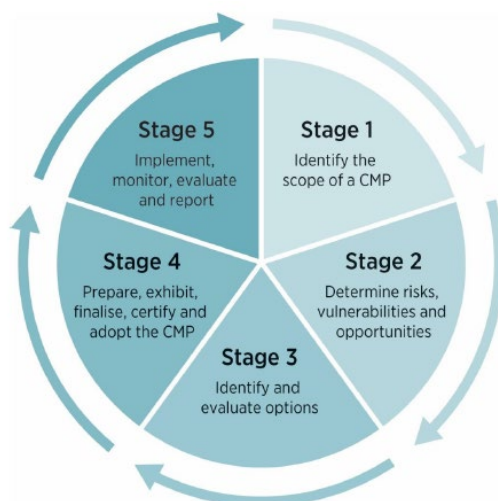


Figure 1: Stages in preparing and implementing a CMP

In 2020, Waverley Council, working together with Woollahra and Randwick Councils, oversaw the completion of the Eastern Beaches CMP Stage 1 Scoping Study as the first stage in the development of a CMP (BMT 2020). The CMP was to cover the Sydney Eastern Beaches sediment compartment extending from South Head on Sydney Harbour in the north to Cape Banks on Botany Bay in the south.

The Eastern Beaches CMP Stage 1 Scoping Study identified coastal hazards and future sea level rise as one of nine priority management issues. More specifically the scoping study noted a medium to high risk to Waverley beaches of:

- beach erosion and shoreline recession
- impacts on seawalls
- coastal inundation primarily through wave overtopping of the seawalls

The scoping study subsequently recommended various actions be undertaken during CMP Stage 2-4 including:

- a review and update of existing coastal and tidal inundation assessments (Study 9a.1)
- damages assessment for current and future coastal inundation (Study 9a.2)
- regional coastal processes conceptual model (Study 9b.1)
- probabilistic analysis of beach erosion and shoreline recession (Study 9b.2)
- first pass and detailed assessment of seawall condition (Study 9b.4)
- cliff and slope instability assessment (Study 9c.1)
- coastal vulnerability area mapping (Study 9d.1)

In 2021, Waverley, Woollahra and Randwick Councils commissioned a sea level rise hazard assessment across the Eastern Beaches region. The aim of the assessment was to determine the relative risk to council assets in the coastal zone, including seawalls, from future tidal and coastal inundation. The outcomes of the assessment were intended to inform more detailed hazard and adaptation studies as well as asset management planning and investment actions, and ultimately be incorporated within a CMP (BMT 2021).

Waverley Council is concerned about the structural condition of its seawalls. Waverley Council commissioned a technical assessment of the Bronte Beach seawall which confirmed the presence of defects as well as a risk of overtopping and seawall failure in large design events under current and future sea level conditions (Arup 2016). Although recommended by WorleyParsons (2011), similar assessments have not yet been undertaken for the seawalls at Bondi and Tamarama beaches. Given these concerns, Waverley Council is keen to move forward with detailed assessments of its seawalls and to investigate seawall renewal and upgrade options.

The Eastern Beaches CMP is, however, considered too broad to progress specific actions specifically for the Waverley LGA. It is also hampered by the lack of a multi council governance framework.

Therefore Waverley Council has sought to prepare this supplement to the 2020 Eastern Beaches CMP Stage 1 Scoping Study to enable priority works at Waverley's beaches. This will be known as the Waverley Beaches CMP Stage 1 Scoping Study.

Ultimately, in developing a CMP for Waverley Beaches, Council aims to:

- outline the long-term strategy for the coordinated management of the coastal zone in the Waverley LGA with a focus on Bondi, Bronte and Tamarama Beaches

- include reference to the implications for the 2022 sea level rise projections for Waverley
- identify relevant and necessary coastal projects that may be required in the next 5 -10 years in consultation with key representatives with Waverley Council’s Assets, Environment, Operations and Strategic planning teams
- meet the requirements of the *Coastal Management Act 2016*, the SEPP (Resilience and Hazards) 2021 and the NSW Coastal Management Manual, and to give effect to the relevant mandatory requirements presented within Part A of the manual and in accordance with Part B of the manual titled Stage 1 – Identify the scope of a coastal management program.

1.2 Scoping Study Approach

This report is the Waverley Beaches CMP Stage 1 Scoping Study which was prepared based on:

- relevant requirements of the NSW Coastal Management Manual (OEH 2018a-f)
- a review of the relevant literature including WorleyParsons (2011), Arup (2016), BMT (2020), the coastal management toolkit and other related guidelines
- discussion with staff from Waverley Council and the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW)
- site inspections conducted on 18 December 2023

The scoping study identifies the proposed scope of CMP Stage 2-4. This scope is discussed primarily in Section 4 and 5 and translated into specific actions for Council in Section 6.

The scoping study covers the coastal zone of Waverley LGA but focusses on the three main beaches of Bondi, Bronte and Tamarama. Coastal cliffs and catchments are also briefly considered. Certain coastal features such as ocean pools, public foreshore access and ephemeral beaches have been excluded from this scoping study, however, these could be assessed during the development of the CMP if warranted.

The Waverley Beach CMP Stage 1 Scoping Study should be considered a supplement to, and be read in conjunction with the Eastern Beaches CMP Stage 1 Scoping Study. For ease of cross-referencing, this scoping study follows the same format as the Eastern Beaches CMP Stage 1 Scoping Study. It confirms where the Eastern Beaches CMP Stage 1 Scoping Study remains relevant as well as highlights recommended updates or changes from the Eastern Beaches CMP Stage 1 Scoping Study.

