



Coastal Zone Management Plan for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)

Prepared for Northern Beaches Council by Haskoning Australia Pty Ltd

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EXECUTIVE SUMMARY

A Coastal Zone Management Plan (CZMP) for Bilgola Beach (at Bilgola) and Basin Beach (at Mona Vale) is set out herein. Haskoning Australia Pty Ltd, a company of Royal HaskoningDHV, was engaged by Pittwater Council (now Northern Beaches Council) in March 2015 to complete the CZMP. The study area generally includes sandy beach areas with adjacent private beachfront development and public lands, but not rocky headlands.

At Bilgola Beach, there are 8 beachfront private lots. Key public assets comprise Bilgola SLSC and the adjacent public car park, as well as the kiosk/café adjacent to the car park. At Basin Beach, there are 16 beachfront private lots, and 5 of these lots are strata properties giving a total of 82 addresses at Basin Beach. There are no significant public building assets in the Basin Beach study area.

Development in the study area has been most threatened or damaged by the action of coastal storms in 1966, 1967, 1974, 1978 and 1997. Bilgola SLSC and the adjacent car park have a vertical sandstone block seawall located seaward, but this has an elevated toe (at 2m AHD) and is at risk of undermining. Wave overtopping of the seawall has damaged the SLSC building in the past. At 21 Bilgola Avenue there are two lines of coastal protection works. At Allen Avenue, coastal storms in 1974 damaged a house and swimming pool, and there is a rock revetment seaward of these properties that is usually buried under the dune sand. At Basin Beach, the only properties likely to be unprotected are at 35, 37, and 39 Surfview Road. Seawalls at 11, 15, 29, 31 and 33 Surfview Road are the most likely to be effective.

As full details of the protection works at Bilgola Beach and Basin Beach are generally unknown or uncertain, or they may be undersized or constructed with an elevated toe level, future effectiveness of these protection works cannot be guaranteed (except where a specialist coastal engineer can certify that the works have been designed and constructed in accordance with standard coastal engineering practice for a specified design life).

The beaches of the study area have been relatively stable over the last 50 or so years. That is, although both beaches (and particularly Bilgola Beach) are subject to short term beach erosion from coastal storms with large waves and elevated water levels, natural recovery after storms has meant that sand has returned to the beach and the long term average beach volumes have been relatively stable. However, due to climate change and particularly sea level rise, it is projected that in the future these beaches will recede (move landward). Where protection works remain in place, this would lead to a narrowing beach width over time.

In combination with erosion caused by wave action, runoff discharging from two of the stormwater outlets at Bilgola Beach (at Bilgola Creek and adjacent to Bilgola SLSC), as well as overland flow runoff over the seawall, can cause additional beach erosion leading to exposure of rocks and rock-filled wire cages used for scour protection. Actions are identified herein to manage these issues.

The key locations at risk from wave runup in the study area are at Bilgola SLSC and the adjacent car park. It is recommended that there is consideration of raising the seawall and reorientating the ramp in this area. Risk to private development from wave runup can generally be managed through maintaining a difference in height between ground floor levels and adjacent natural ground levels.

Risks to public safety can also arise after storms when there may be steep and high erosion escarpments along the beach, and particularly at beach accessways which may make access difficult.

Council should mechanically regrade steep and high erosion escarpments, close off dangerous public beach access points, and undertake beach scraping as required in these situations.

To assess the appropriate setbacks and controls for new development so that future development in the study area is at acceptable risk from erosion/recession, an innovative risk assessment has been completed. The adopted minimum setbacks are depicted in Figure 22 on page 40 (for Bilgola Beach) and Figure 23 on page 41 (for Basin Beach). To manage future new development in the study area such that it is at acceptable risk, these setbacks shall be applied along with a requirement for piled foundations where development is proposed seaward of the setback line for development on conventional foundations.

Landowners are also entitled to consider the installation or upgrading of protection works under *State Environmental Planning Policy (Infrastructure) 2007*. Where works would be entirely within private property (where feasible) and would not impact on adjacent property, protection works may be considered to reduce the risk to development and potentially move the setback line for piled development further seaward (but no further seaward than the Foreshore Building Line). Council does not consider that it has the responsibility to protect private property from coastal erosion and inundation hazards, and does not intend to do so.

The key public asset at risk from erosion/recession in the study area is Bilgola SLSC. Existing private development at almost all lots is at least partially seaward of the acceptable risk line for conventional foundations (except at 21 Bilgola Avenue at Bilgola Beach, and 37 and 39 Surfview Road at Basin Beach).

The potential for rock falls from both headlands at Bilgola Beach is an ongoing public risk management issue for Council, and numerous works have been undertaken to address this issue. It is recommended that a regular monitoring program is established for these headlands following an investigation into an appropriate frequency and monitoring protocol.

An Emergency Action Subplan is included herein, updating the previous version prepared in 2012. Landowners must act well (generally months) in advance of a storm to consider implementing emergency protection works.

Council would seek to maintain public beach access and amenity in the future, within its financial capacity. If beachfront development is to be maintained in the study area, the most feasible option to maintain beach amenity in the future is beach nourishment. However, Council would be unable to implement beach nourishment without the support of NSW Government. Specifically, the NSW Government would have to develop a policy (or modify legislation if required) such that offshore sand sources could be accessed, provide funding, and take a coordinating role as nourishment would only be cost effective if implemented at a regional scale covering numerous coastal council areas.

An implementation schedule for the proposed management actions herein has been provided in Section 8. A summary of the actions is provided in Figure ES1 for Bilgola Beach, and Figure ES2 for Basin Beach. Actions are colour coded as red for actions relating to private development, yellow for actions relating to the sandy beach, light green for actions relating to vegetated dunes, blue for actions related to stormwater (creeks, outlets and runoff), magenta for actions relating to Council built assets, brown for actions relating to geotechnical issues, orange for actions related specifically to Crown Land issues, dark green for actions related to Rock Pools, and black for general actions.

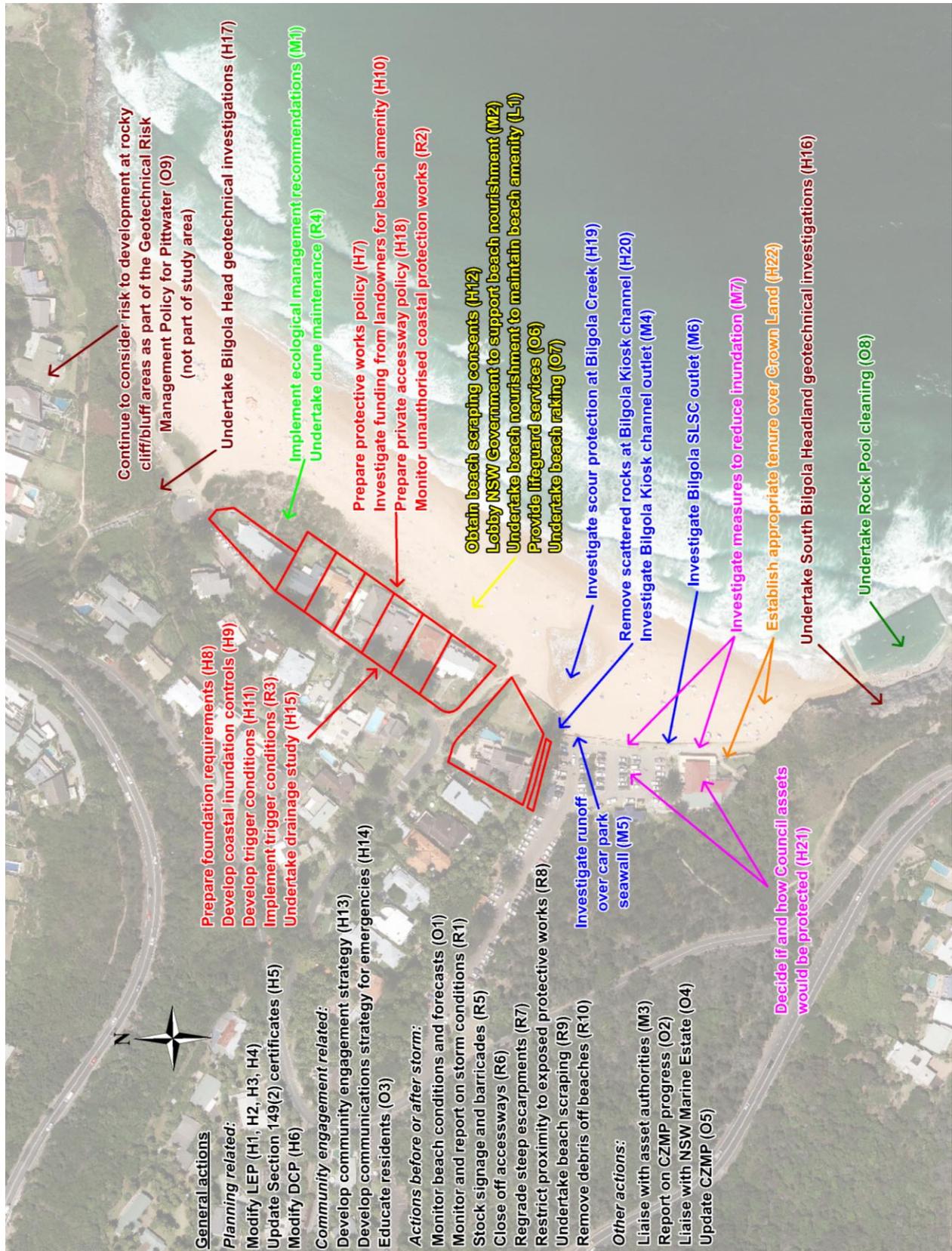


Figure ES1: Summary of management actions for Bilgola Beach

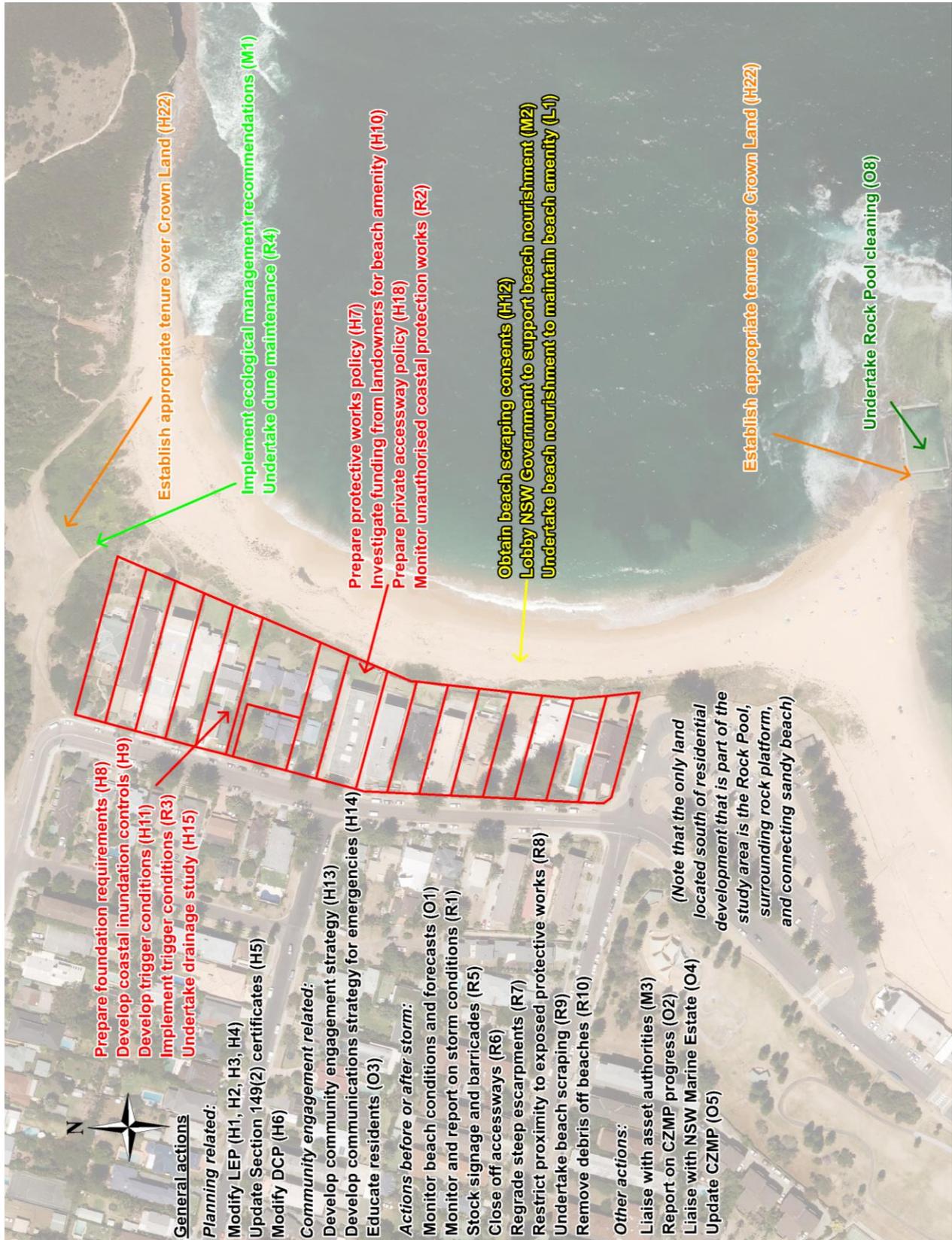


Figure ES2: Summary of management actions for Basin Beach

CONTENTS	Page
EXECUTIVE SUMMARY	iii
1. INTRODUCTION	1
2. DESCRIPTION OF STUDY AREA	2
2.1 Geographical Setting	2
2.2 Land Use and Zonings	6
2.3 Stormwater, Sewage and Water Infrastructure	11
2.4 Historical Coastal Storm Damage and Protection works	14
2.5 Coastal Ecology	15
2.6 Cultural and Heritage Significance	15
2.7 Community Uses	16
2.7.1 Surfing	16
2.7.2 Fishing	17
2.7.3 Surf Life Saving Clubs	17
2.7.4 Swimming Clubs	18
2.7.5 Other Recreational Activities	18
2.7.6 Beach Usage and Lifeguard Patrols	19
2.8 Access to Beaches and Headlands	19
2.8.1 Summary Figures	19
2.8.2 Vehicular Access	22
2.8.3 Pedestrian Access	22
2.8.4 Headland Access	23
2.8.5 Universal Access	23
2.8.6 Discussion on Adequacy of Current Access Arrangements and any Associated Environmental and Safety Impacts	23
3. LEGISLATIVE AND PLANNING CONTEXT	25
4. COASTAL PROCESSES AND COASTLINE HAZARDS	26
4.1 Preamble	26
4.2 Erosion/Recession Related Hazards	26
4.3 Stormwater and Overland Flow Impacts	26
4.4 Coastal Inundation	32
4.4.1 OEH (2013) Requirements	32
4.4.2 Ground Elevations	33
4.4.3 Elevated Ocean Still Water Levels	33
4.4.4 Wave Runup	34
5. RISKS TO PUBLIC SAFETY AND BUILT ASSETS	36
5.1 Preamble	36
5.2 Risks to Public Safety	36
5.3 Risks to Built Assets	38
5.3.1 Erosion/Recession	38
5.3.2 Coastal Inundation	42
5.4 Property Risk and Response Categories	42
5.5 Geotechnical Stability Issues at Bilgola Beach Headlands	42

5.5.1	South Bilgola Headland	42
5.5.2	Bilgola Head	44
5.6	Emergency Action Subplan	45
6.	COMMUNITY AND STAKEHOLDER CONSULTATION	46
6.1	Requirements from <i>Guidelines for Preparing CZMPs</i>	46
6.2	Consultation Activities	46
7.	PROPOSED MANAGEMENT ACTIONS	47
7.1	Preamble	47
7.2	Actions to Manage Current and Projected Future Risks to Private Development from Coastal Hazards	47
7.2.1	Erosion/Recession Hazards	47
7.2.2	Coastal Inundation Hazards	50
7.2.3	LEP and DCP changes	51
7.2.4	Discussion on Existing Use Rights	51
7.3	Actions to Manage Current and Projected Future Risks to Public Assets from Coastal Hazards	53
7.4	Actions to Protect and Preserve Beach Environments and Beach Amenity	53
7.5	Actions to Ensure Continuing and Undiminished Public Access to Beaches, Headlands and Waterways	54
7.6	Actions to Protect or Promote the Culture and Heritage Environment	55
8.	IMPLEMENTATION SCHEDULE FOR MANAGEMENT ACTIONS	56
9.	REQUIREMENTS MET FROM “GUIDELINES FOR PREPARING CZMPS”	67
10.	REFERENCES	71

TECHNICAL APPENDICES INCLUDING COASTAL EROSION EMERGENCY ACTION SUBPLAN (IN SEPARATE VOLUME)

APPENDIX A:	HISTORICAL COASTAL STORM DAMAGE AND PROTECTION WORKS
APPENDIX B:	THREATS TO AND MANAGEMENT OF COASTAL ECOSYSTEMS IN STUDY AREA
APPENDIX C:	LEGISLATIVE AND PLANNING CONTEXT
APPENDIX D:	RISK ASSESSMENT TO DEFINE APPROPRIATE BEACHFRONT DEVELOPMENT SETBACKS AND CONTROLS IN RELATION TO COASTLINE HAZARDS
APPENDIX E:	PRIVATE PROPERTY RISK AND RESPONSE CATEGORIES AS PER OEH (2013)
APPENDIX F:	COASTAL EROSION EMERGENCY ACTION SUBPLAN FOR BILGOLA BEACH (BILGOLA) AND BASIN BEACH (MONA VALE)
APPENDIX G:	NOTES FROM CONSULTATION MEETINGS AND RESPONSES TO PUBLIC SUBMISSIONS
APPENDIX H:	IDENTIFICATION AND EVALUATION OF CZMP MANAGEMENT OPTIONS
APPENDIX I:	SOURCES OF FUNDING FOR CZMP ACTIONS

1. INTRODUCTION

Pittwater Council, now Northern Beaches Council (hereafter denoted as “Council”) was directed by the then (NSW) Minister for Climate Change and the Environment to complete a Coastal Zone Management Plan (CZMP) for Bilgola Beach (at Bilgola) and Basin Beach (at Mona Vale) in 2011.

Haskoning Australia Pty Ltd, a company of Royal HaskoningDHV, was engaged by Council in March 2015 to complete the CZMP, as set out herein.

As stated in *Guidelines for Preparing Coastal Zone Management Plans* (Office of Environment & Heritage [OEH], 2013), “the primary purpose of a CZMP is to describe proposed actions to be implemented by a council, other public authorities and potentially by the private sector to address priority management issues in the coastal zone over a defined implementation period. These issues include:

- managing risks to public safety and built assets;
- pressures on coastal ecosystems; and
- community uses of the coastal zone”.

Accordingly, the CZMP herein is set out as follows:

- a description of the study area is provided in Section 2, including discussion on land use, zonings, infrastructure (stormwater, sewage and water), historical coastal storm damage and protection works (with reference to **Appendix A**), coastal ecology (with reference to **Appendix B**), cultural and heritage significance, community uses, and access to beaches and headlands;
- the legislative and planning context of the study is considered in Section 3 with reference to **Appendix C**;
- coastal processes and coastline hazards are discussed in Section 4, including consideration of erosion/recession (with reference to **Appendix D**), stormwater and overland flow impacts, and coastal inundation;
- risks to public safety and built assets are outlined in Section 5 (including consideration of erosion/recession and coastal inundation, and ‘acceptable risk’ in relation to erosion/recession with reference to **Appendix D**), also with provision of property risk and response categories (with reference to **Appendix E**), discussion on geotechnical stability issues at Bilgola Beach headlands, and development of an Emergency Action Subplan (with reference to **Appendix F**);
- community and stakeholder consultation that has been undertaken as part of the investigation herein is described in Section 6, with additional information provided in **Appendix G**;
- proposed management actions are discussed in Section 7, with identification and evaluation of CZMP management options in **Appendix H**, and discussion on sources of funding for CZMP actions in **Appendix I**;
- the management actions are listed in a prioritised implementation schedule in Section 8;
- a CZMP must be prepared in accordance with OEH (2013) guidelines, and how these requirements have been addressed herein is described in Section 9; and
- references are listed in Section 10.

All Appendices are contained within a separate volume, “Coastal Zone Management Plan for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale), Technical Appendices Including Coastal Erosion Emergency Action Subplan”.

2. DESCRIPTION OF STUDY AREA

2.1 Geographical Setting

The study area for the investigation reported herein comprises Bilgola Beach at Bilgola, and Basin Beach at Mona Vale, as shown in Figure 1 and Figure 2 respectively.



