

Collaroy – Narrabeen Beach Coastal Protection Works Design Specifications



**NORTHERN BEACHES
COUNCIL**

northernbeaches.nsw.gov.au

Collaroy-Narrabeen Beach Coastal Protection Works Design Specifications Northern Beaches Council 2016

Introduction

The implementation of consistent and appropriate protection works on Collaroy-Narrabeen Beach is complex and requires co-ordination of the various property owners, detailed design guidance as well as the consideration of access and maintenance mechanisms.

In recognition of this, one of the highest priority actions of the *Coastal Zone Management Plan (CZMP) for Collaroy-Narrabeen Beach and Fishermans Beach* has been to develop specifications that will inform the application of the CZMP with respect to the assessment of coastal protection works.

All works are to be to a consistent design standard that provides an appropriate level of protection.

The specifications include:

1. Coastal Protection Works Concept Design and Concept Alignment Drawings
2. Seawall Design Criteria for Collaroy-Narrabeen Beach (November 2016)
3. Definitions

All coastal protection works should be constructed and maintained in accordance with these specifications, The Northern Beaches Coastal Erosion Policy and *The CZMP for Collaroy-Narrabeen Beach and Fishermans Beach*. Such works must also be, whenever possible, contained on private property.

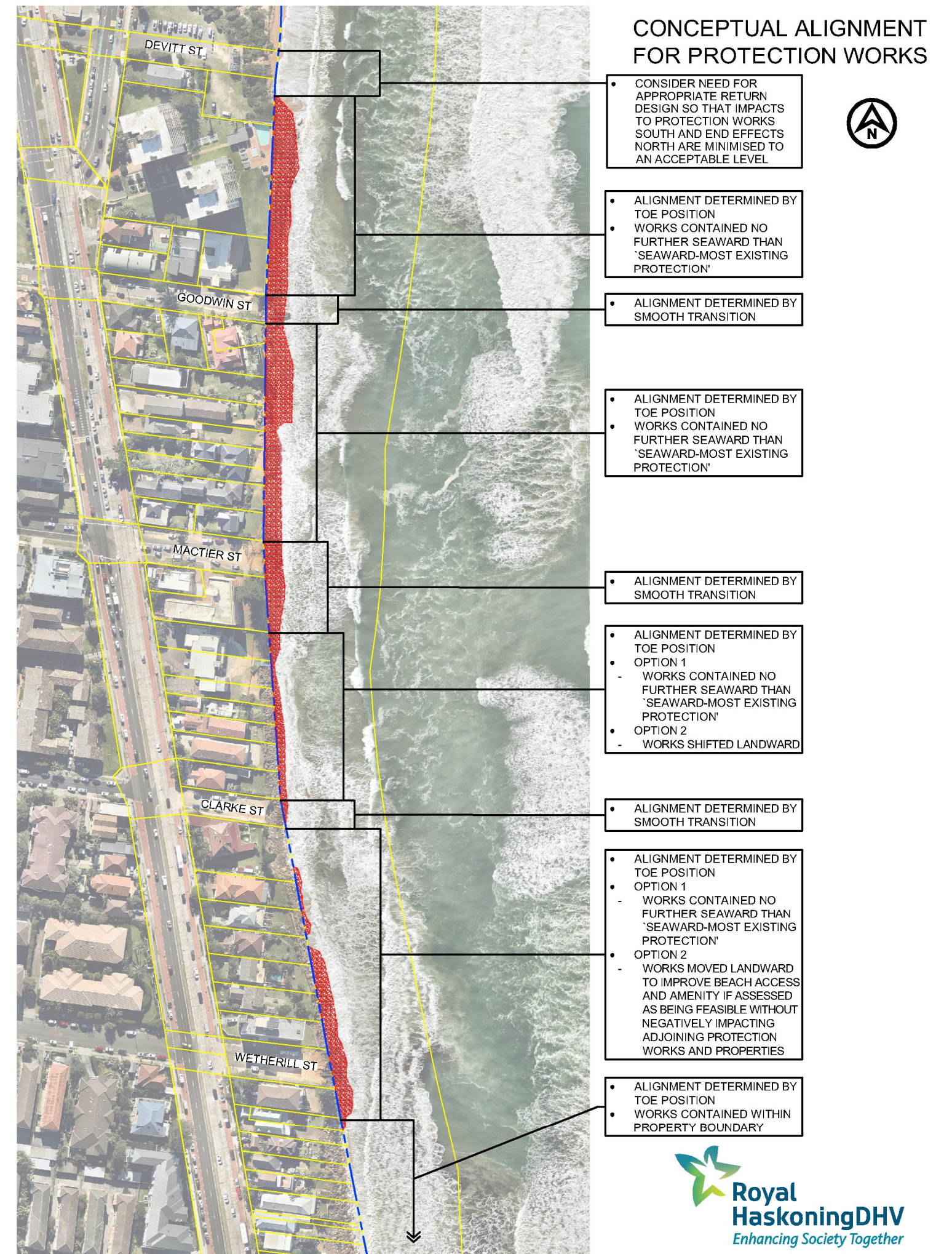
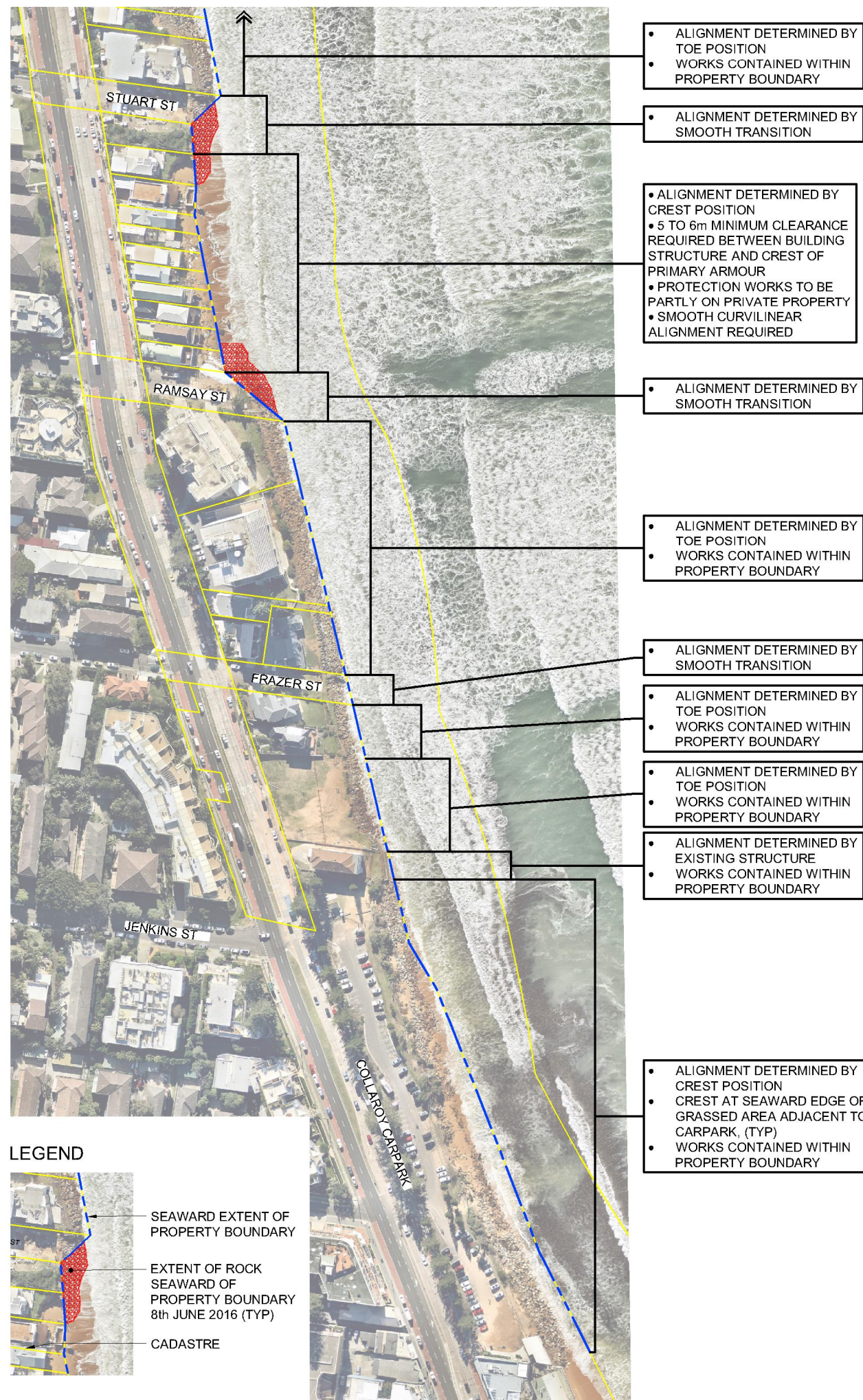
1. Coastal Protection Works Concept Design and Concept Alignment Drawings