2 CMP PURPOSE, VISION AND OBJECTIVES

The purpose of a Waverley Beaches CMP is to provide a long-term coordinated strategy for managing the coastal zone in the Waverley LGA.

The vision for the CMP given in Section 2.2.2 of the Eastern Beaches CMP Stage 1 Scoping Study remains relevant. However, the vision should be considered preliminary until it can be updated to reflect the community’s long-term aspirations for the coastal zone based on consultation to be conducted during CMP Stages 2-3.

The objectives that the CMP seeks to achieve given in Section 2.2.3 of the Eastern Beaches CMP Stage 1 Scoping Study remain valid. However, there is an opportunity as part of the CMP Stages 2-4 to rationalize these objectives using a logical framework approach and make them specific to the Waverley beaches.

3 STRATEGIC CONTEXT FOR THE CMP

The strategic context for developing a CMP as outlined in Section 3 of the Eastern Beaches CMP Stage 1 Scoping Study generally remains valid for the Waverley beaches.

Some changes to the planning and management context have occurred since the completion of the Eastern Beaches CMP Stage 1 Scoping Study. These are outlined in **Table 1** below.

Table 1: Update to the strategic planning and management context for the CMP

Theme	Comments
State environmental planning	The former State Environmental Planning Policy (SEPP) (Coastal Management) 2018 has been incorporated into Chapter 2 of the SEPP (Hazards and Resilience) 2021. It is understood that only one NSW coastal council has mapped the coastal vulnerability area that would allow them to apply the associated SEPP controls.
Metropolitan planning	The 2018 Greater Sydney Region Plan – A Metropolis of Three Cities was proposed to be replaced by a plan encompassing six cities but which still includes the Eastern Harbour City. NSW Government discussion papers for the six cities concept have not acknowledged coastal hazards or the threat of sea level rise. Metropolitan planning based on the six cities concept appears to have been delayed following machinery of government changes in late 2022 and late 2023. The status of strategic regional directions from the NSW Government is currently unclear.
Coastal management	The NSW Government has released several relevant guidelines including: <ul style="list-style-type: none"> • Guidelines for using cost-benefit analysis to assess coastal management options (DPIE 2020) • CMPs and integration with catchment management (DPE 2022a) • NSW Coastal Design Guidelines (DPE 2023a) • Coastal Crown Land Guidelines (DPE 2023b)
Marine estate management	The Marine Estate Management Strategy (MEMA 2018) continues to be delivered by various state agencies. Initiative 1 – Improving water quality and reducing litter is the most relevant of the nine strategy initiatives to metropolitan CMPs. However, associated actions around diffuse source water pollution, the risk-based framework, water quality objectives and marine litter, are being delivered slowly but with little direct relevance to this CMP.
Community strategic planning	Relevant strategies from the Waverley Community Strategic Plan 2022–2032 include: <ul style="list-style-type: none"> • 1.8.3 Partner with stakeholders to facilitate collaborative, effective and consistent approaches to coastal safety risk management • 2.3.1 Deliver the climate change adaptation and resilience framework • 2.5.3 Reduce or minimise pollutants entering waterways

Local strategic planning	<p>The Waverley Local Strategic Planning Statement 2020-2036 includes the following relevant planning priorities and actions:</p> <ul style="list-style-type: none"> • Planning priority 12 – Conserve our water resources and protect our coasts and beaches which includes preparation and delivery of the Eastern Beaches Open Ocean CMP as well as delivery of WSUD across the public and private domains • Planning priority 16 – Plan for and manage our assets and urban environment, and support our community to adapt and be resilient to a changing climate which includes finalizing and responding to risks identified in the CMP scoping study, where appropriate, through LEP and DCP provisions
Local environmental management	<p>Relevant deliverables from Council's Environmental Action Plan 2022 – 2032 include:</p> <ul style="list-style-type: none"> • Assess and address climate risks • Improve and maintain stormwater management by removing sediment and pollutants • Deliver community education and advocacy for waste avoidance and reuse • Prevent litter and illegal dumping
Asset management	<p>Waverley Strategic Asset Management Plan (SAMP) 6 (Waverley Council 2022) has been updated to include an annual allowance for seawall renewal as part of a 10 year renewals plan and for coastal zone management as part of an five year enhanced capital works program. Council has a seawall asset register and is considering developing an asset management plan for seawalls.</p>
Plans of management	<p>The plan of management for Bondi Park, Beach and Pavillion Plan of Management (PoM) was updated in 2021. It includes Action c.21 - Review the location and structural integrity of coastal infrastructure in regard to sea level rise, redesign and reinforce infrastructure to adapt to climate change where necessary.</p>

4 SETTING THE CMP SCOPE

4.1 Geographical Scope

The geographical scope of the Waverley Beaches CMP is the coastline of the Waverley LGA extending from Clarke Reserve in the north to Waverley Cemetery in the south. The coastline comprises the three beaches as well as the coastal cliffs between them as described by WorleyParsons (2011).

4.2 Coastal Management Areas

The Waverley coastline is mapped under the SEPP (Hazards and Resilience) 2021 as a coastal environment area and coastal use area. There are no coastal wetlands or littoral rainforest within the LGA.