Figure 1: Study area at Bilgola Beach

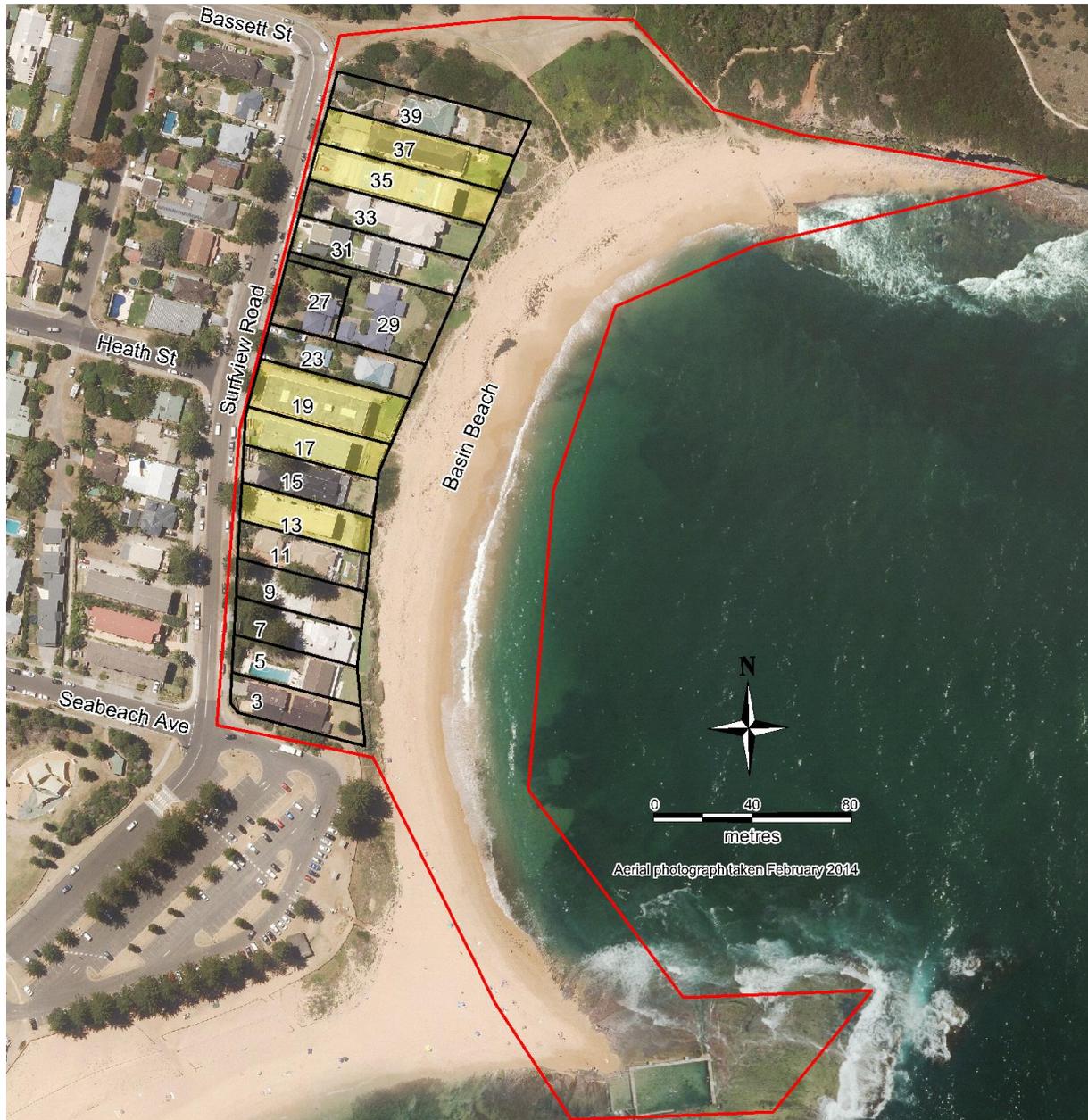


Figure 2: Study area at Basin Beach, with strata lots shown shaded

The study area generally includes only sandy beach areas with adjacent private beachfront development and public lands¹. Risks to development at rocky cliff/bluff areas are considered separately as part of the *Geotechnical Risk Management Policy for Pittwater and GHD (2007a)*. A CZMP action (O9) is included in Section 8 to continue to consider risk to development at rocky

¹ This is consistent with the Ministerial direction given to complete the CZMP in 2011, in which it is stated that: “under the provisions of section 55B of the *Coastal Protection Act 1979* (the Act), I direct Pittwater Council to submit a draft coastal zone management plan in accordance with the requirements under Part 4A of the Act for the coastline that is a beach (i) between the Bilgola Beach North Headland and the Bilgola Beach South Headland, known as Bilgola Beach; and (ii) between opposite Bassett Street and opposite Seabeach Avenue, known as Mona Vale Beach”. Note that the direction incorrectly refers to Basin Beach as “Mona Vale Beach”.

cliff/bluff areas as part of the *Geotechnical Risk Management Policy for Pittwater* (no development affected by this policy is in the study area).

That stated, there is some consideration of risk to the public from geotechnical hazards herein in regard to rock falls from the headlands at each end of Bilgola Beach, see Section 5.5. Inclusion of the Mona Vale rock pool region in the study area was to allow consideration of the ecological significance of this area immediately adjacent to and potentially affected by actions at Basin Beach.

The open coast coastline of the former Pittwater Council extends from Palm Beach in the north to Narrabeen Head (south of Turimetta Beach and north of Narrabeen Beach) in the south, with an aerial view provided in Figure 3. The locations of Bilgola Beach and Basin Beach are highlighted on this Figure.



Figure 3: Aerial view of former Pittwater Council open coastline, with study area beaches highlighted

2.2 Land Use and Zonings

At Bilgola Beach, there are 8 private lots with beach frontage, namely (moving south to north) at 21 Bilgola Avenue, and 1, 3, 5, 7, 9, 11, and 13 Allen Avenue Bilgola (Figure 1). Key public assets comprise Bilgola Surf Life Saving Club (SLSC) and the adjacent public car park, as well as the kiosk/café adjacent to the car park.

At Basin Beach, there are 16 private lots with beach frontage, namely (moving south to north) at 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 27-29, 31, 33, 35, 37, and 39 Surfview Road (Figure 2). Five of these lots are strata properties (unit blocks) as shaded in Figure 2 (namely 13, 17, 19, 35 and 37 Surfview Road, with 10, 12, 21, 18 and 10 units respectively). There is thus a total of 82 addresses at Basin Beach. There are no significant public building assets in the Basin Beach study area.

Key land use features, including the location of private (beachfront) and public (both Council and Crown Land) lands are depicted in Figure 4 (Bilgola Beach) and Figure 5 (Basin Beach).

The Crown Land directly managed by the Department of Industry – Lands (“Lands NSW”) comprises:

- The Crown Land shaded yellow (that is essentially the sandy beach adjacent to the ocean at Bilgola Beach and Basin Beach) that is part of unidentified Crown Land reserve R1011268² for the public purpose of future public requirements (and includes Bilgola and Mona Vale rock pools which are unofficially managed by Council³);
- the Crown Land at Bilgola Beach shaded light blue that is part of Reserve R18805, which is for village purposes. Lands has recommended that Council seeks to transfer R18805 to be under Council care, control and management (ie to have Council as Trust Manager), which would require an additional purpose of “public recreation” being added. A CZMP action is included in Section 8 in this regard as per Footnote 3;
- the Crown Waterway Non Tidal area shaded red at Bilgola Beach corresponding to Bilgola Creek (note that Bilgola Creek passes through private property, that is the land on both the northern and southern sides of Bilgola Creek is private land); and
- the Crown Land at the northern end of Basin Beach known as Lot 1 DP 1094825 and shaded orange.

Crown Land directly managed by Council as corporate Trust managers (for the purpose of public recreation) comprises:

- R58243 at the outlet of Bilgola Creek, managed by the Bilgola Beach Reserve Trust; and
- R73168 north of Basin Beach, managed by Council as North Mona Vale Headland Reserve.

All of the above listed Crown Land managed by Lands NSW, and Crown Land managed by Council, is part of Pittwater Regional Crown Reserve (R 1012329) for the public purpose of access and public requirements, tourism purposes and environmental and heritage conservation. R 1012329 has no Trust.

² The landward boundary of R1011268, and hence the seaward boundary of the adjacent Council land, is Mean High Water Mark as derived at the particular point in time when defined. The Crown Land (Crown Waterway) seaward of this extends to the limit of coastal waters of NSW located 3 nautical miles offshore. It is possible for the landward boundary of R1011268 to be redefined subject to Section 55N of the *Coastal Protection Act 1979*.

³ A CZMP action (H22) is included in Section 8 for Council to liaise with Lands NSW to formalise management arrangements over Crown Land that accommodates infrastructure currently managed by Council.

Council land (directly managed by Council) is shaded in green and comprises:

- three areas at Bilgola Beach adjacent to the sandy beach, namely Lot 3 DP 322514, Lot 6 DP 13497, and Lot 29 DP 11978 (known as “Bilgola Beach Reserve”) moving north to south);
- the Bilgola Avenue road reserve located between 21 Bilgola Avenue and 1 Allen Avenue (west of Lot 29 DP 11978);
- Lot 104 DP 1066371 at Basin Beach, known as Mona Vale Beach Reserve; and
- the Seabeach Avenue road reserve south of 3 Surfview Rd Mona Vale.

Land zonings based on *Pittwater Local Environmental Plan 2014* (LEP) are depicted in Figure 6 (Bilgola Beach) and Figure 7 (Basin Beach). The private beachfront development is zoned as “E4 - Environmental Living” at both locations. Based on the LEP, dwelling houses and environmental protection works, as well as other uses, are permitted with consent in the E4 zone.

However, “environmental protection works” does not include “coastal protection works”, the latter defined as “activities or works to reduce the impact of coastal hazards on land adjacent to tidal waters and includes seawalls, revetments, groynes and beach nourishment”. That stated, based on *State Environmental Planning Policy (Infrastructure) 2007* (denoted as *SEPP Infrastructure* herein), coastal protection works are permitted with consent for landowners, and permitted without consent for Council, so may be considered by landowners and Council as long as environmental impacts are acceptable (see **Appendix F** for further discussion)⁴. A CZMP action (H3) is included in Section 8 for Council to investigate how this anomaly may be resolved, so that the LEP is consistent with *SEPP Infrastructure* and coastal protection works are a permitted use⁵.

⁴ Note that *State Environmental Planning Policy (Infrastructure) 2007* prevails over the LEP.

⁵ Note that coastal protection works are not a permissible land use in the current LEP.

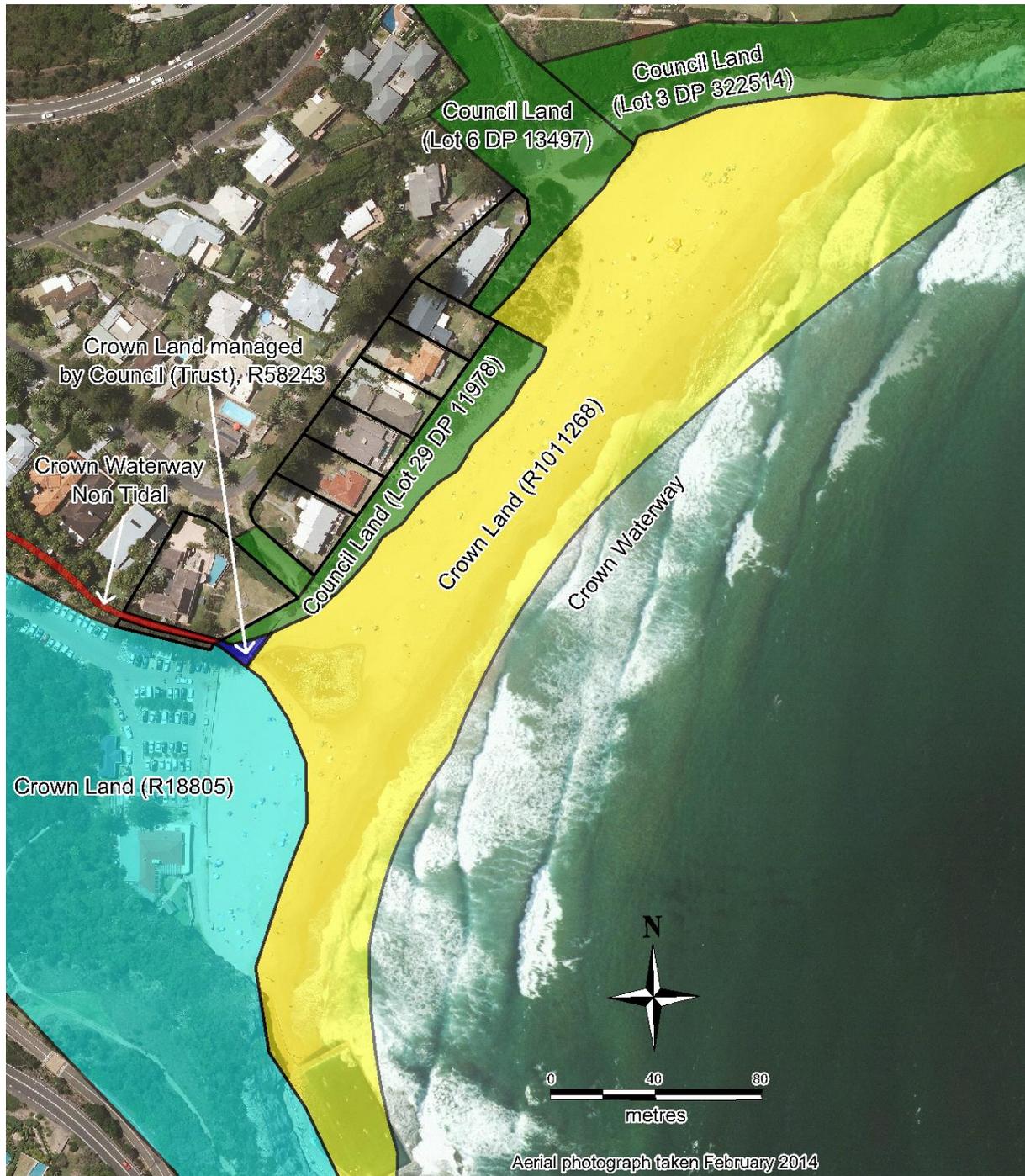


Figure 4: Land use at Bilgola Beach, with public (Crown and Council) land shown shaded and private beachfront lots shown as unshaded black polygons

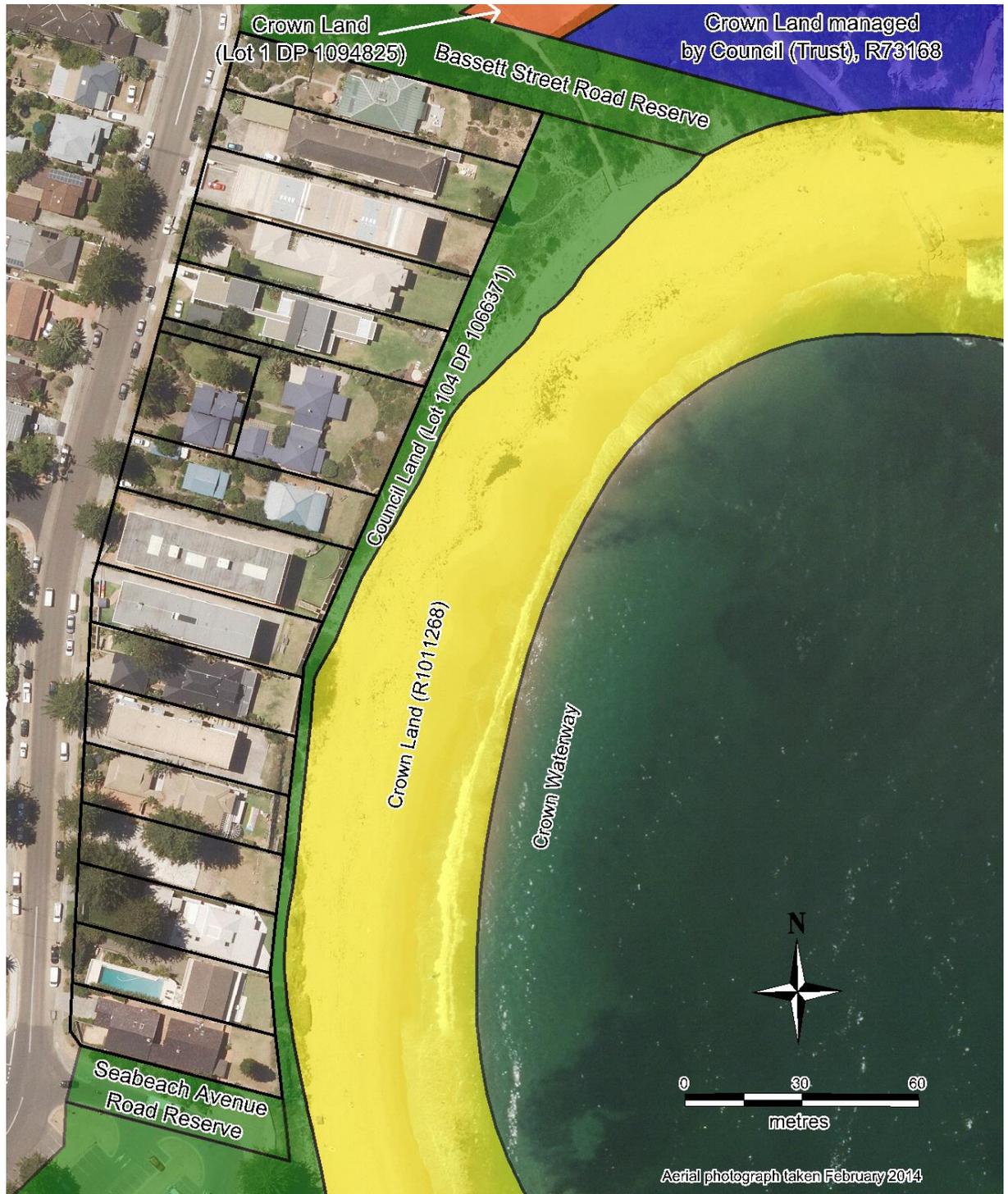


Figure 5: Land use at Basin Beach, with public (Crown and Council) land shown shaded and private beachfront lots shown as unshaded black polygons



Figure 6: Land zonings based on *Pittwater Local Environmental Plan 2014* at Bilgola Beach

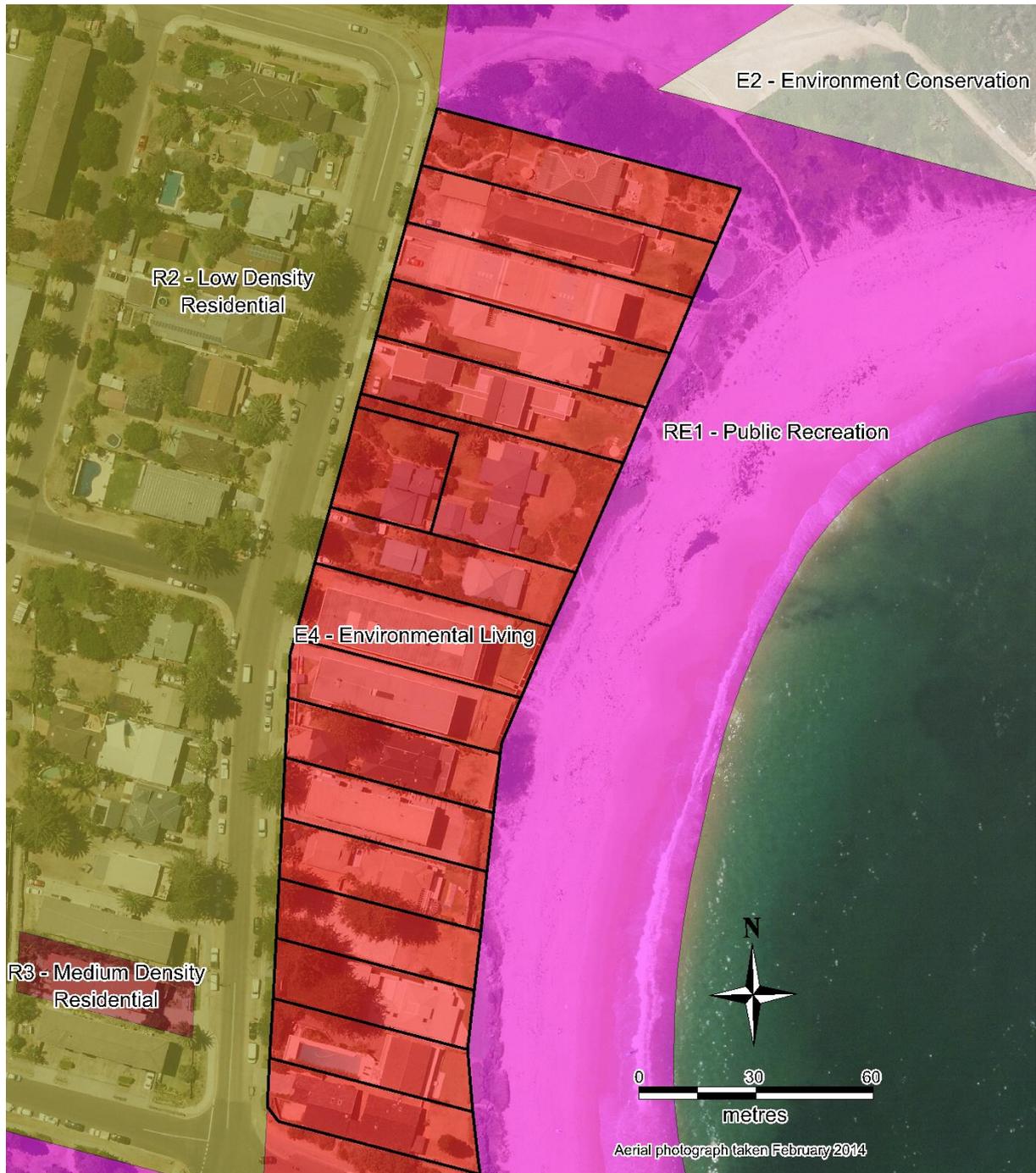


Figure 7: Land zonings based on *Pittwater Local Environmental Plan 2014* at Basin Beach

2.3 Stormwater, Sewage and Water Infrastructure

Based on GIS data provided by Council, stormwater, sewage and water infrastructure locations are shown in Figure 8 (Bilgola Beach) and Figure 9 (Basin Beach). These Figures are schematic only and not intended as an accurate representation of the location of these underground services.