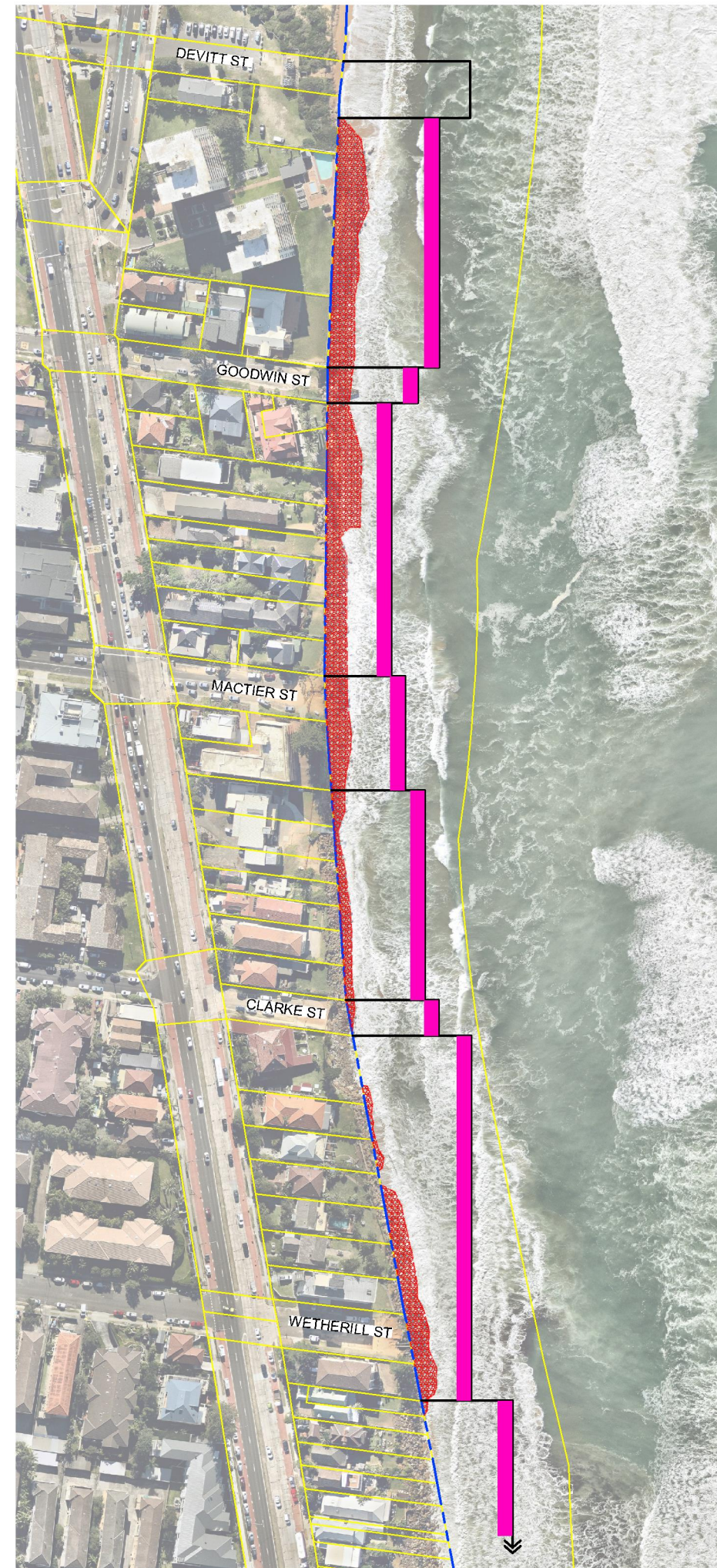