A coastal vulnerability area has not been mapped. However, Waverley Council's (2012) Coastal Risk Management Policy identifies properties with coastal inundation and geotechnical risk based on the findings of WorleyParsons (2011) for which development controls apply. The policy references NSW legislation, regulation and policies although many of these have been superseded by the NSW Coastal Management Framework. As such the policy will require updating and potentially be integrated within the CMP.

4.3 Coastal Values and Management Issues

The nine coastline values described in the Eastern Beaches CMP Stage 1 Scoping Study remain valid for the Waverley beaches. The values of good water quality, marine biodiversity, ecosystem integrity, scenic landforms, natural beauty and recreational opportunities are particularly pertinent to Waverley.

The nine coastal management issues identified in the Eastern Beaches CMP Stage 1 Scoping Study also remain valid. This scoping study will focus on the high priority issues of coastal hazards and future sea level rise as well as the impact of catchment activities, stormwater runoff and discharges.

The above coastal values and management issues are considered in the following sections in relation to various coastal management elements and themes. Recommendations are made regarding items to be included in the scope of the Waverley Beaches CMP.

4.4 Coastal Risk Assessment

Coastal hazards are well described in the Waverley Coastal Risk and Hazards Vulnerability Study (WorleyParsons 2011). The study concluded that the current risk of coastal hazards impacting on the Waverley coastline is low. However, risk will increase with projected rises in sea level and could manifest as:

- decreased beach width and reduction in beach amenity
- increased instability of the seawalls leading to risk of structural failure
- increased overtopping of seawalls leading to increased risk to the seawalls, foreshore building and pedestrians
- increased risk of erosion of coastal cliffs to greater heights leading to increased instability and risk of localized collapses

The study made 17 recommendations concerning planning controls, seawall assessments, installation of warnings signs, monitoring of beaches, seawalls and cliffs, and emergency response. Many of these have been implemented by Council.

The Waverley Coastal Risk and Hazards Vulnerability Study is now approaching 13 years old and should be updated. It is recommended that the update:

- describe relevant changes to the coastline over the past 13 years such as new development, impacts of coastal storms and implementation of coastal protection measures
- refine estimates of storm demand and trends in beach levels for both current and future conditions based on updated wave modelling, photogrammetric analysis and sea level rise projections
- consider reassessing volume and extent of wave overtopping of seawalls for various design storm events based on the above work
- consider the merit of continuing with traditional deterministic approaches for modelling coastal processes and hazards rather than using more recent probabilistic modelling approaches suggested by BMT (2020) as part of recommended study 9b.2

- integrate the work of the Eastern Beaches: Regional Sea Level Rise Hazard Assessment (BMT 2020)
- assess and quantify risk to public assets, public safety and private property utilising the concepts of vulnerability, exposure and sensitivity as described in the NSW Coastal Management Manual (OEH 2018c)
- evaluate the effectiveness of current management action in reducing risk and identify opportunities for improvement

4.5 Geotechnical Risk Assessment

Although WorleyParsons (2011) concluded that cliff faces and foreshore slopes along the Waverley coastline had a 'tolerable' to 'acceptable' level of risk, it was recommended that geotechnical risk be monitored regularly and then reassessed every five years. Geotechnical monitoring has since occurred, however, it is understood that a full reassessment of geotechnical risk has not. A reassessment is now considered critical particularly given ongoing cliff top development at Dover Heights and Vaucluse as well as in light of recent landslips.

It is therefore recommended that a geotechnical risk assessment be undertaken as a high priority. This assessment should reference the WorleyParsons (2011) findings as well as relevant information from development applications and Council's own monitoring, in order to develop an understanding of changes in geotechnical risk over time.

This assessment could either be undertaken as a stand-alone study or undertaken together with the coastal risk assessment described above.

4.6 Seawall Assessment

It is recommended the condition, structural stability and performance of the seawalls at Bondi, Bronte and Bondi beaches be investigated as part of the CMP.

For the Bronte seawall, the investigation would commence with a review and update of the Bronte Seawall Technical Study (Arup 2016). As recommended by Arup (2016) this would include a more detailed inspection of the exposed sections of seawall to determine necessary repairs as well as a subsurface investigation to confirm depth to bedrock at selected locations.

WorleyParsons (2011) considered that despite low concrete compressive strength, small reinforcement bar diameter and low minimum cover to the reinforcement, the Bondi seawall was structurally sound and likely to remain robust for many years. It is understood that the seawall toe has not been exposed by storms at any time since the Reno-mattress toe protection works were installed commencing in 1987.

Nevertheless, it is considered prudent for the condition of the Bondi seawall to be reassessed and compared to what was found by PWD (1988). This information could be used in Council's asset management planning to help derive an asset degradation curve for the seawall and determine the appropriate type and timing of asset maintenance and renewal actions.

The Tamarama seawall can be assessed using the same methodology adopted by Arup (2016) for the Bronte seawall and also described by BMT (2020) as part of their recommended study no. 9b.4. This assessment would include taking concrete cores, digging test pits and undertaking seawall stability analysis.

4.7 Damages Assessment

Based on the findings from the review of coastal hazards and assessment of seawalls it is recommended that damages from coastal hazards be assessed. This would include damages to public assets and private property.

Damages can be estimated for the 'base-case' situation in line with the methodologies described in the guidelines for using cost-benefit analysis to assess coastal management options (DPIE 2020). It should be noted that DPIE (2020) describes damages in terms of 'costs' whereas it is usual practice when assessing the cost-effectiveness of management options to use the term 'benefits' to describe damages avoided, and 'costs' to describe the cost of the management option. The use of these terms should be clarified in the damages assessment.