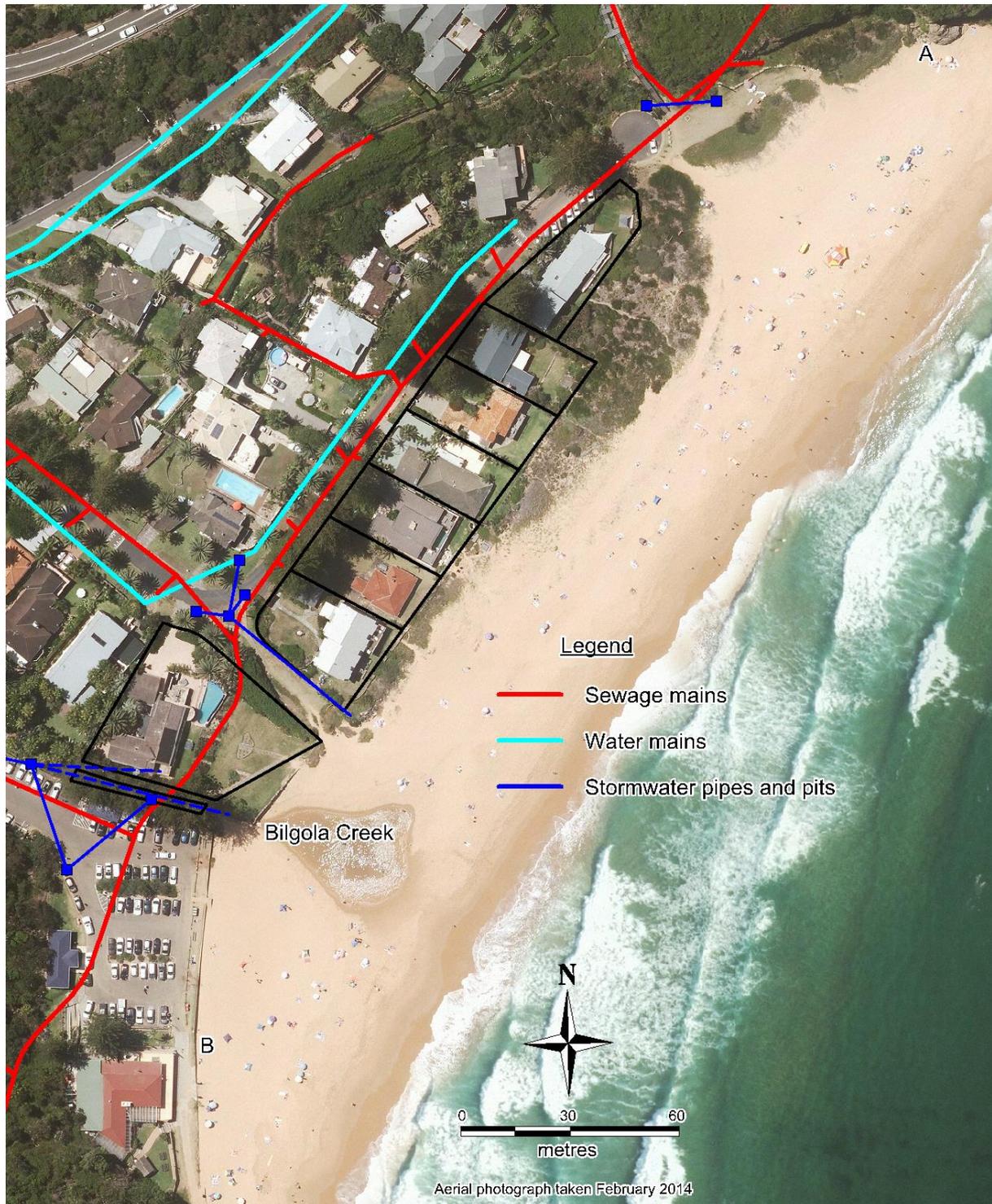


Figure 8: Stormwater, sewage and water infrastructure locations at Bilgola Beach



Figure 9: Stormwater, sewage and water infrastructure locations at Basin Beach

Bilgola Beach includes stormwater lines discharging immediately south of 21 Bilgola Avenue (twin open channels, with the main northern channel known as Bilgola Creek), at the seaward end of Bilgola Avenue, and at the northern tip of the beach adjacent to the headland (extending to location A in Figure 8, not shown in Council GIS data). There are also two stormwater outlets within the seawall adjacent to Bilgola SLSC (at location B in Figure 8, not shown in Council GIS). Stormwater overland

flow and bathing shower runoff also flows over the top of the seawall adjacent to the car park north of Bilgola SLSC at several locations at times (see further discussion in Section 4.3).

Sewage and water mains are located landward of the beachfront development at Bilgola Beach, except at 21 Bilgola Avenue.

A stormwater outlet discharges at the northern end of Basin Beach. Sewage and water mains are located landward of the beachfront development at Basin Beach.

There may be assets such as electricity cables, communications cables (such as Telstra and Optus), and gas lines in beachfront areas, but details on these assets have not been assessed as part of the investigation reported herein. The responsibility for these assets lies with the particular asset owners. However, it is recommended that Council works collaboratively with asset owners as required to encourage them to assess the location and elevation of these assets in relation to coastline hazards so that the risk of damage can be determined and managed by these owners consistently with the CZMP herein. A CZMP action (M3) has been included in this regard in Section 8. Some assets may need to be protected or relocated by the relevant asset authorities, particularly as long term hazards are realised.

2.4 Historical Coastal Storm Damage and Protection works

Information on coastal storms that have caused damage in the study area, and protection works that have been constructed, is provided in **Appendix A**. To summarise, development in the study area has been most threatened or damaged by the action of coastal storms in 1966, 1967, 1974, 1978 and 1997. At Bilgola Beach:

- Bilgola SLSC and the adjacent car park have a vertical sandstone block seawall (constructed in the late 1950's) with rock toe protection down to about 2m AHD which is well above typical extreme scour level of -1m AHD;
- this seawall has suffered some damage in the past, eg with some blocks dislodged in 1974;
- the SLSC seawall has been overtopped in the past, eg in May 1997 when inundation damaged several SLSC roller doors and equipment in a ground floor storage area;
- near the seaward edge of 21 Bilgola Avenue there is a buttressed counterfort vertical seawall of stone and concrete construction, that has successfully protected this property against coastal erosion since at least 1951;
- there is also an additional gabion revetment constructed about 15m landward of this buttressed counterfort seawall, that was constructed at 21 Bilgola Avenue in 1993; and,
- all properties seaward of Allen Avenue have a rock revetment constructed along their seaward edge, which was initially built in 1967 and further strengthened in 1974 and 1979 as a response to storms (the 1974 storm damaged one house and destroyed an adjacent swimming pool).

At Basin Beach, the only properties likely to be unprotected are at 35, 37, and 39 Surfview Road. However, the standard of protection at other properties is variable, although note that seawalls at 11, 15, 29, 31 and 33 Surfview Road are more likely to be effective as they are understood to have been designed with coastal engineering input.

As full details of the protection works at Bilgola Beach and Basin Beach are generally unknown or uncertain, or they may be undersized or constructed with an elevated toe level, future effectiveness of

these protection works cannot be guaranteed (except where a specialist coastal engineer can certify that the works have been designed and constructed in accordance with standard coastal engineering practice for a specified design life⁶).

2.5 Coastal Ecology

Eco Logical Australia Pty Ltd has prepared a description of the coastal ecosystems of the study area, and the threats to and recommended management of these ecosystems, as provided in **Appendix B**. Their management recommendations have been included as management actions in Section 8 herein.

2.6 Cultural and Heritage Significance

Prior to European settlement, the Aboriginal Guringai people inhabited the local foreshore and headlands in the former Pittwater local government area (LGA). However, based on an April 2015 search of the Office of Environment and Heritage “Aboriginal Heritage Information Management System” (AHIMS) it is understood that there are no registered Aboriginal heritage sites within the study areas at Bilgola Beach and Basin Beach.

Schedule 5 of the *Pittwater Local Environmental Plan 2014* lists a number of local heritage items, conservation areas and archaeological sites. Those that are located within the study area at Bilgola Beach comprise:

- street trees (Norfolk Island Pines and Canary Island Date Palms) along Bilgola Avenue and Allen Avenue;
- the ocean rock pool at the southern end of Bilgola Beach; and,
- drainage and bridge structures from No. 15 to No. 21 Bilgola Avenue (along Bilgola Creek).

Local heritage items located within the study area at Basin Beach comprise the Norfolk Island Pines along Surfview Road and the ocean rock pool at the southern end of the beach.

There are no items of State or National significance in the study area.

In the *Pittwater Community Based Heritage Study Review* (City Plan Heritage, 2014), it was recommended that a heritage conservation area was established over an area of foreshore at Bilgola Beach. The proposed boundary of the Bilgola Heritage Conservation Area (refer Figure 10) includes the properties along the southern side of Bilgola Avenue (No. 3 to No. 21, of which 21 Bilgola Avenue is in the study area herein) and the car park, amenities block, Bilgola SLSC and the rock pool. The significance of the area primarily derives from the archaeological remnants of the Bilgola House Estate and its natural values (City Plan Heritage, 2014).

⁶ This is likely to be potentially achievable only at 11, 15, 29, 31 and 33 Surfview Road.

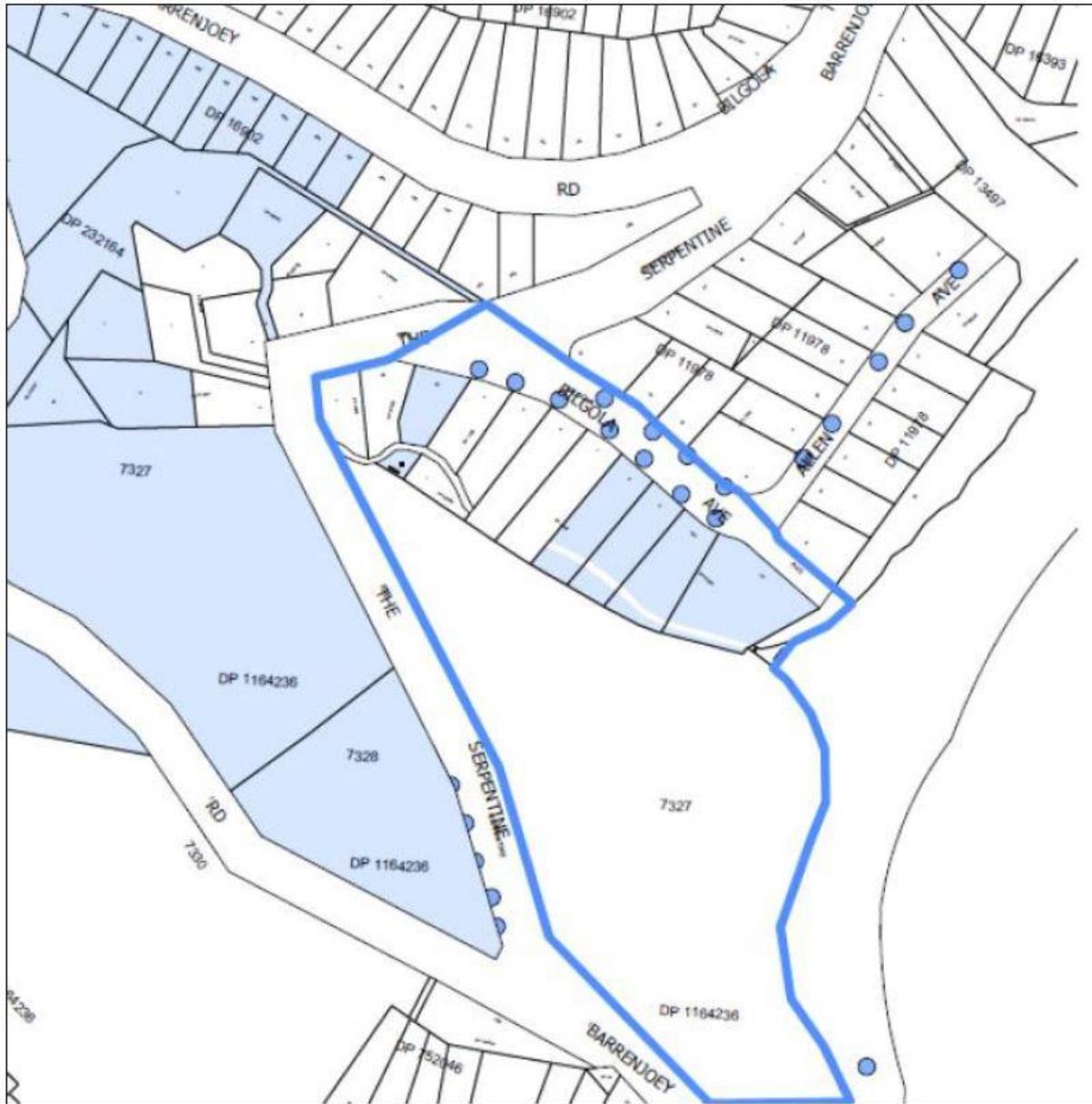


Figure 10: Proposed boundary of recommended Bilgola Conservation Area, from City Plan Heritage (2014)

2.7 Community Uses

2.7.1 Surfing

Bilgola Beach is protected to some degree from south east waves by Newport reef, which extends some 1km out to sea. A permanent rip known as the ‘Newport Express’ exists against the rocks at the southern end of the beach and flows out over rocks in the direction of Newport Beach (Short, 2007). Surfing options include the beach break over the bar, which runs alongshore over the length of the beach and is typically cut by two shifting beach rips (Short, 2007). At the southern end of the beach, a reef break known as ‘Bowles’ exists seaward of the rock pool. ‘Bowles’ consistently breaks left and right over a flat rock ledge in a range of swell directions (Wannasurf, 2015a). At the northern end of

the beach, a beach break known as the 'Bilgola Bank' exists along the edge of the rocks beneath the headland (Wannasurf, 2015b).

Basin Beach is protected to some degree by submerged reefs across the entrance to the embayment (see **Appendix D** for further discussion), which maintain a steep, cusped and reflective beach (Short, 2007). It is a popular spot for surfing during large swells when a heavy and hollow shore break known as the 'Womp' is popular with bodyboarders. A regular reef break known as 'Little Reef' exists seaward of the rock pool at the southern end of the beach. In smaller swells this short right hand break is enjoyed by longboard riders. Other reef breaks include a left hand wave at the northern end of the beach known as 'North Point' and the offshore reef in the middle of the embayment, which both break infrequently and require larger swell conditions to become surfable (Realsurf, 2006).

2.7.2 *Fishing*

Bilgola Head, at the northern end of Bilgola Beach, provides good rock fishing from the rock platform around the base of the headland (Brown, 2007). At the southern end of the beach, the gutter formed by the permanent rip along the rocks can be accessed from the beach or rock platform (Short, 2007). Following storm swells, nearshore gutters provide opportunities for beach fishing.

The rock platforms at the northern and southern ends of Basin Beach provide good rock fishing options. Fishing from the rock platform around the rock pool in slight swell conditions has been reported to produce bream, snapper, luderick, drummer and trevally (Australian Travel & Tourism Network [ATN], 2015). Basin Beach is a renowned location for snapper in large swell conditions (ATN, 2015). Beach fishing is also popular with relatively deep and calm water accessible to anglers at a short distance from the shoreline.

2.7.3 *Surf Life Saving Clubs*

Mona Vale SLSC is located adjacent to Mona Vale Beach to the immediate south of Basin Beach, and has around 1,500 members. Its members primarily patrol Mona Vale Beach. In addition to beach patrols and regular Nippers meetings⁷, Mona Vale SLSC runs fundraising and social events, club championships, participates in interclub competitions, holds two annual ocean swims (including the 'Cold Water Classic' from Basin Beach to Mona Vale Beach), and run training and education courses in first aid and surf lifesaving skills.

The SLSC uses Basin Beach (in addition to Mona Vale Beach) for its activities, particularly in high swell when Basin Beach offers relatively sheltered conditions for Nippers activities. The patrolled area of Mona Vale Beach is typically south of the SLSC building, however flags are occasionally set up at Basin Beach during high swell conditions and small patrol outposts are set up on the sand spit at the rock pool.

Bilgola SLSC is located at the southern end of Bilgola Beach adjacent to the main car parking area, and has around 900 members. The SLSC runs and participates in similar events and courses to those described above for Mona Vale SLSC. Bilgola rock pool is used by the Club to train Bronze Medallion candidates, for Nippers water activities, and for club championship activities.

⁷ Nippers is a junior program that introduces children aged 5 to 13 to surf lifesaving.

2.7.4 *Swimming Clubs*

The “Bongin Bongin Dawn Busters” are an ocean swimming club that meets at Basin Beach on a daily basis throughout the whole year. Club members meet early in the morning to swim from Mona Vale rock pool across Basin Beach and back, and in suitable conditions swim around the rock pool to the shore seaward of Mona Vale SLSC. The Club also holds an annual “Bungan to Bongin Ocean Swim”, which comprises a swim over a distance of around 1.25 km from Bungan Beach to Basin Beach.

Other ocean swims held in the vicinity of the Basin Beach study area include the:

- Don “Doc” Jenkin Memorial Ocean Swim, held annually on the third Sunday of January and comprising a 1.6km swim from Warriewood Beach to Mona Vale Beach; and
- Cold Water Classic, held annually on the third Sunday of June and comprising a swim from Basin Beach to Mona Vale Beach.

Avalon Bilgola Amateur Swimming Club Inc has been in existence since the mid 1960’s, and currently has around 220 members ranging from small children to seniors. The Club uses Bilgola rock pool for race meetings from 9am to around 11.30am on Saturday mornings during the warmer months from mid-October to the end of March. Occasional twilight meetings are also held on mid-week evenings from around 6pm. The Club runs Learn to Swim and Stroke Correction classes for its members. These are held at 8am prior to the regular Saturday race meeting over a period of 10 weeks. A senior swimming training program is also delivered by the Club, which involves 2 to 3 meetings per week over a 10 week period from January/February.

The Bilgola Ocean Swim is an event held as part of five swims in the Pittwater Ocean Swim Series. The main event is held in the summer months (December/January) and comprises a 1.5 km swim starting from the middle of Bilgola Beach and follows a course marked by offshore buoys before returning to the Bilgola Beach shoreline.

2.7.5 *Other Recreational Activities*

The beach, rock pools and foreshore reserves at Basin Beach and Bilgola Beach cater for a wide range of recreational activities including swimming, sunbathing, picnicking, beach walking, running/exercising, bushwalking and snorkelling.