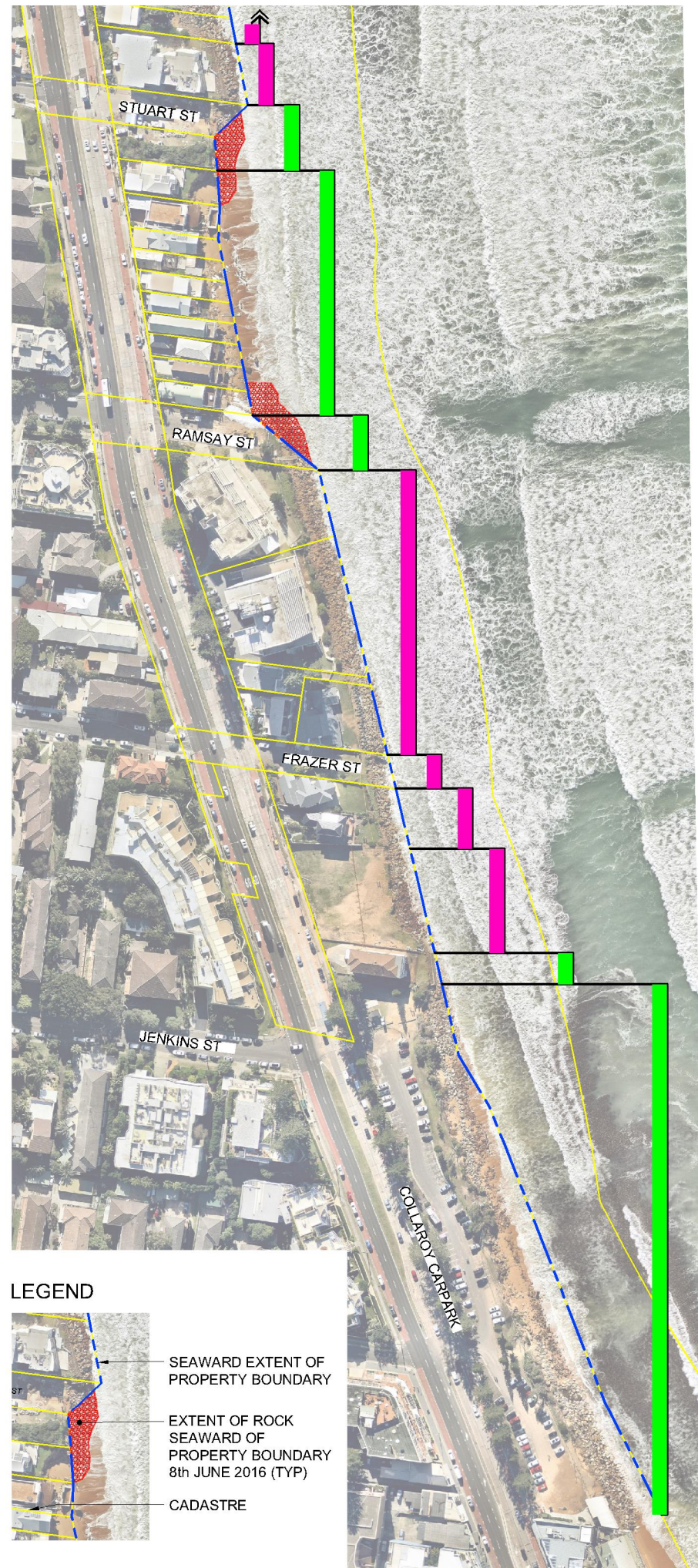