BMT (2020) has suggested that a coastal damages and risk assessment (Study no. 9a.2) be undertaken following a coastal hazard assessment (Study no. 9a.1) but before assessment of beach erosion (Study no. 9b.2) and seawall condition (Study no. 9b.4). Subject to the timing of the above work, it is suggested that the damages assessment could be incorporated within the updated Waverley Coastal Risk and Hazards Vulnerability Study and be used to quantify risk.

4.8 Seawall Renewal and Upgrade Options Assessment

It is recommended that seawall renewal and upgrade options be assessed utilising the findings from the above studies. The options should be considered based on best-practice approaches to asset management, coastal risk management and cost-effectiveness.

Asset renewal is concerned with extending the service life of an asset. For the Bronte seawall, Arup (2016) suggested the life of the seawall could be extended through concrete repairs, local treatment or replacement of reinforcement, crack injection repairs and cathodic protection. Similar treatment options would apply to the Bondi and Tamarama seawalls. Given the risk of scour, Arup (2016) has also suggested stabilising the toe of Bronte seawall by installing placed rock or rock/grout-filled mattresses.

Asset upgrade is about increasing the level of service or performance of an asset. For the Bronte seawalls, Arup (2016) considered options to reduce the risk of seawall overtopping such as by increasing the seawall crest and adding a wave return. Again, similar options can be explored for the Tamarama and Bondi seawalls.

The cost-effectiveness of asset renewal and upgrade options should be assessed using a cost-benefit analysis in line with DPIE (2020) methodologies. In turn, the asset renewal and upgrade option assessment should be used to inform the preparation of an asset management plan for the seawalls.

4.9 Alternative or Complementary Coastal Protection Options

Alternative or complementary coastal protection options should be assessed concomitantly with the assessment of seawall upgrade options. As canvassed by WorleyParsons (2011), Arup (2016) and Horton Coastal Engineering (2020), options could include the following structural and other management measures for at-risk public and private assets:

- strengthen promenade walls at Bronte and Tamarama beaches to resist wave attack
- strengthen building doors, windows, external seating and other fixtures to resist wave attack
- relocate or remove at-risk assets such as promenade walls, external seating, garden beds, grassed areas and other public domain assets
- elevate, relocate or waterproof building electrical outlets, pumps, floor coverings, skirting boards and other fittings
- allow for installation of temporary structural protection measures such as sand bags or boards to resist building inundation
- establish minimum floor levels for habitable and non-habitable use

A comparative cost-benefit analysis should be undertaken and take account of:

- the distribution of costs and benefits to particular parties e.g. Council, lessees of public buildings, private property owners, etc
- mechanism of implementation e.g. public works implemented by council, works required through the development process, works undertaken voluntarily by private property owners, etc
- the timeframe for implementation based on, for example, Council's capital works program, development process, lease renewal, asset degradation, etc

4.10 Beach Management

Wind-blown sand that builds up to excessive levels at the base of the Bondi seawall or on the promenade behind is currently scraped up by Council as needed and relocated towards the front of the beach. WorleyParsons (2011) considered the build-up of wind-blown sand as a nuisance only and recommended Council continue with beach scraping.

Beach scraping is currently undertaken without any formal management approach. BMT (2020) recommended as part of Study 9b.3 for the CMP to develop sand management guidelines that incorporated an overarching strategy, beach scraping approvals, implementation triggers and monitoring procedure, as a means of maintaining amenity and reducing coastal risks.

It is recommended that beach scraping practice be formalized within the CMP for Bondi Beach. This could include examining:

- need for environmental impact assessment under Part V of the *Environmental Planning & Assessment Act 1979*
- approvals required under the *Crown Land Management Act 2016* or *Fisheries Management Act 1994* particularly for any sand relocated to areas of the beach below mean high water

- need for assessing risks to WHS and public safety
- consistency with principles given in the Coastal Crown Land Guidelines (DPE 2023)
- consistency with the Bondi Park, Beach and Pavilion Plan of Management (Waverley Council 2021) as well as plans of management covering Bronte and Tamarama Beaches

4.11 Coastal Adaptation

It is important to consider the need for seawall upgrades, coastal protection and ongoing beach management within the broader context of coastal adaptation. That is, the increased risk of coastal erosion and seawall overtopping due to rising sea levels will necessitate long-term planning for coastal adaptation and making major decisions around whether to protect, accommodate or retreat in the face of these risks.

Coastal adaptation is a component of climate change adaptation and has been an active area of inquiry in Australia for at least the past 15 years. Coastal adaptation has been studied most comprehensively at the federal level through the National Climate Change Adaptation Research Facility (NCCARF) and CoastAdapt, however despite this, there remains a lack of specific guidance for local councils on how to plan for coastal adaptation. Coastal adaptation planning in NSW remains in its infancy and is many years behind international practice.

It is recommended that the CMP scope the preparation of a framework for coastal adaptation planning. It is important to stress that this is a scoping exercise only and will not involve the actual development of a framework or recommendations for specific adaptation options.

Scoping a coastal adaptation planning framework during CMP Stages 3 will involve establishing the development of the framework as a project. Subject to funding, the scope can be used as a basis for developing the actual framework in CMP Stage 5.