A community survey of 217 residents undertaken by Pittwater Council (2012) determined the following ranking of the top ten activities enjoyed by residents of the former Pittwater LGA:

1. Cafes and outdoor dining (135 responses);
2. Walking (132 responses);
3. Bushwalking (107 responses);
4. Swimming pools (105 responses);
5. Cinemas (103 responses);
6. Park visits for recreation (101 responses);
7. Nature appreciation (94 responses);
8. Swimming in the surf (83 responses);
9. Markets (79 responses); and
10. Boating (71 responses).

This community survey indicates that residents of the former Pittwater LGA enjoy the outdoors and natural beauty of the area. A number of the above activities are able to be undertaken at beaches, rock pools or foreshore reserve areas such as those in the study area.

Basin Beach has been reported to be one of the best snorkelling locations in the Sydney metropolitan area (Lockwood, 2005). In calm conditions it offers opportunities to explore the tall kelp beds and rocky reefs within the embayment.

2.7.6 Beach Usage and Lifeguard Patrols

Former Pittwater Council beaches are patrolled by the Australian Lifeguard Service (ALS) during weekdays. Weekend and public holiday patrols are covered by volunteer surf lifesavers and are managed by Sydney Northern Beaches Surf Life Saving (SNBSLS).

Based on the combined statistics contained within the *Season Report 2013-2014: Pittwater Council* (ALS, 2014) and *2013 – 2014 Annual Report* (SNBSLS, 2014), there were about 1.6 million visits to patrolled beaches in Pittwater over the 2013 to 2014 swimming season (end of September to end of April). Statistics for the study area beaches are provided in Table 1 (note that Basin Beach was not identified separately from Mona Vale Beach, but it is expected that the majority of visitations were to Mona Vale Beach and not Basin Beach).

Table 1: 2013-2014 beach attendance and rescue figures for the study area beaches

Beach	Beach Attendance	Proportion of Pittwater visits	Rescues	Average rescues per 100,000 visitors in season
Bilgola Beach	134,900	9%	46	34
Mona Vale Beach	285,100	18%	130	46
Pittwater Beaches (total)	1,559,500	100%	573	37

Bilgola Beach had average rescue numbers close to the Pittwater overall average of 37 rescues per 100,000 visitors. The average rescue numbers at Mona Vale Beach were above the Pittwater average.

2.8 Access to Beaches and Headlands

2.8.1 Summary Figures

Pedestrian access and car parking locations are depicted in Figure 11 (Bilgola Beach) and Figure 12 (Basin Beach). Further discussion on access to beaches and headlands is provided in subsequent sections.



Figure 11: Pedestrian access and parking at Bilgola Beach



Figure 12: Pedestrian access and parking at Basin Beach

2.8.2 *Vehicular Access*

Vehicles are not generally permitted on beaches in the study area.

Vehicular access to near the southern end of Bilgola Beach is available via an access road from The Serpentine, which leads to the main public car parking area. Vehicular access near the northern end of Bilgola Beach is available by turning off The Serpentine into Bilgola Avenue and continuing to Allen Avenue, which ends in a cul-de-sac located landward of the foreshore reserve. Limited car parking is available on the seaward side of Allen Avenue, within a small section of road reserve immediately south of the cul-de-sac. Street parking is not permitted along Bilgola Avenue and the southern section of Allen Avenue.

Vehicular access to near the southern end of Basin Beach is available via Surfview Road, which provides access to the main car parking area for Mona Vale Beach. Street parking is also available along Bassett Street and Surfview Road.

2.8.3 *Pedestrian Access*

Pedestrian access to the southern end of Bilgola Beach is provided by beach access steps at the seawall adjacent to the car park area. The southern end of the beach can also be accessed via a concrete pathway landward of the seawall, where a beach access ramp exists seaward of Bilgola SLSC and where the pathway merges with the beach berm level near the southern headland. The concrete pathway also provides pedestrian access to the rock pool.

Pedestrian access to the southern end of Bilgola Beach is also provided by a path over the dune from the corner of Bilgola Avenue and Allen Avenue. A number of informal access paths provide access over the dune from beachfront private property.

Pedestrian access to the northern end of Bilgola Beach is provided by formalised beach access walkways through the fenced dune vegetation. One beach access walkway leads from the cul-de-sac and the second is located around 50 metres to the north. Pedestrian access to this area from The Serpentine is also provided by a stepped access walkway down the escarpment. Informal access paths from properties along the headland also link with this stepped walkway.

Pedestrian access to the southern end of Basin Beach is provided by two beach access walkways leading from the foreshore reserve adjacent to the main car park area. One access walkway is located in the north east corner of the car park and comprises a set of stairs leading from the foreshore reserve down to beach level. The other access walkway is located around 50 metres to the south and runs through the fenced dune vegetation area. A number of informal and formal access paths and stairways provide pedestrian access over the dune from beachfront private property along Surfview Road.

Pedestrian access to the northern end of Basin Beach is provided via the foreshore reserve area located at the corner of Surfview Road and Bassett Street. Two beach access walkways run from the reserve through the fenced dune area.

2.8.4 *Headland Access*

Vehicular access to Bilgola Head, at the northern end of Bilgola Beach, is provided from The Serpentine to the 'A J Small Lookout'. An 8 space car park is provided from which the public can walk to the nearby lookout positioned at the eastern tip of Bilgola Head.

Pedestrian access to South Bilgola Headland is provided by the access steps and pathway located landward of the car park to the south of the amenities block. This pathway leads to Eric Green Reserve and continues around the headland to Newport Beach via the South Bilgola Headland Walking Track.

Pedestrian access to Mona Vale Head is provided from the northern end of Basin Beach via a stepped walking track that starts from the northernmost beach access walkway and continues to the cul-de-sac at the end of Grandview Parade. The track continues around the perimeter of Mona Vale Head to the cul-de-sac at the end of Hillcrest Avenue. A track also links the ends of Grandview Parade and Hillcrest Avenue, which also provide vehicular access to the headland.

The above headland access pathways and lookouts form part of the Bicentennial Coastal Walkway, which was established to form a continuous coastline route between Manly Beach and Palm Beach.

2.8.5 *Universal Access*

Bilgola Beach has the following universal access provisions:

- 2 disabled parking spaces in the main car park area;
- all weather disabled access at Bilgola rock pool;
- a wheelchair with soft balloon tyres (FreeWheeler Wheelchair) is stored by Bilgola SLSC and available for free weekend use on the beach; and
- a unisex accessible toilet with MLAK lock is located next to the life savers room at Bilgola SLSC.

Basin Beach has the following universal access provisions:

- 3 disabled parking spaces in the main car park area at Mona Vale Beach; and
- disabled toilet access at Mona Vale SLSC.

2.8.6 *Discussion on Adequacy of Current Access Arrangements and any Associated Environmental and Safety Impacts*

The current access arrangements to beaches and headlands in the study area are generally adequate. There are times after storms when access to the beach is difficult due a steep erosion escarpment in the dune sand and/or there is exposure of rock on the beach. However, these are short term impacts (and a natural process in the case of the formation of steep escarpments in the dune sand) and actions are included in Section 8 to mitigate these impacts.

The public beach walkways do not have any significant environmental and safety impacts, being impacted by coastal hazards rather than impacting coastal hazards.

For access from private property (eg stairways and pathways), it is recommended that Council considers developing requirements for accessways so that they are appropriately designed and managed considering the potential for:

- damage from coastal processes;
- impacts on public beach amenity;
- environmental degradation; and
- public liability issues.

A CZMP action (H18) is included in this regard in Section 8. These accessway requirements could potentially be developed when Beach Plans of Management are reviewed for the subject study areas.

3. LEGISLATIVE AND PLANNING CONTEXT

Key legislation and planning/guideline documents relating to the investigation herein are described in **Appendix C**.

4. COASTAL PROCESSES AND COASTLINE HAZARDS

4.1 Preamble

Coastal processes and coastline hazards in the study area are described in WorleyParsons (2012c). In the context of an assessment of acceptable risk, coastal processes and coastline hazards in the study area related to erosion/recession are also described in **Appendix D**, as discussed further in Section 4.2. Risks to public safety and built assets in relation to the identified erosion/recession coastline hazards are considered in Section 5.

Other particular coastline hazards warranting specific consideration are erosion of beaches caused by stormwater and overland flow (see Section 4.3), and coastal inundation caused by wave overtopping of foreshore areas (see Section 4.4).

4.2 Erosion/Recession Related Hazards

To summarise, the beaches of the study area have been relatively stable over the long term, as measured over the last 50 or so years. That is, although both beaches (and particularly Bilgola Beach) are subject to short term beach erosion (storm demand) from coastal storms with large waves and elevated water levels, natural recovery after storms has meant that sand has returned to the beaches such that although beach volumes fluctuate over time, the long term average beach volumes have been relatively stable.

However, due to climate change and particularly sea level rise, it is projected that in the future these beaches will recede (move landward). The magnitude of this recession has been estimated as between a factor of about 10 to 40 times the magnitude of the sea level rise. For example, for a sea level rise of 0.5m, recession of about 5m to 20m is expected where not constrained by protection works. Where protection works remain in place, this would lead to a narrowing beach width over time.

Coastline hazard related mapping is included in **Appendix D** of:

- traditional Immediate, 2050 and 2100 Hazard Lines defined at both the landward edge of the Zone of Slope Adjustment and Zone of Reduced Foundation Capacity ⁸(in Figure D13 to D16);
- “almost certain”, “likely”, “possible”, “unlikely” and “rare” likelihood lines to define the extent of erosion/recession for a 60-year design life to 2075 (also in Figure D13 to D16); and
- acceptable risk setback lines for new development on conventional foundations, and for new development on piled foundations (in Figure D19 and D20).

4.3 Stormwater and Overland Flow Impacts

There are two open channels between 21 Bilgola Avenue and the car park adjacent to Bilgola SLSC. The northern open channel is the main channel and is known as Bilgola Creek, and is located adjacent to (immediately south of) the 21 Bilgola Avenue dwelling. The southern open channel is narrower and is located adjacent to (immediately north of) the kiosk/café, and is a drainage outlet for the car park area. This southern channel has been denoted as the “Bilgola Kiosk channel” herein.

⁸ Definitions for the Zone of Slope Adjustment and Zone of Reduced Foundation Capacity are provided in Section D3.3.2.

In combination with erosion caused by wave action, runoff discharging from three of the stormwater outlets at Bilgola Beach (at Bilgola Creek, the Bilgola Kiosk channel, and adjacent to Bilgola SLSC), as well as overland flow runoff over the seawall, can cause additional beach erosion leading to exposure of rocks and rock-filled wire cages used for scour protection. Photographs of the outlets and impacts are provided in Figure 13 to Figure 21 (all photographs taken 22 April 2015 unless stated otherwise). Bilgola Creek is depicted in Figure 13, with the Bilgola Kiosk channel shown in Figure 14.

Seaward of Bilgola Creek, the predominant impact from the erosion is exposure of deteriorating wire surrounding gabion basket or reno mattress scour protection (Figure 15). The wire has sharp metal ends and could injure a person who trod on the wire, and could eventually unravel leading to rocks being scattered over the beach. To manage the public safety risks associated with this issue, signage could be employed to warn the public to avoid the area when the baskets are exposed (barricading may be impractical to employ due to the area being affected by wave action when beach sand levels are low). It would also be possible to undertake beach scraping to mechanically cover the exposed wire with sand (accelerating the natural beach recovery after coastal storm events). A more permanent solution to this issue would be to remove and replace (if necessary) the wire baskets with more appropriate scour protection. A CZMP action (H19) is included in Section 8 that there is consideration of removal of the scour protection, with replacement (if necessary) of more appropriate scour protection, if this issue cannot be managed through signage and beach scraping.

Seaward of the Bilgola Kiosk channel the predominant impact from the erosion is exposure of rocks that are a potential trip hazard and visually unappealing (Figure 16). A CZMP action (H20) is included in Section 8 that there is removal of the rocks from the beach where scattered over the beach area, or relocation to provide scour protection at a more appropriate localised area. This can be achieved using an excavator with a screening bucket that picks up rock size material while allowing sand to pass through. A CZMP action (M4) is also included in Section 8 that there is consideration of construction of a formalised headwall and scour protection for the Bilgola Kiosk channel outlet.

The scour seaward of the Bilgola Kiosk channel is also related to runoff from the bathing shower (Figure 17) and overland flow runoff over the seawall⁹. Overland flow can also cause scour adjacent to the seawall steps (Figure 19). An overview of the scour at Bilgola Creek, Bilgola Kiosk channel and from runoff over the seawall in the vicinity of the northern shower and steps is provided in Figure 20. To manage this issue a number of options could be considered after assessment of cost effectiveness (CZMP action M5 is included in this regard in Section 8), namely:

- installation of formalised drainage at the two showers (contoured drain outlets and piped drainage to Bilgola Kiosk channel)¹⁰;
- construction of a kerb on the eastern side of the car park to direct overland flow runoff in a controlled manner towards Bilgola Kiosk channel; and/or
- elevating the seawall by a block height that could be used to act as a kerb to direct bathing shower and overland flow runoff in a controlled manner towards Bilgola Kiosk channel (this would also provide the benefit that the magnitude of wave overtopping would be reduced¹¹).

⁹ There are two showers adjacent to the Bilgola SLSC seawall, namely a northern shower near the Bilgola Kiosk channel as per Figure 17, and a southern shower located directly opposite the amenities block north of Bilgola SLSC (Figure 18).

¹⁰ This could be combined with a formalised headwall for the Bilgola Kiosk channel.

¹¹ The seawall is currently overtopped by waves in severe coastal storms (eg in April 2015) and sea level rise would be expected to increase the magnitude of overtopping over the long term future.



Figure 13: Bilgola Creek outlet



Figure 14: Bilgola Kiosk channel located immediately north of kiosk/café



Figure 15: Deteriorating wire from gabion basket or reno mattress scour protection seaward of Bilgola Creek



Figure 16: Rocks exposed seaward of Bilgola Kiosk channel outlet



Figure 17: Northern shower at Bilgola Beach car park, 5 April 2015



Figure 18: Scour at southern shower at Bilgola Beach car park



Figure 19: Scour at Bilgola Beach car park seawall steps

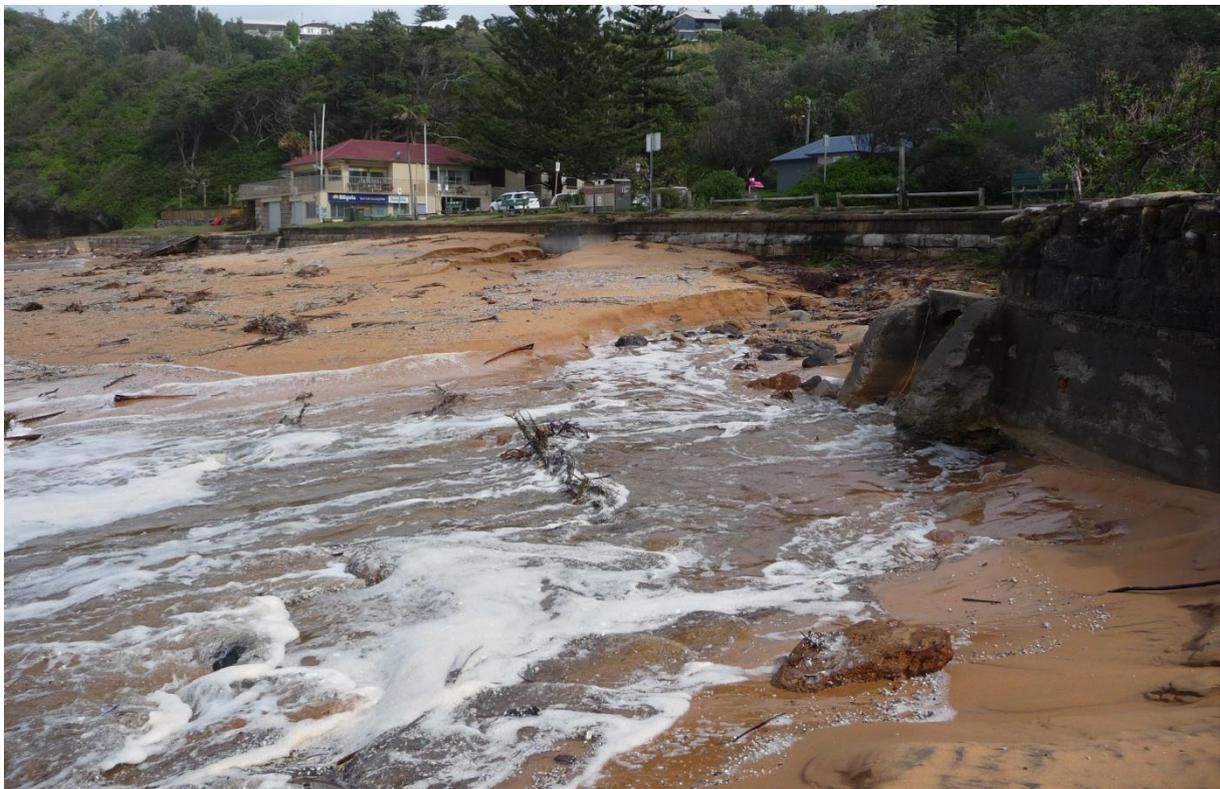


Figure 20: View of scour at northern end of Bilgola SLSC seawall and adjacent to Bilgola Creek and Bilgola Kiosk channel

Scour can also occur at the stormwater outlet near Bilgola SLSC, particularly the larger rectangular outlet further north (Figure 21). There could be consideration of removing smaller rocks and relocating larger rocks to form a more formalised scour protection at this location, and a CZMP action (M6) is included in this regard in Section 8.



Figure 21: Scour at Bilgola SLSC stormwater outlets

4.4 Coastal Inundation

4.4.1 OEH (2013) Requirements

Based on OEH (2013), the following inundation related coastline hazards should be identified as a minimum:

- tidal inundation: estimate of areas inundated from still water levels with a 50 or 100-year ARI, for current conditions and projected future conditions.
- coastal inundation: estimate of wave run-up level and overtopping of dunes resulting from an extreme ocean storm event, for current conditions and projected future conditions.

Tidal inundation (that is, elevated ocean still water levels) is considered in Section 4.4.3, while coastal inundation (that is, wave runup) is considered in Section 4.4.4. Prior to this, ground elevations in the study area are discussed in Section 4.4.2.

4.4.2 Ground Elevations

At Bilgola Beach, ground elevations on the seaward side of beachfront properties and public assets are approximately (moving north to south):

- 7.0m AHD at 5, 7, 9, 11 and 13 Allen Avenue (but with dune crest levels exceeding 7.5m AHD seaward of 9 and 11 Allen Avenue);
- 6.0m AHD at 3 Allen Avenue (but with dune crest levels exceeding 6.5m AHD seaward of most of the lot);
- 5.5m AHD at 1 Allen Avenue and 21 Bilgola Avenue;
- 5.0m AHD at the car park adjacent to Bilgola SLSC; and
- 4.5m AHD at Bilgola SLSC.

At Basin Beach, ground elevations on the seaward side of beachfront properties are approximately (moving north to south):

- 10.0m AHD at 37 and 39 Surfview Road;
- 9.0m AHD at 31, 33 and 35 Surfview Road;
- 8.0m AHD at 29 Surfview Road (but with dune crest levels exceeding 8.5m AHD seaward of most of the lot);
- 7.0m AHD at 17, 19 and 23 Surfview Road;
- 6.5m AHD at 15 Surfview Road;
- 6.0m AHD at 13 Surfview Road;
- 7.5m AHD at 11 Surfview Road;
- 7.0m AHD at 7 and 9 Surfview Road;
- 9.0m AHD at 5 Surfview Road; and
- 8.5m AHD at 3 Surfview Road.

4.4.3 Elevated Ocean Still Water Levels

The main factors which contribute to elevated ocean still water levels on the NSW coast comprise:

- astronomical tide;
- storm surge (barometric setup and wind setup); and,
- wave setup (caused by breaking waves).

Astronomical tide is the regular rise and fall of sea level in response to the gravitational attraction of the sun, moon and planets, and a rotational effect due to the spin of the earth on its axis. Tides along the NSW coastline are semi diurnal, with high and low water approximately equally spaced in time and occurring twice daily (that is, on average, there are two high tides and two low tides in any 24-hour period). There is also significant diurnal inequality in NSW coast tides, a difference in height of the two high waters or the two low waters of each tidal day.