SELECTED SITE INFORMATION



NOTE
 MAXIMUM LANDWARD POSITION
 OF EXISTING ROCK PROTECTION
 AS VISIBLE IN AIR PHOTO
 8th JUNE 2016

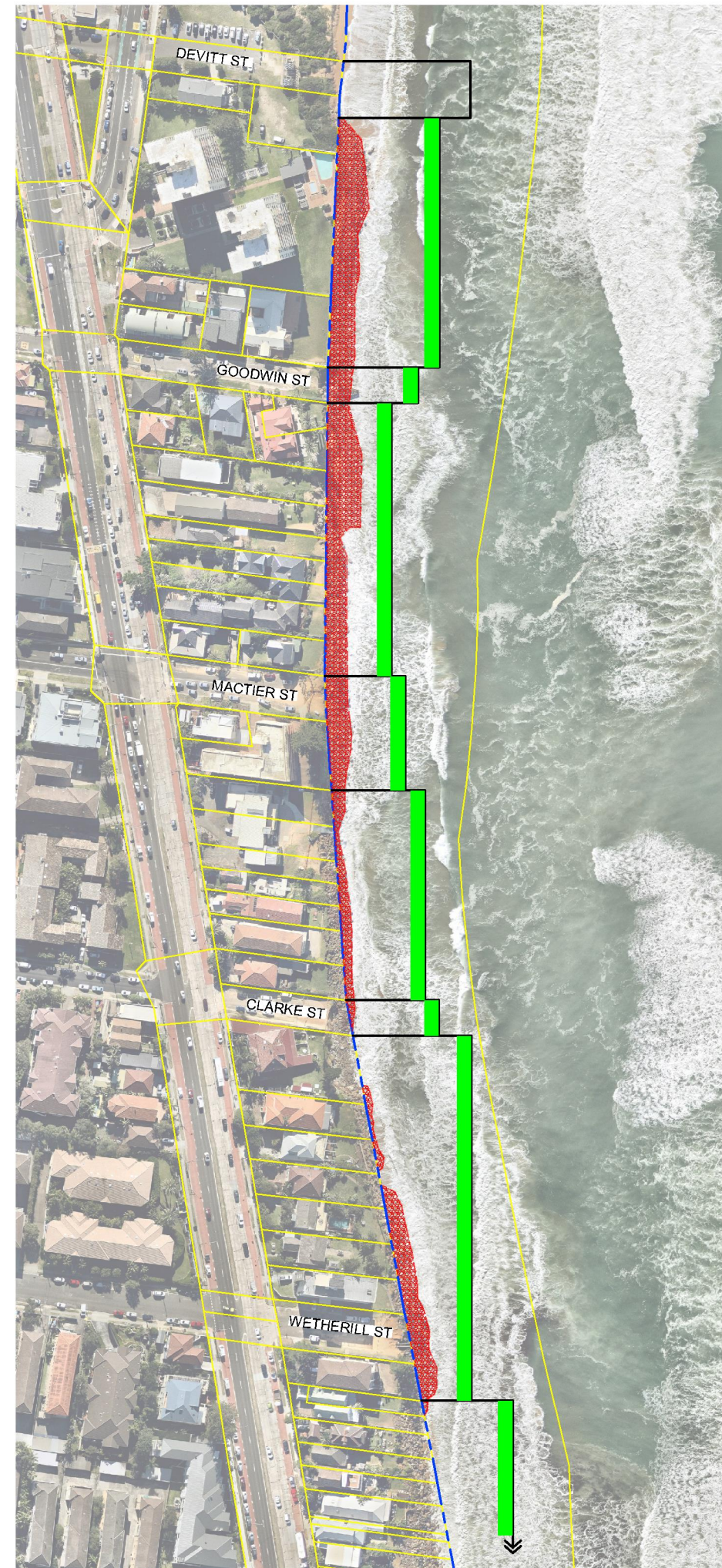
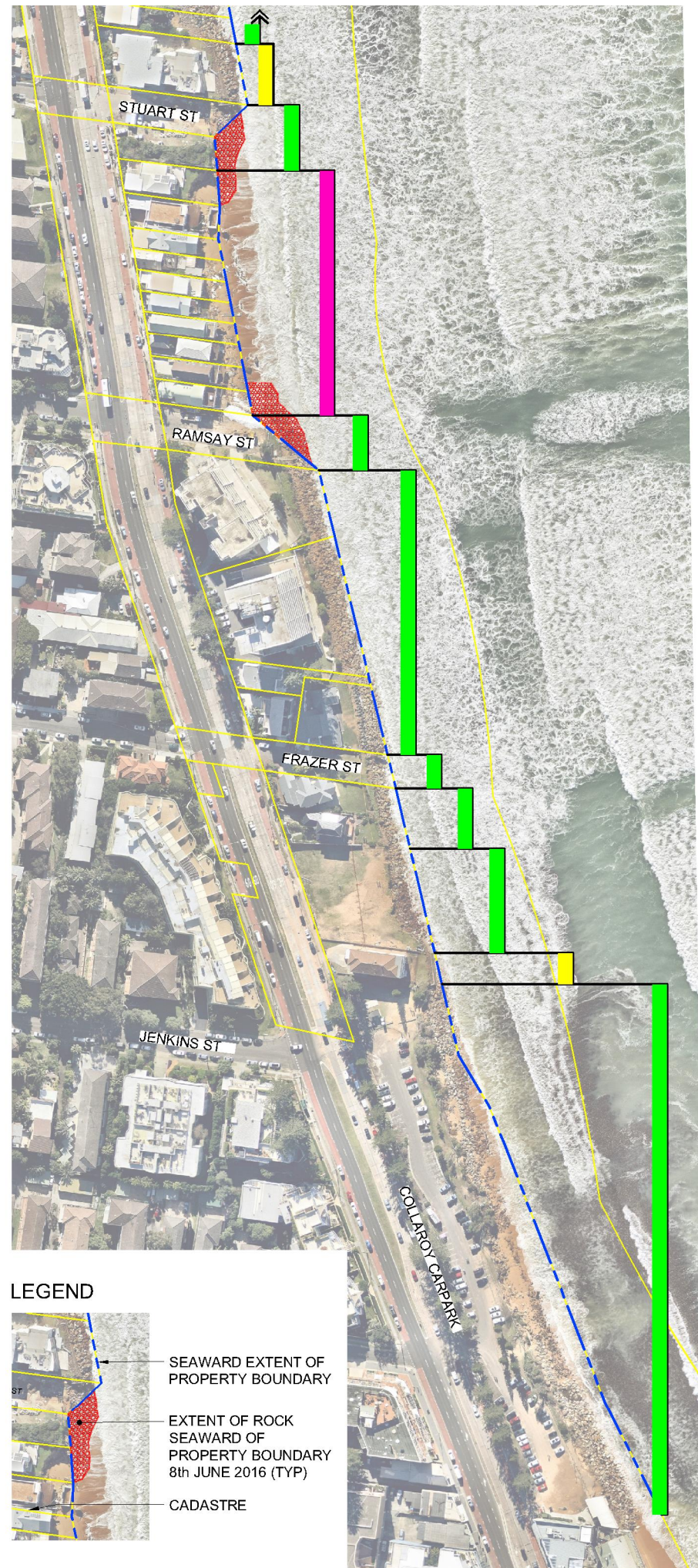




