Preliminary Comments on Parts of the Draft CZMP

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The comments relate to the incomplete Draft Coastal Zone Management Plan Byron Bay Embayment as originally provided to the PRG for the meeting of 17 December 2015, and added to for the Council meeting of 7 April 2016. It is expected that the opportunity will be provided to comment on the complete draft before it goes to Council.

I wish to emphasise up-front that I have been told that in my role on the committee it is not my right to comment on the Coastal Hazard Management Study - Byron Bay Embayment. I understand that comments on Hazard Study have been restricted to affected landholders, Councillors and Government agencies. This is not regarded as a fair or reasonable and should not be regarded as an acceptable process. I have also been told that as the OEH have reviewed the document that my comments on what I regard as fundamental flaws are irrelevant, irrespective of their veracity.

I wish to emphasise that I consider that the consideration of options in the Hazard Study is biased against planned retreat, fails to correctly recognise the commencement of planned retreat, fails to consider the impacts on and around the mouth of the Belongil estuary and North Beach, is based on incorrect and unsubstantiated parameters, fails to identify a feasible source for sand nourishment, fails to identify realistic measures to maintain the public beach and access to the beach, is based on a deeply flawed economic appraisal, fails to consider impacts over the life of the works (ie at least till 2100), and fails to identify and cost measures to restore the beach after 2050 should planned retreat later be adopted, .Its promotion of just rock walls as a preferred option beggars belief.

The comments herein relate to the Coastal Zone Management Plan, though given that the Coastal Hazard Management Study is integral to the CZMP it is necessary to consider it where appropriate as part of this submission on the Management Plan.

Please note that these are only preliminary comments, and that these will be reviewed and added to when the full draft is provided.

SUMMARY OF KEY ISSUES

PART A

Council has not done due dilligence in that it has failed to properly assess the required matters, have failed to duly consider impacts on the mouth of the Belongil estuary, have only considered the consequences of the proposed works over a 36 year timeframe, and have ignored relevant available information.

A1.3. Planning horizon, implementation period and review timeframe

It is unacceptable for Council to limit consideration of the impacts and consequences of their proposed seawalls and groynes to 36 years rather than 100 years when the consequences of such works will accelerate over time, particularly because if built Council has no intention of removing them in 36 years time. The consequences of retaining any proposed protection works over the 100 year timeframe needs to be identified and considered.

The reduction of the planning timeframe to just 15 years to avoid consideration of medium and long term consequences is outrageous and strongly objected to.

A1.4. CZMP planning area

It is reprehensible that Council has refused to duly consider the mouth of the Belongil estuary, and the impacts of their proposed works upon it, despite its being a key part of both the coastline and the beach within the area required to be assessed. This is totally unacceptable given that the intent is to transfer erosion from Belongil beach onto the estuary, and because of the importance of the Belongil estuary for marine ecosystem functioning and as a roosting, nesting and feeding area for a plethora of threatened and migratory seabirds, shorebirds and waterbirds.

The CZMP does not adequately assess either the mouth of the Belongil estuary or North Beach in accordance with the Minister for the Environment's 2011 Direction to consider the coastline that is a beach between the south extremity of the beach within Tyagarah Nature reserve and Cape Byron.

A2.3. Coastal Management Principles

The plan does not comply with most of the Coastal Management Principles, most notably in that it does not: engage the community in a meaningful way, consider the best available information, acknowledge the interrelationship between estuarine and coastal processes, maximise public benefit from proposed public expenditure, account for long-term risks, maintain the condition of high value coastal ecosystems, or maintain safe public access to beaches.

PART B

B.1.2. Belongil Creek entrance instability

Council has failed its responsibility to identify the likely consequences of its intent to redirect erosion onto the end of the Belongil Spit and the mouth of the Belongil estuary, and to assess the likely impacts of this on :

- the loss of Cumbebin Swamp Nature Reserve, Cape Byron Marine Park, and Council Community Land
- the dynamics of the estuarine processes, including the functioning of the ICOLL, opening of the estuary and the ingress of seawater;
- changes to beach, marine and estuarine biota in the Cape Byron Marine Park;
- the maintenance of the shorebird nesting and roosting area, including the persistence of the three NSW endangered and 13 vulnerable waterbirds, 2 Federal Critically Endangered species and 22 migratory waders;
- the erosion, storm damage and inundation of the Endangered Ecological Communities Littoral rainforest, Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest and Saltmarsh;
- the loss of SEPP 14 wetland;
- the loss/displacement of seagrass and mangrove communities;
- bank erosion and the flooding of properties within the estuary; and
- the redirection of the northward flow of sand into the estuary (away from North Beach);

B2. Coastal Hazards Risk Assessment

The Plan is misleading in that it fails to identify the actual risks associated with residences, by not identifying: the type of building (ie not differentiating sheds and houses), those that were purchased

or renovated after Council adopted the principles of Planned Retreat in 1986, and those that are demountable and able to be moved out of the way.

Before any quantification of compensation for houses at Belongil can be made it is first essential to identify:

- Those buildings legally constructed from 1978 to 1986 and required to be demountable and to be removed when threatened;
- Those building legally constructed or renovated post 1986 in the full knowledge that they were required to be demountable and that the landowner was not to interfere with coastal processes;
- Those buildings illegally constructed or renovated and,
- Those properties purchased post 1988 in the full knowledge that buildings were required to be demountable and that the landowner was not to interfere with coastal processes.

The CZMP should be providing clear guidelines that take into account rising sea-levels and increasing storm intensities due to global warming to identify:

- the structure, profile and volume of sand dunes required to withstand overtopping by storm surges and wave runup and accommodate storm bites and short-term coastline fluctuations;
- setbacks from erosion scarps required to accommodate the design sand dunes and accommodate retreat in response to the recession rate of that coast; and
- guidelines for sand-dune management that recognize the need for them to move inland.

B2.2.1. North Beach

For the CZMP not to recognise that "planned retreat" has been applied to the North Beach site since at least 1980, that it is subject to active erosion, and to not identify proposed management of the problem, is at best irresponsible. For the CZMP not to recognise that the Belongil seawalls and groynes will significantly exasperate erosion at North Beach is so grossly irresponsible and negligent that it exposes Byron Council to massive compensation claims in the future.

While Council now acknowledges that there will be an effect, they still make no attempt to assess the consequences of their preferred option or Council's likely liability for the updrift consequences of any works they approve.

B3. Coastal Hazards Risk Management Strategy and Implementation Schedules

The Plan's identification of only one set of options for all areas, if they can be considered to qualify as such, denies the community any opportunity to identify their preferences for the future management of the Byron Bay embayment. The only attempt to assess community preferences has been the extremely limited attitude survey by Umwelt (2014) which found that *"a clear majority of respondents did not agree that protecting private property is the most important priority for Council in managing coastal hazards"*. Council's adopted options are clearly contrary to identified community preferences and it is unacceptable that community are being denied an opportunity to comment on the Coastal Hazard Management Study Byron Bay Embayment or identify their preferences for the various options identified.

The Coastal Hazard Management Study Byron Bay Embayment relies upon conjecture, guestimates, and untested assumptions, it is riddled with errors, and is not an impartial assessment, it is requested that it be subject to independent peer review.

Because of Councillors refusal to ensure an honest and independent CBA appraisal, under supervision by OEH and the community, a third party peer review process is now required. This must be undertaken independently, in an open and transparent process under the supervision of a committee including OEH and community representatives.

The implementation of the adopted option requires the identification of a sand source capable of replacing the 1 million tonnes of initial fill on a periodic basis and the annual top-up of 45,000m3 pa. Until a feasible source for this sand is identified the costings for this option can not be accurately identified.

B3.2 Belongil Beach and B3.4

The Plan's simplistic consideration of this short-term "option" is totally outrageous and strongly objected to. The pretence that there is only the "possibility" of additional measures being required in the future is a fraud and the work of 'climate-change deniers' who are pretending that seas are not going to go on rising and that coastal recession is not worsening. The tick-a-box pretence in Tables 9 and 10 that this option is compliant with legislative requirements is simplistic, unjustified and erroneous.

The Plan needs to identify that rock revetments on their own were identified in the 1978 Department of Public Works study as an ineffective means of controlling an erosion problem, will eventually be undermined, and recommended that they not be used as a basic management option for Belongil. The anticipated longevity and design-life of proposed rock walls needs to be clearly identified.

There can be no doubt that the existing Belongil rock walls have already resulted in increased erosion updrift, and that this will increase into the future. Council fails to acknowledge the existing impacts and does not consider future impacts.

The WRL (2016) estimates of sand nourishment volumes required are highly questionable in terms of initial volumes and maintenance volumes. They are likely to be significantly under-estimated, do not account for the effects of rising sea levels and do not account for the need to replace the initial quantities following storms with a current 5-25 year frequency (which will also increase over time). WRL (2016) mislead the public with their pretence that "The adaptive management scheme is flexible and staged, without large scale nourishment", because the maintenance of a beach will require periodic large scale (>1 million cubic metres) nourishment with increasing frequency as sea levels rise and storms become more intense.

Even if WRL's (2016) highly questionable guesstimates that 1,080,000 m^3 of sand will be required for initial nourishment, and 45,000 m^3/year to top this up, are adopted there is no identified source for the sand. In the absence of any identified source for sand nourishment the option for rock walls and groynes can not be the preferred outcome of the CZMP, meaning that Planned Retreat must be retained and properly implemented as it is the only option that meets the requirements of Part 4A section 55(C) of the CP Act to protect and preserve beach environments, beach amenity and undiminished public access to beaches.

The CZMP needs to make it clear that there should be no increase in development rights or lessening of setback requirements based on pre-protection hazard assessments due to the temporary nature of such works and the ongoing threats posed by sea-level rise and extreme weather events.

It is irresponsible for Council not to consider that it may be taking on a legal liability to maintain the works in perpetuity, and leave itself vulnerable to legal action and massive compensation if it later attempts to abandon the works. Council is also reckless for not considering its legal obligations *to ensure that the beach environment and amenity are protected* and the likely costs of meeting those obligations. Council is similarly reckless for not assessing the likely impacts of the works on the Elements resort and the potential magnitude of compensation payments that could be required.

While Council is pretending that they can just build the rock wall and avoid financial liability for the groynes and sand nourishment required to off-set the impacts on the beach and updrift, this is sheer fantasy. Council's pretence of an "adaptive" response is a charade because ongoing coastal erosion and recession will inevitably remove the beach and increase erosion updrift. These are impacts that Council will be required to mitigate, sooner rather than later. Council must identify its liabilities for maintaining the walls and mitigating their impacts over the long-term. This must include all potential future costs and identify funding responsibilities.

Given the Government's refusal to commit any funding to the construction and maintenance of rock revetments at Old Bar, Council must adopt realistic costings by assuming that the NSW Government will not contribute towards the costs of rock walls and associated works at Belongil, unless and until the NSW Government agrees to contribute.

B3.3 Other Areas and B3.4

The Plan needs to provide clear and unambiguous guidance as to the management regime that is intended to be applied at Pass to Clarkes Beach, Main Beach, Cavvanbah (First Sun Caravan Park to Border Street), and North Beach rather that making meaningless and vague statements.

Appendix 2 Historical approach towards coastal hazard risk management in the Byron Bay Embayment

It is important that the CZMP document the true history of "planned retreat" and that the true dates from when the principles of "planned retreat" be applied, rather than the incorrect date of 1988. Following publication of the Department of Public Work's Byron Bay-Hastings Point Erosion Study in 1979 Council resolved that it *"favours the groyne management option"*, though recognised that because of the very large costs involved it would be unable to implement that strategy or even to plan the funding of such a strategy.

On the 30 September 1983 the Minister made Byron Local Environmental Plan Nos. 4 and 5 for North Beach which first applied the identified erosion hazard lines to delineate an Environmental Protection (Foreshore) area from which permanent development was to be excluded. In July 1986 Council's Planning Administrator announced that Council would begin applying the current "planned retreat" policy to all developments.

PART C COMMUNITY USES

C5 Community Values

While Umwelt have unaccountably obscured some key outcomes favouring planned retreat, Council's failure to identify and consider the outcomes of Umwelt's Community Survey is indicative of a selective and biased assessment, and represents a failure to identify known community values. Council needs to identify and present the key outcomes of the Community Survey that relate to

existing and proposed management of the BBE. . Ideally this should also reference previous community surveys.

C6 Recreation and Amenity

Section 6 Recreation and Amenity identifies five different landscape classes of beaches (based on naturalness) which are vaguely described, but need to be clearly mapped.

C6.1. Recreational Activities

It is wrong for the Plan not consider and recognise the recreational values of Belongil Beach. Given the significance of the Belongil Beach to this CZMP it is important that its relative significance is clearly identified in the CZMP.

C6.2 Tourism

It is essential that the CZMP provide valuations of beaches for residents as well as tourists. There has been no adequate identification of the value of beaches for residents. The valuation of BBE beaches as only being worth $293 per Byron Bay resident, or $75 per Byron Shire resident, per annum is based on inappropriate methodologies and assumptions, and grossly undervalues the worth of Byron's beaches to residents.

As noted above, given the significance of the Belongil Beach to this CZMP it is important that its relative significance is clearly identified in the CZMP. GCCM identify that Belongil Beach accounts for 28.1% of the recreational use of BBE's beaches, though then assume that the proposed protection works will have no updrift impacts to pretend that only 38% of the Belongil Beach will be affected by the proposed works and thus claim that only 10.7% of the BBE's main beaches will be affected. In truth, the transfer of erosion to the updrift end of Belongil Beach means that 62% of Belongil Beach, and thus 17.4% of BBEs main beach usage will be affected.

C.7 Beach Access

The consideration of ongoing access to beaches is largely based on conjecture, is highly subjective, and does not address the issue of ongoing access as sea-levels rise. There needs to be a summary of the various management issues and the ability to modify access over time to accommodate sea-level rises and increasing storm intensities, both with and without protection works. There needs to be an assessment of how existing and proposed works will affect access along, as well as onto, beaches.

The Plan has failed to identify the access provided by Elements directly into the Shorebird Habitat Zone and the current impacts this is having on a Federal Matter of Environmental Significance. It is not good enough to leave management of such an important site up to the adjacent resort. It is essential that the landowner take responsibility for the site and ensure that it is appropriately managed.

PART D OPEN COAST ECOSYSTEM HEALTH

Aside from the Belongil estuary, elsewhere within the embayment the loss of beaches and coastal squeeze are likely to have significant impacts on:

- meiofauna and macrofauna inhabiting sandy beaches, and the shorebirds and fish that feed on them;

- turtle breeding sites; and,
- the Endangered Ecological Community Littoral rainforest.

Council's responsibility to consider the mouth of the Belongil estuary is amplified by the requirement to consider the environments affected by the proposed rock walls. Council has ignored the Coastal Zone Management Planning Guidelines requirement to "*consider any adverse impacts from the works, including increased off-site erosion or flood levels, reduced beach access and environmental impacts*". It is evident that Council's proposed rock walls do not satisfy the requirements to "*maintain the condition of high value coastal ecosystems*" and "*rehabilitate priority degraded coastal ecosystems*", though they do not care.

Byron Council remains in denial that their proposed rock walls and groynes will have any impacts on the natural environment, and have refused to consider the impacts that the redirection of erosion from Belongil beach onto the end of Belongil spit and the mouth of the creek will have. It is certain that the accelerated erosion, increased ocean inundation and altered estuarine processes caused by the Belongil rock revetments will have significant impacts on:

- the dynamics of the estuarine processes, including the functioning of the ICOLL, opening of the estuary and the ingress of seawater;
- beach, marine and estuarine biota in the Cape Byron Marine Park;
- Littoral rainforest in the Cumbebin Swamp Nature Reserve
- the shorebird nesting and roosting area, including three State endangered and 13 vulnerable waterbirds, 2 Federally critically endangered shorebirds, and 22 migratory shorebirds;
- Endangered Ecological Communities Littoral rainforest, Coastal Saltmarsh, Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest;
- a SEPP 14 wetland; and
- seagrass and mangrove communities

D1.1. Flora

By eroding the Belongil spit and initiating a breakthrough to their north, the Belongil seawall will expose the Endangered Ecological Communities Littoral Rainforest, Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest and Coastal Saltmarsh to erosion, oceanic inundation and increased storm damage which will have significant deleterious impacts. It is clearly wrong for the Plan not to recognise and assess these impacts.

D.1.2 Open coast fauna

It is grossly irresponsible that Byron Council has failed to acknowledge that their proposed rock walls are intended to redistribute erosion from Belongil beach onto the Belongil spit and estuary and failed to consider or assess the impacts this will have on the Shorebird roosting and nesting area, including on the three State endangered and 13 vulnerable waterbirds, 2 nationally critically endangered shorebirds, and the 22 migratory shorebirds and seabirds known to utilise the coastal part of the Belongil estuary. There can be no doubt that the Belongil walls will have a significant impact on threatened species which should have been assessed and considered in accordance with the CZMP Guidelines. A Species Impact Statement is required to be prepared under NSW laws, and the proposal must be referred to the Federal Environment Minister in accordance with the EPBC Act

The proposed works will have significant impacts on beaches, the fauna that live within their sands, the fish and birds (including the Pied Oystercatcher) that feed on the sand fauna, and the birds and turtles that nest upon them, by accelerating erosion of key beaches and nesting areas, and causing coastal squeeze. It is grossly irresponsible for Council not to identify the likely impacts of their proposed works upon beaches and how they will mitigate impacts.

D1.4 Pressures and Management Issues

The environmental consequences of the proposed works have not been considered or identified. There is no intent to undertake any monitoring program that will enable the environmental consequences of the proposed works to be identified and trends documented. There is no proposal to identify environmental triggers and thresholds that require specific responses (ie nourishment, removal of the walls). There is no commitment to, or program for, adaptive management, it is just a sham being used to justify the unjustifiable.

The changes in coastal recession resulting from the retention and upgrading of the Belongil rock walls, and the accelerating erosion updrift, are going to have a significant effect on the nature, structure and opening of the Belongil ICOLL. After 15 years since changing the estuary opening there is still no entrance management policy and there is no consideration what-so-ever of how changes to the estuary resulting from the rock walls are likely to affect the estuary opening over the next few decades. Council needs to prepare the long-overdue Belongil Creek Entrance Opening Strategy, which accounts for the likely effect of the impact of the proposed rock walls, to comply with the CZMP Guidelines 4.1. and 4.2.5 requirement to prepare an ICOLL entrance management policy. as part of the CZMP.

Byron Council's proposed Coastal rock walls and groynes are considered to have impacts that contravene the State Water Management Outcomes Plan, constitute threatening processes for numerous threatened species, and contribute to the Key Threatening Processes of "Alter Natural Flow Regimes Of Rivers And Streams". The failure to consider and redress many likely impacts is in contravention of the Coastal Policy 1997.

THIS MAP SHOWS INDICATIVE MODELLED EROSION SCARPS INTO THE FUTURE. IT IS APPARENT THAT ONCE THE SEA BREAKS THROUGH THE SPIT THAT THE COAST WILL RAPIDLY REALINE WITH THE BACK OF THE ESTUARY.

CONTENTS

PART A GENERAL INFORMATION

A1.3. Planning horizon, implementation period and review timeframe

The long term planning periods for the project are 2050 and 2100. Though *"a 36 year timeframe has been used for the purpose of assessing the costs and benefits, and the likely performance of the coastal hazard management options, in mitigating hazard risk to the 2050 planning timeframe. No detailed consideration of the effectiveness of the management options has been taken to 2100*".

Section 55M of the CP Act requires consideration of impacts over the life of the works:

> ***55M Granting of development consent relating to coastal protection works***
>
> *(1) Consent must not be granted under the Environmental Planning and Assessment Act to development for the purpose of coastal protection works, unless the consent authority is satisfied that:*
>
> *(a) the works will not over the life of the works:*
>
> *(i) unreasonably limit or be likely to unreasonably limit public access to or the use of a beach or headland, or*
>
> *(ii) pose or be likely to pose a threat to public safety, and*
>
> *(b) satisfactory arrangements have been made (by conditions imposed on the consent) for the following for the life of the works:*
>
> *(i) 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,*
>
> *(ii) the maintenance of the works.*

The Coastal Zone Management Planning Guidelines identify that "*Relevant time periods will include the long-term planning horizon (e.g. 50 to 100 years to set strategic directions for coastal hazard areas*)".

The decision to limit the consideration of costs, benefits and impacts to a 36 year timeframe is outrageous, particularly as the planning timeframe is until 2100. Due to sea-levels rising at an accelerating rate, and storms intensifying as the East Australian Current strengthens, the impacts will escalate at an accelerating rate. Loss of the beach in front, and updrift, of the proposed walls and groynes will accelerate over time. Accordingly restriction of access to the beach and the threat to public safety will increase over time.

As impacts are accelerating, and there are very significant differences (by orders of magnitude) in impacts between a 50cm rise in sea-levels and a metre rise in sea-levels, the design criteria, and construction costs, are significantly more for a hundred year timeframe. If the walls and groynes are only designed for a 36 year timeframe then it is assumed they will need to be rebuilt to higher standards and at higher costs to withstand a metre rise in sea-level.