Barometric setup is a localised vertical rise in the still water level due to a reduction in atmospheric pressure. The increase in water level is approximately 0.1m for each 10 hectopascal drop below normal barometric pressure of 1013 hPa (MHL, 1992). Wind setup is the vertical rise in the still water level on the downwind side of a body of water caused by wind stresses on the surface of the water.

Wave setup is defined as the superelevation of the mean water level caused by wave action alone. The phenomenon is related to the conversion of the kinetic energy of wave motion to quasi steady

potential energy during wave breaking. It is manifested as a decrease in water level prior to breaking (with a maximum set down at the break point), and from the break point the mean water surface slopes upward to the point of intersection with the shore (Coastal Engineering Research Center, 1984).

Department of Environment, Climate Change and Water [DECCW] (2010) has estimated that the 100 year ARI still water level offshore of Sydney (excluding wave setup) is 1.44m AHD at present. Including wave setup of 1.2m, calculated as 15% of the 100 year ARI significant wave height (H_s) of 8.0m for a 6 hour duration estimated by Shand et al (2011), the 100 year ARI still water level at fully exposed shorelines landward of wave breaking is about 2.6m AHD.

However, it is not relevant to map this elevated still water level (that is, tidal inundation) in the study area. This is because even allowing for 1m of sea level rise (giving a still water level of 3.6m AHD), this is contained within sandy beach areas of the study area, and would not extend landward to developed areas (the lowest landward areas are at 4.5m AHD at Bilgola SLSC). That is, mapping of these water levels on the beach would not be meaningful.

That stated, these water levels may cause backwater effects in the stormwater systems landward of sandy beaches in the study area, which would require further investigations to assess. A CZMP action (H15) is included in Section 8 for there to be assessment of flooding and drainage in the study area considering backwater effects due to oceanic inundation. This could most conveniently be undertaken as part of updating the *Pittwater Stormwater Management Plan* (currently underway).

4.4.4 Wave Runup

Individual waves can cause temporary water level increases above the still water level due to the process of wave runup or uprush.

Wave runup is site specific, but typically reaches a maximum level of about 8m AHD at fully exposed beaches on the open NSW coast at present. Higgs and Nittim (1988) found that for a coastal storm that occurred in August 1986, maximum runup levels at Bilgola Beach were about 5.5m AHD. It is considered to be reasonable to adopt a 100 year ARI wave runup level of 6m to 8m AHD for the study area. Taking sea level rise into account, wave runup values may increase into the future, generally in the order of the magnitude of the sea level rise.

Wave runup levels of 6m to 8m AHD are above dune/foreshore crest levels along the entire length of Bilgola Beach and parts of Basin Beach. Areas with dune/foreshore crest levels at or below 7m AHD are at:

- Bilgola SLSC (4.5m AHD elevation seaward);
- car park adjacent to Bilgola SLSC (5.0m AHD elevation seaward);
- 1 Allen Avenue and 21 Bilgola Avenue (5.5m AHD elevation seaward);
- 3 Allen Avenue and 13 Surfview Road (6.0m AHD elevation seaward);
- 15 Surfview Road (6.5m AHD elevation seaward); and
- 5, 7 and 13 Allen Avenue, and 7, 9, 17, 19 and 23 Surfview Road (7.0m AHD elevation seaward).

There is therefore the potential for occasional wave overtopping and coastal inundation in these (and other) areas. However, it should be noted that runup levels in the order of 6m to 8m AHD would only be realised if the foreshore was at the runup height or higher. In reality, any waves that overtopped

the foreshore in the study area would 'fold over' the foreshore crest and travel as a sheet flow at shallow depth, spreading out and infiltrating over landward areas. A significant reduction in the velocity and depth of the runup would be expected within the order of 10m landward from the foreshore crest. Therefore, for example, the existing development (dwelling) at 21 Bilgola Avenue is not at a particularly high risk of damage from coastal inundation as it is setback well landward of two seawalls.

That is, even if a structure (in particular habitable floor level) was below a predicted wave runup level, this does not necessarily imply there would be damage to the structure, as this would depend primarily on the depth of overtopping flow (or flow momentum in immediate foreshore areas), distance of the structure from the foreshore crest, nature of the construction, and relative difference between natural ground levels and ground floor levels at the structure.

Inundation hazards should be assessed on a site specific basis and can generally be managed through maintaining a difference in height between ground floor levels and adjacent natural ground levels (a 0.5m difference would typically be acceptable where ground levels exceed 7.0m AHD), and/or by applying risk minimisation measures such as:

- using construction materials that would not be adversely damaged by inundation, such as concrete floors;
- placing electrical equipment, wiring, or any other service pipes and connections that could be damaged by water at a suitably high level;
- storing goods or materials that could potentially be water damaged or water polluting at a suitably high level;
- using impact resistant construction materials in areas that may be subject to direct wave action; and
- maintaining seawalls seaward of development at a suitably high crest level.

For Bilgola SLSC and the adjacent car park, it is recommended that there is consideration of the following measures to reduce the risk of inundation damage (CZMP action M7 is included in this regard in Section 8):

- elevating the seawall by two block heights adjacent to Bilgola SLSC;
- reorientating the timber ramp at the SLSC (damaged in recent April 2015 storms) so as not to provide a direct pathway for wave runup towards the SLSC; this would also require a kerb on the seaward side of the ramp to act as a barrier to wave runup (a new concrete ramp directed to the north may be most appropriate); and
- elevating the seawall by a block height adjacent to the car park (as discussed in Section 4.3, this could also be used to act as a kerb to direct bathing shower and overland flow runoff).

Works at the SLSC would be a significantly higher priority than the car park due to the SLSC having a lower ground level, proximity to the seawall crest and higher value of infrastructure at risk.

Note that besides coastal inundation, it is also necessary to consider the risk of overland flow flooding, such as in terms of setting minimum habitable floor levels. Refer to the *Pittwater Overland Flow Mapping and Flood Study* (Cardno, 2013) and Section B3.22 and B3.24 of the Pittwater 21 DCP for further information. Adopted overland flow levels at particular properties are also provided at Council's website.

5. RISKS TO PUBLIC SAFETY AND BUILT ASSETS

5.1 Preamble

It is a requirement of OEH (2013) that a CZMP contains a description of the nature and extent of risks to public safety and built assets from coastal hazards, which is provided in Section 5.2 and Section 5.3 respectively. Both existing and future risks are considered. Property risk and response categories are discussed in Section 5.4, with reference to **Appendix E**. Geotechnical stability issues at the Bilgola Beach headlands, which may potentially impact on public safety, are also considered in Section 5.5. An Emergency Action Subplan has been prepared as discussed in Section 5.6, with reference to **Appendix F**.

5.2 Risks to Public Safety

Risks to public safety at beaches in the study area may arise at any time for swimmers. Short (2007) has described the risks to such beach users in the study area.

To assist in managing these risks, lifeguards patrol Bilgola Beach and Mona Vale Beach. As noted in Section 2.7.6, these beaches are patrolled by professional lifeguards on weekdays and SLSC volunteers on weekends from late September to late April. However, note that there are no regular patrols at Basin Beach.

Council advises that swimmers and waders should only enter the water at patrolled locations, and only between the red and yellow flags. A CZMP action (O6) is included in Section 8 recommending continuation of professional weekday lifeguard patrols at Bilgola Beach and Mona Vale Beach.

Risks to public safety may also potentially arise both during coastal storms, and after coastal storms (prior to beach recovery).

Large waves and elevated water levels may be a risk to swimmers, surfers and other water users (or those near the water) during storms. Lifeguards have the opportunity to close beaches when conditions are considered to be unacceptably hazardous during patrol hours. If beach users only swim between flags installed by lifeguards on the beach, risks of drowning or near-drowning related injuries would be minimised. Council does not consider that it has a responsibility to provide a 24 hour a day and year around lifeguard service, nor to provide a lifeguard service in areas outside the flags.

Risks to public safety can also arise after storms when there may be steep and high erosion escarpments along the beach, and particularly at beach accessways which may make beach access difficult. A CZMP action (R6) is included in Section 8 regarding closing off accessways that are damaged and/or dangerous. A CZMP action (R7) is included in Section 8 regarding mechanically regrading steep and high erosion escarpments where required, to reduce risks to public safety from collapsing sand dunes as the escarpment dries out. These works may typically be required when erosion escarpments are several metres high.

Dune protective fencing, board and chain walkways, garbage receptacles and signage may also be dislodged or detached by storm activity and erosion. Where damaged, these materials should be removed from the active beach zone as soon as practicable after a storm event to reduce risks to public safety and avoid further mobilisation of debris by wave action.

A CZMP action (R5) is included in Section 8 to ensure sufficient warning signage and barricades are available for use, and to implement these as required to close off damaged and potentially dangerous public beach access points after storm erosion. It is recommended that signage is placed both at the top and the bottom of public accessways, since injury can occur by people trying to leave as well as arrive at the beach. Natural beach recovery after storms would be expected to eventually restore ease of access after erosion, and beach scraping (discussed below) may also be considered to assist in mechanically accelerating that recovery.

Exposure of existing protection works (eg rock revetments that are usually buried under sand) may also be a risk to public safety if beach users choose to climb on the structures or tunnel into them, due to the potential (for example) for rocks to be dislodged, or for such a beach user to slip, with a risk of injury in both cases. The existing rock protection works have not generally been designed for beach access, often being relatively steep and with random rock placement, thus potentially making traversing the structures inappropriate. There is also the possibility that exposed rocks could suddenly collapse, posing a risk of injury to any beach users who were adjacent to the protection works.

As noted in Section 4.3, significant beach erosion near Bilgola Creek can also expose rock-filled wire cages used for scour protection. A CZMP action (H19) is included in Section 8 that there is consideration of removal of the scour protection, with replacement (if necessary) of more appropriate scour protection, if this issue cannot be managed through signage and beach scraping.

It is recommended that Council manages risks associated with exposed protection works by employing warning signage and barricading as required. A CZMP action (R8) is included in Section 8 regarding erecting barricades and safety signage to discourage people from walking on or near exposed existing protection works.

Landowners are advised not to access the beach seaward of their property if existing protection works are exposed. A CZMP action (O3) is included in Section 8 that ongoing education of residents on these and other relevant issues is undertaken by Council.

Council could also manage risks associated with exposed protection works (including exposed scour protection) by undertaking beach scraping. A CZMP action (R9) is included in Section 8 relating to beach scraping, namely: "undertake beach scraping after storms to accelerate beach recovery where resources allow, in particular to accelerate the burial of exposed protection works and restoration of beach accessways"¹².

Risks to public safety may also arise during non-storm periods, for example due to foreign objects on the beach or poor water quality. Council currently undertakes beach raking at Bilgola Beach to remove litter weekly in the swimming season (October to April), but only rarely rakes Basin Beach. A CZMP action (O7) is included in Section 8 that raking at Bilgola Beach continues.

It is recognised that cleansing of the beach of debris and other inappropriate materials may be required at other times (outside the raking cycle), and also at Basin Beach (as well as Bilgola Beach), particularly after storms. Where feasible, Council would remove or order removal of inappropriate objects on beaches in the study area, once aware of their presence. Fencing/barricading around

¹² Council would need to complete an environmental assessment for these beach scraping works, obtain land owners consent and/or licensing of construction works from Crown Lands where sand is to be scraped from below the Mean High Water Mark, and ensure that any other necessary consents, approvals, licences and permits are in place for the works (Council may also be required to obtain land owners consent for placement of sand on private land, should this be involved). A CZMP action (H12) is included in this regard in Section 8.

inappropriate objects may be necessary until they are removed. A CZMP action (R10) that Council would remove debris and other inappropriate materials off beaches in the study area as required is included in Section 8. Seaweed washed up on the beaches is considered to be a natural material and is not removed by Council.

The Bilgola and Mona Vale rock pools are cleaned once a week in the swimming season and once a fortnight in the non-swimming season (annual cleaning rosters for all former Pittwater ocean rock pools are available on the Northern Beaches Council website). A CZMP action (O8) is included in Section 8 that this continues. Hot humid conditions, high water temperature, decomposing seaweed, and a large number of people using the pools will affect water quality in the pools. Water may appear discoloured or cloudy due to these factors quickly after cleaning, particularly if ocean seas/swell are relatively calm and there is thus little tidal exchange of fresh seawater. Where installed in rock pools (such as at Bilgola), Council operates submersible pumps to increase exchange of seawater and improve water quality during periods of high pool usage.

The NSW Office of Environment and Heritage (OEH) administers a Beachwatch program that includes water quality (faecal contamination) monitoring of Bilgola Beach and Mona Vale Beach and daily pollution forecasts. OEH (2014) recommended the following:

- avoid swimming during and at least one day after heavy rain at ocean beaches, due to the possibility of pollution from stormwater drains;
- avoid swimming near stormwater drains or sewage outfalls; and
- avoid swimming if you see signs of pollution such as discoloured water, oil or scum on the water, and litter or other debris floating in the water or on the tide line.

Water quality has generally been good at Bilgola Beach and Mona Vale Beach over the last decade, but the water may be susceptible to pollution after rain. Both beaches were rated as having very good water quality in the most recent Beachwatch “State of the Beaches 2013–2014” report, but it was noted that enterococci levels often exceeding the safe swimming limit in response to 20mm or more of rainfall.

5.3 Risks to Built Assets

5.3.1 *Erosion/Recession*

Risk to built assets from erosion/recession primarily depends on:

- how far landward they are relative to hazard lines or likelihood lines (or relative to the beach);
- the nature of foundations (eg piled development can be designed to not be damaged if undermined by erosion); and
- the presence and integrity of protection works located seaward of the asset.

To assess the appropriate setbacks and controls for new development so that future development in the study area is at acceptable risk from erosion/recession, an innovative risk assessment has been completed as outlined in **Appendix D**. In essence, it is proposed that to manage future new development in the study area such that it is at acceptable risk, adequate setbacks be applied. The three setback lines that have been delineated are a:

- setback for development on conventional foundations (such as slab-on-ground, strip footings or shallow piers);
- setback for development on (deep) piled foundations; and
- setback for all development (either on conventional or piled foundations).

To reduce risk to development, piled development is also proposed to be applied as required. The adopted setbacks from Appendix D are depicted in Figure 22 (Bilgola Beach) and Figure 23 (Basin Beach). Note that these are minimum setbacks, and there may be other planning considerations such as visual impacts and effects on views that would require an additional setback as each Development Application is assessed on its merits.

Landowners are also entitled to consider the installation or upgrading of protection works under *State Environmental Planning Policy (Infrastructure) 2007*. Where works would be entirely within private property (where feasible) and would not impact on adjacent property, protection works may be considered to reduce the risk to development and potentially move the setback line for piled development further seaward (but no further seaward than the Foreshore Building Line).

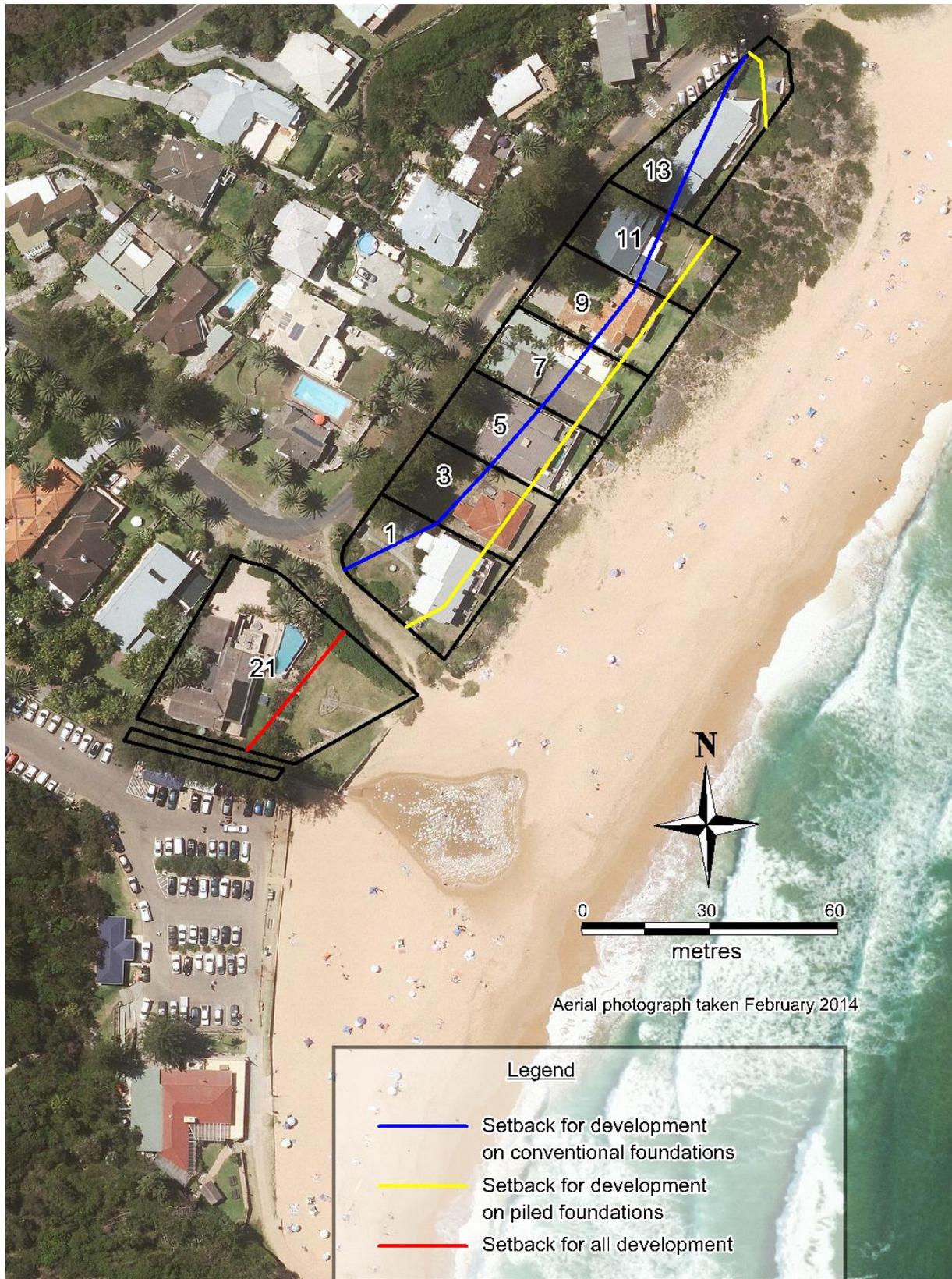


Figure 22: Adopted minimum beachfront setback lines for development on conventional and piled foundations at Bilgola Beach



Figure 23: Adopted minimum beachfront setback lines for development on conventional and piled foundations at Basin Beach

Referring to **Appendix D**, the key existing public asset at risk in the study area is Bilgola SLSC, which is located partially seaward of the WorleyParsons (2012c) Immediate Zone of Slope Adjustment (ZSA) Hazard Line and seaward of a “likely” likelihood line for a design life of 60 years (to 2075). The seawall seaward of the SLSC has an elevated toe level and could fail catastrophically in a severe coastal storm at present, so cannot be relied upon to provide protection to the SLSC.

Again referring to Appendix D, existing private development at almost all lots is at least partially seaward of the acceptable risk line for conventional foundations (the only lots where this is not the case are at 21 Bilgola Avenue at Bilgola Beach, and 37 and 39 Surfview Road at Basin Beach). However, considering existing engineered seawalls and piled foundations, the existing development which is at an unacceptably high risk of damage over a 60 year design life comprises:

- 1, 3, 7, 9, 11 and 13 Allen Avenue at Bilgola Beach¹³; and
- 3, 5, 7, 9, 13, 17, 19, 23 and 35 Surfview Road¹⁴.

There is no management action proposed by Council to directly deal with the risk to existing private development, beyond informing residents of the risk. It is the responsibility of landowners to address the risks. Council advises landowners that they should take action to reduce the risk to existing development so as to render it acceptably low.

5.3.2 Coastal Inundation

As discussed in Section 4.4.4, areas in the study area at particular existing risk from coastal inundation (wave runup) include Bilgola SLSC and the Bilgola SLSC car park. To reduce inundation risks at these locations, various recommendations were provided in Section 4.4.4 including elevating the Bilgola SLSC seawall and reorientating the ramp at the SLSC

To manage inundation risk for new future beachfront development, inundation hazards should be assessed on a site specific basis and can generally be managed through maintaining a difference in height between ground floor levels and natural ground levels (a 0.5m difference would typically be acceptable where natural ground levels exceed 7m AHD).

