Milad Investments No. 1 Pty Ltd
c/- studiointernationale Pty Ltd
8-16 Soudan Lane
Paddington, NSW 2021

Climate Change and Sea Level Rise

MP06_0034

Preferred Project Report

Department of Planning issue no.10

Proposed Tourist and Commercial Development
Goodnight Island and Greenwell Point

ENVIRONMENTAL

WATER

WASTEWATER

GEOTECHNICAL

CIVIL

PROJECT MANAGEMENT

P0601331JC15_v1
June 2009

1. Introduction

Martens & Associates Pty Ltd (Martens) were briefed to respond to key issue number 10, in the Department of Planning (DoP) report (dated 17 December, 2008) for the proposed Tourist and Commercial Development at Goodnight Island and Greenwell Point. This report will form part of the Preferred Project Report (PPR).

DoP requested additional information in relation to sea level rise and climate change on Goodnight Island and 76 & 84 Greenwell Point Rd. The following is a summary of the DoP request:

'The impacts of climate change on the marine and terrestrial ecosystems affected by the proposal have not been considered. The location of the site renders the proposal susceptible to the impacts of rising sea levels as a result of climate change, however these impacts and the impacts of rising sea levels on the EEC's which fringe the Island have not been addressed.

The DECC's Floodplain Risk Guideline, (2007) and the CSIRO projections for sea level rise along the NSW coast provide a reference for consideration of this issue. Consultation with the Coastal Branch of the DECC should be undertaken for this project. This assessment may need to include sensitivity analyses of various scenarios…evidence that climate change has been factored into the design of built assets is to be provided in the revised plans and documentation.'

In light of discussions with Doug Lord (NSW DECC) the objectives of this report are tailored to consider the impacts of climate change on the built aspects of the proposal. Subsequently, our response is provided in the following sections.

2. Climate Change Discussion:

Reference to the IPCC projections on sea level change suggest that for 95 percentile maxima, median projected sea level rise ranges between 0.2 and 0.6m, with an upper limit of 0.79 m by 2100. Reference to DECC's Floodplain Risk Management Guideline (2007) suggests that sea level along the Australian coast is expected to rise by 0.18 – 0.91m by 2100. Considering the design life of the project is 100 years, sea level rises of 0.6m and 0.9m were used for sensitivity analysis of the development to climate change.

3. Impacts of Sea Level Rise on Proposed Development:

Table 1 provides details of the proposed development levels, and documents possible impacts of sea level rise.

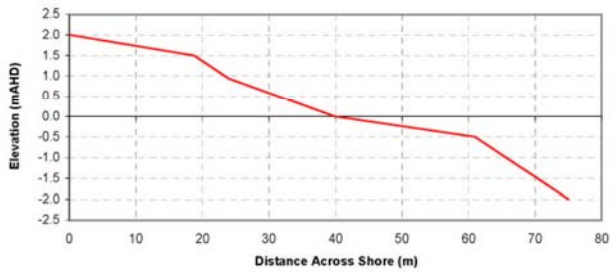
Table 1: Summary of sea level change impact assessment on development proposal.

Element	Item	76 Greenwell Point Road	84 Greenwell Point Road	Goodnight Island
Inundation of Structures	Minimum Ground Level (mAHD)	1.45	3.2	8.0
	Comment	All openings to structures are located above the flood planning level (FPL) of 4.3 mAHD which is nominated for the 1% AEP flood height of 3.2m, + 0.5 m free board and 0.6 m allowance for sea level rise based on discussions with WMA Water. All built elements below the FPL will be water proofed and 'tanked'. Flooding and sea level rise will not affect structures.		
Mean High Water Spring Tide (MHWS, mAHD)	Existing	0.64	0.64	0.64
	With 0.6 m SL Rise	1.24	1.24	1.24
	With 0.9 m SL Rise	1.54	1.54	1.54
	Comment	All structures will be located above the MHWS tide under median and maximum sea level rise scenarios. Openings to structures will be significantly higher than any future MHWS level. All basements will be 'tanked' to ensure that groundwater ingress does not occur in response to any possible future rises in groundwater table. Changes to the tidal plan and groundwater conditions will not affect the development or site structures.		
Coastal Erosion[1]	Recession @ 0.6 m SL Rise (m)	8.96	10.02	na
	Recession @ 0.9 m SL Rise (m)	13.44	15.02	na
	Comment	Areas potentially affected by coastal recession consist of sands and silty deposits and could therefore recede. However, current rate of sediment supply is unknown to this portion of the coast but likely to be positive given that the estuary is not at full 'maturity'. On this basis, the recession estimate is a maximum and likely to be somewhat less than modelled. No structures will be affected by any possible recession given that structures will be founded on bedrock and the maximum recession estimated is within the 15 m set-back allowance included in the development plans.		The island is bedrock controlled and will not be subject to significant coastal recession. Surrounding wetland areas could contract somewhat given these are comprised of silts and sands.