WRL (2015) state: *"Subject to the realisation of projected global climate change and sea level rise, ongoing recession of the beach and ongoing monitoring, there may be a time in the future when protection options are no longer viable. Retreat may then become a viable option ..."*

On behalf of the Australian Greenhouse Office, SMEC (2009) advised Councils that:

> *The costs of adaptation measures can be substantially reduced if these measures are implemented at the stage of upgrade or replacement of existing infrastructure. This is because the costs of designing new buildings to incorporate climate change is in some cases very small whereas the costs of adapting existing infrastructure in the future is*

> *potentially large. The implementation of early adaptation strategies in the infrastructure and property services responsibility of local government will ultimately decrease the risk of asset damage and failure in the future which would represent an economic and social cost to councils (UKCIP, 2001).*

The longevity of infrastructure, the irreplaceability of ecosystems and the economic costs of underestimations demand that a precautionary approach is adopted.

WRL (2015) justify their proposed timeframe on the basis that:

> *It should be noted that the typical design life for structures is approximately 50 years. Horton et al (2014) noted that the cost of new residential development is amortised for tax purposes over 40 years based on Subdivision 43-25 of the Income Tax Assessment Act 1997.*

The design life of any protection works has to be more than 36 years unless the stated intent is to remove them after this time - in which case the costs of their removal and restoration of the beach need to be clearly identified and accounted for.

It is unacceptable for Council to limit consideration of the impacts and consequences of their proposed seawalls and groynes to 36 years rather than 100 years when the consequences of such works will accelerate over time, particularly because if built Council has no intention of removing them in 36 years time. The consequences of retaining any proposed protection works over the 100 year timeframe needs to be identified and considered.

Now the plan has reduced the timeframe of its preferred option down to 15 years, saying that "*there is a possibility that other stages in the 'adaptive management protection scheme' may be implemented at some time in the future. These stages are beyond the scope of this CZMP implementation timeframe, which is 15 years, and will require further investigation*".

The reduction of the planning timeframe to just 15 years to avoid consideration of medium and long term consequences is outrageous and strongly objected to.

A1.4. CZMP planning area

On 12 October 2011, the Minister for the Environment, Robyn Parker MP, issued Council with the following Direction:

> *Under the provisions of section 55B of the Coastal Protection Act 1979 (the Act), I direct Byron Shire 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 between the south extremity of the beach within Tyagarah Nature reserve and Cape Byron, including Belongil, Main and Clarkes Beaches, Byron Bay, to the Minister administering the Act by 30 June 2013.*

"beach" is defined **to** include the area of unconsolidated or other readily erodable material up to the highest level reached by wave action,

The area is defined by the CZMP to include:

> *Landward limit: as necessary to evaluate and assess the coastal hazard risk to 2100 and the management options to the 2050 planning horizon,; therefore the landward boundary of the CZMP's planning area is broadly defined by the 2100 erosion hazard line 'maximum' estimate combination scenario 1 and 2 (BTM WBM, 2013).*

The map included in the CZMP clearly shows that the mouth and part of the Belongil estuary are included within the area required to be considered. Despite this it is stated (1.4) *"This CZMP addresses coastal hazard risks and coastal ecosystem health as it pertains to the 'Open Coast' of the BBE. It does not address coastal hazards specifically relating to estuarine processes such as the coastal inundation risk to the Belongil Estuary or the interaction of tidal waters with catchment floodwaters".*

It is claimed (2.2) that *"In accordance with the Minister's direction, this CZMP is about the coastline "that is a beach". ... For the most part, the Belongil Estuary is outside the CZMP planning area (refer section 1.4), therefore there is minimal emphasis on ecosystem health as it relates to the Belongil Estuary in this CZMP"*.

The mouth of the Belongil estuary is clearly part of the beach system and is required to be considered in the CZMP. It is particularly important that the area around the mouth of the Belongil estuary be fully considered because this is where the impacts of the proposed seawalls and the groynes will be concentrated.

It is reprehensible that Council has refused to duly consider the mouth of the Belongil estuary, and the impacts of their proposed works upon it, despite its being a key part of both the coastline and the beach within the area required to be assessed. This is totally unacceptable given that the intent is to transfer erosion from Belongil beach onto the estuary, and because of the importance of the Belongil estuary for marine ecosystem functioning and as a roosting, nesting and feeding area for a plethora of threatened and migratory seabirds, shorebirds and waterbirds.

Council has also failed to consider North Beach (see below).

The CZMP does not adequately assess either the mouth of the Belongil estuary or North Beach in accordance with the Minister for the Environment's 2011 Direction to consider the

coastline that is a beach between the south extremity of the beach within Tyagarah Nature reserve and Cape Byron.

Extract from Figure 1 showing that the mouth of the Belongil estuary is clearly within the coastal area covered by the plan.

Extract from Figure 2: Light Green is Cumbebin Swamp Nature Reserve, Blue is Cape Byron Marine Park, and pink is Council Community Land. This clearly shows the significant areas of National Parks, Marine Parks and community land to the north and west of the proposed works that will be affected.

A2.3. Coastal Management Principles

The plan preparation is not considered to comply with most of the Coastal Management Principles:

Principle 3: Involve the community in decision making and make coastal information publicly available

The single community forum organised by WRL only included selected community representatives and was poorly organised, provided with selective material and resulted in no meaningful outcomes.

The outcomes of the limited attempt to assess community preferences for future management were misrepresented and mostly ignored in the Plan.

The Project Referrence Group was only formed very late in the process, not allowed time to discuss key issues, provided with partial and incomplete information in an ad-hoc manner, and had no meaningful input into the process.

Principle 4: Base decisions on the best available information and reasonable practice; acknowledge the interrelationship between catchment, estuarine and coastal processes; adopt a continuous improvement management approach

The assessment has been based on numerous false assumptions aimed at downplaying likely impacts of coastal processess (such as taking into account the strengthening EAC when considering sea-level rise, misrepresenting the depth of closure when considering sand-nourishment volumes).

There has been no attempt to consider likely impacts of proposed coastal protection works on estuarine processes.

Principle 5: The priority for public expenditure is public benefit; public expenditure should cost-effectively achieve the best practical long-term outcomes

The Cost Benefit Assessment is based on numerous false assumptions and has been heavily criticised by the OEH. yet Council has refused offers by OEH to set up a Steering Committee to ensure a credible and reliable assessment was undertaken.

Principle 7: Adopt an adaptive risk management approach if risks are expected to increase over time, or to accommodate uncertainty in risk predictions

The timeframe of 36 years was intentionally adopted to avoid considering long-term risks and there has been to attempt to consider the consequences of long-term risks on proposed works. The uncertainty bounds associated with numerous parameters have not been accounted for, the medium and long-term risks have not been considered, and worse case scenarios have not been considered.

Principle 8: Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems

There has been no attempt to consider the impacts of proposed coastal works on coastal ecosystems such as; Littoral rainforest, saltmarsh, or sandflats used by threatened seabirds and migratory shorebirds for roosting and nesting.

Principle 9: Maintain and improve safe public access to beaches and headlands consistent with the goals of the NSW Coastal Policy

> The proposed coastal works will accelerate beach erosion, rob the community of their beaches and decrease beach safety. A walkway atop a pile of rocks is not a substitute beach access.

The plan does not comply with most of the Coastal Management Principles, most notably in that it does not: engage the community in a meaningful way, consider the best available information, acknowledge the interrelationship between estuarine and coastal processes, maximise public benefit from proposed public expenditure, account for long-term risks, maintain the condition of high value coastal ecosystems, or maintain safe public access to beaches.

PART B COASTAL HAZARDS AND RISK ASSESSMENT

B.1.2. Belongil Creek entrance instability

The most significant environmental impacts of the proposed protection works are going to be concentrated by the rock walls and groynes directly onto the sand spit and sand flats around the mouth of the Belongil Creek estuary, and when these are eroded then directly onto the endangered ecological communities fringing the estuary, yet the CZMP ignores these impacts on the pretence that the affected areas are not part of the coast.

(Also see related comments in to Section 8)

The Plan (A2.2) recognises there is minimal emphasis on ecosystem health as it relates to the Belongil Estuary, in this CZMP, claiming that this approach is in accordance with the Guidelines, which state:

> *All CZMPs are to address relevant coastal risks and community uses of the coastal zone. CZMPs for an estuary must also address estuary health.*

The Coastal Zone Management Planning Guidelines identify that an assessment of coastal risks should include *"proposed actions in the implementation schedule to manage current and projected future risks from coastal hazards, including risks in an estuary from coastal hazards"*. The Guidelines identify the *"minimum criteria for assessing the extent of coastal hazards"* as including for *"Coastal lake or watercourse entrance instability"* a "*Qualitative assessment of entrance dynamics based on historical records (assess under current conditions and projected future conditions)"*. Coastal inundation and Tidal inundation are also meant to include estuaries.

The '*Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands'* is identified as a "key threatening process" under the *Threatened Species Conservation Act 1995* and, in part, under the *Fisheries Management Act 1994*'.

The CZMP fails to adequately consider the previous changes in estuary characteristics and totally ignores likely changes, simply stating *"The behaviour of Belongil Creek in response to shoreline recession and wave overtopping that would break through to the creek is speculative and uncertain".*

The CZMP notes "*With reference to the Hazard Study Update (BMT WBM, 2013), the erosion hazard lines are discontinuous at the Belongil Creek entrance, refer* **Error! Reference source not found.**. *This is a reflection of the dynamic, complex and interacting processes occurring at this part of the coastline, which are difficult to isolate and map".*

The CZMP also identifies that "*the existing 'immediate' wave run-up and overtopping hazards are*" " *A clear potential for overtopping and/or inundation within the mouth area of Belongil Creek*": What a misleading understatement.

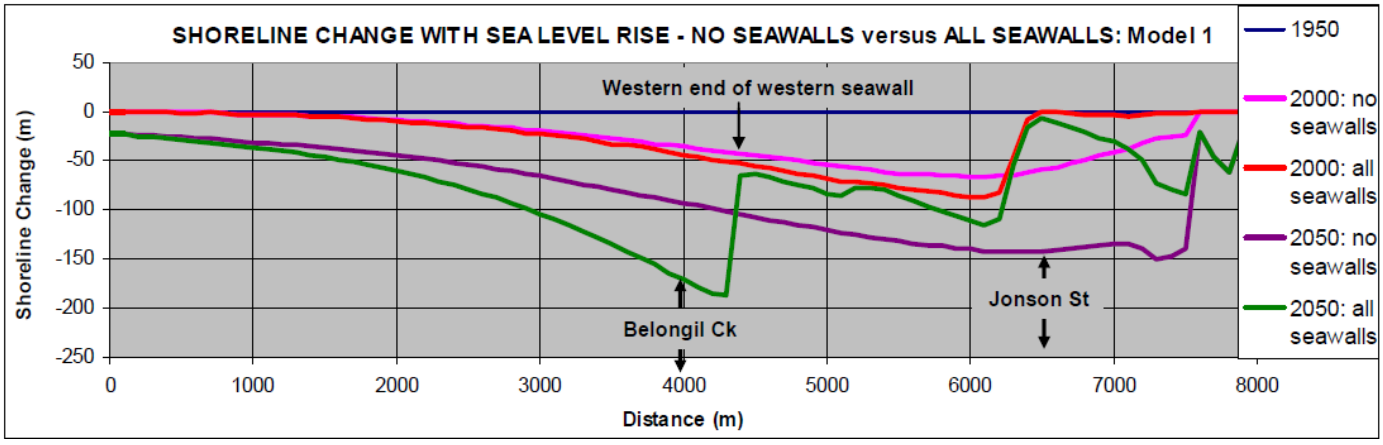
This is simply not good enough. The intent of the preferred option is to redirect erosion from Belongil beach directly onto the end of the Belongil spit and the mouth of the estuary and there is no attempt to consider it. There can be no doubt that the proposed rock walls, with or without groynes, will transfer erosion to the end of the current walls. This will accelerate erosion of the Belongil spit,

with the increased erosion focussed immediately to the north of the walls likely to cause a breakthrough to the estuary, becoming the estuary mouth over time. This likelihood is not even canvassed.

BMT WBM (2 November 2010) in a letter to Council about their modelling state:

> The model results indicate, in brief summary, that:
>
> - the seawalls have acted as small 'headlands' that have trapped sand on their updrift (eastern) side;
> - this 'headland' effect has tended to stabilise the shoreline east of each structure and transfer the erosion that would otherwise have occurred naturally on the eastern side to the western side;
> - where seawalls have been built to the west of other seawalls, they have the progressively cumulative effect of transferring the erosion that would otherwise have occurred along the protected area to the western side of the most western seawall; and
> - a similar effect of the seawalls occurs in response to sea level rise in which the shoreline recession that would otherwise occur would be, at least in large part, transferred to the shoreline west of the seawalls.
>
> ...
>
> Similarly, the subsequently constructed seawalls along Belongil Spit have affected the erosion further west but have not been the sole cause of that erosion; ... the walls will increasingly exacerbate the erosion of the western end of Belongil Spit over time.

Patterson ('Byron Bay Shoreline Erosion, 2010) modelled the effect of seawalls on coastal recession with a sea-level rise of just 42 cm. His modelling clearly shows that impacts from elsewhere will be transfered onto the mouth of the Belongil estuary because of the proposed seawalls. The inclusion of groynes will exasperate the identified impacts around the mouth of the Belongil estuary - though Council has not bothered to assess these impacts.



Patterson (2010) also identified that "*Breakthrough to Belongil Ck immediately west of western seawall likely within 20-30 years*"

Worley Parsons (2013 Byron Bay Erosion Protection Structures – Risk Assessment), states:

> *The most northerly erosion protection structures along Belongil Spit may have exacerbated long term foreshore erosion on their downdrift side (as determined through analysis of photogrammetry data), potentially reducing the available habitat at the entrance to the Belongil Estuary. Photogrammetry analysis indicates that 8 m of foreshore dune recession (as measured by recession of the 4 m contour) occurred between 1999 and 2011 near the mouth of the Belongil Estuary, compared with no foreshore dune recession between 1977 and 1999 (Figure 18). This 8 m recession may be partially an effect of the erosion protection structures at Belongil Spit, as the recession distance diminishes with distance north from the*

northerly limit of erosion protection structures. Patterson (2010) modelled the incremental recession north-west of the most north-westerly seawall to be around 15 m between 2000 and 2010 (Figure 22).

In the CZMP, Figure 1, 'Erosion Hazard Zones – Scenario 1 (Belongil Spit seawalls retained): Belongil Spit and North Beach', is the only illustration of the theoretical erosion hazard lines with the Belogil rock walls. Aside from identifying a uniform increase in coastal recession, there has been no attempt to account for the zeta-curve that develops at the end of rock structures (as applied by Patterson 2010 above).

There is enough evidence to clearly establish that because of the transference of most erosion to the end of the seawalls and groynes that the mouth of the estuary will migrate to there, meaning that the end of the proposed seawalls and the terminal groyne will effectively become the eastern side of the mouth of the estuary over time (the proposed isolated groyne near the mouth of the existing estuary is unlikely to stop this - if it is ever built) . Given the constraints imposed by the railway on one side and the proposed seawalls on the other there is nowhere else for the creek to go. You don't have to have to be Einstein to recognise the inevitability of this, or have to pay consultants hundreds of thousands of dollars to fail to identify it.
It is irresponsible for Council not to identify the likely consequences of the proposed rock walls and groynes on the mouth of the Belongil estuary, particularly as this will have significant environmental impacts.

Extract from Fig. 2, Erosion Hazard Zones – Scenario 1 (Belongil Spit seawalls retained. Note the failure to apply the zeta-curve or recognise that the estuary mouth will in future be located at the end of the rock walls.

Council has failed its responsibility to identify the likely consequences of its intent to redirect erosion onto the end of the Belongil Spit and the mouth of the Belongil estuary, and to assess the likely impacts of this on :

- **the loss of Cumbebin Swamp Nature Reserve, Cape Byron Marine Park, and Council Community Land**

- **the dynamics of the estuarine processes, including the functioning of the ICOLL, opening of the estuary and the ingress of seawater;**
- **changes to beach, marine and estuarine biota in the Cape Byron Marine Park;**
- **the maintenance of the shorebird nesting and roosting area, including the persistence of the three NSW endangered and 13 vulnerable waterbirds, 2 Federal Critically Endangered species and 22 migratory waders;**
- **the erosion, storm damage and inundation of the Endangered Ecological Communities Littoral rainforest, Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest and Coastal Saltmarsh;**
- **the loss of SEPP 14 wetland;**
- **the loss/displacement of seagrass and mangrove communities;**
- **bank erosion and the flooding of properties within the estuary; and**
- **the redirection of the northward flow of sand into the estuary (away from North Beach);**

B2 Coastal Hazards Risk Assessment

The Plan is misleading in that it fails to identify the actual risks associated with residences, by not identifying: the type of building (ie not differentiating sheds and houses), those that were purchased or renovated after Council adopted the principles of Planned Retreat in 1986, those that are demountable and able to be moved out of the way.

The plan identifies that:

Table 1 **Property and development threatened by coastal erosion and recession in combination with projected sea level rise using 'best estimate' hazard lines (BMT WBM, 2013), adapted from WRL (2016)**

Scenario (S) and planning horizon	Residential houses						Commercial structures						Total affected cadastres					
	The Pass	Clarkes Beach	Main Beach	Cavvanbah	Belongil Beach	North Beach	The Pass	Clarkes Beach	Main Beach	Cavvanbah	Belongil Beach	North Beach	The Pass	Clarkes Beach	Main Beach	Cavvanbah	Belongil Beach	North Beach
S1 Immediate										1			4	2	2	10	34	2
S2 Immediate					33					1	1		4	2	2	10	114	2
S1 2050								16		1			5	4	2	11	36	3
S2 2050					56			16		1	1		4	2	2	11	144	3
S1 2100				3	1			36		15			5	4	2	24	44	6
S2 2100				5	71			36		29	12		6	3	2	38	175	6

WRL (2016) identify:

Table 2.7: Number of Buildings Impacted under Retreat Scenario

	Building numbers for AEP (%)				
	63%	9.5%	1%	0.1%	0.01%
2015 relocatable	1	6	9	9	9
2015 non relocatable	9	16	25	34	44
2015 total	10	22	34	43	53
2050 relocatable	6	9	9	9	9
2050 non relocatable	23	29	41	47	49
2050 total	29	38	50	56	58

Note: Almost all buildings are within Belongil precinct, with a small number in Cavvanbah for rare AEP events in 2050

WRL (2016) note:

> *Based on BSC's coastal audit (2011), there are 14 private properties at Belongil subject to coastal hazards to 2050 that were purchased prior to 1988 and would therefore be subject to publicly funded retreat under a Planned Retreat (Public-Private) model.*

The Plan is misleading in that it fails to identify the actual risks associated with residences, by not identifying: the type of building (ie not differentiating sheds and houses), those that were purchased or renovated after Council adopted the principles of Planned Retreat in 1986, and those that are demountable and able to be moved out of the way.

Before any quantification of compensation for houses at Belongil can be made it is first essential to identify:

1. **Those buildings legally constructed from 1978 to 1986 and required to be demountable and to be removed when threatened;**
2. **Those building legally constructed or renovated post 1986 in the full knowledge that they were required to be demountable and that the landowner was not to interfere with coastal processes;**
3. **Those buildings illegally constructed or renovated and,**
4. **Those properties purchased post 1988 in the full knowledge that buildings were required to be demountable and that the landowner was not to interfere with coastal processes.**

Managing Sand Dunes to Reduce Hazards

Sand dunes provide the first line of defence on sandy coasts from oceanic inundation due to tsunamis and extreme weather events. Their bulk is a sacrifice to a storm's fury and their height a defence against storm waves. Storm surges and wave set up can raise sea-levels by up to 2.6 metres above high tides, and wave runup can be up to 6 metres above this. They need to be strong to withstand this.

The CZMP gives minimal consideration to the importance of sand dunes, stating "Coastal protection works located on the dune may hinder the colonisation of dunal grasses and the formation of incipient dunes, affecting the colonisation of foredune and hind dune areas and / or the resilience of vegetation communities located in or adjacent to these zones"

As identified by Wickham (1984) the need for *"expensive protection in the form of sea-walls, and groynes … can be overcome by reserving and maintaining stable dunes as naturally-occurring protection"*, though *"the success of dune reserves as coastal protection must be conditional on adequate measures being taken to preserve the effect of this natural stability"*

.WBM (2004) identify that:

> *The potential for oceanic inundation relates to:*
>
> - *direct overtopping of low dunes or low points in the dune system; and/or*
> - *removal of the frontal dune by erosion processes exposing low lying land behind…*
>
> *Where inundation has been identified as a potential threat to development, the most appropriate option to eliminate this threat is to ensure that the dune system has sufficient height and volume to prevent direct overtopping and accommodate storm erosion. In most situations a dune height of 5.5m AHD should be sufficient to ensure substantial overtopping does not occur.*

In many developed coastal areas the retreat of sand dune has been halted on the landward side by developments, while the shoreward side continues to erode s the dune system and the protection it provides is progressively depleted. This progressive depletion of sand dunes and blocking of landward movement is the essence of the problem with coastal recession on sandy beaches.