The scoping work will involve describing essential project elements such as project logic, methodology, budget, resourcing, timing, stakeholder and community engagement, governance and risk. The project methodology should consider at least the following elements:

- coastal management approaches such as protect, accommodate or retreat
- conceptual models for adaptation planning such as the dynamic adaptive policy pathways (DAPP) approach that are promoted through research institutes like Deltares and CSIRO
- economic decision-making frameworks, for example, Randall et al (2012) and Wise & Capon (2016)
- risk management principles and approaches
- planning approaches at the strategic, statutory and asset planning level
- legal issues and responses
- community and stakeholder engagement approaches

The scoping of a coastal adaptation planning framework should have regard to:

- the work of CoastAdapt which is currently being reinvigorated by the Federal Department of Climate Change, Energy, the Environment and Water
- the recent release of the NSW State Disaster Mitigation Plan and the promotion of disaster adaptation planning by the NSW Reconstruction Authority
- forthcoming DCCEEW guidance on coastal adaptation triggers and thresholds that is expected to be incorporated within the NSW coastal management toolkit
- potential development of a Sydney coastal adaptation planning framework as proposed by Sydney Coastal Councils Group (SCCG)
- the Eastern Beaches: Regional Sea Level Rise Hazard Assessment (BMT 2021)
- examples of best-practice coastal adaptation being pursued in other LGAs such as at Lake Macquarie, Central Coast and Sunshine Coast

4.12 Emergency Response Management

Emergency response in the Waverley LGA is currently dealt with under the Waverley-Woollahra Local Emergency Management Plan 2021 (EMPLAN) and Council's enterprise risk management system.

The EMPLAN lists coastal erosion, landslip / subsidence and flash flooding as hazards with a low to medium risk. However, there is no subplan or supporting plan attached to the EMPLAN that addresses coastal emergencies in greater detail.

As outlined by OEH (2018e) and DPIE (2019) a coastal zone emergency action subplan (CZEAS) is required under the *Coastal Management Act 2016* if the LGA contains land within the coastal vulnerability area (CVA) and beach erosion, coastal inundation or cliff instability is occurring on that land. Although no CVA has been mapped for the Waverley LGA it is considered appropriate for a CZEAS to be prepared as part of CMP Stages 2-4 to address existing coastal hazards.

Preparation of a CZEAS will need to meet the requirements outlined by DPIE (2019) and be informed by the findings from the update to the Waverley Coastal Risks and Hazards Vulnerability Study, seawall assessment and damages assessment as discussed above.

The CZEAS will specify the criteria and thresholds for when emergency action under the CZEAS will be initiated. However, there will be smaller events for which the declaration of an emergency under the CZEAS is not warranted but which will still require some form of emergency response. This could include, for example, Council restricting public access to beach promenades during wave overtopping of the seawalls.

It is therefore recommended that, simultaneously with the preparation of the CZEAS, internal emergency operational procedures be developed for use by Council during smaller events. These procedures could be incorporated within Council's enterprise risk management system.

Both the CZEAS and Council's emergency operational procedures should also contemplate how private property owners, lessees of public buildings, state agencies, utility companies, etc, can best prepare for and respond to coastal emergencies.

4.13 Monitoring of Cliff Stability

Cliff stability was comprehensively assessed by WorleyParsons (2011) and led to a recommendation for Council to monitor geotechnical hazards annually or after prolonged or heavy rainfall. It is understood that a monitoring program was subsequently developed and implemented by Council, however, there are concerns the program has not been fully followed.

Building on the reassessment of geotechnical risk as recommended in Section 4.5 above, it is recommended that the adequacy of Council's geotechnical monitoring program be reviewed and updated. Such a review should assess and make recommendations around resourcing, record keeping, liaison with private property owners and reporting.

4.14 Water Quality Improvement

In 2017, Waverley Council commissioned an assessment of opportunities for stormwater quality improvement across the LGA (McGregor Coxall 2017). Some 20 options for stormwater quality improvement, including gross pollutant traps (GPTs), raingardens and swales, were found to be feasible. Ten of these were recommended for more detailed feasibility investigation and concept design.

The impact of catchment activities, runoff and discharges was identified by BMT (2020) as one of the coastal management issues with the highest level of risk. To address this it is recommended that the CMP include a feasibility investigation and concept design for those recommended devices located in the catchments draining to the open coastline.

This investigation and design work will need to have regard to DPE (2022a) guidelines on the integration of catchment management actions within a CMP. This may involve:

- quantifying the benefits of proposed devices in protecting coastal values
- prioritizing devices located in the coastal zone for initial investigation, design and recommended installation, before catchment-based devices
- working with Sydney Water and other funding agencies to identify funding programs for the investigation, design and installation of devices, other than the NSW Coastal & Estuary Grants Program
- considering supporting catchment management actions such as development controls, street sweeping, enforcement and community education, as part of broader catchment management planning and which can be funded by means other than the NSW Coastal & Estuary Grants Program

DPE (2022a) suggests councils have an option of submitting a planning proposal to expand the coastal environment area to cover the catchment as a means of allowing broader catchment-based actions to be included in a CMP. This is not recommended for the Waverley Beaches CMP given the SEPP controls for the coastal environment area are not considered an appropriate mechanism for improving catchment stormwater quality in either the private or public domain.