CONCEPTUAL ALIGNMENT FOR PROTECTION WORKS



- ALIGNMENT DEFINED BY CREST
- ALIGNMENT DEFINED BY TOE



VISUAL REPRESENTATION OF PROTECTION WORKS CONCEPT



- 'TOPPING UP' OF EXISTING ROCK SEAWALL
- RETENTION OF EXISTING VERTICAL / VERTICAL-ROCK SEAWALL
- NEW SEAWALL

NOTE:

THE TERM 'NEW SEAWALL' IS USED HERE TO DENOTE A SECTION OF SHORELINE WHERE NO PROTECTION HAS PREVIOUSLY EXISTED, IE RAMSAY STREET TO STUART ST.

IT IS ACKNOWLEDGED THAT SOME SECTIONS OF SHORELINE WHERE 'TOPPING UP' IS NOMINATED MAY HAVE HAD ONLY LIMITED (BUT SOME) EXISTING PROTECTION PRIOR TO THE JUNE 2016 STORM AND WERE SUBSTANTIALLY DAMAGED, THUS 'TOPPING UP' IN THESE CASES COULD APPROACH THE MEANING OF A NEW STRUCTURE.

2. Seawall Design Criteria for Collaroy-Narrabeen Beach (November 2016)

Item	Design Criteria
Minimum Average Recurrence Interval	Minimum Average Recurrence Interval (ARI) for design event: 50 years Refer Footnote 1
Minimum design life	Minimum design life: 60 years Refer Footnote 2
Crest level	Minimum crest level: 6.5mAHD A lower crest level may be considered. Where a lower crest level is proposed it shall be supported by a report prepared by a suitably qualified engineer. Refer Footnote 3
Toe level	Minimum toe level: -1mAHD A higher toe level may be considered. Where a higher toe level is proposed it shall be supported by a report prepared by a suitably qualified engineer and include evidence of an inerodible layer at a level above -1mAHD Refer Footnote 4
Maximum slope of seaward face	Maximum slope of seaward face for rock structures: 1 Vertical to 1.5 Horizontal (1V:1.5H) Refer Footnote 5
Rock durability and other factors	<p><u>General</u></p> <ul style="list-style-type: none"> individual rocks shall be free from cracks, cleavage planes, seams, defects and the like, which would result in the breakdown of the rock in a marine environment rock shall be rough and angular the ratio of the maximum dimension of any rock to the minimum dimension, measured at right angles to the maximum dimension, shall not exceed 2.5 armour rock shall be individually placed, not rolled or dropped into position placed rocks shall be wedged and locked together such that they are not free to move <p><u>Sandstone</u></p> <ul style="list-style-type: none"> minimum dry density 2,300kg/m³ water absorption less than 1.5% saturated point load strength index (Is50) greater than 1.5MPa sodium soundness weight loss less than 9% wet/dry strength variation less than 30% <p><u>Igneous</u></p> <ul style="list-style-type: none"> minimum dry density 2,650kg/m³ saturated point load strength index (Is50) greater than 5.0MPa sodium soundness weight loss less than 12% no more than 15% (by volume) olivine and no zones of secondary alteration such as chloritisation no signs of stress relief

Item	Design Criteria												
Rock size grading and filtration design	<table><tr><th>Layer</th><th>Median Rock Size</th><th>Rock Size Gradation (%)</th></tr><tr><td>Primary Armour Layer</td><td>W (see Note 1)</td><td>125 to 75</td></tr><tr><td>First Underlayer</td><td>W/10</td><td>130 to 70</td></tr><tr><td>Second Underlayer</td><td>W/200</td><td>150 to 50</td></tr></table> <p>Notes:</p> <ol style="list-style-type: none">Minimum median rock mass: W=5.0t (sandstone), W= 3.8t (igneous)Each layer shall have a minimum thickness of two rocks <p>Variations to the above rock sizes and grading may be considered. Where a variation is proposed it shall be supported by a report proposed by a suitably qualified engineer. Use of a suitable geotextile filter under the First Underlayer is acceptable rather than inclusion of a Second Underlayer.</p>	Layer	Median Rock Size	Rock Size Gradation (%)	Primary Armour Layer	W (see Note 1)	125 to 75	First Underlayer	W/10	130 to 70	Second Underlayer	W/200	150 to 50
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Primary Armour Layer	W (see Note 1)	125 to 75											
First Underlayer	W/10	130 to 70											
Second Underlayer	W/200	150 to 50											
Global slope stability	The seawall shall have a minimum factor of safety of 1.5 against global slope stability failure. The global slope stability shall be demonstrated using a recognised slope stability program. Slope stability analysis shall be conducted by a suitably qualified engineer. Factors to consider in the analyses should include, but not necessarily be limited to: beach scour in front of the seawall, elevated landward groundwater table level, and surcharge behind the seawall												
Cross shore positioning	The seawall shall be located as far landward as practicable to minimise impact on coastal processes and beach amenity, and shall be located fully on private land wherever feasible												
Interaction with adjoining properties or works	The seawall design shall aim to integrate with adjacent seawalls and shall not adversely affect the performance of adjacent seawalls												
Criteria for addressing sea level rise	<p>The following sea level rise projections may be adopted, measured relative to 1990.</p> <table><tr><th>Year</th><th>Sea Level Rise</th></tr><tr><td>2050</td><td>0.4m</td></tr><tr><td>2100</td><td>0.9m</td></tr></table> <p>Variations to the above sea level rise projections may be considered. Where a variation is proposed, it shall be supported by a report prepared by a suitably qualified engineer.</p>	Year	Sea Level Rise	2050	0.4m	2100	0.9m						
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2050	0.4m												
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Access for maintenance	The seawall design shall include consideration of the need for access for future maintenance. A minimum distance of 5 to 6m is recommended from the landward edge of the seawall crest to adjacent building structures.												
Basis of Design statement	A Basis of Design (BoD) statement shall be prepared as part of the seawall design process and submitted with the Development Application. The BoD shall clearly state all of the design factors, assumptions and qualifications adopted in the design, including specific reference to the above design criteria												
Minimum level of geotechnical investigation prior to design	A geotechnical investigation shall be conducted at the property as part of the seawall design process to confirm, among other things, the extent of existing rock protection. The investigation shall be carried out by a suitably qualified engineer. The investigation shall include, as a minimum, excavation of three test pits along the seaward property boundary with the pits generally aligned perpendicular to the seaward property boundary.												
Certification post	The construction of the seawall shall be certified by a suitably qualified engineer												