An orderly planned retreat process needs to account and plan for the need for sand dunes to migrate inland in response to shoreline recession. If we allow sand dunes to be depleted to the extent that they are likely to be overtopped it places at risk lives and property. This should not be treated lightly.

If there is an intent to maintain sand dunes and the protection they provide from coastal inundation, then they must be managed to retain sufficient height and volume to resist storm surges and wave runup as they retreat inland in response to rising sea levels. Ideally using a planned retreat approach *"once threatened facilities are removed and a dune system re-established, there will be no further costs for ongoing works apart from standard dune and beach management activities"* (WBM 2004).

As recognised by DPW (1978)

> *Early planners in the Byron Bay-Hastings Point region, by providing 50 to 100 metre buffer zones, demonstrated their appreciation of at least one aspect of the system; the dramatic response of the coastline to short term beach fluctuations.*
>
> *…*
>
> *… it can be seen that the mean sea level line on the beach fluctuates markedly with time; 50 to 100 metres movement being not uncommon. This reflects the rapid changes in the beach slope and berm width associated with changing weather conditions.*

Back in 1978 the Department of Public Works identified one option in response to shoreline recession is to "retain a buffer zone of a variable width (say 50 to 100 m) which is moved inland with the shoreline recession", recognising:

> *In this case it would be advisable that the area be zoned such that protective works cannot be undertaken and that the buildings have to be removed as soon as they become affected by the landward boundary of the buffer zone*

From his assessment of coastal sand dunes in the Byron and Tweed areas, Wickham (1984) found that in Byron Shire *"The readily disposable section of dunes above the beach … were generally of the order of 50-100 metres wide with only rapidly receding points at New Brighton and Belongil Creek being less than 50 metres at the date of measurement".*

Wickham (1984) identifies two categories of dunes for management purposes; dune reserves and recession reserves. The dune reserve is intended to provide *"a complete ecological niche of closed canopy vegetation which extends intact from the enduring erosion scarp …at least 50 metres …encompassing the full width of elevated frontal dune"*. The recession reserve is intended to accommodate ongoing coastline recession *"with a width calculated to be expected nett movement in 100 years"*.

Wickham (1984) maintains that the dune reserve *"would be periodically eroded and reinstated in response to short-term influences but would be maintained with a minimum width of either the entire frontal dune, or 50 metres, whichever was greater"*. The intent being that as the dune reserve would move inland, through the recession reserve, in response to coastal erosion.

In general the inland migration of a sand dune requires the transport of windblown sand inland. Though windblown sand is generally regarded as a nuisance and is one of the motivations often cited for stabilisation of sand dunes with vegetation. Vegetation cover is important to reduce excessive transport of sand inland, if too much occurs it will deplete beach reserves and accelerate erosion, though if no transport is allowed to occur then sand dunes remain fixed in place and will be progressively depleted by coastal erosion.

The conventional wisdom of stabilising sand dunes with vegetation to stop their movement needs to be broadened to accommodate the concept of allowing some sand transport to facilitate movement of sand dunes inland in response to coastal erosion.

The CZMP should be providing clear guidelines that take into account rising sea-levels and increasing storm intensities due to global warming to identify:

1. **the structure, profile and volume of sand dunes required to withstand overtopping by storm surges and wave runup and accommodate storm bites and short-term coastline fluctuations;**
2. **setbacks from erosion scarps required to accommodate the design sand dunes and accommodate retreat in response to the recession rate of that coast; and**
3. **guidelines for sand-dune management that recognize the need for them to move inland.**

B2.2.1. North Beach

The CZMP fails to recognise that "planned retreat" has been applied to North Beach since 1979 and that since 1983 the coastal erosion zone has been formalised in Byron Local Environmental Plan Nos. 4 and 5 as *"Environmental Protection – Foreshore"* areas that were meant to remain free of permanent development. Aside from the questionable approval of some caravan sites as demountable cabins in 1985 on the basis of pre-existing uses (recently reapproved through a S96 variation) and the ill-fated Bayshore Building, the identified erosion zone has been retained free of development because of the principles of planned retreat.

The CZMP *notes " It is possible that a combination of coastal and estuarine processes, notably Belongil Creek entrance instability and wave propagation across the entrance of Belongil Creek, will pose a risk to existing or future development and property located in the North Beach precinct over the CZMP planning timeframes (WRL, 2016). Future changes to North Beach will be affected by the management strategies implemented for Belongil (WRL, 2016).*

The wording of this was changed as a result of my comments on the first draft, which stated:

> *It is possible that a combination of coastal and estuarine processes, notably beach erosion, coastal inundation and Belongil Creek entrance instability, will pose a risk to development and property located in the North Beach precinct over the CZMP planning timeframes".*

As originally noted, it is not just "possible", it is a fact that has been identified for over 35 years and is obviously already occurring. It is thus, at best, irresponsible for the CZMP not to recognise this and to identify appropriate management of the problem. Council clearly needs to identify whether it will maintain a policy of either planned retreat or protection for the site. Though if the Belongil rock walls and groynes are approved Council is likely to be required to overturn over 35 years of "planned retreat" as applied to the site.

Despite now acknowledging that strategies implemented for Belongil will affect "North Beach", this problem is still not dealt with. Section B3.3 Other Areas fails to identify any strategy for North Beach simply stating "*Monitor coastal processes and impacts on North Beach*".

As originally noted, it is negligent for the CZMP not to recognise that the proposed Belongil seawalls and groynes will exasperate erosion of North Beach and potentially expose Council to massive compensation payouts and requirements to pay for works to protect the property. Council can not pretend ignorance as they have been aware of this for at least the past 30 years. Now admitting that North Beach *will be affected* by the Belongil works without identifying how the various options will affect it and the likely physical, economic and legal consequences remains irresponsible.

As previously identified, the Shire Engineer's Report of 26 March 1985 (Sunrise Beach Resort Development – (Coral Investments) – Review of coastal aspects by P.W.D. Ordinary Meeting (BSC File: P24-329) states:

> *On the other hand, however, should Council and/or State Government implement in the future a strategy of foreshore protection works for the Byron Bay/Belongil section of the coastline, then there will be an acceleration of the erosion rate on the Globetrotters site, unless such works are extended to the northern boundary of that site.*
>
> *...*
>
> *What the Public Works Department appears to be concerned about here is that, should the development of the site proceed now and, at some future point in time, State Government and/or Council decides to carry out foreshore works to protect the Byron/Bay/Belongil section of the coastline, it will then be necessary to extend, at public expense, these works to protect the Globetrotters site.*

Patterson's ('Byron Bay Shoreline Erosion, 2010) modelling of the effect of seawalls on coastal recession clearly demonstrates that the seawalls at Belongil are already exasperating erosion of North Beach, and if maintained will dramatically transfer erosion from Belongil beach to North Beach over time.

While Council may now pretend ignorance of the consequences of the Belongil works on North Beach, it will not withstand scrutiny.

For the CZMP not to recognise that "planned retreat" has been applied to the North Beach site since at least 1980, that it is subject to active erosion, and to not identify proposed management of the problem, is at best irresponsible. For the CZMP not to recognise that the Belongil seawalls and groynes will significantly exasperate erosion at North Beach is so grossly irresponsible and negligent that it exposes Byron Council to massive compensation claims in the future.

While Council now acknowledges that there will be an effect, they still make no attempt to assess the consequences of their preferred option or Council's likely liability for the updrift consequences of any works they approve.

B3. Coastal Hazards Risk Management Strategy and Implementation Schedules

The Plan's identification of only one set of options for all areas, if they can be considered to qualify as such, denies the community any opportunity to identify their preferences for the future management of the Byron Bay embayment. The only attempt to assess community preferences has been the extremely limited attitude survey by Umwelt (2014) which found that *"a clear majority of respondents did not agree that protecting private property is the most important priority for Council in managing coastal hazards"*. Council's adopted options are clearly contrary to identified community preferences and it is unacceptable that community are being denied an opportunity to comment on the Coastal Hazard Management Study Byron Bay Embayment or identify their preferences for the various options identified.

The Coastal Hazard Management Study Byron Bay Embayment relies upon conjecture, guestimates, and untested assumptions, it is riddled with errors, and is not an impartial assessment, it is requested that it be subject to independent peer review.

Cost/Benefit Analysis

OEH (4 February 2015) commented:

> *However, interaction between two critical assumptions in the CBA appears to create an unintended technical effect that favours options involving a sea wall. These assumptions concern the timing of:*
>
> - *a major storm event (1 in 100 year storm); and*
> - *the vacating of houses as part of a planned retreat management option.*
>
> *The technical effect of the assumptions is to emphasise the benefits of the sea wall option and to emphasise the costs of the planned retreat option.*

OEH (Don Arnold, 11 March 2015) clarified this:

> *"...the key issues with the existing coast benefit analysis (CBA) related to how consideration was given to the probability of a one in one hundred year erosion event occuring in year 5, and the assumptions used to underpin the retreat option".*

An uncited email to Shannon Burt, presumably from OEH, is included as Attachment 3 to the Agenda for the Council meeting of 9 April 2015 states:

> *"...a review of the draft CBA suggests there may be concerns with double counting coasts and benefits, that transfer payments (such as rates) might have been inappropriately included, and that the base case had not been fully specified. However, there was*

insufficient information available to say with any certainity that these are significant issues. On the other hand, the draft CBA does have two issues that have a large dollar impact: (1) the inclusion of a 1 in 100 year storm event in year 5; and (2) planned retreat being undertaken and completed in year 1.

WRL base their costings on two categories of landowners: those who purchased their properties before 1988 and those that purchased their properties after 1988. Does not account for the fact that Planned Retreat was adopted as policy by Council in 1986, that many landowners have since significantly modified their properties (both legally and illegally),
Dr Dave Anning of Griffith Centre for Coastal Management (15 March 2015) responded to Council:

"Additional documents included in the audit findings highlight which individual properties are subject to planning consent conditions, but importantly DO NOT detail what those restrictions entail from an economic or engineering perspective.

While the focus of this comments were on which properties were already within the trigger distance for consent to lapse, it is equally important to ascertain whether properties have been modified since 1986 and thus become subject to planned retreat or illegally modified and thus have no consent.

It is revealing that Byron Shire Council wrote to OEH (13 April 2015)

With respect to the proposed Steering Committee for the new CBA, the implication of resolution 15 - 139 is that Council will be declining your offer to participate in this committee

It needs to be recognised that the costs associated with the proposed protection works are purely speculative, OEH (Don Arnold, 18 August 2015 Appendix A) notes:

It is acknowledged that the funding amounts and ratios presented throughout the report are speculative and unconfirmed.

In addition and as a cautionary note, the NSW Government's Coastal Management Program doesn't generally provide funding assistance for recurrent maintenance or ongoing operational activities such as groyne maintenance or renourishment (i.e. refer to Table 11.5).

Council has paid the price for refusing OEH's offer to assist, and for employing the same consultants to fix their mess. OEH (Monica Collins, 28 October 2015) reviewed the new CBA and informed Council:

The Office of Environment and Heritage (OEH) has completed a review of the CBA (Attachment A). The review has corrected errors and assumptions identified in the consultant's CBA using the best data available at this time, resulting in a change in the relative ranking of options (planned retreat is most preferred). The review has also highlighted the high degree of sensitivity of benefit-cost ratios to variation in property values and tourism impacts, and the potential effects of further issues, for example sand nourishment, further engineering costs and timing of planned retreat.

This review indicates that the CBA does not provide accurate information on the overall performance of the proposed coastal management options, nor a reliable indication of their relative performance. As such, assessment of management options for coastal hazard risk mitigation in the Byron Bay Embayment should not rely on the benefit-cost ratios arising from that analysis.

If council is to rely on its CBA to finalise a coastal zone management plan for the Byron Bay Embayment, then additional work on the CBA is recommended.

OEH (Monica Collins, 28 October 2015 Appendix A) identified numerous errors in the CBA, including:over-estimation of property values by 16-81%; failure to quantify potential tourism impacts; inability to cost sand nourishment until a source is identified; failure to account for likely re-engineering of structures in light of performance; and an ongoing failure to account for a phase in of planned retreat. OEH note:

This review has corrected errors and assumptions identified in the consultant's CBA using the best data available at this time, resulting in a change in the relative ranking of options (planned retreat is most preferred). The review has also highlighted the high degree of sensitivity of BCRs to variation in property values and tourism impacts, and the potential effects of further issues (sand nourishment, further engineering costs, and timing of planned retreat).

This review indicates that the CBA does not provide accurate information on the overall performance of the proposed coastal management options, nor a reliable indication of their relative performance. As such, assessment of management options for coastal risk mitigation in Byron Bay should not rely on the BCRs arising from that analysis. Further work is recommended to address issues identified in this review.

OEH identify a significantly different CBA:

Table 1: BCRs from CBA with errors and erroneous assumptions corrected

Option	Description	NPV (original)	NPV (amended)	BCR (original)	BCR (amended)
2	Planned retreat	*-16.86*	**-4.04**	*0.73*	**0.85**
3	Groyne Seawall Nourishment	*17.14*	**-26.69**	*1.31*	**0.52**
4	End Control Seawall Nourishment	*17.36*	**-21.26**	*1.37*	**0.55**
5	End control Seawall no Nourishment	*19.26*	**-8.94**	*1.65*	**0.70**
6	Adaptive management	*230.6*	**-16.02**	*1.63*	**0.56**

The Department of Primary Industries (Lands) (Stephen Wills 15 October 2015) were not impressed either, identifying key risks and issues with the CZMP as:

1. The cost sharing arrangements outlined in the study do not adequately assess differing levels of risk associated with coastal processes for private and public lands. The negative impacts on public land assets, such as loss of access, beach amenity, etc are not considered. The proposed cost sharing methodology and proposed arrangements are not supported. A comprehensive cost benefit analysis is recommended.
2. Works proposed in the short listed options and the recommended adaptive management scheme will have significant policy, management, and funding implications for the state. DPI Lands will not support actions that are not subject of a comprehensive cost benefit analysis and all risks associated with measures considered.
3. Clarification is required as to the expectation on all parties for the required duration of funding commitments.

Issues identified by DPI include:

- negative impacts and associated costs to Crown assets, including beach access and amenity, are not adequately identified or considered in the study.
- the Crown land reserve at the old jetty site can accommodate landward retreat and does not require protection
- the potential impacts on public access and beach amenity needs to account for any delays in groyne construction or nourishment after the seawalls are constructed.
- the tenure of any proposed seawalls needs to be considered as if they are on freehold properties it will have implications for the maintenance of public access along their crests.
- clarification is required as to the consequences should one or more parties become unable to continue funding their portion of costs

On the 9 April 2015 report to Council staff warned:

> It may be more difficult to determine a management strategy for the draft CZMP if the outcome / results of the two different CBAs are widely divergent, however this may not eventuate; if it does eventuate then an independent, third party peer review process may be required.

Because of Councillors refusal to ensure an honest and independent CBA appraisal, under supervision by OEH and the community, a third party peer review process is now required. This must be undertaken independently, in an open and transparent process under the supervision of a committee including OEH and community representatives.

The Coastal Zone Management Planning Guidelines identify that an assessment of coastal risks should include

> *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 (section 55C(g) of the Coastal Protection Act 1979)*

The implementation of the adopted option requires the identification of a sand source capable of replacing the 1 million tonnes of initial fill on a periodic basis and the annual top-up of 45,000m3 pa. Until a feasible source for this sand is identified the costings for this option can not be accurately identified.

B3.2 Belongil Beach and B3.4

The plan proposes as a standalone measure 'engineered seawall with walkway', noting:

> *The strategy for Belongil Beach is underpinned by the consultant's recommendation concerning Stage 1 of the 'adaptive management protection scheme', i.e. 'engineered seawall with walkway'. Additional measures are required however for meeting legislative requirements and for providing for 'adaptation' in response to implementation, funding, and climate based uncertainties.*

The Plan notes:

> *As per the Management Study recommendation, there is a possibility that other stages in the 'adaptive management protection scheme' may be implemented at some time in the future. These stages are beyond the scope of this CZMP implementation timeframe, which is 15 years,*

The plan notes that the Management Study found:

> *Progress to later stages would be warranted if triggers within the adaptive scheme are reached, however, economic modelling indicates that, relative to the status quo, increased beach width over a 1 km stretch of Belongil is not economically viable.*

Table 2 Belongil Beach adaptive 'seawalls with walkway' - Compliance with 55C(1) of *Coastal Protection Act 1979, and* Table 3 Belongil Beach adaptive 'seawalls with walkway' – Compliance with section 55M of *Coastal Protection Act 1979* are surely a joke. Council seems to believe that just by putting ticks in boxes that this somehow means their ludicrous option is compliant with the requirements, when it often clearly isn't. Council has made no attempt to justify why the "ticks" are deserved.

The Plan's simplistic consideration of this short-term "option" is totally outrageous and strongly objected to. The pretence that there is only the "possibility" of additional measures being required in the future is a fraud and the work of 'climate-change deniers' who are pretending that seas are not going to go on rising and that coastal recession is not worsening. The tick-a-box pretence in Tables 9 and 10 that this option is compliant with legislative requirements is simplistic, unjustified and erroneous.

Rock Walls

It needs to be clearly recognised that rock walls are not a long-term solution. The DPW (1978) stated:

> *Sea walls are generally in the form of rigid structures and therefore require good foundation conditions. … the depth to bedrock in most of the Byron Bay and New Brighton region is such that sea wall construction would be prohibitively expensive. Rock revetments are a flexible form of sea wall which is well suited to poor foundation conditions and which can therefore be founded on sand. …It is however believed that this type of structure will require increasing maintenance and will eventually be undermined.*
>
> *[with a rock revetment] … In time, the offshore zone will steepen, allowing larger waves to attack the revetment and eventually this steepening will result in the slumping of the revetment. In fact, the presence of the revetment on the beach will act to accelerate the erosion process due to the increased energy situation caused by wave reflections from the structure.*
>
> *The consequences of a revetment type structure would be a steady reduction in beach width until the foreshores of the protected areas become a boulder coast as has happened in front of the surf club/parking area at Byron Bay. The loss of the beach would detract from the natural beauty of the area and could be expected to seriously reduce its tourist potential. Also, whilst the revetment remained intact, the sand locked up behind it would be denied to the littoral drift system, thus resulting in an increase in the rate of erosion to the north of the structure.*
>
> *14. Recommendations*
> *…*
> *Rock Revetments have been used extensively in many areas along the coast, particularly on the Gold Coast (Queensland). The effectiveness of these structures is a function of a number of variables including: wave exposure; rock size; height of revetment with respect to peak run-up levels; onshore-offshore sand movement; and whether the shoreline is stable, accreting or eroding. It is believed that the available information indicates that in the long term, on an eroding coastline, particularly where the erosion is due (or partially due) to a longshore drift differential, revetment type structures are an ineffective means of controlling an erosion problem. At best, a well designed and constructed revetment will hold a shoreline and protect buildings for a limited period of time (but because of its presence will cause a gradual loss of beach). At worst, the same well designed revetment may be destroyed in a single storm, accelerate erosion and cause a rapid and total loss of the beach.*

Any success which has been attributed to revetments in similar beach system conditions, such as one the Gold Coast (Queensland), is believed to be the result of the associated works (for example, the sand nourishment programme). That is, it is the sand nourishment which is providing the protection against the long term erosion in the case of the Gold Coast, the revetments only serve to limit short term fluctuations in the position of the shoreline. This interpretation can be supported by actual events, for example on some of the Gold Coast Beaches where revetments have been built, but no associated works have been carried out, there have occurred a number of spectacular failures.

The Revetment option cannot therefore be recommended as a basic management option for regions within the study area. Revetments may however be usefully included in some other major works, such as beach nourishment and groynes, to provide a landward limit for short term fluctuations in shoreline position.

The Plan needs to identify that rock revetments on their own were identified in the 1978 Department of Public Works study as an ineffective means of controlling an erosion problem, will eventually be undermined, and recommended that they not be used as a basic management option for Belongil. The anticipated longevity and design-life of proposed rock walls needs to be clearly identified.

The Department of Climate Change (2009) note:

Building a protective structure of modest height is often quite affordable, but the cost of these structures rises significantly with the square of the height; a structure twice as high costs four times as much. Given sea levels are projected to rise for hundreds of years, protective structures may only play a role in protecting very high value assets and in transiting to a planned retreat phase for many locations around the coast that will be unable to sustain the ongoing and increasing expense of such structures.

The Department of Climate Change (2009) also note:

Many protection works will have a decadal life, as they will be constructed to a particular standard that will be exceeded over time with climate change. As indicated in Chapter 2, the effectiveness of beach nourishment will decrease over time as beaches switch from being stable to eroding ... The public will often call for protection when private property is threatened by coastal erosion. However, the use of protective structures can also lead to a false sense of security and encourage greater development in areas behind protective structures, than for similar locations that do not have protective barriers.