4.15 Monitoring, Evaluation and Reporting

Various data are collected within and around the Waverley coastal zone often as part of ongoing monitoring programs. These include:

- beach water quality monitoring under the NSW Beachwatch Program
- monitoring of GPTs and stormwater harvesting systems
- asset condition assessments
- litter monitoring at beaches
- cliff stability monitoring
- sewerage monitoring through Sydney Water's sewage treatment system impact monitoring program
- monitoring of the marine estate through the activities of the NSW Marine Estate Management Authority (MEMA), Sydney Institute of Marine Science (SIMS) and other state and federal agencies
- community values, satisfaction and aspirations surveys

Building on BMT's (2020) study no. 1.4, it is recommended that these monitoring programs be reviewed and, where possible, integrated within a monitoring, evaluation and reporting (MER) program to be developed for the Waverley coastal zone. This will require consultation with state and federal agencies with assets in the coastal zone e.g. Sydney Water, or which have responsibility for marine biodiversity e.g. MEMA and NSW Fisheries. This work presents an opportunity to improve the understanding of current and future threats to marine biodiversity, which BMT (2020) notes is currently limited.

It is suggested the MER program be founded on well-established conceptual models such as:

- logical framework
- driver-pressure-state-impact-response (DPSIR) framework
- source-pathway-receptor model
- triple loop learning model
- various monitoring program design approaches e.g. before-after-control-impact

An MER program is a mandatory requirement of CMPs (OEH 2018a). In developing an MER program it is important to distinguish between undertaking MER for the recommended actions in the CMP and undertaking MER for the results of those actions. The former is concerned with monitoring 'outputs', that is, have the CMP actions been undertaken. The latter is concerned with monitoring 'outcomes', that is, what have the CMP actions achieved and which aligns more with the discussion above. Both outputs and outcomes are listed by OEH (2018f) as MER elements to be included in the CMP.

4.16 Management of Bronte-Coogee Aquatic Reserve

The 4 km long Bronte-Coogee Aquatic Reserve, which is one of only 12 aquatic reserves in NSW, is a valuable environmental asset for the local community that serves to protect marine biodiversity and habitat as well as facilitate education and research. Although the aquatic reserve provides good protection it is still subject to the threats identified by BMT WBM (2017) in its state wide threat and risk assessment.

It is recommended that Council engage with NSW Fisheries during CMP Stage 2-4 to ensure a plan of management for the Bronte-Coogee Aquatic Reserve is prepared and implemented by NSW Fisheries.

5 PRELIMINARY BUSINESS CASE

5.1 Overview

The broad reasoning, benefits and risks in preparing a CMP as outlined in Section 5 of the Eastern Beaches CMP Stage 1 Scoping Study apply equally to a CMP for Waverley Beaches. Governance arrangements for the Waverley Beaches CMP will, however, differ from an Eastern Beaches CMP. Several studies recommended by BMT (2020) or are suggested by guidelines given in the NSW Coastal Management Toolkit are also recommended to be excluded from the CMP.

5.2 Governance

It has been difficult to progress a CMP for the Eastern Beaches given organizational priorities, resourcing and available funding could not be aligned across Waverley, Randwick and Woollahra Councils. As a result, project governance arrangements for progressing the Eastern Beaches CMP were not established.

Project governance for developing the Waverley Beaches CMP will be more straightforward. Notwithstanding, it is recommended Waverley Council continue to collaborate with Randwick and Woollahra Councils on coastal matters where warranted. This could involve collaboration with individual councils or through regional forums like the Sydney Coastal Councils Group. The proposed scoping of a coastal adaptation planning framework is one example where collaboration will likely be beneficial.

A decision by Waverley Council to proceed with the Waverley Beaches CMP is also not expected to limit the ability of Randwick or Woollahra Councils in progressing CMPs within their LGAs.

5.3 Funding

It is recommended that Council apply to the NSW Coastal and Estuary Grants Program to fund Waverley Beaches CMP Stages 2-4. If successful, grant funding would be offered on a two to one basis with Council. Council should work closely with DCCEEW staff in preparing the grant application to maximise Council's chance of success.

Council may wish to consider utilising sources of funding other than general revenue when applying for grant funding. For example, Council's stormwater levy funding could be put towards the proposed feasibility investigation and concept design of stormwater quality improvement devices.

Council should also consider approaching other state agencies such as Sydney Water, NSW Reconstruction Authority and NSW Fisheries to explore potential funding or in-kind contributions towards specific CMP studies. This could include contributions towards investigating stormwater quality improvement devices on Sydney Water infrastructure, scoping of the coastal adaptation planning framework and preparing updated marine species lists and plan of management for the Bronte-Coogee Aquatic Reserve.

5.4 Exclusions

The development of a regional coastal process conceptual model (Study 9b.1) was recommended by BMT (2020) on the basis that it was deemed important for the CMP to consider broader regional coastal processes as well as possible management actions that could affect sand transport within the primary Eastern Beaches sediment compartment.

However, the scoping study noted that individual beaches within this sediment compartment are essentially closed sediment systems. WorleyParsons (2011) further confirmed that Bondi, Tamarama and Bronte beaches do not lie on a littoral drift coastline and sand is not exchanged between them. Accordingly, the development of a regional coastal process conceptual model is not considered warranted for this CMP.

WorleyParsons (2011) also found that the Waverley Beaches were stable and that beach nourishment was not currently required. Unless the update to the Waverley Coastal Risks and Hazard Vulnerability Study finds otherwise, there is unlikely to be a need to investigate beach nourishment as a management option.

