Our reference: LB-SFB2

15 September 2018

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Kromme Enviro-Trust
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For attention: Warren Manser (Chairman)

Sir/ Madam

RE: PROPOSED GRANNY'S POOL TO MAIN BEACH BOARDWALK, ST FRANCIS BAY: COASTAL ENGINEERING REVIEW COMMENTS

The Kromme Enviro-Trust wishes to construct a timber-based boardwalk along a set alignment between the concrete slipway at Granny's Pool and the existing concrete retaining wall at the Main Beach. Engineer Ken McGregor has developed a detailed engineering design.

As part of the environmental authorization process, Coastal Environmental Engineer, Laurie Barwell was requested to assess the potential impact of the current design of the proposed boardwalk on the abiotic coastal environment.

The work was commissioned via Ms Samantha Robertson of Eco Route Environmental Consultancy on behalf of the Kromme Enviro-Trust.

The Background Information Document (BID), engineering sketches and other information supplied were used. A site visit and survey were undertaken and both e-mail and telephonic interaction with Mr Ken McGregor took place. Requests for further information from the Engineer were carried out.

1.0 Approach

The assignment was undertaken in the following three steps:

1. A site visit (at low tide) to become familiar with the specific state of the shoreline and the position of the proposed boardwalk was carried out over the weekend of 2 to 4 June 2018.
2. The engineering design parameters were assessed in the context of the available information on the local coastal storm hazard level including the effect of potential sea level rise.
3. An assessment of the potential impact of the proposed boardwalk on the abiotic processes at St Francis Bay (this letter-report).

2.0 Basic design features

Since the walkway is an extension of a community developed and maintained walkway along the coastline, it is considered to be temporary in design. As communicated by Ken McGregor, the design is specifically of timber as it is accepted that the sea may damage it during large storms from time to time. It is also accepted that members of the Kromme Enviro-Trust will do the required maintenance and reparations as and when needed.

A drawing of the longitudinal section of the walkway is available from the Engineer. The following features are highlighted:

- The proposed timber boardwalk is to be located along a line starting at the level of the existing concrete slipway at the southern end at Granny's Pool (+3.03 m MSL).

- The walkway is raised above the natural ground level by means of wooden poles set onto a concrete foundation plinth set amongst and onto existing natural boulders and rocks.

- The timber walkway level remains at +3.03 m MSL for just under 143 m, essentially following the edge-of-vegetation line along the seaward edge of the existing dune.

- It rises slightly to an elevation +3.5 m MSL approx. 20 m further (at a distance of approx. 164 m from the starting point at the slipway).

- From that point it crosses an existing rocky dune-beach interface, rising to a viewing platform at an elevation of +5.03 m MSL at a distance of 199 m from the starting point.

- The walkway gradually rises to the highest point of +7.39 m MSL at distance of 218.5 m. From there it drops to a level of +6.88 m MSL at the public access way at the 272 m mark.

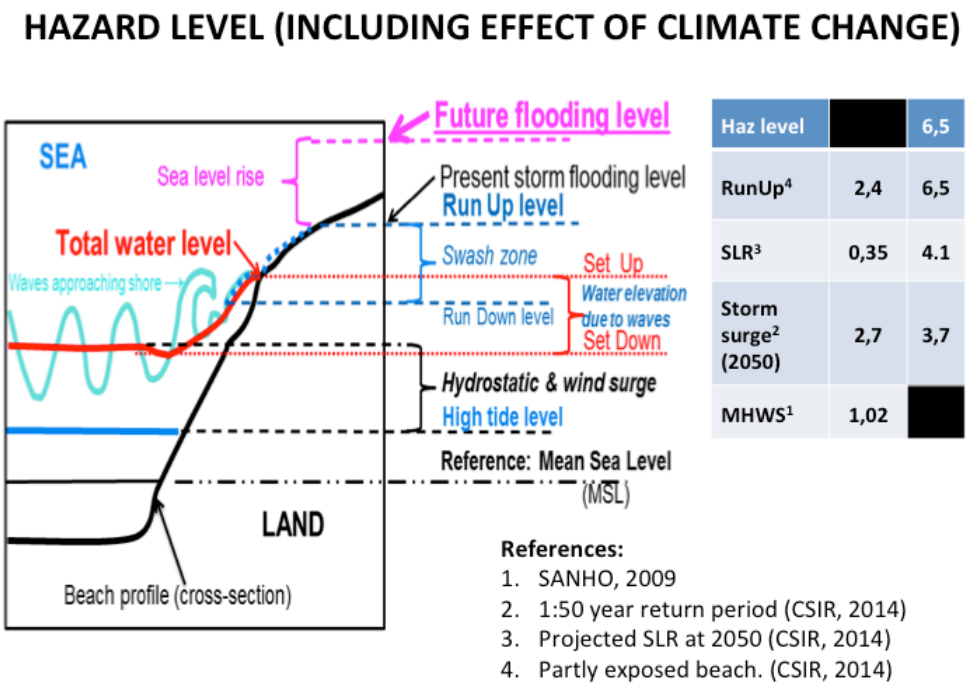
- Over a distance of 61 m it passes existing beach access steps (level +5.88) and a viewing/fishing platform at an elevation of +5.73 m MSL. The walkway terminates at a distance 333 m on the existing concrete retaining wall level of +5.88 m MSL

3.0 Relevant design parameters

The key abiotic parameters along the coastline are the geology (soft or hard); the geomorphology (any trends in coastline configuration); the natural forces (wind, waves, tides, rainfall, floods etc) that are influenced by and influence the above.