Costs

• Construction and ongoing maintenance costs could be high

• Expectations that area will continue to be protected can limit the flexibility of retreat options in the future

• Costs are likely to be much higher if structures fail, because their construction encourages development in protected areas compared with similar but unprotected areas

• Impacts on areas upstream or downstream of protective works include loss of coastal and marine habitats

BMT WBM (2 November 2010) in a letter to Council about their modelling state:

The model results indicate, in brief summary, that:

- the seawalls have acted as small ‘headlands’ that have trapped sand on their updrift (eastern) side;

- this ‘headland’ effect has tended to stabilise the shoreline east of each structure and transfer the erosion that would otherwise have occurred naturally on the eastern side to the western side;
- where seawalls have been built to the west of other seawalls, they have the progressively cumulative effect of transferring the erosion that would otherwise have occurred along the protected area to the western side of the most western seawall; and
- a similar effect of the seawalls occurs in response to sea level rise in which the shoreline recession that would otherwise occur would be, at least in large part, transferred to the shoreline west of the seawalls.

...

Similarly, the subsequently constructed seawalls along Belongil Spit have affected the erosion further west but have not been the sole cause of that erosion; ... the walls will increasingly exacerbate the erosion of the western end of Belongil Spit over time.

The Byron Bay Erosion Protection Structures – Risk Assessment (Worley Parsons 2013) identifies that

> *Patterson found that the seawalls have acted as small “headlands” that have trapped sand on their updrift (eastern) side, transferring the erosion that would have otherwise occurred naturally on the eastern side to the western side. Patterson (2010) also found from the results of the modelling that the Jonson Street seawall had some initial impact on the erosion at Belongil Spit, and that the subsequently constructed seawalls along Belongil Spit have affected the erosion further west. Patterson (2010) also found that the erosion was, “in significant part, the result of natural sand losses from the beach system”.*
>
> *...*
>
> *At Belongil Spit north-west of the seawalls, where 27 m of shoreline recession occurred between 1999 and 2011 according to photogrammetry data supplied by OEH and following construction of the coastal protection works in the Manfred Street area (Figure 17).*
>
> *...*
>
> *The most northerly erosion protection structures along Belongil Spit may have exacerbated long term foreshore erosion on their downdrift side (as determined through analysis of photogrammetry data), potentially reducing the available habitat at the entrance to the Belongil Estuary. Photogrammetry analysis indicates that 8 m of foreshore dune recession (as measured by recession of the 4 m contour) occurred between 1999 and 2011 near the mouth of the Belongil Estuary, compared with no foreshore dune recession between 1977 and 1999 (Figure 18). This 8 m recession may be partially an effect of the erosion protection structures at Belongil Spit, as the recession distance diminishes with distance north from the northerly limit of erosion protection structures. Patterson (2010) modelled the incremental recession north-west of the most north-westerly seawall to be around 15 m between 2000 and 2010 (Figure 22).*

The 'Byron Bay Shoreline Erosion Research application of shoreline erosion model' (Patterson2010) models future coastal erosion with and without seawalls up to 2050, identifying significantly increased erosion due to seawalls.

There can be no doubt that the existing Belongil rock walls have already resulted in increased erosion updrift, and that this will increase into the future. Council fails to acknowledge the existing impacts and does not consider future impacts.

Sand Nourishment

WMB Oceanics (2000 p57) estimate that from 1947-99 the area of beach from Memorial Pool to Belongil Creek *"has lost about 1,000,000 cubic metres of sand from the sub-aerial (above MSL) dunal system over this 52 year period"*. This is some 20,000m^3 per annum from the beach (with some walls in place), with a further 30,000-45, 000m^3 per annum likely to be lost below water. This is 50,000 to 65,000 m^3 per annum. As seas deepen erosion losses will increase.

For Belongil the WBM Coastline Management Study (2004, pp 6-25, 26) had as Option C2 "Beach Nourishment with End Control and Terminal Protection". This involved the upgrading the existing seawalls over the 1.5 km of developed frontage, constructing an *"artificial headland or a T groyne"* at the western end of the developed area, and the initial importation of one million cubic metres of sand.

The up-front costs of the Study's preferred protection measures were estimated as being $26.2 million. With additional significant annual maintenance costs and the need to pay to replenish the sand supply at least every 20-30 years, or after the next major storm washes it away.

Patterson Britton & Partners (PBP, 2006) identified various significant flaws with WBM Oceanics (2004) estimates for sand nourishment, most notably that the proposed sand nourishment would require 2,850,000 m^3 of sand and cost $ 51.9 million.

Based on the lowest assessment of estimates of satisfactory beach widths, WRL decided a *"minimum dry beach width of 20 m at +2 m AHD (elevation derived below) was adopted to maintain beach amenity"*. They then (sec 9.4) apply a series of assumptions, with no allowance for sea-level rise and the increasing sand volumes required over time, to identify the design volume, stating "*Note that the ARI of the erosion event (approximately 120 m3/m) which would result in zero beach width for the design nourished profile at +2 m AHD is between approximately 5 and 25 years*". Meaning that there will be regular and prolonged periods when there will be effectively no beach in front of the rock walls.

Based on their simplistic assessment WRL claim " *a sand volume of approximately 120 m3/m above AHD (with 240 m3/m below AHD, 360 m3/m total added native volume) would be needed to provide acceptable dry beach amenity following a 1 year ARI erosion event*".

Compared to previous studies WRL (2015) reduce the renourishment period from 25 years down to 1-10 years to reduce the initial fill amounts required down to 1,080,000 m3, and assume that the renourishment volume required will be up to 45,000 m3/year. Because of their failure to consider sea-level rise in their calculations WRL fail to account for the fact that the volumes required will increase over time as the sea deepens (and underwater volume requirements increase), and refraction off the rock walls becomes more frequent.

Despite assuming renourishment will be required every 1-10 years WRL do not take this into account in their costings. WRL also fail to account for the refill required after storms (ie on average every 5-25 years) will require replacement of the initial fill amount - possibly more than 6 times over the 36 year design life (particularly as storm intensity and return times are increasing).

There are also a variety of errors in WRL's (2015) data. For example PBP (Sec 6.5.2) discuss at length the significance of the "depth of closure" as one of the key parameters, noting "*It is necessary, however, to establish the likely depth to which the beach profile will develop as this will govern the quantity of sand required to achieve a specific volume above MSL or a specific widening*

of the beach". From their analysis of the data Patterson Britton & Partners (2006) determined an *"average value for dL of 8.5 m and consequently an average value for di of 17 m"*, where dL is the seaward limit of extreme surf related effects" and d_i being the limit of significant onshore-offshore sand transport. Patterson Britton & Partners (2006) state:

> *Delft Hydraulics Laboratory indicate that for purposes of determining the subaqueous nourishment volume it would be usual practice to define a transition zone below the depth dL out to the depth di in which the thickness of the nourishment volume decreases linearly to zero*

For Belongil beach Patterson Britton & Partners (2006) specifically state "*depth of closure of approximately -17 m AHD*" (p94). BMT WBM (2013) also discuss this at some length, while they do not identify an applicable depth, they state:

> *On that basis, the depth of closure to cater for sea level rise over a planning period of 100 years will be greater than that adopted for shorter durations. Typical parameter values derived for the study region wave climate suggest a longer term (approx. 100 years) depth of closure in the range 15-16m. However, this does not provide for the concept of accumulation at the lower part of the equilibrium profile translation to balance upper profile erosion, on which the Bruun Rule is based. Nevertheless, use of the Hallermeier (1981) limiting depth (di) of significant net cross-shore sand transport is not recommended. This is given as HsmTsm(g/5000d50)0.5, where subscript m denotes the long term median values and Ts is the significant wave period and d50 is the median grain size in metres. The recorded wave data indicates approximate values Hsm=1.35m and Tsm=9s, yielding a limiting depth (di) of about 36m.*

In his paper "**Shore-face profile response time-scale and its significance for shoreline evolution"** Patterson (2013) identifies that for coastal recession "a depth of closure of about 18-22m is appropriate, corresponding to a Bruun Rule slope factor of about 45:1".

It is thus incorrect for WRL (2015) to claim in their "Table 9.6: Quantities Used in Nourishment Calculations" that "PBP (2006)" adopt a "Closure depth" of "-8.5 m AHD". Most significantly, because they assume (without any justification) the closure depth will only be 10m they have significantly under-estimated required nourishment quantities. Because of the significance of this parameter on sand-nourishment requirements WRL need to justify their decision to ignore the evidence and adopt an unrealistic depth of closure.

Though the bigger problem is that many of the parameters relied on by WRL are just guesstimates and they have made no attempt to model how their proposed structures will affect sand transport and sand losses.

As noted by the Committee on Beach Nourishment and Protection (CBNP 1995 p167-8):

> *Although beach nourishment projects have been carried out actively for several decades, there is still not an adequate methodology to predict their detailed performance. This is due in part to the complicated alongshore and cross-shore transport processes, the near uniqueness of every setting for such projects, and the generally inadequate monitoring of both the forces on and responses of past projects to provide a basis for assessment of available methodologies and guidance for their improvement"*

CBNP (1995) state:

> *The design of a successful beach nourishment project depends on an understanding of the underlying causes of erosion at the site and a capacity to model or evaluate quantitatively*

the coastal processes, such as wave climate variations and the cross-shore and alongshore transport rates of sediments (p141).

Good design is an iterative process that requires attention to detail. Beach nourishment design involves selecting the project's length, profile cross-section, dune height, use of structures for erosion control, sediment characteristics, and borrow source.

Analysis is an important tool by which various designs or elements of a design can be objectively evaluated. For beach nourishment, analysis brings knowledge on coastal processes to bear on the evaluation of alternative designs. Analytical and numerical models of alongshore sand transport and cross-shore transport are examples of coastal process models that are important in beach nourishment project analysis. (p190).

CBNP (1995 p212) emphasise the need to use *"analytical and numerical models and **not** just the average background rates"*. CBNP (1995 p3) consider it essential in beach nourishment projects that *"state-of-the-art engineering standards are used for planning, design, and construction"* (p3) and that improved project design requires *"an ability to model and evaluate coastal processes quantitatively"* (p6).

As noted by CBNP (1995 p168-9) *"simple analytical prediction procedures are best suited for the less complex geometries and for preliminary design in the early phase and scoping of the volumes, costs and renourishment intervals. More complex geometries, including the effects of structures, require the use of numerical models".* And (p183) *"Due to the complexity of the interaction of sediment transport processes with coastal structures, predictions of the performance of beach nourishment projects in the presence of coastal structures will usually require the use of numerical models. Knowledge of the interaction of coastal structures with beach systems is on the edge of the state of the art".*

CBNP (1995, p177) state:

An important tool in the design and implementation of many beach nourishment projects is the application of computer models that simulate the processes of alongshore sediment transport and the resulting evolution of the shoreline planform. Such models incorporate equations that relate sediment movements to the nearshore waves and currents. They also include a continuity equation that in essence keeps track of the total volume of beach sediment as it is redistributed alongshore and permits computations of the resulting patterns of shoreline recession and advance. ...the use of numerical models has become a standard tool in the design of beach nourishment projects involving the U.S. Army Corps of Engineers ...

Similarly Leatherman *et. al.* (1994) recognise *"Accurate designs are essential for predicting beach-fill longevity and maintenance requirements"*. Leatherman *et. al.* (1994) caution:

Predictability of the performance of beach nourishment is still poor in spite of its increasing use. This lack of understanding exists because: (1) predictive models of beach behaviour in response to varying hydrodynamic forces are still relatively crude tools for engineering purposes and (2) most completed projects did not include adequate post-emplacement monitoring to allow for objective project assessment and necessary adjustment of designs (Davidson et. al. 1992). Therefore, each beach fill remains, in part, an educated experiment. Although many believe that there is sufficient understanding and inherent flexibility within the

procedure to produce practical and successful designs (Delft Hydraulics, 1987), this confidence is not universally accepted.

…A Delft Hydraulics (1987) report summarises our present understanding: "an exact forecast of the behaviour of the beach fill is not possible, not even in the case where a large number of data of the relevant areas is available". At the present stage of technology, beach nourishment is more art than science...

Even if WRL's (2015) highly questionable guesstimates that 1,080,000 m^3 of sand will be required for initial nourishment, and 45,000 m^3/year to top this up, they have not identified a feasible source for the sand. WRL (2016) mislead the public with their pretence that "The adaptive management scheme is flexible and staged, without large scale nourishment", because the maintenance of a beach will require periodic large scale (>1 million cubic metres) nourishment with increasing frequency.

The lack of a source of sand for sand nourishment has always been the problem with the pretence that an artificial beach can be maintained in front of rock walls. The previous draft Coastal Zone Management Plan (Parsons Brinckerhoff 2009) states:

Importantly, the Cape Byron Sand Lobe is considered the only potential local source of sand which might be suitable for the purpose of large scale beach nourishment.

Following consideration of the complexities and perceived costs associated with accessing the lobe as outlined in the study, Council resolved unanimously to abandon any further consideration of sand nourishment from the Cape Byron Sand Lobe (Resolution 06-157).

In the absence of a suitable offshore sand source for beach nourishment, the recommended coastline hazard management options involving beach nourishment were, therefore, unachievable as recommended by the Byron Coastline Management Study (2004).

Importantly, the perceived impacts of implementing 'hard' protection works in the Byron embayment without a complimentary beach nourishment program would result in large off-site impacts such as loss of beach access, loss of beach amenity, environmental degradation via exacerbated down drift erosion, and ongoing maintenance issues.

These impacts are unacceptable with respect to principles of ecologically sustainable development, environmental protection, and public access and use of the beach. The perceived impacts would also contravene the requirements of a suite of state and federal legislation and policy including (but not limited to) the NSW Coastal Policy (1997), NSW Coastline Hazards Policy (1988), NSW Coastline Management Manual (1990), and the NSW Coastal Protection Act, 1979.

The Office of Environment and Heritage (OEH) advised Council on the 14 January 2015:

A small-scale sand nourishment scheme is thus considered the most feasible and reasonable impact mitigation strategy over the short to medium term for the adaptive management approach advocated. Development and finalisation of a scheme should be an action of the CZMP implementation strategy. This scheme would need to be set up prior to the construction of the proposed seawall.

It is the view of OEH that a solution to mitigate projected impacts from the seawall protection strategy must be thoroughly investigated, determined, and ready to implement before commencing the approvals, upgrade and/or construction of permanent approved seawalls along

Belongil Spit. Development and finalisation of a solution to mitigate the projected seawall protection strategy impacts should be the key first action of the CZMP implementation strategy.

A self-filling groyne would not be a 2nd phase element beyond the upgrade of seawall structures because without the nourishment, the off-site impacts from a self-filling groyne simply cannot be managed. The possible construction of groynes may be staged over many years subject to the monitored performance of a sand nourishment scheme.

This advice from the OEH was recently updated as per a letter to Council, dated 20 February 2015, as follows:

"Further, I understand there has been concern from Council and Belongil residents regarding recent advice from OEH advocating the seawall element of the so called "adaptive (or staged) management approach" to be contingent on the sand transfer scheme being in place to offset the adverse off-site impacts of a seawall. The Minister has recently advised OEH that in principle he supports the adaptive management approach currently proposed that would appear to have the general support of the Council and Belongil residents. Whilst the Minister is keen to ensure the sand transfer system remains a key element of the CZMPs adaptive management approach, he has listened to resident concerns and would permit the seawall component to be constructed prior to the sand transfer scheme in order to alleviate the threat to the properties. The Minister asked that this position be conveyed to council to update prior advice from OEH on this particular requirement."

OEH (Don Arnold, 18 August 2015) advised Council:

Should council choose to proceed with adopting the adaptive management approach recommended in the CHMS, then some key issues would need to be resolved prior to the finalisation of the draft CZMP if it is to meet the certification requirements of section 55 of the *Coastal Protection Act 1979*. The key outstanding concern is that there is no assessment of feasible options for the proposed sand nourishment scheme to protect and preserve beach environments and beach amenity, and to manage associated impacts from coastal protection works.

As previously advised, the Minister would consider the seawall component to be constructed prior to the sand transfer scheme in order to alleviate the threat to properties. However, the Minister was unequivocal in reinforcing that nourishment to offset impacts was an essential element of the proposed approach.

OEH (Don Arnold, 18 August 2015 Appendix A) notes:

adaptive approach. If Council is to adopt the approach recommended in the CHMS then Council would need to demonstrate the practical feasibility of these issues prior to the finalisation of the CZMP.

As per comment #9 above, sand nourishment still remains uncertain. It is recommended that Council undertakes a more detailed investigation into small scale nourishment options as a matter of priority. Funding assistance for this investigation may be sought under the Coastal Management Program 'Hot Spot' allocation at any time throughout the year (refer to covering comments).

It is noted that the discussion on the recommended Managed Adaptive Scheme fails to describe the possible impacts that may result in the absence of a sand nourishment scheme.

The WRL Hazard Study states:

Section 55M of the Coastal Protection Act (1979 as amended) states that the consent authority must be satisfied that proposed works should not: "unreasonably limit or be likely to

unreasonably limit public access to or the use of a beach or headland". This is a reason for including nourishment and/or sand retaining groynes within several shortlisted options. However, since the works are intended to be staged and may involve delays in sand nourishment, alongshore pedestrian access during times of beach erosion has been incorporated into the seawall crest (Figure 9.1).

WRL (2016) state:

While detailed data is not available, on the premise that following a minor to moderate storm (approximately 1 year ARI), the sand levels against the seawalls (without nourishment) would be approximately 0 m AHD, as shown in Table 9.6, a sand volume of approximately 120 m_3/m above AHD (with 240 m_3/m below AHD, 360 m_3/m total added native volume) would be needed to provide acceptable dry beach amenity following a 1 year ARI erosion event.

WRL (2015) note " *Subject to determination of the wall alignment, portions of the seawall (including the walkway) may be on road reserve, crown land or private land*". Maintaining access to a path along the top of a rock wall (assuming private property owners agree) does not substitute for maintaining access to, and enjoyment of, a public beach.

WRL (2016) state *"relative to the status quo, the cost of increasing beach width (above the status quo) over a 1 km stretch of Belongil is not economically viable".*

The WRL (2016) estimates of sand nourishment volumes required are highly questionable in terms of initial volumes and maintenance volumes. They are likely to be significantly under-estimated, do not account for the effects of rising sea levels and do not account for the need to replace the initial quantities following storms with a current 5-25 year frequency (which will also increase over time). WRL (2016) mislead the public with their pretence that "The adaptive management scheme is flexible and staged, without large scale nourishment", because the maintenance of a beach will require periodic large scale (>1 million cubic metres) nourishment with increasing frequency as sea levels rise and storms become more intense.

Even if WRL's (2016) highly questionable guesstimates that 1,080,000 m^3 of sand will be required for initial nourishment, and 45,000 m^3/year to top this up, are adopted there is no identified source for the sand. In the absence of any identified source for sand nourishment the option for rock walls and groynes can not be the preferred outcome of the CZMP, meaning that Planned Retreat must be retained and properly implemented as it is the only option that meets the requirements of Part 4A section 55(C) of the CP Act to protect and preserve beach environments, beach amenity and undiminished public access to beaches.

Costs of Protection

In 1979 Byron Shire Council resolved that it *"favours the groyne management option"*, though recognised that because of the very large costs involved it would be unable to implement that strategy or even to plan the funding of such a strategy. It therefore proceeded down the "planned retreat" path. There can be no doubt that in an era of rising sea levels and increasing storm intensities that any protection strategy is going to become increasingly expensive to implement and more vulnerable to failure over time.

In the February 2003 Peer Review of the draft WBM Coastline Management Study, one reviewer states *"The extent of works required and their likely long-term costs means that it is likely a*

protection option will drive the need for intensification of development in order to fund the overall scheme. The Gold Coast in Queensland is a good example of the product of protection strategies. Property values and operating costs (such as rates) are so high for coastal property that intensification is essential to fund the protection option."

In the February 2003 Peer Review, Professor Thoms, then Chair of the Coastal Council, notes *"The Gold Coast can afford an expensive combination of sand nourishment and terminal wall/dune protection because of strong financial backing from state governments (Qld and NSW) and the City Council. Some of the options outlined by WMB Oceanics are in the Gold Coast league and require population intensification to sustain unless subsidised by the State Government in perpetuity. Given that there are other beaches in NSW under threat, this could be regarded as a least likely (although not impossible) outcome."*

One of the strategic questions identified by Professor Thoms is *"is it envisaged that there will be population intensification (high rise, medium rise) for the Clarks to Belongil section of a scale to justify a rate of revenue which will pay for on-going maintenance of beach works ("hard" plus "soft")?"*

The other issue is whether it is wise to allow more intensive development in erosion hazard areas, irrespective of the provision of protective measures.

As noted by the Committee on Beach Nourishment and Protection (CBNP 1995):

> *In view of the uncertainties that can affect the level of shore protection, it is not prudent to lower or eliminate construction or building location standards that are based on prefill hazard assessments or to alter dune protection setback requirements in a beach nourishment project benefit area"* (p13*),*
>
> *…government authorities should establish and maintain construction and location requirements to set construction back from the storm hazard regardless of whether a beach nourishment project is in place* (p156), and
>
> *… establish and maintain construction standards for buildings or lots within the benefit area of a beach nourishment program* (p156).