Item	Design Criteria
construction	
Consideration of alternative seawall proposals	Alternative seawall designs to rock will be considered. Any alternatives shall be designed by a suitably qualified engineer. Where alternatives are proposed early consultation with Council is recommended. Any alternative design shall address, where relevant, the above design criteria

Footnotes:

1. This ARI event is based on generally accepted industry practice for 'flexible' rock structures. Rarer ARI criteria would apply for alternative seawall designs that involve, for example, reinforced concrete structures and/or seawalls comprising pattern placed armour units which require greater reliance on toe support.
2. A minimum design life of 60 years is based on considerations included in Horton, P and Britton, G (2015), 'Defining beachfront setbacks based on 'acceptable risk' – is it the new approach?' 22nd Australasian Coastal & Ocean Engineering Conference and the 15th Australasian Port and Harbour Conference. This design life recognises, among other things, that redevelopment of beachfront properties typically occurs within such a period. In practice, rock incorporated within seawall structures would have a considerably greater life than 60 years based on the durability criteria specified (refer Table above). This enables reuse of rocks in the event a rock seawall needs to be modified as part of a redevelopment.
3. It may be possible to justify a lower crest level than 6.5mAHD particularly with distance south along the beach. Adaption strategies to accommodate sea level rise can be considered in assessing the appropriate crest level.
4. Cemented sand layers are known to exist at locations along Collaroy-Narrabeen Beach at levels above -1mAHD and provide a suitable foundation for rock seawalls.
5. It is necessary to ensure slope stability including global slope stability, ie. overall sliding (rotational) failure of the entire rock structure. Temporary construction slopes may need to be flatter than 1V:1.5H to be stable.
6. Variations to the rock durability criteria will be considered at the discretion of Council and where supported by a report prepared by a suitably qualified engineer/geologist. The report shall include particular reference to where rock from the proposed source has been used in similar applications.

3. Definitions

The concept of **‘topping up’**:

- means the removal and repositioning of existing rock, and placement of new imported rock, as required, to provide an appropriate level of protection to development;
- where it might apply:
 - typically where there is substantial existing rock, the overall thickness of which provides a reasonable basis (foundation) for construction of an appropriate level of protection and its removal to provide a completely new structure could impact on the stability of existing structures and other assets, and/or be very costly,
 - it could also apply in situations where there is some level of existing rock protection but this has been substantially damaged and the need for removal and repositioning of existing rock, and placement of new imported rock, is more significant, approaching the meaning of a new structure.
- where ‘topping up’ is proposed and involves repositioning of existing rock and/or placement of new imported rock against existing rock, the works should generally not extend any further seaward than the ‘existing seaward-most rock protection’ (refer below). Tolerance for any further seaward extension to be nominally 2m.

The **‘existing seaward-most rock position’**:

- means the seaward extent of a coherent layer(s) of rock reasonably interlocked, not isolated individual rocks;
- generally as visible in the 8 June 2016 aerial photography;
- the position may need to be ground-truthed in some locations by excavation of test pits or other means.