A lot of research has been done on the natural processes and experienced changes within St Francis Bay and the adjacent coastline. This is not repeated here, suffice to say that the coastline is in an eroding state. This has long-term implications on the design of permanent structures along the coast. The walkway is of a temporary nature and therefore not of significant concern to the walkway design.

The relevant coastal parameters that have to be considered are summarized in the figure and table below.



Haz level		6,5
RunUp[4]	2,4	6,5
SLR[3]	0,35	4.1
Storm surge[2] (2050)	2,7	3,7
MHWS[1]	1,02	

Figure 1: Hazard level for the St Francis Bay area using the method used by CSIR for DEA Oceans and Coast[1]

[1] CSIR (Council for Scientific and Industrial Research). 2014. *Determination of the inshore wave climate along the South African coast – Phase 1 for coastal hazard and vulnerability assessment*. CSIR Report CSIR/NRE/ECOS/ER/2014/0037/A, Stellenbosch.

Table 1: Characteristic tidal levels at Port Elizabeth (PE) (From SAN HO-2)[2]

	FEATURE / FACTOR / PARAMETER	PE (m CD)	PE (+ m MSL)
1	Leveling datum correction	-0.836	0
2	LAT (Lowest Astronomical Tide)	0	-0.836
3	MLWS (Mean Low Water Spring)	0.21	-0.626
4	MLWN (Mean Low Water Neaps)	0.79	-0.046
5	ML (Mean Level)	1.04	0.204
6	MHWN (Mean High Water Neaps)	1.29	0.454
7	MHWS (Mean High Water Springs)	1.86	1.024
8	HAT (Highest Astronomical Tide)	2.12	1.284
9	HAT Including potential sea level rise (+ 0.35 m by 2050)	2.47	1.634
10	HAT Including potential sea level rise (+ 1.0 m by 2100)	3.12	2.284
11	Storm surge level (no wave runup) (2020)	2.86	3.700
12	Storm surge level (no wave runup) (2050)	3.26	4.100
13	Hazard level (including wave run-up) (2020)	5.31	6.150
14	Hazard level (including wave run-up) (2050)	5.66	6.500
15	Elevation of lowest point of proposed walkway	2.19	3.030

The parameters of importance in assessing the impact of the coastal processes on the walkway; and also the impact of the walkway on the natural processes are those numbered 11 to 15.

4.0 Impact assessment and conclusion

Natural processes on the structure.

It can be seen that there is a likelihood that the walkway will have seastorm surges overwashing the lowest parts (elevation lower than +3.7 m MSL) even without any sea level rise (SLR).

It is a fact that the area at Granny's Pool is well protected from the prevailing seastorm waves. This will most probably limit the wave run-up factors so feature numbers 13 and 14 are probably highly conservative.

What can be concluded is that the lower portions of the walkway will be submerged by stormwaves on occasion and the risk of storm damage to the structure should be noted and accepted. This risk will be greater should the projected SLR be realized.

Although the design calls for a heavy concrete foundation plinth to be constructed to secure the vertical walkway support poles, the risk of the foundation being undercut by the removal of the beach sand and subsequent destabilization of the mainly loose beach boulders during a large storm is real. The construction methodology should

[2] http://www.sanho.co.za

take this into account. The suggestion is to use a water-jet probe to determine the actual level of the bedrock and then to place the poles deep enough to counter failure due to cross-shore erosion, the ideal being to go down onto bedrock.

Structure on the natural abiotic environment

The timber-based design allows for little residual impact on the natural environment should the boardwalk structure fail. Wooden poles can easily be removed to avoid future hazard should failure happen. This as apposed to if concrete or steel superstructure is used.

However the concrete plinths may become expensive to remove if they need to be abandoned if a failure occurs.

I trust that this is acceptable to you. Please feel free to call me on 0824622285 should you require more information on this or any related matter. Please note that the attachment***: Indemnity and conditions relating to this report*** forms an integral part of this letter-report.

Best regards

Laurie Barwell (MSc Eng)
Director

Attached: ***Indemnity and conditions relating to this report***

Indemnity and conditions relating to this report

General

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information. The author reserves the right to modify aspects of the report including the recommendations if and when new information may become available from ongoing assessments or pertaining to further investigations.

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Author

The author (Mr Laurie Barwell) has a B.Eng Civil and an MSc.Eng degree in Coastal Engineering, specializing in coastal environmental assessment and engineering with specific reference to climate change risk and vulnerability assessment and response strategies. Having retired from the CSIR in 2014, the author has 35 years of experience related to water and coastal environmental engineering and environmental management practices.

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