In relation to development rights the WBM Coastline Management Study (p5-9) recommends:

> *include clear statements in planning instruments of Council's policy toward erosion management – that even if physical works are implemented, these should only be taken as temporary measures that could cease in the future and no longer have any effect after that time. Accordingly, it is at the property owners own risk that development occurs. These statements should clarify the reasonable expectations that residents should hold when living with a coastal erosion hazard zone;*
>
> *The following could complement a works option, designed to mitigate erosion:*
>
> > *review the planning provisions currently in Part J of the DCP and Section 34 of the LEP (as amended by amendment 66) to clarify that land between the 50 and 100 year hazard line should not be developed if it is not already and if currently developed, should not be intensified;*
> > *the current planning provisions for land between the immediate impact line and the 50 year hazard line should not be altered, other than allowance of more permanent buildings, without the requirement for 12 hour evacuation;*

maintain provisions in planning instruments, other than those changes suggested above;
increase enforcement of planning instrument provisions;

Similarly, the WRL Hazard Study (p.v) states:

> *Subject to the realisation of projected global climate change and sea level rise, ongoing recession of the beach and ongoing monitoring, there may be a time in the future when protection options are no longer viable.*

Even if Council does not increase development rights, if it adopts the proposed protection measures it is taking on a commitment to maintain them over time. The November 2003 "Peer Review" of the WBM Coastline Management Study notes:

> ***It is imperative that Council can meet any financial obligations incumbent upon the recommended management strategy.*** *For example, if future developments are approved by Council based upon a level of certainty provided (for example) by an adopted protective management strategy, there may be a necessity for Council to adequately maintain the protective works in perpetuity for said consents to remain legally binding. Alternatively, Council may be required to adequately maintain protective works in order to meet duty of care obligations for developments approved on the assumption of a certain level of protective* (sic) *being afforded.* ***Under the Coastal Protection Act 1979, as amended in 2002, Council is also required to ensure that the beach environment and amenity are protected.***

The CZMP needs to make it clear that there should be no increase in development rights or lessening of setback requirements based on pre-protection hazard assessments due to the temporary nature of such works and the ongoing threats posed by sea-level rise and extreme weather events.

It is irresponsible for Council not to consider that it may be taking on a legal liability to maintain the works in perpetuity, and leave itself vulnerable to legal action and massive compensation if it later attempts to abandon the works. Council is also reckless for not considering its legal obligations *to ensure that the beach environment and amenity are protected* and the likely costs of meeting those obligations. Council is similarly reckless for not assessing the likely impacts of the works on the Elements resort and the potential magnitude of compensation payments that could be required.

While Council is pretending that they can just build the rock wall and avoid financial liability for the groynes and sand nourishment required to off-set the impacts on the beach and updrift, this is sheer fantasy. Council's pretence of an "adaptive" response is a charade because ongoing coastal erosion and recession will inevitably remove the beach and increase erosion updrift. These are impacts that Council will be required to mitigate, sooner rather than later. Council must identify its liabilities for maintaining the walls and mitigating their impacts over the long-term. This must include all potential future costs and identify funding responsibilities.

In response to Greater Taree Coastal Zone Management Plan (CZMP) the Environment Minister Rob Stokes announced (26 September 2014) that while he supported the CZMP he did not support the construction of a rock revetment wall at Old Bar and refused to contribute to funding the works. The Minister stated:

Through detailed research, we know the option to construct any protection structure at Old Bar is likely to transfer the problem to future generations to deal with, which is unacceptable.

In addition, the cost of the revetment wall was estimated at $50 million with a lifespan limited to about 50 years, leaving the community and Council with the same problem in the long term.

Environment Minister Rob Stokes told ABC radio (29 September 2014):

The State Government - being aware of course of the precedent it would set for other areas along the coast - is not in a position to entertain that quantum of funding

Given the Government's refusal to commit any funding to the construction and maintenance of rock revetments at Old Bar, Council must adopt realistic costings by assuming that the NSW Government will not contribute towards the costs of rock walls and associated works at Belongil, unless and until the NSW Government agrees to contribute.

B3.3 Other Areas and B3.4

The Plan states:

"Revise and update coastal hazard land use and development planning controls - for development at The Pass to Clarkes Beach, Main Beach, Cavvanbah (First Sun Caravan Park to Border Street), and North Beach, providing for adaptation of development".

This is a meaningless statement that provides no guidance as to the management regime that is to be applied.

Table 8 is similarly a meaningless tick-a-box exercise, where all the boxes are ticked. meaning anything goes. The only activity that is limited is *"Coastal or flood protection works (short term or long term) Seawalls"*, which is only allowed for Belongil and Main Beach.

The Plan needs to provide clear and unambiguous guidance as to the management regime that is intended to be applied at Pass to Clarkes Beach, Main Beach, Cavvanbah (First Sun Caravan Park to Border Street), and North Beach rather that making meaningless and vague statements.

B3.5. Coastal Hazard Risk Management Implementation Schedules

SECTION MISSING

Appendix 1 Executive Summary Coastal Hazard Management Study Byron Bay Embayment (WRL, 2016)

SECTION MISSING

Appendix 2 Historical approach towards coastal hazard risk management in the Byron Bay Embayment

SECTION MISSING

Implementation of Planned Retreat

It is wrong for Council to pretend that Planned Retreat (in principle) only began to be implemented in 1988. It was applied by the Department of Public Works from when they published their Byron Bay-Hastings Point Erosion Study in 1979. It is understood (A. Gordon pers.comm) that any houses approved after that date in the coastal erosion zone at Belongil were required to be demountable.

On 7 August 1980, in a letter from D.D. Lloyd, Department of Public Works to The Shire Clerk (BSC File:T3.24, No.2, 49-53), it is stated:

> *… As you are aware the Department has published the Byron Bay-Hastings Point Erosion Study in which the 50 and 100 year erosion hazard lines are shown.*
>
> *The Department considers that these design erosion lines indicate a realistic boundary for determining the types of development, in land-use, and development strategy along the coastline.*
>
> *Generally, the area to the east of the 50 year design erosion hazard line is one where the Department considers that permanent structures are subject to unacceptable risk as it is highly likely that they would be destroyed within a life time of the structure. The Department therefore considers that the area should be set aside for activities such as recreation, caravan parks, moveable and demountable type structures and buffer areas for dunal restoration. All of the above is intended to permit capital investment of a nature which can be removed prior or in the face of imminent threat due to erosion. Furthermore, should damage occur, the cost of the structure damaged should be minimal and may be acceptable to the community.*
>
> *Generally, the area located between the 50 and 100 year design erosion hazard lines the Department does not object to development. However, the developer should be warned that the area may be subject to serious threat within the design periods specified.*
> *…*
> *It is appreciated that the design erosion hazard zones shown are general, and as stated in your letter, lesser shoreline recession rate may be determined depending upon the factors taken into account. The Department's assessment incorporates an appreciation of the accuracy of the findings, and the realization that a buffer zone and a frontal dune must be provided in front of any development. …*

It is important to recognise that for North Beach the Minister made Byron Local Environmental Plan Nos. 4 and 5 on 30 September 1983 which amended Interim Development Order No.1 and identified an Environmental Protection (Foreshore) area from which development was to be excluded. In the Public Works Department's submission (Draft Local Environmental Plans, Globetrotters' and Moss' Sites. Letter from D. Pettigrew, Public Works Department, to The Shire Clerk, 1 September 1983, BSC File: P23-1331) it is stated:

> *…The Department concurs in the proposed clauses 35B (3) (c) (i) of plan 4 and 34B (3) (b) (i) which would preclude any building from encroaching into the assessed coastal impact zone as delineated in the maps attached to both plan 4 and plan 5.*
>
> *…"Environmental Protection – Foreshore" areas should remain free of permanent development. The Department would not object to an "open space" use of these areas. However it is considered that public car parking and road uses are inappropriate in these areas. …*

…the Department considers that, where practicable, the "Environment Protection – Foreshore" areas should remain free of development …

The Shire Engineer's Report of 26 March 1985 (Sunrise Beach Resort Development – (Coral Investments) – Review of coastal aspects by P.W.D. Ordinary Meeting (BSC File: P24-329) states:

It is advised that Council has no overall management strategy to either combat or alleviate the long term coastline recession as identified in the Byron Bay/Hastings Point Erosion Study. The only viable options identified in the study, to prevent the continuation of erosion, involve major works (i.e. groynes, revetments or continual sand nourishment) and expenditure that is well outside Council's current financial capabilities.

Dune management and preservation works, involving fencing and vegetation, whilst desirable, are not identified in the study, nor are they considered by the Department, as being substantial enough to have any significant effect on combating or alleviating the long term erosional trend. In other words, these management works do not qualify as "coastal foreshore works" and, even if carried out would not in the Department's view materially affect the assessed location of the 100 year line or the recession rates.

…

On the other hand, however, should Council and/or State Government implement in the future a strategy of foreshore protection works for the Byron Bay/Belongil section of the coastline, then there will be an acceleration of the erosion rate on the Globetrotters site, unless such works are extended to the northern boundary of that site. Obviously such works, if implemented, would either slow down, or arrest the erosion rate thus making more of the Globetrotter site available for development since the present 100 year erosion line would be effectively translated in a seaward direction.

Council, at present, has no adopted management strategy for coastal foreshore protection works for the Byron Bay/Belongil area, although there is a resolution on the books from 1979 that Council "favours the groyne management option" from the Byron Bay/Hastings Point Erosion Study. If Council were to adopt the groyne field, or one of the other similarly expensive options from the Byron Bay/Hastings Point Study, as a strategy, then, because of the very large costs involved, Council would be unable to implement that strategy or even to plan the funding of such a strategy. Moreover, the State Government has steadfastly refused to commit itself to any funding of foreshore works. …

What the Public Works Department appears to be concerned about here is that, should the development of the site proceed now and, at some future point in time, State Government and/or Council decides to carry out foreshore works to protect the Byron/Bay/Belongil section of the coastline, it will then be necessary to extend, at public expense, these works to protect the Globetrotters site.

…

Additionally there would seem to be little point in any strategy that is not coupled with a realistic funding programme that will ensure its implementation.

…

<u>RECOMMENDATION</u>: (1) That Council advise the Department that its current position is that, as with the rezoning, it is intending to consider the development application on the basis of there being no adopted strategy for foreshore protection works, but request that the Department also advise what, if any, additional recommendations it would make if Council

were to continue to stand by its current resolution favouring the groyn field management option for the Byron Bay/Belongil section of the coastline.
[ADOPTED]

As part of process of preparing its 1988 Local Environment Plan, Council's Planning Administrator, Mr. Jim Waugh, announced in July 1986 (North Coast Advocate 30 July 1986) that he had adopted the principles worked out by Council's Coastal Management Committee which were later applied to Council's 1988 LEP and DCP. He announced that "In the interim all development within the erosion zone is to proceed according to the policy". Thereafter the current "planned retreat" provisions were applied to all developments.

The WRL (2015) claim that *"Part J of this plan formally made the public aware of the coastal hazards within the Byron Bay Embayment for the first time"* is patently false and misleading.

WRL (2015) justify their proposed timeframe on the basis that:

> *It should be noted that the typical design life for structures is approximately 50 years. Horton et al (2014) noted that the cost of new residential development is amortised for tax purposes over 40 years based on Subdivision 43-25 of the Income Tax Assessment Act 1997.*

This means that any structures built pre-1979 are now over 37 years old, and those built before 1986 are over 30 years old and any valuation of them must take their age into account.

It is important that the CZMP document the true history of "planned retreat" and that the true dates from when the principles of "planned retreat" be applied, rather than the incorrect date of 1988. Following publication of the Department of Public Work's Byron Bay-Hastings Point Erosion Study in 1979 Council resolved that it *"favours the groyne management option"*, though recognised that because of the very large costs involved it would be unable to implement that strategy or even to plan the funding of such a strategy.

On the 30 September 1983 the Minister made Byron Local Environmental Plan Nos. 4 and 5 for North Beach which first applied the identified erosion hazard lines to delineate an Environmental Protection (Foreshore) area from which permanent development was to be excluded. In July 1986 Council's Planning Administrator announced that Council would begin applying the current "planned retreat" policy to all developments.

PART C COMMUNITY USES

C5 Community Values

Section 5 **Community Values notes:**

> *From the most recent stakeholder engagement activity in 2014 (Umwelt in WRL, 2015) the following values are consistently viewed as the most important drivers for managing the BBE*
>
> - *natural, ecological values and a healthy coastal environment*
> - *access to beaches*
> - *recreational and aesthetic amenity*
>
> *...*

This section totally and unacceptably ignores most of the findings of Umwelt (2014). Umwelt (2014) state:

> *The stand out most important feature nominated by the survey respondents is:*
>
> *• Healthy ocean environment with clean water and lots of marine species.*
>
> *Three related features about aspects of beach access were the next most frequently nominated as the 'most important feature' of BBE:*
>
> *• access to at least one beach;*
> *• access to a variety of beaches that are good in different conditions; and*
> • ease of access to beaches.

Though most importantly Umwelt (2014) attempted to assess community preferences for future management that are totally ignored in this section of the CZMP. The CZMP's pretence that *"The values analysis has been used to inform the preparation of this CZMP, for example to assist with: developing the CZMP management objectives, identifying and prioritising management issues, and with assessing potential management options",* would seem to be wrong as they do not appear to have been considered at all*..*

Umwelt (2014) recognised that *"a clear majority of respondents did not agree that protecting private property is the most important priority for Council in managing coastal hazards"*. Sixty three percent **disagreed or strongly disagreed** with the statement *"The most important priority about managing the Byron coast is to protect existing private property from coastal erosion*" compared to 21% agreeing or strongly agreeing.

More significantly 68% **Disagree and Strongly Disagree** with the statement *"If I had to choose between a rock wall (to protect built assets) and maintaining a sandy beach, I'd go for the rock wall"*, compared to 23% agreeing or strongly agreeing.

Also 66% **Agree and Strongly Agree** that **"**The most important thing about managing the embayment is to retain sandy beaches that are accessible and safe for everyone except in storm conditions".

Based on this Umwelt (2014) state:

> *Supporting these strong views are two other statements:*
>
> *• the most important thing about managing the coast at Byron Bay is to maintain its reputation as a beautiful coastal landscape; and*
> *• the most important thing about managing the coast in the BBE is to retain sandy beaches that are accessible and safe for everyone at all times.*
>
> *Conversely, but consistent with these sentiments, the* ***highest level of disagreement*** *was with the statement:*

> *• If I had to choose between a rock wall (to protect built assets) and maintaining a sandy beach, I'd go for the rock wall.*

Umwelt's 2014 reporting of some issues is strangely obscure, for example one of the strongest responses was in response to the statement *"Council should require that buildings are removed from properties affected by erosion at a future time when certain trigger conditions are met"*, with which 70% of respondents agreed. Similarly 59% agreed that *"Council should require private landowners to remove damaged, under-designed or ad hoc private protection works now"*. These outcomes are strangely obscured, with actual response percentages not provided in Table 2.6, though it is claimed "*see **Table 2.5** for all percentages of responses*", but the responses for both these are not provided in Table 2.5. I had to search the Appendices to find them.

The Plan claims **"**The values analysis has been used to inform the preparation of this CZMP, for example to assist with: developing the CZMP management objectives, identifying and prioritising management issues, and with assessing potential management options". This is plainly false.

While Umwelt have unaccountably obscured some key outcomes favouring planned retreat, Council's failure to identify and consider the outcomes of Umwelt's Community Survey is indicative of a selective and biased assessment, and represents a failure to identify known community values. Council needs to identify and present the key outcomes of the Community Survey that relate to existing and proposed management of the BBE. . Ideally this should also reference previous community surveys.

C6 Recreation and Amenity

Section 6 **Recreation and Amenity** identifies five different landscape classes of beaches (based on naturalness) which are vaguely described, but need to be clearly mapped.

C6.1. Recreational Activities

Section 6.1. concludes:

> *From Table 2, the most frequently nominated 'main' activities across all respondents were:*
> *• going for a swim;*
> *• using the beach with family or friends or groups for exercise and relaxation;*
> *• using the beach by myself – run, walk or other exercise;*
> *• going for a surf;*
> *• using the foreshore reserve for exercise; and*
> *• conservation activities.*

Over half (55%)of the 142 people who responded to the Umwelt (2014) survey reported using a BBE beach daily or at least once a week all year round. A further 26% reported using the beaches between once a week and once a month. Specifically in relation to Belongil beach 37% used it at least once a week, 33% at least once a month and 23% at least once a year. There was slightly less frequent use of Belongil Beach compared to Main and Clarkes Beaches, though this was not significant, and *"If occasional use is added to regular use, the usage across the three main beaches in BBE evens out".*

It is wrong for the Plan not consider and recognise the recreational values of Belongil Beach. Given the significance of the Belongil Beach to this CZMP it is important that its relative significance is clearly identified in the CZMP.

C6.2 Tourism

Section 6.2 Tourism recognises that "*the annual total tourism spend for the Byron LGA was $415 M (Destination NSW, 2013). It is estimated that in 2011, employment arising from tourism expenditure was around 2,500 full time jobs (BSC website, undated)*", further stating *"'going to the beach' is in the second most popular activity for both domestic overnight and daytrip tourists to the Byron LGA, second only to 'eating out at restaurants'. ... of both domestic and international tourists interviewed, 'going to the beach' was the second most popular activity at 76 per cent, second only to 'general sightseeing' at 79 per cent".*

Umwelt (2014) also found that their small sample of the community consider beaches to be extremely important for the local and regional community, noting:

> *... almost 80% of respondents regard the BBE beaches as highly important to the success of the local economy. They agreed that 'Byron Bay town and its beaches as synonymous (31% of responses)' and/or 'Byron Bay beaches attract people to the whole area, not just to Byron Bay town (47% of responses)'.*

Section 6.2 claims that *"From the cost benefit analysis undertaken as part of the Coastal Hazard Management Study Byron Bay Embayment (Appendix N of WRL, 2015), beach related tourism expenditure was estimated to amount to over $115 million annually. Noting this figure assumes that 50 per cent of daily tourism expenditure is spent on beach related activities (WRL, 2015 with data from Tourism Research Australia)".*

GCCM (WRL Technical Report 2013/28 2015) state *"Tourism Research Australia (TRA) visitation data for Byron Bay is incorporated with some basic assumptions about the number of beach trips made on each visit and the proportion of expenditure that can be attributed to a beach visit"*, noting *"Dedicated beach user surveys would be required to determine the number of beach visits taken by each tourist category type visiting Byron Bay, and the distribution of these visits".*

The GCCM assessment is based on some very questionable assumptions, such that only 50% of day trippers visit the beach, and that only 50% of the expenditure on the days they visit the beach is associated with the beach use. This means that only 25% of the expenditure of day-trippers is considered to be beach related (note that this is very different to that claimed by the CZMP). GCCM acknowledge that this is an *"extremely conservative approach*" and that *"real expenditure is believed to be higher than stated in this report, but there is insufficient data to confirm the higher values".*

The GCCM assessment uses highly questionable and dubious assumptions to identify that the 2011 population of Byron Bay of 7,383 makes on average 48 visits to the beach each year, giving a total visitation of 354,384 pa. (presumably people living elsewhere in the shire, such as at Suffolk Park and Ewingsdale, don't visit the beaches of the BBE). GCCM then use the totally inappropriate Travel Cost methodology and a "Fuel only model" derived from the Clarence to ascribe the Consumer Surplus Per Adult Per Visit as $6.10. By extrapolation theses extremely dubious figures are used to value Byron's Beaches as being worth $2,161,742 per annum to the local community. Just based on the given Byron population this means that our beaches are only worth $293 per Byron Bay resident, or $75 per Byron Shire resident, per annum. This is sheer nonsense and grossly undervalues the importance of beaches to local residents. Those of us who have paid a premium for buying or renting houses in Byron Bay know that this is a nonsense

GCCM (2015) then use surf lifesaver data to identify that on average 28.1% of Byron Bay beach visits are to Belongil (which corresponds to the Umwelt 2014 figure of 37% using Belongil at least once a week). WRL (2015) state *"The predominant economic benefits of Planned Retreat accrue to tourists/tourism and the general public in the form of enhanced natural beaches "Appendix N estimates that beach tourism expenditure is approximately $115 million per annum for Byron Shire, of which $32 million is attributed to the beaches between First Sun Caravan Park and the northern end of Belongil"*.

GCCM (2015) then erroneously claim that only 1km (38%) of the 2.6km long Belongil Beach will be affected by the proposed works, which therefore only represents 10.7% of Byron's beach usage. This false pretence is then used to claim that 10.7% of the identified tourism and recreational values are affected by management choices and that this therefore equates to $12,575,762.

GCCM have got it wrong again as all the beach updrift from the Belongil rock walls will be subject to accelerated erosion because of the Belongil rock walls, (as well as becoming inaccessible when there is no beach in front of the rock walls - except along a track ontop the walls, partially requiring trespass through private property). Based on GCCMs rationale the area of affected Belongil beach is actually 62% of Belongil Beach, which represents 17.4% of Byron's beach usage. Using GCCM's dubious and understated tourism and recreational values of beaches, this equates to $20,492,438 which is significantly more than GCCM claim.