[1] Preliminary conservative estimate based on the Bruun rule. See Figures 1 and 2 for details.

PRELIMINARY COASTAL RECESSION ANALYSIS

SITE: No. 76 Greenwell Point Road



Profile Distance (m)	RL
0.00	2.00
18.75	1.50
24.00	0.93
39.84	0.00
60.94	-0.50
65.63	-1.00
70.32	-1.50
75.01	-2.00

Depth of Closure Analysis

Mean Significant Wave Height (H)	0.30	m
Significant Wave Height Standard Deviation (S)	0.10	m
Mean Significant Wave Period (T)	3.00	secs
Gravity	9.81	m/s^2
Mean Grain Size	0.25	mm
Depth of Closure (h, Hallermeier, 1981))	2.27	m

Preliminary Recession Analysis (Bruun, 1954)

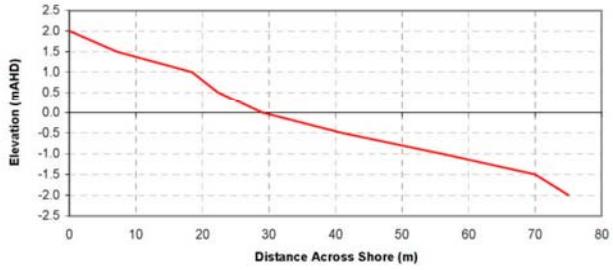
	Scenario 1	Scenario 2	
Sea Level Rise (S)	0.60	0.90	m
Cross-shore Width (L)	56.26	56.26	m
Closure Depth (h)	2.27	2.27	m
Beach / dune elevation (B)	1.50	1.50	m
Maximum Recession (R)	8.96	13.44	m

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	JSF	**Preliminary Coastal Recession Analysis: 76 Greenwell Point Rd**	Drawing No: **FIGURE 1**
Approved:	DMM		
Date:	22 / 06 / 2009		
Scale:	N/A		Job No: P0601331

martens

PRELIMINARY COASTAL RECESSION ANALYSIS

SITE: No. 84 Greenwell Point Road



Profile Distance (m)	RL
0.00	2.00
7.10	1.50
18.40	1.00
22.40	0.50
29.00	0.00
41.00	-0.50
56.00	-1.00
70.00	-1.50
75.00	-2.00

Depth of Closure Analysis

Mean Significant Wave Height (H)	0.30	m
Significant Wave Height Standard Deviation (S)	0.10	m
Mean Significant Wave Period (T)	3.00	secs
Gravity	9.81	m/s^2
Mean Grain Size	0.25	mm
Depth of Closure (h, Hallermeier, 1981))	2.27	m

Preliminary Recession Analysis (Bruun, 1954)

	Scenario 1	Scenario 2	
Sea Level Rise (S)	0.60	0.90	m
Cross-shore Width (L)	62.90	62.90	m
Closure Depth (h)	2.27	2.27	m
Beach / dune elevation (B)	1.50	1.50	m
Maximum Recession (R)	10.02	15.02	m

martens

Martens & Associates Pty Ltd ABN 85 070 240 890		**Environment | Water | Wastewater | Geotechnical | Civil | Management**	
Drawn:	JSF	**Preliminary Coastal Recession Analysis: 84 Greenwell Point Rd**	Drawing No: **FIGURE 2**
Approved:	DMM		
Date:	22 / 06 / 2009		
Scale:	N/A		Job No: P0601331