Preparation of coastal vulnerability area mapping (Study 9d.1) and a subsequent planning proposal was recommended by BMT (2020). Given that development controls are already applied via Council's Coastal Risk Management Policy and given the length of time to prepare, consult on and submit a planning proposal, it is recommended the preparation of CVA mapping and associated planning proposal not be contemplated until CMP Stage 5.

The risk-based framework for considering waterway health outcomes in strategic land-use planning decisions is briefly identified by OEH (2018c) and discussed by DPE (2023d) regarding its integration with CMPs. Application of the risk-based framework to the Waverley Beaches CMP is considered to be of little value because:

- the framework and associated guidance from DPE (2023d) provide insufficient detail on how the framework can be applied
- the framework is more relevant to catchments where major changes in landuse are occurring or are predicted such as greenfield catchments, and not in established, fully urbanised catchments like in the Waverley LGA
- water quality impacts are already proposed to be addressed in the CMP through the feasibility investigation and concept design of stormwater quality improvement devices

6 FORWARD PLAN

6.1 Overview

The forward plan in the Eastern Beaches CMP Stage 1 Scoping Study adequately describes the obligations of councils and public authorities in implementing CMPs as well as the key requirements for CMP Stages 2-5.

The forward plan given here outlines the recommended actions for completing the Waverley Beaches CMP together with supporting actions around CMP governance, community and stakeholder engagement, staging, more detailed scoping, procurement and other concurrent actions.

6.2 Recommended Actions for CMP Stages 2-4

Table 2 below outlines the recommended studies and components for completing Waverley Beaches CMP Stages 2-4. The table includes links to the corresponding study or component identified within the Eastern Beaches CMP Stage 1 Scoping Study, indicative costs and funding sources.

The table only highlights CMP studies and components for which consultants will need to be engaged. Work undertaken by Council in managing the project and assisting consultants in preparing the CMP is not included in the table. It is expected that Council will make a significant in-kind contribution to community and stakeholder engagement in CMP Stages 2-3 as well as public exhibition, finalization, certification and adoption of the CMP in Stage 4.

Indicative costs for CMP studies and components are provided as a range. Costs can be further refined as project briefs are developed, consultant quotations are received and studies are progressively completed. The total estimated cost to complete CMP Stage 2-4 ranges from \$418,000 to \$1,280,000.

Nearly all proposed CMP studies and components are considered eligible for grant funding under the NSW Coastal and Estuary Grants Program. Matching funding can be allocated as part of Council's strategic asset management plan (SAMP) and/or from general funds.

The draft CMP document to be developed in Stage 4 will need to satisfy the mandatory requirements for a CMP as outlined by OEH (2018a) and DPIE (2020b). The development of the required CMP business plan and MER program is included in the indicative cost for the development of the CMP document.

Depending on available resources and funding as well as Council's desire to expedite completion of CMP Stages 2-4, Council may wish to postpone the delivery of selected CMP Stage 2 studies until CMP Stage 5. This could apply to Items 3.6 to 3.9 as noted in **Table 2**. In this instance, these studies would only be broadly scoped during CMP Stage 2 (similar to Item 3.3) and not actually delivered.

Studies recommended for the Waverley Beach CMPs should not preclude Waverley Council from progressing with other actions recommended in the Eastern Beaches CMP Stage 1 Scoping Study should these later be deemed warranted.

Table 2: Recommended CMP Studies and Components

Recommended CMP Studies / Components	EB CMP Stage 1 Item No.	Indicative Cost	Council SAMP	Funding Source		CMP Stage 5 action
				Council general revenue & in-kind	NSW Government	
CMP Stage 2: Risks, Vulnerabilities and Opportunities						
2.1. Undertake coastal risk assessment	9a.1	\$60,000 - \$120,000	✓		✓	
2.2. Undertake geotechnical risk assessment	9b.2	\$150,000 - \$300,000	✓		✓	
2.3. Review & update seawall condition assessments	9b.4	\$10,000 - \$80,000	✓			
2.4. Assess coastal inundation damages	9a.2	\$20,000 - \$50,000	✓		✓	
2.5. Community and stakeholder consultation	1.02	\$0 - \$20,000		✓	✓	
CMP Stage 3: Identify and Evaluate Options						
3.1. Identify & evaluate seawall renewal and upgrade options	3.02	\$50,000 - \$180,000	✓		✓	
3.2. Identify & evaluate alternate or complementary coastal protection options		\$40,000 - \$80,000	✓	✓	✓	
3.3. Scope framework for long-term coastal adaptation planning (taking account of SLR)		\$10,000 - \$50,000	✓	✓	✓	
3.4. Prepare coastal zone emergency action subplan (CZEAS)	3.03	\$0 - \$20,000		✓	✓	
3.5. Prepare sand management framework	9b.3	\$8,000 - \$20,000	✓	✓	✓	
3.6. Review and update cliff stability monitoring program	9c.1	\$10,000 - \$50,000	✓		✓	Yes
3.7. Assess feasibility and prepare concept design of priority water quality improvement devices	1.1	\$40,000 - \$130,000	✓	✓	✓	Yes
3.8. Review water quality and ecosystem (including marine) monitoring, evaluation and reporting program	1.4	\$10,000 - \$30,000		✓	✓	Yes
3.9. Prepare plan of management for Bronte-Coogee Aquatic Reserve		TBD			✓	Yes
3.10. Community and stakeholder consultation	1.02	\$0 - \$30,000		✓	✓	

CMP Stage 4: Prepare, Exhibit, Finalise, Certify and Adopt the CMP					
4.1. Prepare draft CMP document including business plan	4.01/4.02	\$10,000 - \$80,000	✓		✓
4.2. Publicly exhibit draft CMP	4.04	\$0 - \$20,000	✓	✓	✓
4.3. Finalise, certify and adopt CMP	4.06	\$0 - \$20,000	✓	✓	✓
		TOTAL	\$418,000 – 1,280,000		

6.3 CMP Governance

Governance arrangements for delivering the CMP Stages 2-4 should be established in accordance with Waverley Council's project management system. This will likely involve appointing a project manager, establishing a cross-departmental project control group, preparing relevant project management documentation and listing the project for delivery within the appropriate Council work program and/or Council's operational plan.