It is essential that the CZMP provide valuations of beaches for residents as well as tourists. There has been no adequate identification of the value of beaches for residents. The valuation of BBE beaches as only being worth $293 per Byron Bay resident, or $75 per Byron Shire resident, per annum is based on inappropriate methodologies and assumptions, and grossly undervalues the worth of Byron's beaches to residents.

As noted above, given the significance of the Belongil Beach to this CZMP it is important that its relative significance is clearly identified in the CZMP. GCCM identify that Belongil Beach accounts for 28.1% of the recreational use of BBE's beaches, though then assume that the proposed protection works will have no updrift impacts to pretend that only 38% of the Belongil Beach will be affected by the proposed works and thus claim that only 10.7% of the BBE's main beaches will be affected. In truth, the transfer of erosion to the updrift end of Belongil Beach means that 62% of Belongil Beach, and thus 17.4% of BBEs main beach usage will be affected.

C.7 Beach Access

Section 7 **Beach access and coastal walkways** is deficient in that it only considers access onto the beach and not the importance of the actual beach for recreation, despite recognising that access includes "*pedestrian access along the beach or foreshore for swimming, fishing, walking and other recreational activities*".

Section 7.2 overlays the various existing beach accesses with erosion hazard lines, but makes no attempt to consider how the identified erosion will affect opportunities for future access. This is a useless section.

Section 7.3 Table 4 does make limited attempts to consider impacts, though these are partial, often based on conjecture and highly subjective, for example claims that at the Pass *"Accesses may become damaged and / or unviable as a result of coastal erosion over the 2050 time frame"* are

baseless conjecture which is claimed to be *"Informed by hazard maps at BMT WBM, 2013 (refer Fig 4 and 5)"*, yet there are no hazard lines provided for the Pass, and there is no consideration what-so-ever as to whether access is capable of adaption over time. This example displays a lack of professionalism and objectivity.

The various comments identify a variety of problems with existing engineering works, ie for Cavvanbah "*Rock toe protection poses a 'high' risk in terms of structure resilience, potential for public safety risks"*, for Main Beach "*there are informal, potentially hazardous pathways over rock revetment ... rock protection and groyne restricts access along the beach under most conditions ... Rock protection in front of reserve, and adjacent western side of car park, rated as an 'extreme' and 'high' risk in terms of structure resilience, potential for major injuries as a result of wave overtopping and/or erosion of the structures ... Rock protection in front of western side of Jonson St carpark rated as a 'high' risk re structure resilience, potential for public safety risks as a result of wave overtopping or erosion of the structure ... Concrete ramp at Main Beach has been undermined by large cavities ... Retaining walls tend to funnel sand into access, making it difficult to negotiate by wheelchair users".*

The consideration of ongoing access to beaches is largely based on conjecture, is highly subjective, and does not address the issue of ongoing access as sea-levels rise. There needs to be a summary of the various management issues and the ability to modify access over time to accommodate sea-level rises and increasing storm intensities, both with and without protection works. There needs to be an assessment of how existing and proposed works will affect access along, as well as onto, beaches.

The committee were originally provided with an Appendix 1: Public Beach Access and Walkways Byron Bay Embayment. It was claimed that:

> *The purpose of this study is to describe and assess the current beach access arrangements, including coastal walkways, in the Byron Bay Embayment (BBE) so that high priority management issues may be identified. The information in this study will inform the development of management actions for consideration in the Coastal Zone Management Plan Byron Bay Embayment (draft CZMP BBE) with respect to public beach access.*

This supposed Public Beach Access and Walkways Byron Bay Embayment "study" was just presentation of a series of photographs with a few Council resolutions thrown in. It did not satisfy its stated purpose of describing and assessing current beach access arrangements so that priority management issues may be identified. Council has now dropped that pretend study, which means that what they percieved as a key requirement has simply been dropped.

Belongil Shorebird Site

The Plan (Table 4) recognises that *"Recreational activities, such as exercising unleashed dogs, may lead to negative impacts on shorebird and seabird roosting and breeding area at Belongil Estuary entrance"* and includes as an action (Table 5) *" Implement relevant actions from the North Byron Beach Resort Estuarine and Dunal Management Plan (WetlandCare Australia, 2014) with respect to both public and private beach / estuary access are implemented"* though fails to recognise or consider the access provided by the resort directly into the Shorebird Zone in the mouth of the Belongil Estuary and the current failure to implement requirements, including by Council..

Development Application No. 87/208 was approved on 11 August 1987 with the following conditions:

A. THE FOLLOWING CONDITIONS WILL BE REQUIRED TO BE COMPLIED WITH BEFORE THE RELEASE OF ANY BUILDING APPLICATIONS.

7. *Submission of a management plan to cover the dunal and estuarine areas, specifically to address pedestrian access to the beach and to the creek vicinity. The management and location of walking trails and reafforestation procedures and the inclusion of information guides to the endangered species of the Belongil Creek area.*

In 1990 a fenced area was first established to protect the Little Tern nesting area. In 2003 the Belongil Bird Buddies were formed and they have since been maintaining moveable fences over part of the estuary, trying to discourage dog walkers in the vicinity and undertaking public education. They later became the Byron Bird Buddies.

In relation to planning for this site, DIPNR (2004) note:

> *The assessment must assess the direct and indirect impact of the development upon threatened species and the surrounding environment, including impacts of increased human visitation to the shorebird feeding, roosting and breeding areas at Belongil Spit as a result of the development and the proposed Surf Club facility. It is recommended that threatened species and threatened species habitat should be mapped showing the development footprint and associated infrastructure.*

Byron Shire Council adopted DCP 18 in 2005 that identified a Seabird Habitat Precinct that encompasses the entire area utilised by the shorebirds and seabirds for foraging, roosting and nesting, establishing requirements to direct human movements away from the estuary and to create barriers to prevent access. These requirements were in part incorporated in DCP 2014. Byron Bird Buddies (2007) prepared a management plan for this area in consultation with the NSW Government and Council.

These requirements were again reinforced by Condition 13 of Development Consent No. 5.1987.208.1, which required:

> ***Management plan for the protection of estuarine and dunal areas.***
> *Submission of a management plan to cover the dunal and estuarine areas, specifically to address pedestrian access to the beach and to the creek vicinity, the management and location of walking trails and reafforestation procedures, and the inclusion of information guides to the endangered species of the Belongil Creek area. The management plan must be submitted for approval by Council and incorporate (but not limited to) the following key issues identified by Council and the NSW Marine Parks Authority:*
>
> > *a) A requirement that careful management of the habitat values of the Belongil Creek estuary and environs is undertaken to reduce the potential of the area to degrade due to increased disturbance associated with higher visitation levels resulting from this and any future development on this site. Note: The Belongil Creek estuary and environs are frequented by resident and migratory shorebirds. Some of these birds are threatened species protected under the Threatened Species Conservation Act 1995 while others are international migratory species protected under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Some of these species have nested in and around the Belongil Creek estuary in recent years. Increased usage of Belongil Creek or the beaches around the estuary has the potential to disturb these birds while they are roosting, nesting, feeding or resting to gather energy reserves for intercontinental migration.*
> > *b) A requirement for the continued prohibition of dogs from the Belongil Creek Estuary Zone, dunal areas and the beach. Note: Disturbance from dogs is a key concern in the management of shorebird habitat.*
> > *c) A requirement to develop and implement an education strategy that aims to increase visitor understanding of the ecological values of the Belongil Creek estuary and to minimise visitation and human disturbance in and around the estuary area. Any education program should include interpretive signage.*
> > *d) A limitation that lighting from the development does not spill onto the beach and preferably, that lights from the development are not visible form the beach. Note: The beach adjacent to the site is zoned "sanctuary" and artificial lighting can affect ecological processes, for example, in summer, female turtles may come ashore on beaches in the local area to lay their eggs and lights near the beach can distract and disorient them and any subsequent hatchlings.*

The North Byron Beach Resort Estuarine and Dunal Management Plan (Wetland**Care** Australia 2014) states:

> *Unmanaged recreational access of beach areas around the Belongil Estuary mouth is the key threat to the significant shorebird habitat values of the site (Byron Bird Buddies 2007). Shorebirds are highly sensitive to all forms of recreational use, especially when accompanied by unleashed dogs. Human access disturbs feeding, roosting and breeding activities of shorebirds and may lead some birds to avoid using the area. Recreational activities area known to be a threat to Beach Stone Curlew, Great Knot, Greater Sand-plover, Little Tern, Pied Oyster Catcher, Sanderling, Sooty Oystercatcher, and Terek Sandpiper and minimising disturbances is identified as a Priority Action for all these species (Byron Bird Buddies 2007).*

...

> ***Resort Guest Access***
> *There is an opportunity for resort guests to privately access the beach area from the north eastern extent of the resort development area where the resort adjoins the beach area (access point B). This requires careful management as this access point enters the beach near the mouth of Belongil Creek, part of the dunal and estuarine management zone and the shorebird habitat zone. There is also some risk of ongoing erosion at this point which many be exacerbated by human traffic.*

Due to a high risk of shorebird disturbance at this site, it is recommended that access via this pathway be managed in close co-operation with Byron Bird Buddies and align with objectives of the Shorebird Management Plan. Guests using this access point should be guided through the estuary mouth and shorebird zone toward the beach further north as indicated by track B in Figure 5. It is important that this access point is used primarily as a pathway for guests to access beach areas and that guests are discouraged from scattering or lingering within the estuary mouth area and key shorebird habitat areas. This could be achieved with the use of fencing/bunting and directional/educational signage from the entry of the access point within the resort to guide guests through the estuary and shorebird zone and away from key habitat areas. Temporary exclusion fencing should also be constructed around active nesting areas to avoid disturbance to breeding shorebirds. The North Byron Beach Resort should work with Byron Bird Buddies to assist with managing guest access at the site, especially during key times of shorebird activity.

The Estuarine and Dunal Management Plan identifies a Shorebird Habitat Zone and the direction of guests around it, including as an action:

Design and install signage/fencing to direct guests to northern beach area and prevent scattering into estuary mouth and shorebird zone during shorebird migration and breeding times

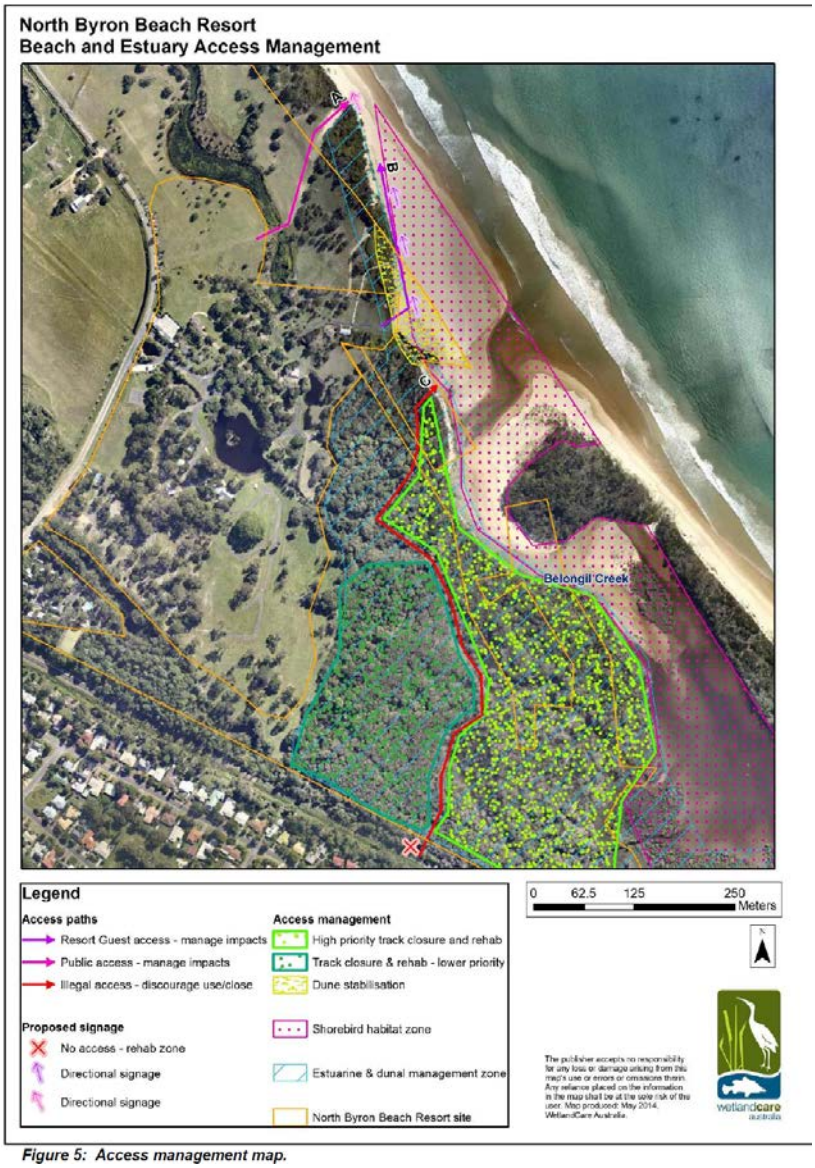


Figure 5: Access management map.

The Commonwealth's 'EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, Commonwealth of Australia 2015' identify significant impact guidelines for 37 migratory shorebird species, of which 21 have been recorded at Belongil.

> Latham's snipe, Bar-Tailed Godwit, Whimbrel, Eastern Curlew, Common Greenshank, **Terek Sandpiper,** Common Sandpiper, Grey-tailed Tattler, Ruddy Turnstone, **Great Knot,** Red Knot, **Sanderling,** Red-necked Stint, Grey-tailed Tattler, Sharp-tailed Sandpiper, Curlew Sandpiper, Pacific Golden Plover, Grey Plover, Double-banded Plover, **Lesser (Mongolian) Sand-Plover, Greater Sand Plover,**

Over the 5 years (7 February 2010 -15 January 2015) the Byron Bird Buddies (Jan Olley, pers.comm) recorded 16 of these species during their surveys (number of occasions are in brackets):

> Latham's snipe (8), Bar-Tailed Godwit (14), Whimbrel (2), Eastern Curlew (18), Common Greenshank (3), Common Sandpiper (1), Grey-tailed Tattler (6), Red Knot (1), Sanderling (1), Red-necked Stint (3), Sharp-tailed Sandpiper (5), Curlew Sandpiper (1), Pacific Golden Plover (30), Double-banded Plover (14), Lesser (Mongolian) Sand-Plover (1), Greater Sand Plover (2).

Two species, Curlew Sandpiper and Eastern Curlew, are listed as critically endangered under the EPBC Act. Both species were recorded in the Shorebird Area by the Australian Museum in the early 1990s and more recently by Byron Bird Buddies. Over the above period Byron Bird Buddies (Jan Olley pers. com) reports regular sightings of 1-3 Eastern Curlews and one record of Curlew Sandpiper (7 February 2010).

The Little Tern is listed as a migratory species protected under international agreements (ie. Bonn Convention, China-Australia Migratory Birds Agreement (CAMBA) and Japan-Australia Migratory Birds Agreement (JAMBA) and protected as a migratory species under the Environment Protection and Biodiversity Conservation Act 1999. Large flocks (with over 200 birds at times) of the Little Tern still regularly roost and feed in the estuary. Historically 30 pairs of Little Terns have been recorded as nesting in the estuary at one time, though they have not been recorded nesting there since the early 1990s.

Roosting sites, such as the mouth of the Belongil estuary, provide areas for the birds to rest safely. The high energy demands on migratory shorebirds as a result of their migratory lifestyle means that resting is a critical part of their life cycle. The particular significance of Belongil is as a stepping stone for birds migrating northwards because there are few roosting areas left on the Gold and Sunshine Coasts, and nowhere as significant for shorebirds in Byron Shire.

The mouth of the Belongil estuary satisfies the EPBC Act criteria for being important habitat as it supports at least 16 shorebird species. The Commonwealth's referral Guidelines recognise that:

> *Human disturbance is a major threat to migratory shorebirds in some areas and can have a significant impact on the quality of habitat available to migratory shorebirds. As such, it is important that shorebird surveys adequately assess the current disturbance regime. This will allow for an analysis of whether cumulative disturbance in the area (for example existing disturbance plus expected disturbance from the proposal) will likely result in a significant impact on migratory shorebirds.*

The Guidelines also state:

Disturbance is emerging as a major conservation issue for migratory shorebirds, particularly because it is so widespread. Certain activities interrupt or prevent feeding during limited foraging periods. Disturbance can also affect roosting birds and cause loss of energy reserves being accumulated for migration.

Actions which involve disturbance at important habitat areas during vital life cycle stages are ***highly likely*** *to be significant. Disturbance can result from residential and recreational activities such as four-wheel-driving, jet- and water-skiing, power boating, fishing, walking, wind-surfing, kite-surfing, walking dogs, noise and night-lighting. While some activities may result in only low-levels of disturbance, it is important to consider the combined effects of disturbance with other threats when determining the level of potential impact of a proposed action. Roosting and foraging birds are most sensitive to discrete, unpredictable disturbances such as sudden loud noises (for example from demolition activities) and from objects that approach them from the water (for example boats). High and sustained levels of disturbance can prevent shorebirds from using all or parts of the habitat.,*

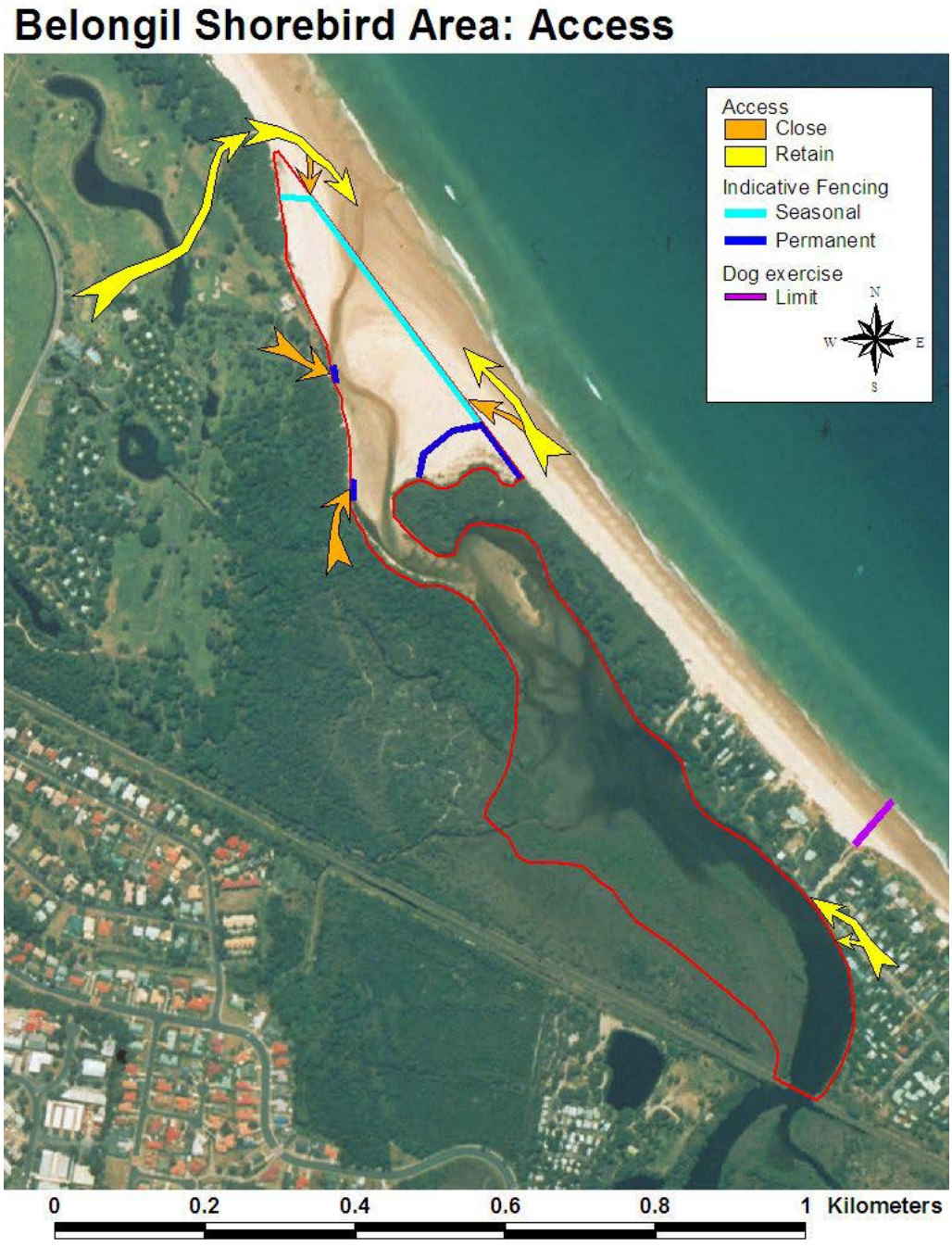
The Commonwealth's Listing Advice for Eastern Curlew states:

Human disturbance can cause shorebird s to interrupt their feeding or roosting and may influence the area of otherwise suitable feeding habitat that is actually used. Disturbance to pre-migratory eastern curlews may adversely affect their capacity to migrate, as the birds will use energy reserves to avoid disturbance, rather than for migration. Eastern curlews take flight when humans approach to within 30–100 metres (Taylor & Bester, 1999), or even up to 250 metres away (Peter, 1990).