5.4 Property Risk and Response Categories

Based on “Guidelines for Preparing Coastal Zone Management Plans” (OEH, 2013), there is a requirement to define “property risk” and “property response” categories for private property with reference to the Immediate, 2050 and 2100 Coastline Hazard Line positions. This is provided in **Appendix E**.

5.5 Geotechnical Stability Issues at Bilgola Beach Headlands

5.5.1 South Bilgola Headland

Geotechnical stability of the rock face above the concrete walkway leading to Bilgola rock pool has been an ongoing public risk management issue. A protective barrier comprising steel mesh safety fencing (several metres high) was first constructed landward of the concrete seating area along the

¹³ Assuming that 5 Allen Avenue is piled.

¹⁴ Approval has been given by Council for a new dwelling on deep pile foundations at 9 Surfview Road.

rock pool in 1968, following remedial works including drilling and trim blasting of the rock face (Coffey Partners International Pty Ltd [Coffey], 1990).

As described by Coffey (1990), the rock face at South Bilgola Headland was inspected in December 1989 following an increase in the number and size of rocks falling onto the public walkway after recent heavy rainfall. This inspection concluded that the risk of a major rock fall from the cliff face was low, however a number of overhanging ledges, partially dislodged blocks, completely detached boulders and accumulations of slope debris were considered to pose a potential risk to the public. It was recommended that all loose material and detached blocks on the slope were scaled down with hand held implements. It was considered that ongoing weathering of the rock face may necessitate scaling down every 5 years. It was also suggested that additional control of falling rocks could be provided by installation of hexagonal wire mesh netting over the rock face. It is understood that slope grooming and scaling down of the rock face has been undertaken periodically in response to minor rock falls.

Other site works undertaken include the construction of block support buttresses beneath locally undercut rock masses landward of the central safety fence area. Routine maintenance has included the frequent removal of rock fragment debris from the floor of the rock pool (Longmac, 1993).

Slope grooming and scaling down was carried out in February 1993 prior to a stability assessment of the rock face undertaken in October 1993 (Longmac, 1993). An inspection of the safety fence at this time concluded that it had sustained impact damage at several locations, was suffering from locally advanced corrosion and was at the end of its design life. It was concluded that rock fall hazards existed landward of the rock pool and alongside the concrete walkway leading to the rock pool. A number of remediation options were proposed including:

- rock face grooming;
- reinstatement of the safety fence;
- shotcreting with mesh reinforcement;
- rock fall mesh netting draped and secured over the rock face following grooming;
- relocation of the concrete walkway away from the base of the cliff line;
- removal of overhanging rock masses; and
- construction of concrete buttress arches at selected locations beneath the overhangs and shotcrete protection of carbonaceous siltstone in the overhang zone to prevent continued accelerated weathering.

It is understood that the following measures were implemented in 1996 (Longmac, 1998):

- grooming of the rock face;
- installation of rock fall protection netting over the rock face landward of the rock pool and adjacent to the concrete walkway leading to the rock pool (but not in the overhang zone further towards Bilgola SLSC);
- placement of fibre mat and native seeding in areas adjoining and overlying the rock fall protection netting;
- installation of masonry and rock-faced buttresses on the rock face above the concrete walkway leading to the rock pool and at several points along the toe of the cliff line;
- installation of rock bolts to secure a prominent rock mass;
- revegetation of the headland immediately above the stabilisation works; and
- extension of the stormwater cut-off drain on the crest of the headland to divert stormwater away from areas of slope instability above the stabilised rock face.

It is understood that the high mesh safety fence, previously installed to deflect rock falls, has been replaced with a lower (1.8m high) metal fence with vertical metal bars to limit access to the base of the cliff.

The stabilisation works were subsequently monitored with periodic engineering geological inspections undertaken in October 1996, July 1997 and April 1998. In the 1998 inspection report (Longmac, 1998) it was concluded that:

- the stabilisation works were functioning efficiently, effectively and as intended;
- careful hand removal of small eroded debris deposits identified immediately above the rock fall protection netting should be actioned and further native seeding or planting should be undertaken at these locations;
- stabilisation works and drainage provisions on the crest of the headland should be subject to regular inspections by Council maintenance personnel; and
- engineering geological inspections of the stabilisation works should be carried out on an annual basis prior to the commencement of each swimming season.

Monitoring of South Bilgola Headland has been undertaken on an irregular and infrequent basis in conjunction with similar monitoring at other coastal headlands in the former Pittwater LGA where geotechnical works and protective measures have been installed. It is recommended that a regular monitoring program for South Bilgola Headland is established following an investigation into an appropriate frequency and monitoring protocol, and a CZMP action (H16) is included in this regard in Section 8.

5.5.2 *Bilgola Head*

Similar geotechnical stability issues to those encountered at South Bilgola Headland have also been identified at Bilgola Head, which is at the northern end of Bilgola Beach. An inspection report prepared by GHD (2007b) identified that geotechnical instability in the rock face above the foreshore reserve area posed a risk to the safety of the public and Council maintenance personnel as a result of potential rock falls. The following mitigation measures were recommended by GHD (2007b):

- rock face scaling and grooming works to remove rock fall hazards;
- establishing an exclusion zone to prevent public access into potential rock fall impact areas; and
- placement of a sandstone boulder wall to discourage entry into the garden zone at the base of the rock face.

All three of the above risk mitigation measures were subsequently implemented by Council. The cliff face was scaled and groomed using an excavator and a boulder rock barrier was constructed with vegetation planted between the cliff and the barrier preventing pedestrian access.

It is recommended that a regular monitoring program for Bilgola Head is established following an investigation into an appropriate frequency and monitoring protocol. It is also recommended that more specific signage (eg “do not enter past boulders due to danger of rock falls”) is installed to discourage entry to the area landward of the boulder rock barrier, which is physically easy to access. A CZMP action (H17) is included for both of these items in Section 8.

5.6 Emergency Action Subplan

A “Coastal Erosion Emergency Action Subplan for Bilgola Beach (Bilgola) and Basin Beach (Mona Vale)” was prepared previously by the main author of the investigation reported herein, as documented in WorleyParsons (2012a, b). This was certified by the Minister for the Environment on 22 April 2012 as a CZMP under the *Coastal Protection Act 1979*¹⁵.

However, due mainly to NSW Government legislative changes in recent years, this previous Emergency Action Subplan had to be updated, with the revised document set out in **Appendix F**.

It is emphasised that landowners must act well (generally months) in advance of a storm to consider implementing emergency protection works. It should also be noted that landowners are not permitted to install protection works without following the procedures described, and severe penalties may apply if they are not followed.

¹⁵ Note that an Emergency Action Subplan can be certified individually as a CZMP, in the absence of a fully completed CZMP.

6. COMMUNITY AND STAKEHOLDER CONSULTATION

6.1 Requirements from *Guidelines for Preparing CZMPs*

In *Guidelines for Preparing CZMPs* (OEH, 2013), it is noted that CZMPs are to be prepared using a process that includes consulting with the local community and other relevant stakeholders. The minimum consultation requirement is to publicly exhibit a draft plan for not less than 21 days, with notice of the exhibition arrangements included in a local newspaper as per Section 55E of the *Coastal Protection Act 1979*. The document herein is to be notified and exhibited to meet these requirements.

To meet the requirements of OEH (2013) it will also be necessary to consider all submissions made during the consultation period, and potentially amend the draft plan as a result of these submissions as per Section 55F of the *Coastal Protection Act 1979*.

It is recommended that a community engagement strategy be developed to decide how CZMP outcomes will be communicated within Council, to beachfront landowners and to the wider community. A CZMP action (H13) is included in this regard in Section 8.

The engagement could include a fact sheet summarising the CZMP that is mailed to all landowners. It is also recommended that landowners are reminded/updated on risk to development and ongoing CZMP implementation at regular intervals through mailouts (say every 2 years).

A number of consultation activities have already been undertaken during the course of the investigation reported herein, as summarised in Section 6.2.

6.2 Consultation Activities

As part of the development of the report herein, a number of community and stakeholder activities have been undertaken, namely:

- internal consultation with Council staff;
- consultation with OEH staff;
- mail-out with CZMP information sheet to all property owners in the study areas in March 2015;
- community workshop held on 29 April 2015, including a presentation to attendees and answering their questions;
- review of public submissions made in response to the mail-out and community workshop;
- presentation to and answering questions from the Natural Environment Reference Group (NERG) of Council on 13 May 2015;
- Public Exhibition of Issue B of the report herein for 23 days from 17 July to 7 August 2015 (exceeding the required minimum exhibition period of 21 days);
- public workshop held on 29 July 2015 (during the Exhibition period), including a presentation to attendees and answering their questions; and
- review of public submissions made during the Public Exhibition noted above.

Notes from the community/public workshops and NERG meeting are provided in **Appendix G**, indicating how questions were considered and responded to. Discussion on the public submissions noted above is also included in **Appendix G**.

7. PROPOSED MANAGEMENT ACTIONS

7.1 Preamble

Based on OEH (2013), it is necessary to develop actions to:

- manage current and projected future risks from coastal hazards (see Section 7.2 with regard to private development, and Section 7.3 with regard to public assets);
- protect and preserve beach environments and beach amenity (Section 7.4);
- ensure continuing and undiminished public access to beaches, headlands and waterways (Section 7.5);
- manage any environmental or safety impacts from current access arrangements; and
- protect or promote the culture and heritage environment (Section 7.6).

Risks to public safety, and actions to manage these risks, have already been identified and discussed in Section 5.2. Therefore, the focus of the discussion in Section 7.2 is on risks to built assets. Environmental or safety impacts from current access arrangements were considered in Section 2.8.6 and actions to manage these were also discussed in Section 5.2 (such as closing off damaged and potentially dangerous public beach access points after storm erosion).

Further discussion on identification and evaluation of CZMP management options is provided in **Appendix H**. Various potential Federal (Commonwealth), NSW and Council sources for funding of CZMP actions are outlined in **Appendix I**.

This initial screening of available options to manage coastline hazards was based on a broad assessment of social, economic and environmental factors (and based on the experience of the author in developing management options in other developed areas), to identify a shortlist of realistic and affordable measures with acceptable (or positive) environmental and social impacts. Feedback received from community and stakeholder engagement activities (Section 6) was also considered.

7.2 Actions to Manage Current and Projected Future Risks to Private Development from Coastal Hazards

7.2.1 *Erosion/Recession Hazards*

Council seeks to allow private landowners to construct new beachfront development in the study area where the risk of damage to development from coastal processes can be demonstrated to be acceptably low. Based on **Appendix D**, this can be achieved through stipulating the following for new development (while also considering broader issues of beach amenity and the like, see Section 7.4):

- minimum landward setbacks,
- piled foundations where required;
- allowing new or upgraded protection works where environmental impacts of such works can be demonstrated to be acceptable (although note that appropriately designed new development would be feasible at all lots in the study area without the necessity for protection works to be constructed); and
- sufficiently raised ground floor levels (see Section 7.2.2).

The recommended setbacks have been depicted in Figure 22 and Figure 23 in Section 5.3.1. It should also be a requirement of the Development Application process that a specialist qualified practising coastal engineer must prepare a risk management report to demonstrate that the proposed development would be at an acceptable risk of damage from erosion/recession, and certify that for a 60-year design life.

In Clause 7.5(2) of the *Pittwater LEP 2014*, there is reference to that clause applying to the land shown on the Coastline Hazard Map as: (a) Wave Inundation, or (b) Coastal Erosion/Wave Inundation, or (c) Bluff/Cliff Instability. The Coastline Hazard Maps (Coastal Risk Planning Maps) already appropriately identify the lots subject to Coastal Erosion/Wave Inundation in the study area.

Council could consider including the adopted setback lines on the Coastal Risk Planning Maps and revising Clause 7.5(2) of the LEP to: “This clause applies to the land shown on the Coastline Hazard Map as seaward of the Setback Line for Development on Piled Foundations, or Setback Line for All Development, as applies at the particular lot”. The setback could then be potentially applied in the LEP as an additional clause such as “development consent must not be granted for development on land seaward of the [particular setback line] except for the following purposes...”.

It is reiterated that Council does not consider that it has the responsibility to protect private property from coastal erosion and inundation hazards, and does not intend to do so. Based on *State Environmental Planning Policy (Infrastructure) 2007*, landowners may submit a Development Application for construction of a new or upgraded protection works on their property, which must be considered on its merits by the consent authority (the NSW Coastal Panel until the CZMP herein is gazetted, and Council thereafter).

Based on Clause 129A of *State Environmental Planning Policy (Infrastructure) 2007*, development for the purposes of a seawall or beach nourishment may be carried out by any person with consent on the open coast or entrance to a coastal lake. Therefore, Part 4 of the *Environmental Planning and Assessment Act 1979* would apply to the works, and unless the development is complying development¹⁶, the following activities would need to be undertaken:

- preparation of a Statement of Environmental Effects or Environmental Impact Statement (the latter if significant impacts were expected); and
- lodging a Development Application (DA) with a consent authority¹⁷.

The DA would then be determined by the consent authority. Before determining the DA for protection works, the consent authority must take the following matters into consideration:

- the provisions of any CZMP applying to the land;
- the matters set out in Clause 8 of *State Environmental Planning Policy No 71 - Coastal Protection*; and
- any guidelines for assessing and managing the impacts of coastal protection works that are issued by the Director-General as applicable.

¹⁶ As per Section 76A(5) of the *Environmental Planning and Assessment Act 1979*, an environmental planning instrument may provide that development, or a class of development, that can be addressed by specified predetermined development standards is complying development. Division 5 of *SEPP Infrastructure* also has discussion on complying development.

¹⁷ It should be noted that multiple landowners can work together (for example to create consistent protection works over a continuous length) and submit a combined environmental assessment and development application.

Note that it is the general expectation of Council that any protection works implemented by landowners would be entirely on private land (that is, within their property boundaries), where feasible.

Clause 8 of *State Environmental Planning Policy No 71 - Coastal Protection* has numerous matters for consideration, including public access issues, effects on beach amenity, conservation of threatened species of animals and plants, conservation of fish, and the likely impact of coastal processes and coastal hazards on the development and any likely impacts of the development on coastal processes and coastal hazards (such as 'end effects').

Section 55M of the *Coastal Protection Act 1979* sets out preconditions to the granting of development consent relating to coastal protection works. Consent must not be granted under the *Environmental Planning and Assessment Act 1979* to development for the purpose of coastal protection works, unless the consent authority is satisfied that:

- the works will not over the life of the works unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or pose or be likely to pose a threat to public safety; and
- satisfactory arrangements have been made (by conditions imposed on the consent) for the following for the life of the works:
 - the restoration of a beach, or land adjacent to the beach, if any increased erosion of the beach or adjacent land is caused by the presence of the works; and
 - the maintenance of the works.

These "satisfactory arrangements" are to secure adequate funding for the carrying out of any such restoration and maintenance, including by either or both of the following:

- by legally binding obligations¹⁸ (including by way of financial assurance or bond) of all or any of the following:
 - the owner or owners from time to time of the land protected by the works;
 - if the coastal protection works are constructed by or on behalf of landowners or by landowners jointly with a Council or public authority – the Council or public authority,
- by payment to the relevant Council of an annual charge for coastal protection services (within the meaning of the *Local Government Act 1993*), discussed further in **Appendix I**.

Council intends to make requirements for maintenance of any upgraded/new protection works to be a condition of consent, and the responsibility of landowners. For example, if protection works seaward of an approved structure (relying on protection works to be at acceptable risk) were damaged or failed, the conditions could be such that the consent would lapse. A CZMP action (H10) is included in Section 8 that funding mechanisms for landowners to contribute to restoration of beach amenity adjacent to protection works after storms, such as through beach scraping, be investigated.

To further mitigate any impacts of landowner protection works, it would be a requirement that any upgraded/new works were built entirely on private property, where feasible. This would include a requirement that the portion of existing protection works on public land be removed in this process, again where feasible. A CZMP action (H7) is included in Section 8 for a protection works policy to be developed, which would include consideration of the alignment of the protection works and whether construction on public land would be considered to be appropriate.

¹⁸ These funding obligations are to include the percentage share of the total funding of each landowner, Council or other public authority concerned.

Landowners may also apply for a certificate to construct specific “temporary coastal protection works” (as per Part 4c of the *Coastal Protection Act 1979*) to attempt to reduce coastal erosion threats to structures by placing sand or sandbags (fabric bags filled with sand, with larger sizes often denoted as “geobags” or sand-filled geotextile containers). As discussed in **Appendix F**, these temporary coastal protection works are not recommended for use in the study area.

As a consequence of the *Standard Instrument—Principal Local Environmental Plan* (Standard Instrument LEP) and requirement that there are no sub-zones for planning purposes, coastal development setbacks and the like are not specified in *Pittwater LEP 2014*, and they cannot be included in the current Standard Instrument LEP form other than as a Local provision. To best ensure the legal enforceability of coastal development setbacks and other controls as described above, these should be stipulated in *Pittwater LEP 2014* and reinforced with DCP controls as required (modifying the *Coastline Risk Management Policy for Development in Pittwater*, with CZMP action H6 included in this regard in Section 8). Until the LEP is modified, the new setbacks and controls would not be legally enforceable if included in the DCP only.

To achieve insertion of setbacks and other controls into *Pittwater LEP 2014*, it would be necessary to liaise with the Department of Planning and Environment to create a Local planning clause to enable modification of the LEP consistent with the CZMP. A CZMP action (H1) is included in this regard in Section 8.

Based on Clause 1.5 of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*, “land identified by an environmental planning instrument, a development control plan or a policy adopted by the council as being a coastal erosion hazard” defines “excluded land identified by an environmental planning instrument”. Any land seaward of the “setback line for development on conventional foundations” would be considered as being such land affected by a coastal erosion hazard. Therefore, based on Clause 1.19(6) of *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008*, the area seaward of the “setback line for development on conventional foundations” would be land on which complying development may not be carried out. However, exempt development would not be restricted.

Consideration should also be made as to whether exempt development should be excluded from areas at risk from coastal hazards, for example by nominating the coastal hazard area as a foreshore area. A CZMP action (H4) is included in this regard in Section 8. This may be warranted if certain types of exempt development are considered by Council as inappropriate for a coastal hazard area.

7.2.2 Coastal Inundation Hazards

To manage the risk of coastal inundation, it is recommended that inundation controls be added into Council’s development assessment process as appropriate. A CZMP action (H9) is included in this regard in Section 8.

In developing these inundation controls, it should be recognised that inundation hazards can generally be managed through ensuring minimum structure floor levels and/or a maintaining a difference in height between structure floor levels and surrounding land levels (say 0.5m), and/or by applying risk minimisation measures that are already listed in the *Coastline Risk Management Policy for Development in Pittwater*.

It should be a requirement of the Development Application process that a specialist qualified practising coastal engineer prepares a risk management report to demonstrate that the proposed development is at an acceptable risk of damage from inundation, and certify that for a 60-year design life.

7.2.3 LEP and DCP changes

To summarise, some of the changes to the LEP that would be required are as follows:

- Section 7.5(2): a new Coastline Hazard Map would need to be prepared as discussed in Section 7.2.1; and
- Section 7.5: a new Clause would need to be added to refer to required setbacks as discussed in Section 7.2.1.

The DCP (or in particular the *Coastline Risk Management Policy for Development in Pittwater*) could be edited to include:

- a requirement that a specialist qualified practising coastal engineer must prepare a risk management report to demonstrate that the proposed development is at an acceptable risk of damage from erosion/recession and inundation, and certify that over a 60-year design life;
- an appropriate definition of a specialist qualified practising coastal engineer that has been developed in consultation with the National Committee on Coastal and Ocean Engineering (NCCOE) of Engineers Australia;
- reference to a protection works policy, eg advising applicants on design standard, alignment and required setback for development located landward of the works, with a CZMP action (H7) included in this regard in Section 8;
- details on foundation requirements for development seaward of the “setback line for development on conventional foundations”, with a CZMP action (H8) included in this regard in Section 8;
- the inundation controls discussed in Section 7.2.2; and
- controls to mitigate the potential environmental impacts of beach access stairways and pathways that may be proposed as a part of landscaping for new development.

Where appropriate and where accepted by the Department of Planning and Environment, some of the DCP changes should be incorporated in the LEP to give greater force.

7.2.4 Discussion on Existing Use Rights

It is acknowledged that adoption of the proposed future development setbacks stipulated in a revised Pittwater LEP would lead to a portion of some existing development, where seaward of this setback line, being at variance to the setback. However, based on “existing use rights”, existing lawful development can remain seaward of the setback, and nothing in the CZMP (or in particular any changes in the LEP resulting from the CZMP) alters these existing use rights. As stated in Section 107(1) of the *Environmental Planning and Assessment Act 1979*, “except where expressly provided in this Act, nothing in this Act or an environmental planning instrument prevents the continuance of an existing use”.