Governance arrangements for delivering CMP actions as part of CMP Stage 5 should be investigated in CMP Stage 4. This will involve considering how CMP actions are integrated within Council's IP&R framework, assigned to the appropriate Council department for delivery and reported through the appropriate standing or advisory committees of Council. As suggested by BMT (2020), consideration could also be given to establishing a coastal advisory committee and obtaining ongoing community input to CMP Stage 5.

6.4 Community and Stakeholder Engagement

The community and stakeholder engagement strategy presented at Appendix A of the Eastern Beaches CMP Stage 1 Scoping Study should be reviewed and updated to be made specific to the Waverley Beaches. The strategy should maintain consistency with the guidelines for community and stakeholder engagement in coastal management (OEH 2018g) and Waverley Council's Community Engagement Strategy 2023.

Given the technical nature of the proposed CMP Stage 2 studies it is recommended that consultation be targeted towards stakeholders and sections of the community that are directly affected by coastal hazards. The aim of this consultation will be to develop a shared understanding of coastal risks that will serve as a basis for investigating management options in CMP Stage 3.

Community and stakeholder engagement in CMP Stage 3 would be broader and ideally consider all 'users' of the coastal zone. Community engagement actions should be tailored based on the group being engaged with i.e. property owners within the coastal zone, local ratepayers, local businesses and visitors.

Close contact should be maintained with state agencies throughout the CMP project. This will help in obtaining timely input to and ultimate support for recommended CMP actions.

Costs for community and stakeholder consultation will vary depending on the number of stakeholders to be engaged, type of engagement, community and stakeholder sensitivity and intensity of feedback, and the ability of Council to support engagement.

6.5 CMP Staging

It is recommended that Council apply for grant funding and commit to the delivery only of CMP Stage 2 in the first instance. This is advantageous in that it:

- allows Council to develop an up-to-date appreciation of coastal hazards prior to considering management options

- will help inform the development of project briefs for CMP Stages 3 -4 studies / components and allow for consultants to provide a more accurately priced quotation
- allows Council to build its capacity and confidence to manage the CMP

Following the completion of CMP Stage 2, Council could then apply for grant funding and commit to the delivery of CMP Stages 3-4. Timing for completion of CMP Stages 3-4 will depend on several factors including:

- alignment of Council's budget cycle with timeframes for preparing a grant application and awarding a grant
- community interest and sensitivities
- any decision to postpone recommended studies to CMP Stage 5
- input, feedback and ultimate agreement on CMP actions from participating state agencies
- reporting the CMP document to Council for public exhibition and adoption
- review of CMP document by DCCEEW and certification by the Minister for the Environment

It is suggested that Council allow up to three years to complete CMP Stages 2-4.

6.6 CMP Scoping and Procurement

Council may wish to obtain assistance in scoping the recommended studies and components in greater detail than what is presented in this scoping study. Options for assistance include:

- engaging specialist consultants to advise on and/or prepare project briefs
- calling for expressions of interest from selected consultants and asking for an initial appreciation of the work required
- consulting with staff from DCCEEW
- consulting with staff from other coastal councils that are completing open coast CMPs

The studies and components recommended for Stage 2 can feasibly be let under one contract to a single consultant with expertise in coastal management. That consultant could seek assistance from sub-consultants specializing in, for example, geotechnical engineering and community consultation.

The majority of studies and components recommended for Stages 3-4 could also be let to a single consultant with assistance from sub-consultants. Council may wish, however, to consider engaging more specialist consultants directly, for example, consultants with expertise in stormwater management to deliver Item 3.7.

In scoping the required work and in preparing to engage consultants, Council should have regard to the Rollason et al (2016) report on how to hire and make the best use of consultancy services in coastal adaptation.

6.7 Concurrent Actions

There are several actions that Council could contemplate pursuing concurrently with the CMP Stages 2-4. These actions would likely not be eligible for grant funding under the NSW Coastal and Estuary Grants Program.

Firstly, Council should consider preparing an asset management plan for seawalls. This plan would be informed by the outcomes of the Stage 2 studies.

Council should look to review and update its coastal risk management policy as an interim measure before the CMP is adopted and certified. The update to the policy should incorporate the findings from the CMP Stage 2 studies, reflect the NSW Coastal Management Framework and reference relevant guidelines such as the NSW Coastal Design Guidelines (DPE 2023a) and Crown Coastal Design Guidelines (DPE 2023b). Ultimately, it is suggested the policy could be integrated within and be replaced by the CMP.

Finally, Council's plans of management for Waverley beaches and coastal parks should be reviewed and updated to reflect the same items as for Council's coastal risk management policy as discussed above.

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