A significant impact on migratory shorebirds is taken to include: Increased disturbance leading to a *substantial reduction* in migratory shorebird numbers.

The Plan claims *"Of particular significance is the upper beach berm adjacent to the Belongil Creek entrance which provides for shorebird foraging, roosting and breeding resources. This area is currently zoned 7(j) Environmental Protection Scientific Zone under the Byron LEP 1988, and acts as a surrogate conservation area for significant wader and shorebird species (Parker and Pont, 2001 and Byron Bird Buddies, 2007), refer Figure 3"*

This misrepresents the area used by most of the migratory species, which use the open sandflats in the mouth of the estuary for roosting and nesting. The currently zoned area is misplaced, and then only covers a small breeding area suitable for some permanent residents (ie Pied Oystercatcher). The Belongil Estuary Seabird and Shorebird Management Plan (Byron Bird Buddies 2007) identifies a small area for permanent exclusion and the extensive sandflats as a seasonal exclusion area for migratory shorebirds and seabirds:



The location of the estuary opening significantly affects the sandflats available for nesting as it is the sandflats to the east of the creek that are best protected from human interference and predators.

The Belongil Estuary Study and Management Plan attempted to compromise between the desire of the Byron Bay Beach Resort to stop the stream eroding the dunes on which the Bayshore building was located and the need to avoid the 7(j) Scientific zone by creating the opening *"halfway between the bird protection area and the Byron Bay Beach Club ... at right angles to the beach".* . The timing and position of openings will have also affected the shorebird area around the mouth of the estuary, though these effects were not assessed. Council failed to undertake the required assessments in accordance with the *Environmental Planning and Assessment Act, 1979* and the *Water Management Act 2000*.

Fifteen years after changing the opening strategy, and 14 years after a Belongil Estuary Opening group was formed in 2002 to devise a Draft Strategy on behalf of Byron Council, the estuary is still being opened under conditional interim licences which require limited monitoring of some water quality and wetland vegetation parameters - the impacts on the shorebirds are ignored. The Belongil Creek Entrance Opening Strategy is being developed, based upon the objective:

> *To ensure that the estuary mouth is opened in such a way as to maintain the health and vigour of riparian vegetation, the biodiversity of aquatic organisms and meet the EPA water quality standards (ie protects aquatic ecosystems and allows safe swimming in the estuary).*

The Belongil Estuary Seabird and Shorebird Management Plan (Byron Bird Buddies 2007) notes:

> *The location of the opening will also affect the potential breeding habitat. Naturally the estuary mouth is trained by a north-west littoral drift and would usually open to the north, though the opening strategy has been to reduce potential erosion of the Bayshore building by opening the estuary near the historic fenced bird breeding area. The Bayshore building has now been removed and consideration needs to be given to undertaking any artificial opening in the vicinity of where it would naturally occur. This may allow for greater development of the sand spit, increase the protection from predators for the open sandy areas and enhance its suitability for nesting.*

The resort has recently created an access directly into the Shorebird Habitat Zone for their guests where they allow unrestrained access and have begun promoting the estuary for swimming, kayaking, and stand-up paddle-boarding. At the same time the regular estuary openings have been moved further to the south-east, redirecting the opening away from the resort, effectively making most of the sandflats contiguous with the resort and removing the natural barrier provided by the estuary. This significantly reduces the area of sandflats available for roosting and nesting by most shorebirds. The combined impacts have been a significant reduction in the area available for roosting by migratory shorebirds.

These aerial photographs show the recent openings of the estuary shifting to the south-east, the moving of the creek away from the resort's main access and the reduction in the area available for shorebird roosting (ie to the east of the creek): The promotion of the estuary for recreation is further reducing the utility of the greatly diminished shorebird area.

February 2012

May 2015

It was irresponsible for the resort to discharge their patron's into the main shorebird roosting area. Their development consent and Management plan commit them to funnelling people along the shore, outside the Shorebird Habitat Zone, onto the beach. Yet the resort is already using the Shorebird Habitat Zone as its beach.


Resort entrance, April 2016, showing beach within the shorebird area extending from the resort up to edge of estuary, with seating in the shorebird habitat area and no impediments to access to the estuary.

The resort has also been actively promoting the estuary within the Shorebird Habitat Zone for recreation, in April, following complaints the resort *"suspended kayaking and stand-up paddle boarding in the creek, which were trialled during the Easter weekend"* (Echo 6 April 2016). As well as directly affecting the foraging area for the shorebirds, this increased usage dramatically increases disturbance effects on shorebirds and leaves little of the shorebird area habitable by most species.

As well as impacts on shorebirds, the waters of the Belongil Creek are heavily polluted by runoff from Acid Sulfate Soils and urban areas, as well as treated sewerage. They are unlikely to be safe for primary contact recreation.

Recreational facilities within the shore-bird area (April 2016).

Remaining Shorebird Area, April 2016, **limited to a small area of vegetated sand dunes, with none of the necessary sandy flats included, and highly vulnerable due to increased recreational use of the estuary.**

The resort is also intending to hold frequent events, involving night-time music and lights. Even If these are managed to minimise impacts on the shorebird area, they could still have a significant impact. Music from a beach-front wedding (the resort's first major event) on the 2nd April 2016 was so loud that residents at nearby Sunrise complained to the resort, police and council. Such noisy events have the potential to scare away wildlife, with a particularly significant impact if undertaken in or near the shorebird area. This needs rigorous review.

The Shorebird Habitat Zone is also being threatened by coastal squeeze due to coastal defences (currently sandbags) being constructed around the estuary adjoining the resort to protect it from coastal erosion. The effect is to stop the landward migration of the estuary sandflats as sea-levels rise, with erosion being increased due to protection works on Belongil. The outcome will be ever diminishing shorebird roosting and nesting areas.

Photo showing placement of sandbags as coastal defences around the boundary of the shorebird management zone, limiting the retreat of shorebird sandflats in response to rising seas.

The Elements resort and Council have ignored decades of efforts to ensure the shorebird roosting and nesting area is protected and instead developed the shorebird area into the resort beach. The loss of the migratory shorebird's roosting area due to visitor disturbance and re-direction of the creek are significant impacts. With the major increase in guests resulting from this latest approval, and the recreational use of the shorebird area being actively promoted and expanded, this will have a significant impact on migratory shorebirds, as well as use of the area by the critically endangered Curlew Sandpiper and Eastern Curlew.

The relocation of the opening of the estuary changing the location and protection of roosting areas, sandbagging of the landward extent of the shorebird management area stopping the retreat of the sand flats in response to coastal erosion, increased recreational use of the shorebird area scaring away shorebirds, and periodic disturbances caused by major events on or near the roosting area, there has already been changes in the nature, extent, duration and timing of impacts, increasing their likelihood and consequences, that will result in changes in bird numbers and species diversity.

It is considered that the increasing recreational usage of the shorebird area and the changing of the estuary opening are likely to have a significant impact on an important habitat for *listed migratory shorebird species* and should have been referred for consideration to the Federal Environment Minister under the EPBC Act. It is considered that it was grossly irresponsible by Council to move the estuary opening so as to reduce the usable shorebird habitat and for the resort to use and promote the sandflats and estuary in the Shorebird Habitat Zone for recreation.

The Plan has failed to identify the access provided by Elements directly into the Shorebird Habitat Zone and the current impacts this is having on a Federal Matter of Environmental Significance. It is not good enough to leave management of such an important site up to the adjacent resort. It is essential that the landowner take responsibility for the site and ensure that it is appropriately managed.

PART D OPEN COAST ECOSYSTEM HEALTH

Principle 8 of the objectives of a CZMP is:

> *Maintain the condition of high value coastal ecosystems; rehabilitate priority degraded coastal ecosystems*

The CZMP Guidelines *"specify the minimum requirements that are to be met when preparing a draft CZMP, in addition to the requirements in the Act. The additional requirements in these guidelines relate to:*

> *coastal ecosystems (Section 4.1)*

In Section 4.1. the Coastal Zone Management Plan Guidelines identify for **Coastal ecosystem health:**

> Minimum requirements: coastal ecosystems
> **A CZMP which addresses coastal ecosystem management is to include:**
> • a description of:
> – the health status of estuaries within the plan's area
> – the pressures affecting estuary health status and their relative magnitude
> – projected climate change impacts on estuary health (section 55C(f) of the *Coastal Protection Act 1979*), based on council's adopted sea level rise projections or range of projections.
> • proposed actions in the implementation schedule to respond to estuary health pressures (section 55C(e) of the *Coastal Protection Act 1979*)
> • an entrance management policy for intermittently closed and open lakes and lagoons (ICOLLs)
> • an estuarine monitoring program, consistent with the NSW Natural Resources Monitoring, Evaluation and Reporting (MER) Strategy.

The Guidelines identify a large number of considerations for estuaries. It is considered that changes in coastal erosion due to accelerated erosion due to the proposed protection works will have particularly significant impacts on:

> Changes to tidal exchange, salinity regimes and inundation levels (e.g. altered entrance conditions for ICOLLs, berm status, entrance training works)

The Guidelines also identify that:

> *A CZMP may address pressures on other coastal ecosystems if actions are proposed by council or a public authority over the CZMP's implementation period to address any management issues relating to these ecosystems. These coastal ecosystems include:*
> - *open coast ecosystems such as dunes, sandy beaches, rock platforms*
> - *other ecosystems within the coastal zone such as freshwater wetlands and littoral rainforest.*

In order to avoid having to consider the Belongil Estuary, the CZMP limits its assessment to "Open Coast Ecosystems". The CZMP variously defines "Open Coast Ecosystems" as *"Ecosystems within the open coastal zone such as dunes, sandy beaches, rock platforms"*, or claims "*The general habitat types of the 'open coast' of the BBE include:*

- *marine waters,*
- *deep sub-tidal areas with sandy substrates,*
- *shallow nearshore and offshore reefs e.g. Wilsons Reef, Bait Reef,*
- *inter-tidal sandy beaches and shores,*
- *inter-tidal rocky reefs and shores,*
- *coastal dunes and associated vegetation communities, and*

- *the rocky islet of Julian Rocks.*

Council has certainly stretched credibility by claiming *shallow nearshore and offshore reefs e.g. Wilsons Reef, Bait Reef* and *the rocky islet of Julian Rocks* as being within the coastal zone (when they clearly are not), while at the same time excluding the Belongil estuary and Littoral Rainforest from their narrowed definition of coastal ecosystems despite their location within the identified coastal zone.

The fallacy of Council's resolve to exclude any consideration of the mouth of the Belongil estuary is discussed in section 'A1.4. CZMP planning area' of this submission. The parameters of the requirements are to consider the coastline and beaches that will be affected over the planning timeframe. As identified above, this includes the beach in front of the walls, the Belongil spit, and the mouth of the Belongil estuary, including most of the Shorebird Precinct and nearby vegetation. This is particularly so given that the intent of the plan is to use rock walls to transfer erosion from Belongil beach onto the mouth of the Belongil spit and estuary.

Aside from the Belongil estuary, elsewhere within the embayment the loss of beaches and coastal squeeze are likely to have significant impacts on:

- **meiofauna and macrofauna inhabiting sandy beaches, and the shorebirds and fish that feed on them;**
- **turtle breeding sites; and,**
- **the Endangered Ecological Community Littoral rainforest.**

The Coastal Zone Management Planning Guidelines identify that *"Decisions on any coastal or flood protection works should consider any adverse impacts from the works, including increased off-site erosion or flood levels, reduced beach access and environmental impacts"*. There can be no doubt that the existing rock and rubble walls at Belongil are causing increased erosion to the north-west, and that this impact will intensify into the future (see section 'Rock Walls' 'B3.2 Belongil Beach and B3.4', and the discussion on Belongil Beach below).

Council's responsibility to consider the mouth of the Belongil estuary is amplified by the requirement to consider the environments affected by the proposed rock walls. Council has ignored the Coastal Zone Management Planning Guidelines requirement to "*consider any adverse impacts from the works, including increased off-site erosion or flood levels, reduced beach access and environmental impacts*". It is evident that Council's proposed rock walls do not satisfy the requirements to "*maintain the condition of high value coastal ecosystems*" and "*rehabilitate priority degraded coastal ecosystems*", though they do not care.

BELONGIL ESTUARY

The failure of the Council to consider the impacts of their adopted option on the mouth of the Belongil estuary is unacceptable. As acknowledged it will significantly increase erosion updrift from the walls. This will result in significant erosion of the Belongil spit and estuary, the Shorebird Habitat zone, including a variety of state and nationally threatened shorebirds and seabirds, endangered ecological communities as well as changing the nature of the estuary and its opening.

This includes significant impacts on 2 matters of national environmental significance, the Critically Endangered ‘Littoral Rainforest and Coastal Vine Thickets of Eastern Australia’ and 'Migratory

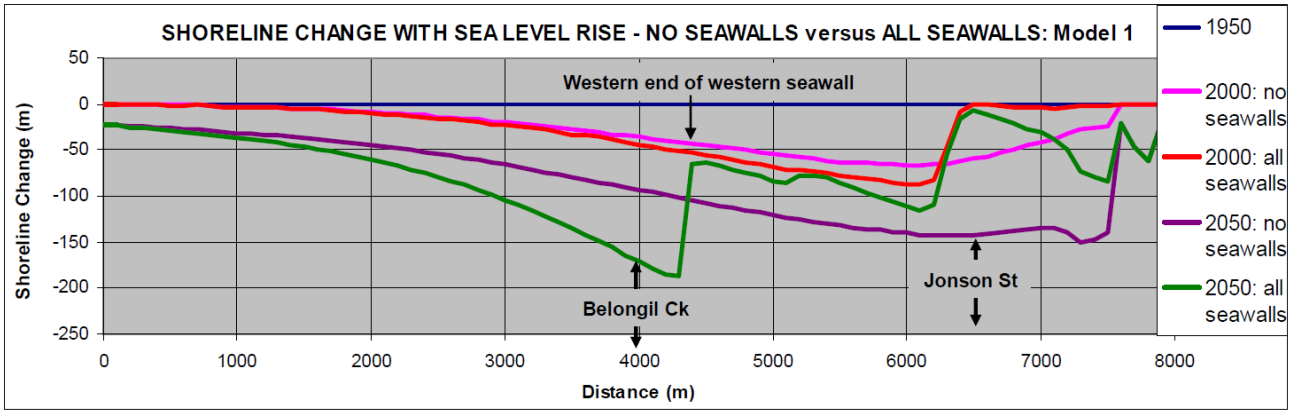
Shorebirds', that should be referred to the Federal Environment Minister in accordance with the EPBC Act.

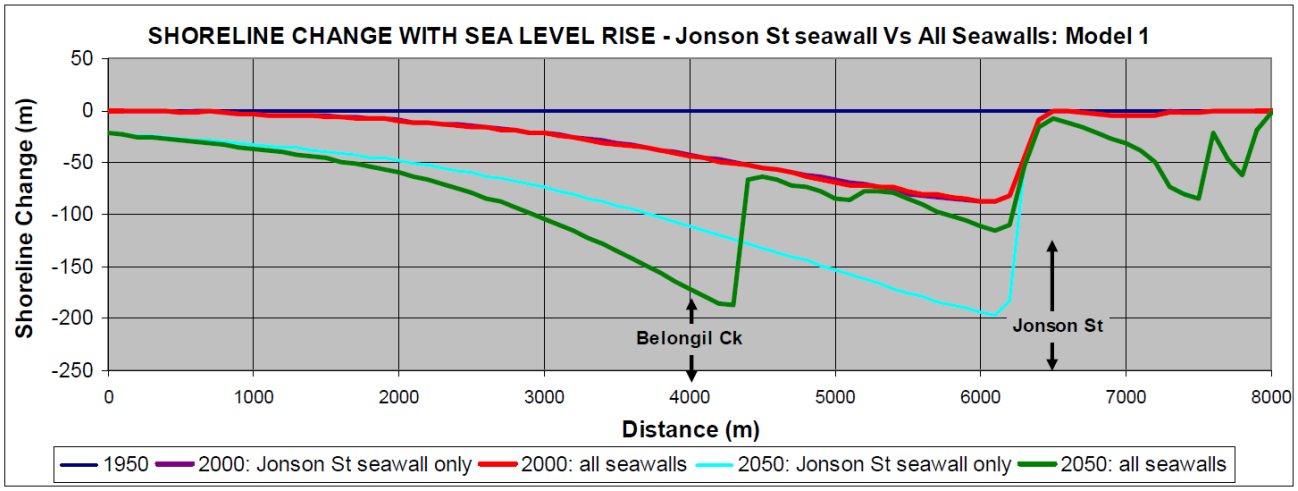
Given that Byron Shire Council refuses to undertake any assessment of the likely environmental impacts of their proposed seawalls, an indicative assessment was undertaken by identifying indicative recession lines in relation to the estuary and mapped environmental features.

The Plan relies upon the simplistic 'stylized' erosion hazard lines identified in the 'Byron Shire Coastline Hazards Assessment Update' (BMT WBM Pty Ltd 2013), with Figures 4-43 Erosion Hazard Zones – Scenario 1 (Belongil Spit seawalls retained), and Figure 4-45 Erosion Hazard Zones – Scenario 2 (Belongil Spit seawalls removed) being the most relevant. Regrettably the identified hazard lines make no attempt to account for variations in erosion rates with distance from headlands and rock walls. These stylized erosion lines do not accurately represent the future erosion lines updrift of the Belongil rock walls. The dip shown around the current mouth of the Belongil estuary is merely indicative.

Figure 4-43 Erosion Hazard Zones – Scenario 1 (Belongil Spit seawalls retained) **(**BMT WBM Pty Ltd 2013)(

The 'Byron Bay Shoreline Erosion Research application of shoreline erosion model' (Patterson2010) identifies a more realistic erosion profile as it incorporates the 'zeta curve', whereby the greatest erosion is immediately updrift of the structure and thereafter tapers off with distance. Patterson (2010) modelled erosion up til 2050, using two models and various scenarios with or without rock walls.





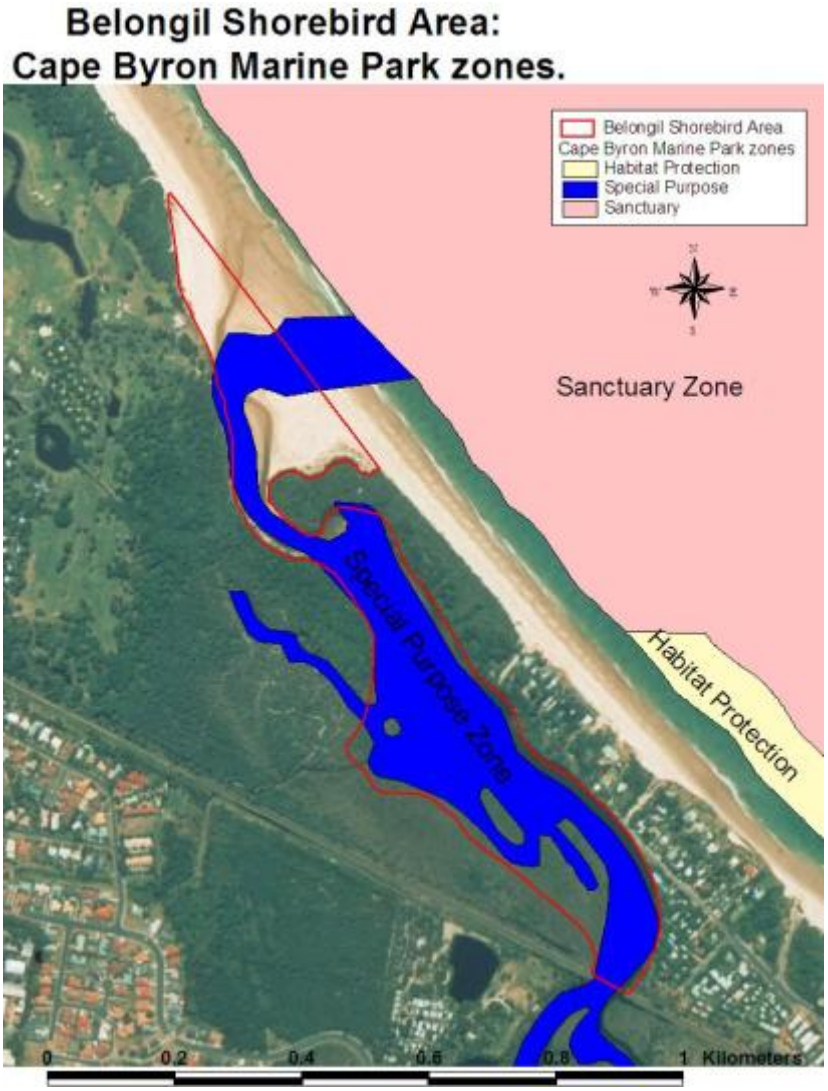
The most telling aspect of these models is that the erosive force is focussed immediately updrift of the walls. Patterson (2010) dentified that "*Breakthrough to Belongil Ck immediately west of western seawall likely within 20-30 years*". For illustrative purposes, indicative 2050 and 2100 erosion escarpments based on a hybrid of the above estimates

The hybrid lines on the map below are intended to indicate the erosion scarp by 2050 both with and without the Belongil Rock walls, and the indicative erosion scarp in 2100. The railway bridge and railway embankment will act to limit the shoreward migration of the estuary. While the spit is actively eroding on the seaward side, it is not apparently migrating inland on the estuary side. The erosive force being directed at the end of the wall and the erosion of the spit updrift, means it is likely that the estuary will most frequently open at the end of the walls. Once the sea breaks through estuary it is likely to regularly scour out the bank on the other side, meaning that the indicative estuary changes will be far greater than that mapped.