An existing use (as defined in Section 106 of the *Environmental Planning and Assessment Act 1979*) is a use that is lawfully commenced but subsequently becomes a prohibited use under a new LEP or other environmental planning instrument. The *Environmental Planning and Assessment Act 1979* and

the *Environmental Planning and Assessment Regulation 2000* makes provisions for the continuance of existing uses.

Clause 41(1) of the *Environmental Planning and Assessment Regulation 2000* allows that:

“An existing use may, subject to this Division:

- (a) be enlarged, expanded or intensified, or
- (b) be altered or extended, or
- (c) be rebuilt, or
- (d) be changed to another use, but only if that other use is a use that may be carried out with or without development consent under the Act, or
- (e) if it is a commercial use—be changed to another commercial use (including a commercial use that would otherwise be prohibited under the Act)¹⁹, or
- (f) if it is a light industrial use—be changed to another light industrial use or a commercial use (including a light industrial use or commercial use that would otherwise be prohibited under the Act)”.

That is, the *Environmental Planning and Assessment Act 1979* and *Environmental Planning and Assessment Regulation 2000* allows intensification and alteration of existing uses (particularly residential uses as applies in the study area). This would be subject to submission and approval of a development application to Council, for which matters for consideration would be as per Section 79C of the *Environmental Planning and Assessment Act 1979* (see **Appendix C**), which includes the LEP, DCP and CZMP.

Enlarging, expanding, intensifying, altering, extending or rebuilding a structure on conventional foundations with existing use rights is generally not supported (due to unacceptable risk of damage) where that structure (existing or proposed) is seaward of the setback line for conventional foundations. There should be consideration of including this advice in the DCP.

Similar works on a structure on piled foundations with existing use rights would only generally be supported if:

- the new works were also piled;
- the structure was landward of the setback line for piled development;
- the structure met the inundation controls in Section 7.2.2; and
- a coastal engineer certifies that the existing and proposed foundations are adequate in ensuring that the development is at acceptable risk.

If there was concern that existing use rights may lead to the expansion and intensification of structures at unacceptable risk, there may be legal/planning avenues to avoid creating existing use rights in the study area. This could include avoiding setback provisions in the LEP and using a foreshore area, for example. A CZMP action (H2) is included in this regard in Section 8.

¹⁹ Based on Clause 41(2) of the *Environmental Planning and Assessment Regulation 2000*, the existing use must not be changed under subclause (1) (e) or (f) unless that change: (a) involves only alterations or additions that are minor in nature, and (b) does not involve an increase of more than 10% in the floor space of the premises associated with the existing use, and (c) does not involve the rebuilding of the premises associated with the existing use, and (d) does not involve a significant intensification of that existing use.

It can also be noted that if an existing use (or indeed any structure including those not benefitting from existing use rights) becomes undermined by coastal erosion/recession and is deemed by Council to be unsafe for occupation or likely to be a danger to the public, then Council may order its demolition or removal under Section 121B of the *Environmental Planning and Assessment Act 1979*.

7.3 Actions to Manage Current and Projected Future Risks to Public Assets from Coastal Hazards

In Appendix F5.1 and F5.3, there is discussion on how Council would manage the risk of damage to its assets in coastal erosion emergencies, where Council's current position is that it does not intend to undertake emergency protection of its assets unless supported by further studies. This position also applies over the long term. That is, Council's current position is that it does not intend to undertake emergency protection of its assets, nor long term protection, unless supported by further studies. This particularly applies to Bilgola SLSC and its adjacent car park and promenade.

The further studies proposed comprise assessing the level of risk to Council assets in detail, completing a cost:benefit assessment of the value of emergency or long term protection of assets, assessing insurance implications, and completing an environmental assessment (REF) and designs for intended protection works (if any). A CZMP action (H21) is included in Section 8 with regard to undertaking these studies.

It is not considered to be appropriate nor practical to protect the following assets in emergencies, nor are long term coastal protection works proposed for these assets, namely:

- Bilgola ocean rock pool;
- three stormwater outlets discharging on to Bilgola Beach;
- stormwater outlet at the northern end of Basin Beach;
- Mona Vale rock pool; and
- dune fencing and beach accessways.

These assets would be repaired or replaced after storms as required, where appropriate.

Bilgola SLSC and the adjacent car park are at risk from ocean inundation. Various measures have been recommended to reduce the risk of inundation damage as discussed in Section 4.4.4, and a CZMP action (M7) is included in this regard in Section 8.

7.4 Actions to Protect and Preserve Beach Environments and Beach Amenity

Council would seek to maintain public beach access and amenity in the future, within its financial capacity. If beachfront development is to be maintained in the study area, the most feasible option to maintain beach amenity in the future is beach nourishment.

Beach nourishment would most economically be achieved by using offshore sand sources (assuming environmental impacts of such works will be demonstrated to be acceptable). Undertaking beach nourishment is consistent with Coastal Management Principles 9 and 10 from OEH (2013), and has generally been strongly supported by the community in consultation completed during the CZMP to date. However, Council would be unable to implement beach nourishment without the support of the NSW Government in:

- developing a policy (or modifying legislation if required) such that offshore sand sources could be accessed;
- providing funding; and
- taking a coordinating role as nourishment would only be cost effective if implemented at a regional scale covering numerous coastal council areas.

Beach nourishment is not likely to be necessary for about 20 years, subject to monitoring of beach width. However, a CZMP action (L1) is included in Section 8 to investigate beach nourishment and to liaise with and lobby the NSW Government on legislative and funding issues²⁰. This action is necessary to progress beach nourishment from concept to completion.

The type of beach nourishment envisaged for the study area would be to maintain the present beach widths into the future, thus addressing the effects of long term recession due to sea level rise. Beach nourishment is typically applied as an initial bulk campaign followed by periodic maintenance campaigns. It is most effective if the nourishment sand is similar in particle size and other characteristics (such as colour) to the native beach sand. Further details on beach nourishment are provided in **Appendix H**.

As noted in Section 7.2.1, any upgraded/new protection works would generally be required to be built entirely on private property, with the portion of any existing works on public land removed (where feasible). These actions would be expected to enhance beach amenity.

Beach scraping, as discussed in Section 5.2, is also an action that would be expected to assist in accelerating the recovery of beach amenity after storms.

Any additional adjacent erosion, seaward of and at the ends of protection works, has generally been short-term and localised in the past in the study area. These impacts could be managed, if required, through beach scraping and/or beach nourishment.

As noted in Footnote 12 on Page 37, beach scraping is subject to environmental assessment, land owners consent and licencing etc. This also applies to beach nourishment.

7.5 Actions to Ensure Continuing and Undiminished Public Access to Beaches, Headlands and Waterways

No specific actions are considered to be required to ensure continuing and undiminished public access to beaches, headlands and waterways. This is because there are no significant current issues or impacts expected on access into the future, beyond risks to public safety (as this affects access) as noted in Section 5.2, where actions to address these risks were outlined.

Undertaking beach nourishment as described in Section 7.4 would be expected to reduce the frequency that existing protection works were exposed and reduce the likelihood of steep escarpments forming within beach accessways (in both cases compared to the case of not undertaking beach nourishment and long term recession due to sea level rise proceeding), thus reducing the potential for restricted beach access for private landowners and the general public.

²⁰ A CZMP action (M2) is included in this regard in Section 8.

7.6 Actions to Protect or Promote the Culture and Heritage Environment

The cultural and heritage significance of the study area was outlined in Section 2.6. Surfing is also part of the culture of the study area, and was discussed in Section 2.7.1.

With regard to the items noted in Section 2.6:

- there are no known Aboriginal objects or Aboriginal Places that need to be protected from coastline hazards in the study area;
- the beach culture of the study area would be expected to be maintained if beach nourishment was undertaken as described in Section 7.4; and
- no heritage items in the vicinity of the study area would be significantly affected by actions in the CZMP, and no additional protection of such items is considered to be warranted at this stage.

With regard to Section 2.7.1, it can be noted that surfing conditions change naturally as sand is moved offshore in response to storms and onshore in calmer conditions (affecting the amount of sand in offshore bars), and alongshore. The effect that long term recession due to sea level rise would have on surfing conditions has not been investigated herein. Surfrider Foundation Northern Beaches has generally been supportive of the concept of beach nourishment, as long as potential effects on surfing breaks are considered (and noting the potential for surfing conditions to be enhanced as a result if designed appropriately).

8. IMPLEMENTATION SCHEDULE FOR MANAGEMENT ACTIONS

Recommended management actions for Council are presented below as follows

- high (H) priority, see Table 2;
- medium (M) priority, see Table 3;
- low (L) priority, see Table 4;
- ongoing (O) actions (actions that should be undertaken on a regular cycle), see Table 5; and
- as-required (R) actions (actions that should be undertaken if an event occurs such as severe coastal erosion), see Table 6.

Whilst the Catchment Management and Climate Change Unit would be responsible for administering and reviewing the CZMP and monitoring the effectiveness of the recommended actions, most business units of Council would be responsible to a greater or lesser extent to implement the recommended actions of the CZMP. To this end, all business units with a responsibility for actions recommended by this CZMP will need to ensure that the relevant matters receive appropriate consideration (based upon the relative priority of each action) when framing annual budgets and developing projects and programs for inclusion in Council's delivery plan.

Progress in the implementation of the CZMP would generally be reported to Council and the Northern Beaches community through Council's annual management plan, major project updates and the relevant requirements of the Division of Local Government's integrated planning and reporting process. A CZMP action (O2) is included in this regard in Table 5. As many of the recommended actions are likely to be undertaken under the operational plans of the relevant business unit, they would not necessarily be captured in a formal reporting process.

A CZMP action (O5) is included in Table 5 to update the CZMP every 10 years (to take account of new data, better understanding of coastline hazards, revised climate change information, changes to legislation, etc).

All recommended actions in the CZMP would need to be funded and undertaken in terms of Council-wide priorities and as funding constraints and available resources permit. Actions may be funded through Council's general revenue or other potential sources as discussed in **Appendix I**. Various actions would be suitable for consideration for financial assistance under the NSW Coastal Management Program and should be the subject of future grant applications under this and other applicable financial assistance programs.

Action L1 is not proposed to be fully funded by Council, as implementing beach nourishment to maintain beach amenity is beyond its financial capacity.

A number of actions (namely H1, M2, and L1) mention involvement of other agencies besides Council. However, as the recommended actions do not commit the agency to any involvement in these actions their written concurrence is not necessary as per the specific requirements in *Guidelines for Preparing CZMPs* (OEH, 2013).

Table 2: Recommended high-priority management actions

Action	Description	Issues addressed	Section referred to herein	Timeframe for completion once CZMP is certified
H1. Modify LEP with local planning clause	<ul style="list-style-type: none"> liaise with Department of Planning and Environment to create a local planning clause to enable modification of <i>Pittwater LEP 2014</i> (to ensure new CZMP setbacks, coastal hazard mapping and other appropriate controls are stipulated in LEP) 	Risk to private development	Section 7.2.1	In conjunction with completion of certification of CZMP for all remaining former Pittwater open coast beaches
H2. Assess existing use rights	<ul style="list-style-type: none"> undertake legal/planning investigations to assess suitability of alternative LEP clauses to prevent existing use rights being generated through setback prohibitions, that may provide benefits for control of alterations and intensification of existing development 	Risk to private development	Section 7.2.4	In conjunction with Action H1
H3. Investigate how coastal protection works could be permitted use	<ul style="list-style-type: none"> Modify LEP to be consistent with <i>SEPP Infrastructure</i> 	Risk to private development	Section 2.2, Appendix H5.1	In conjunction with Action H1
H4. Investigate exempt development	<ul style="list-style-type: none"> assess suitability of alternative LEP clauses to restrict exempt development, if warranted 	Risk to private development	Section 7.2.1	In conjunction with Action H1
H5. Update Section 149(2) certificates	<ul style="list-style-type: none"> update to reflect modification of planning instruments and properties affected 	Risk to private development	Appendix C3.2.2	In conjunction with Action H1
H6. Modify DCP	<ul style="list-style-type: none"> modify DCP to be consistent with CZMP, and in particular modify <i>Coastline Risk Management Policy for Development in Pittwater</i> 	Risk to private development	Section 7.2.1	< 2 years
H7. Prepare protection works policy	<ul style="list-style-type: none"> Modify <i>Coastline Risk Management Policy for Development in Pittwater</i> to include advice on design standard and alignment for protection works, and required setback of development from protection works 	Risk to private development	Section 7.2.1 and 7.2.3	< 2 years and in conjunction with Action H6
H8. Prepare foundation requirements	<ul style="list-style-type: none"> Modify <i>Coastline Risk Management Policy for Development in Pittwater</i> to include details on foundation requirements for development seaward of the "setback line for development on conventional foundations" 	Risk to private development	Section 7.2.3	< 2 years and in conjunction with Action H6

Action	Description	Issues addressed	Section referred to herein	Timeframe for completion once CZMP is certified
H9. Develop controls for coastal inundation	<ul style="list-style-type: none"> create additional inundation controls in <i>Coastline Risk Management Policy for Development in Pittwater</i> 	Risk to private development	Section 7.2.2	< 2 years and in conjunction with Action H6
H10. Investigate funding from landowners to restore beach amenity	<ul style="list-style-type: none"> investigate funding mechanisms for landowners to contribute to restoration of beach amenity adjacent to protection works after storms 	Beach amenity	Section 7.2.1	< 2 years
H11. Develop trigger conditions	<ul style="list-style-type: none"> develop guidance on appropriate trigger conditions for new development 	Risk to private development	Appendix H5.4	< 2 years
H12. Obtain beach scraping consents, approvals, licences and permits	<ul style="list-style-type: none"> ensure that any necessary consents, approvals, licences and permits are in place for beach scraping works 	Public safety Beach amenity	Section 5.2	< 2 years
H13. Develop community engagement strategy	<ul style="list-style-type: none"> decide how CZMP outcomes will be communicated within Council, to beachfront landowners and to the wider community (this is expected to include a fact sheet summarising the key outcomes) 	Community consultation	Section 6.1	< 2 years and ongoing
H14. Develop communications strategy for emergencies	<ul style="list-style-type: none"> to keep affected communities informed during a coastal erosion emergency 	Risk to development Risk to public infrastructure Public safety	Appendix F5.3	Ongoing and in consultation with SES
H15. Undertake drainage study	<ul style="list-style-type: none"> assessment of flooding and drainage in the study area considering backwater effects due to oceanic inundation 	Risk to development	Section 4.4.3	As part of updating <i>Pittwater Stormwater Management Plan</i>
H16. Undertake South Bilgola Headland geotechnical investigations	<ul style="list-style-type: none"> establish regular monitoring program at South Bilgola Headland following an investigation into an appropriate frequency and a monitoring protocol 	Public safety	Section 5.5.1	< 2 years
H17. Undertake Bilgola Head geotechnical investigations	<ul style="list-style-type: none"> establish regular monitoring program at Bilgola Head following an investigation into an appropriate frequency and a monitoring protocol install specific signage to discourage entry to the area landward of the boulder rock barrier 	Public safety	Section 5.5.2	< 2 years and in conjunction with Action H16

Action	Description	Issues addressed	Section referred to herein	Timeframe for completion once CZMP is certified
H18. Prepare private accessway policy	<ul style="list-style-type: none"> develop appropriate management provisions in relevant plans of management or the DCP for access from adjoining private properties to public beach areas in consultation with all affected stakeholders and land owners 	Beach amenity	Section 2.8.6 and Section 7.2.3	2 to 5 years
H19. Investigate scour protection at Bilgola Creek	<ul style="list-style-type: none"> consider removal and/or replacement of existing scour protection 	Public safety Beach amenity	Section 4.3 and 5.2	2 to 5 years
H20. Remove scattered rocks at Bilgola Kiosk channel	<ul style="list-style-type: none"> removal of the rocks from the beach where scattered over the beach area, or relocation to provide scour protection at a more appropriate localised area 	Public safety Beach amenity	Section 4.3	2 to 5 years and as further exposed by storms
H21. Decide if and how Council assets would be protected	<ul style="list-style-type: none"> assess level of risk to Council assets in detail complete a cost:benefit assessment of the value of emergency or long term protection of assets assess insurance implications complete an environmental assessment (REF) and designs for intended protection works (if any) 	Risk to public infrastructure	Section 7.3 and Appendix F5.1 and F5.3	2 to 5 years and ongoing
H22. Establish appropriate tenure over Crown Land at Bilgola Beach and Basin Beach	<ul style="list-style-type: none"> Liaise with Department of Industry – Lands to formalise management arrangements, as necessary, over Crown Land that accommodates infrastructure currently managed by Council at Bilgola Beach and Basin Beach 	Risk to public infrastructure	Section 2.2	2 to 5 years

Table 3: Recommended medium-priority management actions

Action	Description	Issues addressed	Section referred to herein	Timeframe for completion once CZMP is certified
M1. Implement ecological management recommendations	<ul style="list-style-type: none"> implement recommendations on page 9 of Appendix B 	Coastal ecosystems Beach amenity	Appendix B	5 to 10 years
M2. Lobby the NSW Government to support a program of beach nourishment	<ul style="list-style-type: none"> liaise with and lobby NSW Government to develop a policy (or modify legislation if required) such that offshore sand sources could be accessed, and to secure NSW Government funding (and investigate other funding sources) to undertake beach nourishment to maintain beach amenity in future 	Beach amenity	Section 7.4, Appendix H3, Appendix G6.4	Ongoing
M3. Liaise with asset authorities	<ul style="list-style-type: none"> work collaboratively with asset owners as required to encourage them to assess the location and elevation of their assets in relation to coastline hazards so that the risk of damage can be determined and managed by these owners consistently with the CZMP 	Risk to public infrastructure	Section 2.3, Appendix G	As issues arise and ongoing
M4. Investigate Bilgola Kiosk channel outlet	<ul style="list-style-type: none"> consider construction of a formalised headwall and scour protection for the Bilgola Kiosk channel outlet 	Public safety Beach amenity	Section 4.3	5 to 10 years
M5. Investigate runoff over Bilgola car park seawall	<ul style="list-style-type: none"> consider formalised drainage at showers, construction of a kerb on the eastern side of the car park and elevating the seawall 	Public safety Beach amenity	Section 4.3	5 to 10 years and in conjunction with Action M4
M6. Investigate Bilgola SLSC outlet	<ul style="list-style-type: none"> consider removing smaller rocks and relocating larger rocks to form a more formalised scour protection 	Public safety Beach amenity	Section 4.3	5 to 10 years and in conjunction with Action M4
M7. Investigate measures to reduce inundation at Bilgola SLSC and car park	<ul style="list-style-type: none"> consider elevated seawall and reorientating ramp 	Risk to public infrastructure	Section 4.4.4	5 to 10 years and in conjunction with Action M4

Table 4: Recommended low-priority management actions

Action	Description	Issues addressed	Section referred to herein	Timeframe for completion once CZMP is certified
L1. Undertake beach nourishment to maintain beach amenity	<ul style="list-style-type: none"> • undertake investigations to define sand source, extraction method and beach nourishment profile and volumes • complete environmental assessment • secure all necessary approvals and permits • engage dredging contractor to undertake beach nourishment works • all of the above tasks are likely to be undertaken in conjunction with the NSW and Federal Governments as well as other NSW coastal councils 	Beach amenity Economic value	Section 7.4	Unknown (depends on outcomes from Action M2)

Table 5: Recommended ongoing management actions

Action	Description	Issues addressed	Section referred to herein	Frequency
O1. Monitor beach conditions and forecasts	<ul style="list-style-type: none"> monitor beach conditions and forecasts 	Risk to private development and public infrastructure Public safety Beach amenity		Daily to weekly
O2. Report on CZMP progress	<ul style="list-style-type: none"> report progress on implementation of CZMP through the integrated planning and reporting framework 	Overall CZMP implementation	Section 8	As required by framework
O3. Educate residents	<ul style="list-style-type: none"> ongoing education of residents on coastal hazards, risk to development, risk to public safety and other relevant issues 	Risk to private development Public safety	Section 5.2 and 6.1	As relevant and ongoing
O4. Liaise with NSW Marine Estate Management Authority	<ul style="list-style-type: none"> continue to liaise with the NSW Marine Estate Management Authority (particularly during the preparation of the Hawkesbury Shelf Marine Bioregion Assessment) to enhance marine biodiversity conservation, by all appropriate means, along the Northern Beaches coastline 	Coastal ecosystems	Appendix G	As relevant and ongoing
O5. Update CZMP	<ul style="list-style-type: none"> update CZMP to take account of new data, updated coastline hazards understanding, revised climate change information, changes to legislation, etc. 	Overall CZMP implementation	Appendix D	Every 10 years or earlier if there are significant legislative changes
O6. Provide lifeguard services	<ul style="list-style-type: none"> continue to provide lifeguard patrols and volunteer surf lifesaving at Bilgola Beach and Mona Vale Beach 	Public safety	Section 5.2	Daily from late September to late April
O7. Undertake beach raking	<ul style="list-style-type: none"> continue raking of Bilgola Beach weekly in swimming season 	Public safety Beach amenity	Section 5.2	Weekly from October to April
O8. Undertake Rock Pool cleaning	<ul style="list-style-type: none"> continue cleaning of Bilgola and Mona Vale rock pools weekly in swimming season and fortnightly in non-swimming season 	Public safety Beach amenity	Section 5.2	Weekly from October to April and fortnightly otherwise
O9. Manage geotechnical risks to development under separate policy	<ul style="list-style-type: none"> Continue to consider risk to development at rocky cliff/bluff areas as part of the <i>Geotechnical Risk Management Policy for Pittwater</i> (no development affected by this policy is in study area) 	Risk to private development	Section 2.1	As Development Applications are submitted

Table 6: Recommended as-required management actions

Action	Description	Issues addressed	Section referred to herein
R1. Monitor and report on storm conditions	<ul style="list-style-type: none"> monitor beach erosion and weather, wave and water level conditions and forecasts during storms collate relevant information after each significant storm (describing the storm, extent of erosion/inundation etc., including photographs) 	Risk to private development Risk to public infrastructure Public safety	
R2. Monitor unauthorised coastal protection works	<ul style="list-style-type: none"> monitor the study area to detect installation of unauthorised works and order removal of works if required 	Beach amenity Public safety	
R3. Implement trigger conditions	<ul style="list-style-type: none"> in consultation with the Department of Planning and Environment and if appropriate, implement trigger conditions with approvals for new beachfront development to ensure that increasing risks over time can be managed (also see Action H11) 	Risk to development	Appendix D
R4. Undertake dune maintenance	<ul style="list-style-type: none"> continue the implementation of dune maintenance works including repair of fencing and walkways, restoration of blow-outs and weed eradication and revegetation works as necessary 	Coastal ecosystems Beach access Beach amenity	
R5. Stock signage and barricades	<ul style="list-style-type: none"> ensure sufficient warning signage and barricades are available for use (after severe storms) as required 	Public safety	Section 5.2
R6. Close off accessways	<ul style="list-style-type: none"> implement signage and barricades as required to close off damaged and potentially dangerous public beach access points after storm erosion 	Public safety	Section 5.2
R7. Regrade steep escarpments	<ul style="list-style-type: none"> mechanically regrade steep and high erosion escarpments where required, to reduce risks to public safety from collapsing sand dunes 	Public safety	Section 2.8.6 and Section 5.2
R8. Restrict proximity to exposed protection works	<ul style="list-style-type: none"> implement signage and barricades as required to restrict public from areas near exposed protection works or scour protection after storm erosion 	Public safety	Section 5.2
R9. Undertake beach scraping	<ul style="list-style-type: none"> undertake beach scraping after storms to accelerate beach recovery where resources allow, in particular to accelerate the burial of exposed rock and restoration of beach accessways 	Public safety Beach amenity	Section 5.2 and 7.4
R10. Remove debris off beaches	<ul style="list-style-type: none"> remove debris and other inappropriate materials off beaches in study area as required (where feasible), particularly after storms 	Public safety Beach amenity	Section 5.2

A summary of the recommended CZMP actions is provided in Figure 24 for Bilgola Beach, and Figure 25 for Basin Beach. Actions are colour coded as red for actions relating to private development, yellow for actions relating to the sandy beach, light green for actions relating to vegetated dunes, blue for actions related to stormwater (creeks, outlets and runoff), magenta for actions relating to Council built assets, brown for actions relating to geotechnical issues, orange for actions related specifically to Crown Land issues, dark green for actions related to Rock Pools, and black for general actions.

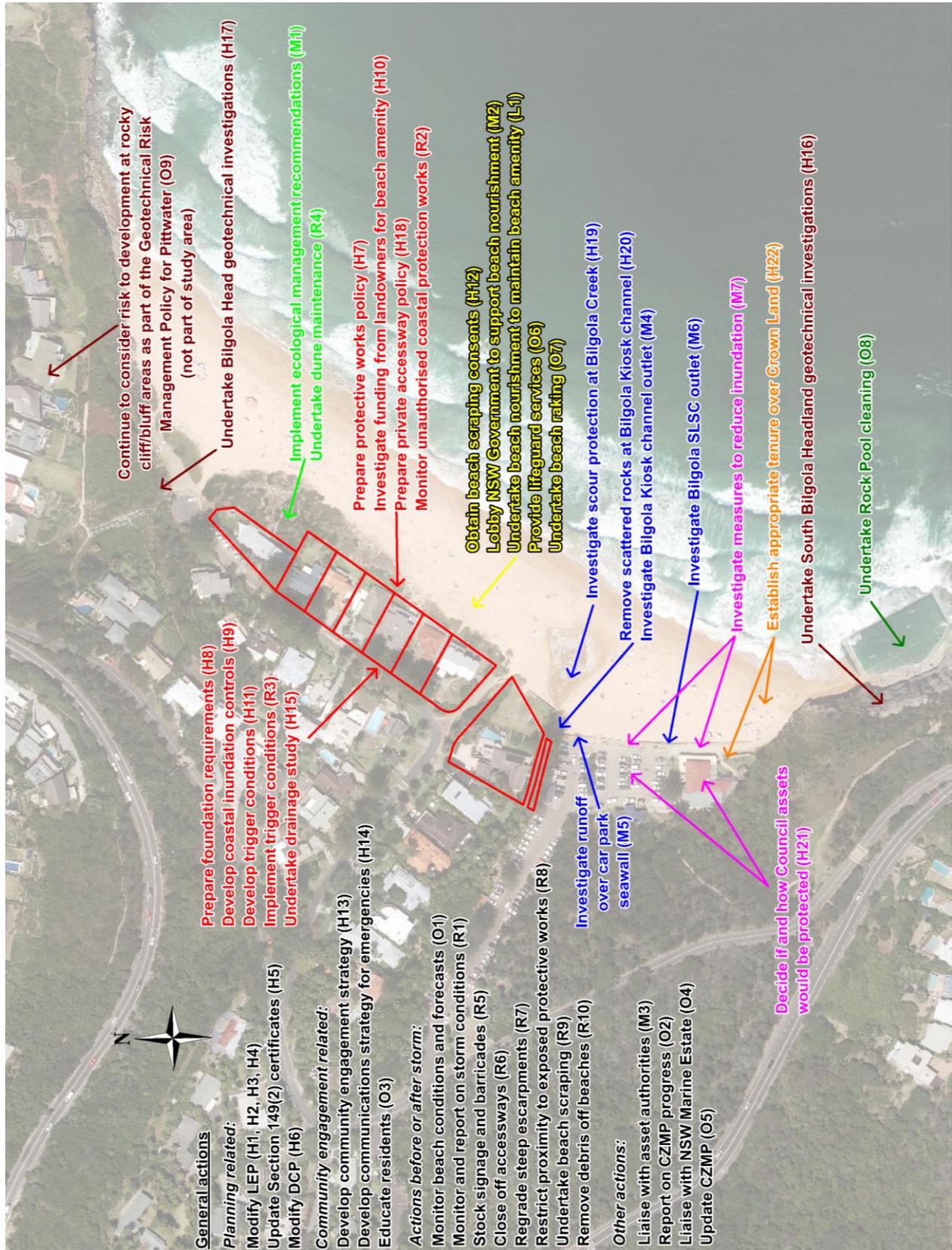


Figure 24: Summary of management actions for Bilgola Beach

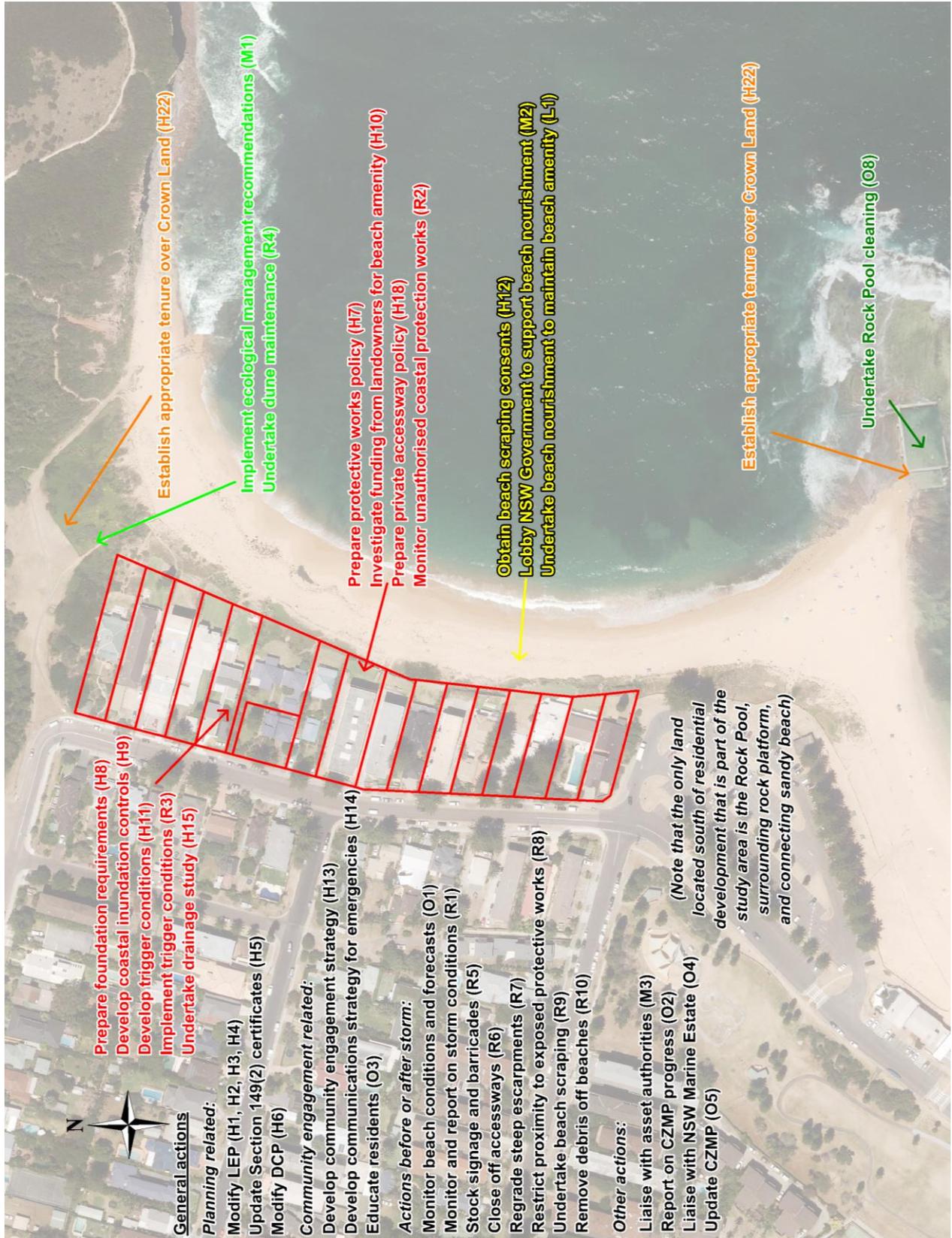


Figure 25: Summary of management actions for Basin Beach

9. REQUIREMENTS MET FROM “GUIDELINES FOR PREPARING CZMPs”

Coastal Management Principles have been developed by OEH (2013b) to inform strategic considerations in coastal management, including the preparation of CZMPs, which are presented in Figure 26. Relevant principles should be considered in evaluating potential coastal management actions.

As has been undertaken herein:

- consideration of acceptable risk is consistent with Coastal Management Principle 6;
- Council seeking to maintain beach amenity in the future as required (and within its financial capacity) through beach nourishment is consistent with Coastal Management Principle 9 and 10; and
- giving the responsibility to landowners to address risks (eg risk to private development or construction of protection works where approved) is consistent with Coastal Management Principle 5.

A CZMP must be prepared in accordance with “Guidelines for Preparing Coastal Zone Management Plans” (OEH, 2013) as per Section 55D of the *Coastal Protection Act 1979*. In Table 7, requirements of OEH (2013) are listed, along with the sections herein where they are addressed. Given that no estuaries are included in the study area, requirements in OEH (2013) relating to coastal ecosystem estuary health as per Section 4 of that document are not considered herein.

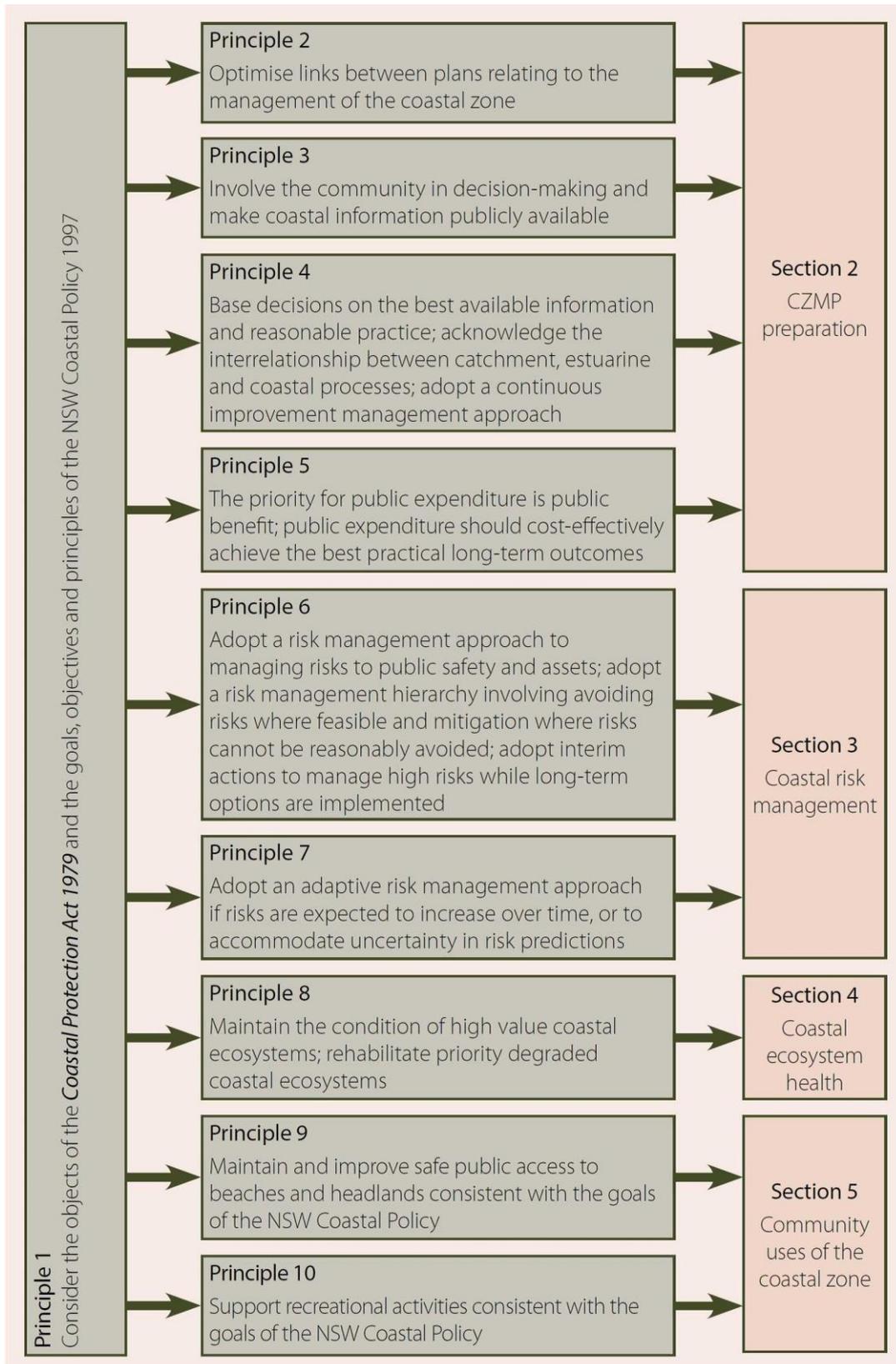


Figure 26: Coastal Management Principles (OEH, 2013)

Table 7: Sections herein in which requirements of “Guidelines for Preparing CZMPs ” (OEH, 2013) are addressed

CZMP requirement	Section where addressed herein
Description of how the relevant Coastal Management Principles have been considered in preparing the plan	Section 0
Description of the community and stakeholder consultation process, the key issues raised and how they have been considered	Section 6 and Appendix G
Description of how the proposed management options were identified, the process followed to evaluate management options, and the outcomes of the process	Appendix H
<p>Proposed management actions over the CZMP’s implementation period in a prioritised implementation schedule which contains:</p> <ul style="list-style-type: none"> • proposed funding arrangements for all actions, including any private sector funding • actions to be implemented through other statutory plans and processes • actions to be carried out by a public authority or relating to land or other assets it owns or manages, where the authority has agreed to these actions as per Section 55C(2)(b) of the <i>Coastal Protection Act 1979</i>²¹ • proposed actions to monitor and report to the community on the plan’s implementation, and a review timetable 	Section 8
Description of coastal processes within the plan’s area, to a level of detail sufficient to inform decision-making	Section 4 and Appendix D
Description of the nature and extent of risks to public safety and built assets from coastal hazards	Section 5 and Appendix D
Description of projected climate change impacts on risks from coastal hazards, as per Section 55C(f) of the <i>Coastal Protection Act 1979</i> , based on council’s adopted sea level rise projections or range of projections. Councils should consider adopting projections that are widely accepted by competent scientific opinion	Section 5 and Appendix D
Description of suitable locations where landowners could construct coastal protection works (provided they pay for the maintenance of the works and manage any offsite impacts), subject to the requirements of the <i>Environmental Planning and Assessment Act 1979</i>	Appendix F
Description of property risk and response categories for all properties located in coastal hazard areas	Appendix E
Proposed actions in the implementation schedule to manage current and projected future risks from coastal hazards, as per Section 55C(d) of the <i>Coastal Protection Act 1979</i> . Actions are to focus on managing the highest risks	Section 7.2
Where the plan proposes the construction of coastal protection works (other than temporary coastal protection works) that are to be funded by the council or a private landowner or both, the proposed arrangements for the adequate maintenance of the works and for managing associated impacts of such works as per Section 55C(g) of the <i>Coastal Protection Act 1979</i>	Section 7.2.1 for any landowner works (no particular Council funded works are proposed herein)
<p>An emergency action subplan, which is to describe:</p> <ul style="list-style-type: none"> • intended emergency actions to be carried out during periods of beach erosion such as coastal protection works for property or asset protection, other than matters dealt with in any plan made under the <i>State Emergency and Rescue Management Act 1989</i> relating to emergency response, as per Sections 55C(b) and (g) of the <i>Coastal Protection Act 1979</i> • any site-specific requirements for landowner temporary coastal protection works, and • the consultation carried out with the owners of land affected by a Subplan 	Appendix F

²¹ Written correspondence must be provided from public authorities supporting any actions contained in the draft CZMP which they are responsible for or that affect their land or assets (besides Council, which by definition explicitly supports the actions in the CZMP herein once the document has been adopted by Council).

CZMP requirement	Section where addressed herein
Proposed actions in the implementation schedule that protect and preserve beach environments and beach amenity	Section 7.4
Proposed actions in the implementation schedule that ensure continuing and undiminished public access to beaches, headlands and waterways, particularly where public access is threatened or affected by accretion, as per Section 55C(c) of the <i>Coastal Protection Act 1979</i>	Section 7.5 (also Sections 2.8.6 and 5.2)
Description of the current access arrangements to beaches, headlands and waterways in the plan's area, their adequacy and any associated environmental impacts	Section 2.8
Description of any potential impacts (e.g. erosion, accretion or inundation) on these access arrangements	Section 2.8.6
Description of the cultural and heritage significance of the plan's area	Section 7.5
Proposed actions in the implementation schedule to manage any environmental or safety impacts from current access arrangements	Section 2.8.6 and Section 7.5
Proposed actions in the implementation schedule to protect or promote the culture and heritage environment	Section 7.6

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