Based on this, it can be expected that, if the rock walls at Belongil are rebuilt and expanded, that by 2040 (at least) most of the Belongil Spit updrift will have been eroded, the back of the estuary will effectively become the coastline (ie the 100 year line), and the estuary mouth will be near the end of the seawalls.

THIS MAP SHOWS INDICATIVE MODELLED EROSION SCARPS INTO THE FUTURE. IT IS APPARENT THAT ONCE THE SEA BREAKS THROUGH THE SPIT THAT THE COAST WILL RAPIDLY REALINE WITH THE BACK OF THE ESTUARY.

The Marine Parks Authority have zoned the Belongil Estuary as a Special Purpose Zone that is intended to be for protection and rehabilitation of environmental values, while allowing for traditional Aboriginal uses.



In relation to both The Belongil Creek and Tallow Creek SPZs, MPA (2006) note:

> *These special purpose zones include the waters and tidal wetlands of Belongil Creek and Tallow Creek for the protection and rehabilitation of the creeks. A permit from the Marine Parks Authority is required for any harvesting activity (collecting and fishing) and will only be issued for important Aboriginal ceremonial and cultural events. Permits are also required for rehabilitation works and research.*

It is abundantly clear that the retention and upgrading of the Belongil rock walls is already, and will continue to, significantly accelerate erosion of the spit to the north-west, with most of the spit likely to be eroded within the next 15-25 years. This is causing accelerated erosion of the Belongil Spit, including Council's Community Land and the coastal sections of the Cumbebin Swamp Nature Reserve, along with the Littoral rainforest they encompass and a significant part of the Shorebird Habitat Zone.

The increased erosive force focussed at the end of the seawall will tend to open the estuary in that vicinity, particularly as the spit erodes away. The diminishing spit and migration of the estuary opening are likely to open the northern part of the current estuary up to the sea, so shoreline progression is then likely to be rapid. This means the indicative 100 year erosion line could be reached in decades rather than a century. Certainly the loss of the spit would have an immediate

effect on the endangered Littoral Rainforest and Swamp Oak Floodplain Forest fringing the western bank of the estuary. Without any barrier there is likely to be a relatively rapid realignment of the coast with the western bank of the estuary, oceanic inundation of the endangered Saltmarsh and Paperbark Swamps and sedgelands will become increasingly frequent. A large part of the Belongil Creek Special Purpose Zone of the Cape Byron Marine Park, and the Belongil Shorebird Habitat Zone, will be effectively lost. While the sandflats used for roosting by Migratory Shorebirds will be diminished by then, as the coast realigns with the back of the estuary there will be little room left for sandflats.

The Elements resort is attempting to stop the essential landward migration of the estuarine systems, wetlands and littoral rainforest in response to rising sea-levels at the same time as Council is proposing to accelerate coastal erosion. The endangered Littoral Rainforest, Swamp Oak Floodplain Forest. Swamp Sclerophyll Forest and Saltmarsh communities will largely be squeezed into oblivion by the rising sea-levels on one side and the new development on the other.

The accelerated erosion of the spit north of the existing walls is not being matched by a landward migration of the diminishing spit. The landward migration of the estuary is hampered by the alignment of the railway line, the position of the railway bridge, and the Elements resort. The forced migration of the Belongil spit is likely to be too rapid for natural processes to adapt to, so the spit is just being eroded away.

Byron Council remains in denial that their proposed rock walls and groynes will have any impacts on the natural environment, and have refused to consider the impacts that the redirection of erosion from Belongil beach onto the end of Belongil spit and the mouth of the creek will have. It is certain that the accelerated erosion, increased storm damage, increased ocean inundation and altered estuarine processes caused by the Belongil rock revetments will have significant impacts on:

- **the dynamics of the estuarine processes, including the functioning of the ICOLL, opening of the estuary and the ingress of seawater;**
- **beach, marine and estuarine biota in the Cape Byron Marine Park;**
- **Littoral rainforest in the Cumbebin Swamp Nature Reserve**
- **the shorebird nesting and roosting area, including three State endangered and 13 vulnerable waterbirds, 2 Federally critically endangered shorebirds, and 22 migratory shorebirds;**
- **Endangered Ecological Communities Littoral rainforest, Coastal Saltmarsh, Swamp Oak Floodplain Forest and Swamp Sclerophyll Forest;**
- **a SEPP 14 wetland; and**
- **seagrass and mangrove communities**

D1.1. Flora

The Plan gives no regard to the Endangered Ecological Communities occurring on the Belongil sand spit and around the mouth of the estuary despite these being the most affected by the increased coastal erosion resulting from the Belongil seawalls. The Endangered Ecological Communities *Littoral Rainforest* Swamp Oak Floodplain Forest, Swamp Sclerophyll Forest and Saltmarsh are all likely to be affected.

The Littoral Rainforest on the Belongil spit and around the mouth of the estuary is *Cupaniopsis anarcardiodies, Synoum glandulosum*, simple notophyll-microphyll, mid-high closed forest. It

qualifies as the NSW Endangered Ecological Community *Littoral Rainforest in the NSW North Coast Bioregion* and the Commonwealth Critically Endangered 'Littoral Rainforest and Coastal Vine Thickets of Eastern Australia'.

The Commonwealth's 'Littoral Rainforest and Coastal Vine Thickets of Eastern Australia' identifies as a threat:

> *Climate change may directly impact on the listed community by changes to rainfall and temperature regimes and by an increased intensity of coastal processes. This may include changes to inundation regimes and an increase in severity and frequency of storm events. Storm events may directly damage the forest canopy and increase the chances of weed invasion and establishment within the rainforest.*

In accordance with the EPBC ACT referral guidelines the increased erosion resulting from the seawalls will directly impact on the critically endangered Littoral rainforest by eroding the Belongil spit and the stands thereon and removing the protection the spit provides to inland stands resulting in inundation and storm damage.

There are four sclerophyll associations identified on the Belongil spit and around the estuary Coast Banksia-Horestail Oak, Coast Banksia-Paperbark, Broad-leaved Paperbark-Bare Twig rush swamp open-sclerophyll forest, and Baumea juncea-Juncus maritimus sedgeland.

Most of the Broad-leaved Paperbark-Bare Twig rush swamp open-sclerophyll forest, and Baumea juncea-Juncus maritimus sedgeland qualifies as the Endangered Ecological Community Swamp Sclerophyll Forest. The stand of mapped Coast Banksia-Horestail Oak on the western banks of the estuary has been identified as the Endangered Ecological Community Swamp Oak Floodplain Forest, and it may be more widespread through this mapped community.

For both Swamp Sclerophyll Forest and Swamp Oak Floodplain Forest the NSW Scientific Committee recognises: "Anthropogenic climate change may also threaten ... if sea levels rise as predicted or if future flooding regimes are affected (IPCC 2001, Hughes 2003)".

The mapped saltmarsh qualifies as the Endangered Ecological Community Coastal Saltmarsh. While most of the mapped saltmarsh is to the south of the likely breakthrough of the Belongil Spit, it will be directly affected by the changed estuary opening and changed estuarine processes. The NSW Scientific Committee recognises: *"Global warming and increased relative sea level are likely to pose an increasing threat to the survival of many areas of Coastal Saltmarsh (Adam 2002, Hughes 2003)"*.

By eroding the Belongil spit and initiating a breakthrough to their north, the Belongil seawall will expose the Endangered Ecological Communities Littoral Rainforest, Swamp Sclerophyll Forest, Swamp Oak Floodplain Forest and Coastal Saltmarsh to erosion, oceanic inundation and increased storm damage which will have significant deleterious impacts. It is clearly wrong for the Plan not to recognise and assess these impacts.

D.1.2 Open coast fauna

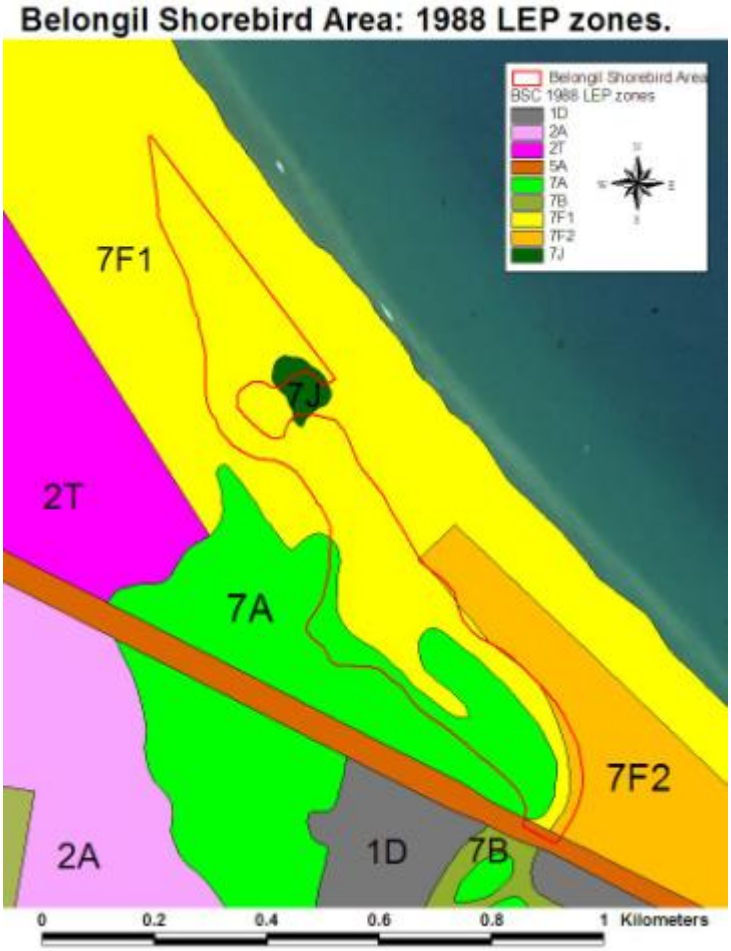
Threatened and Migratory Birds

The mouth area of the Belongil estuary is the most significant roosting and breeding area for shorebirds in Byron Shire, and an important habitat for other waterbirds. Under State listings three

endangered waterbirds regularly utilise the Belongil estuary and 13 vulnerable waterbirds use it to varying degrees, including as a nesting site. Two shorebirds are listed as critically endangered under the EPBC Act. Twenty two species of birds recorded at Belongil breed in other countries and migrate to Australia for feeding each year, with seventeen of these migrating over 4,000 km from breeding grounds in artic regions.

(The section Belongil Shorebird Site in C.7 Beach Access of this submission deals with aspects of this more fully).

The 1988 Byron Local Environmental Plan attempted to establish a 7(j) Scientific Zone over the then Little Tern nesting area at Belongil, though it was misplaced so as to only include part of the nesting area.



The Marine Parks Authority (2003) note "*Belongil Spit is a nesting site for the little tern, osprey, pied oystercatcher and great knot (Parker 2001b) and a foraging area for the pacific golden plover and beach stone curlew (NPWS records). Pied oystercatcher chicks and fledglings have been observed in the area on several occasions (D. Rhoweder pers. comm.).*

Byron Shire Council's Development Control Plan No. 18 for the "Becton Site and Adjoining Lands" identifies a Seabird Habitat Precinct of 19.6 hectares located in the mouth of the Belongil Creek estuary, upstream from the coastal mean high water mark to the railway bridge. The bulk of the site is public land, with about 1.3. hectares being over private lands under various ownerships. 11.9 hectares of this is mapped as being within the Cape Byron Marine Park. The Precinct encompasses the entire area utilised by the shorebirds and seabirds for foraging, roosting and nesting,

establishing requirements to direct human movements away from the estuary and to create barriers to prevent access. These requirements were in part incorporated in DCP 2014. Byron Bird Buddies (2007) prepared a management plan for this area in consultation with the NSW Government and Council.

These requirements were again reinforced by Condition 13 of Development Consent No. 5.1987.208.1 for the Elements resort, which stated:

> *a) A requirement that careful management of the habitat values of the Belongil Creek estuary and environs is undertaken to reduce the potential of the area to degrade due to increased disturbance associated with higher visitation levels resulting from this and any future development on this site. Note: The Belongil Creek estuary and environs are frequented by resident and migratory shorebirds. Some of these birds are threatened species protected under the Threatened Species Conservation Act 1995 while others are international migratory species protected under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Some of these species have nested in and around the Belongil Creek estuary in recent years. Increased usage of Belongil Creek or the beaches around the estuary has the potential to disturb these birds while they are roosting, nesting, feeding or resting to gather energy reserves for intercontinental migration.*

A large variety of birds use or visit the Belongil estuary, Jan Olley of the Byron Bird Buddies (BBB) recorded 114 bird species using the lower estuary in 2005, with up to 700 individuals being recorded at one time (BBB 2006). Eighty seabirds, shorebirds, waterbirds and other wetland associated birds have been identified in various surveys by Jan Olley, Peter Parker and the Australian Museum within the shorebird area. Sixteen of these species are listed under the Threatened Species Conservation Act (1995) as threatened species.

The most significant species are the endangered Curlew Sandpiper, Eastern Curlew, Little Tern, Black-necked Stork, and Beach Stone-Curlew. Curlew Sandpiper and Eastern Curlew, are listed as critically endangered under the EPBC Act. They and the Little Tern are listed as a migratory species protected under international agreements (ie. Bonn Convention, China-Australia Migratory Birds Agreement (CAMBA) and Japan-Australia Migratory Birds Agreement (JAMBA) and protected as a migratory species under the Environment Protection and Biodiversity Conservation Act 1999. Large flocks (with over 200 birds at times) of the Little Tern still regularly roost and feed in the estuary. Historically 30 pairs of Little Terns have been recorded as nesting in the estuary at one time. Regarding Little Tern nesting at Belongil, NPWS (2003b) note:
A traditional site known to have been used in the past by up to about 30 pairs (Smith 1990). Since 1974 used irregularly by up to seven pairs (Morris, 1979, Clancy 1987), most recently by one pair in 1992/93 (Morris and Burton 1995).

There is a record of Beach Stone Curlews attempting to nest in the estuary in 1982, and they have been regular visitors in recent years. The Black-necked Stork forages in and around the mangrove area.

Thirteen species are identified in NSW as Vulnerable to extinction: Lesser (Mongolian) Sand-Plover, Sanderling, Terek Sandpiper, Great Knot, Greater Sand Plover, Sooty Tern, Pied Oystercatcher, Sooty Oystercatcher, Osprey, Black Bittern, Australasian Bittern, Bush-hen and Brolga. A pair of Pied Oystercatchers nest in the mouth of the estuary, while the Sooty Oystercatcher, Lesser Sand-Plover and Sanderling are regular visitors that nest elsewhere. Like the Black-necked Stork, the Black Bittern, Bush-hen and Brolga can be expected to favour the central area. The Osprey hunts

over the whole area, and has been recently recorded nesting on a pole in the central area and to the west on the Element's resort.

The Commonwealth's 'EPBC Act Policy Statement 3.21—Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species, Commonwealth of Australia 2015' identify significant impact guidelines for 37 migratory shorebird species, of which 21 have been recorded at Belongil.

> Latham's snipe, Bar-Tailed Godwit, Whimbrel, Eastern Curlew, Common Greenshank, **Terek Sandpiper,** Common Sandpiper, Grey-tailed Tattler, Ruddy Turnstone, **Great Knot,** Red Knot, **Sanderling,** Red-necked Stint, Grey-tailed Tattler, Sharp-tailed Sandpiper, Curlew Sandpiper, Pacific Golden Plover, Grey Plover, Double-banded Plover, **Lesser (Mongolian) Sand-Plover, Greater Sand Plover,**

Over the 5 years (7 February 2010 -15 January 2015) the Byron Bird Buddies (Jan Olley, pers.comm) recorded 16 of these species during their surveys (number of occasions are in brackets):

> Latham's snipe (8), Bar-Tailed Godwit (14), Whimbrel (2), Eastern Curlew (18), Common Greenshank (3), Common Sandpiper (1), Grey-tailed Tattler (6), Red Knot (1), Sanderling (1), Red-necked Stint (3), Sharp-tailed Sandpiper (5), Curlew Sandpiper (1), Pacific Golden Plover (30), Double-banded Plover (14), Lesser (Mongolian) Sand-Plover (1), Greater Sand Plover (2).

Two species, Curlew Sandpiper and Eastern Curlew, are listed as critically endangered under the EPBC Act. Both species were recorded in the Shorebird Area by the Australian Museum in the early 1990s and more recently by Byron Bird Buddies. Over the above period Byron Bird Buddies (Jan Olley pers. com) reports regular sightings of 1-3 Eastern Curlews and one record of Curlew Sandpiper (7 February 2010).

The Little Tern is listed as a migratory species protected under international agreements (ie. Bonn Convention, China-Australia Migratory Birds Agreement (CAMBA) and Japan-Australia Migratory Birds Agreement (JAMBA) and protected as a migratory species under the Environment Protection and Biodiversity Conservation Act 1999. Large flocks (with over 200 birds at times) of the Little Tern still regularly roost and feed in the estuary. Historically 30 pairs of Little Terns have been recorded as nesting in the estuary at one time, though they have not been recorded nesting there since the early 1990s.

Roosting sites, such as the mouth of the Belongil estuary, provide areas for the birds to rest safely. The high energy demands on migratory shorebirds as a result of their migratory lifestyle means that resting is a critical part of their life cycle. The particular significance of Belongil is as a stepping stone for birds migrating northwards because there are few roosting areas left on the Gold and Sunshine Coasts, and nowhere as significant for shorebirds in Byron Shire. The Commonwealth's referral Guidelines recognise that:

> *Within estuarine environments, principal roost areas include: exposed sands at estuary mouths and on adjacent beaches, saltmarshes that are only marginally submerged during high tide, grassy areas adjacent to estuaries, mangroves, nearby freshwater wetlands, claypans, and occasionally, rock groynes and exposed reefs.*

A variety of seabirds and shorebirds require open sandy areas for nesting, relying upon camouflage of themselves, their eggs and their chicks, along with water barriers and/or distance from dense vegetation, to protect them from predators. For example, NPWS (2003b) note:
Little Terns nest on the ground in the open. …Nests are typically located on flat or gently sloping ground, on a loose, sandy substrate with abundant surface shell grit or pebbles, and bare or almost bare of vegetation. The birds appear to select sites with good visibility all around for the sitting bird, and with good camouflage for the mottled eggs and chicks…. Some birds will nest on bare sand, but such nests are more prone to predation.

> *Nesting habitat is also lost to the natural process of overgrowth by vegetation. Under natural conditions, these losses are balanced by the continual creation of new nesting habitat through disturbance of estuarine sand deposits by water and wind. In the long term, the supply of nesting habitat for the Little Tern depends on the dynamic nature of estuarine geomorphological processes. However, in many New South Wales estuaries these processes have been deliberately dampened by human activities to produce a more stable environment.*

The Little Tern Recovery Plan (NPWS 2003b) identifies threats to the Little Tern as nest flooding, native predators, adverse weather conditions, human disturbance, introduced predators, habitat destruction and threats to food resources.

The mouth of the Belongil estuary satisfies the EPBC Act criteria for being important habitat as it supports at least 16 shorebird species. A significant impact on migratory shorebirds is taken to include: *"substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species".* There can be no doubt that the Belongil rock walls will have a significant impact on the *"timing, intensity, duration, magnitude and geographic extent"* of shorebird roosting and nesting habitat, and are likely over time to result in the destruction or isolation of an area of important habitat for a migratory species.

The NSW Scientific Committee has identified a variety of Key Threatening Processes, those considered to be of particular relevance are:

- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands;
- Anthropogenic Climate Change.

Sandy areas and mudflats in the vicinity of estuary openings are of particular importance. Many waterbirds, including migratory waders, use them for foraging. Many seabirds and shorebirds use open sandy areas for roosting, relying on the distance from cover and water barriers to protect them from predators. A variety of seabirds and shorebirds require open sandy areas for nesting, relying upon camouflage of themselves, their eggs and their chicks, along with distance from dense vegetation, to protect them from predators.

Any diminishment of such areas, particularly known roosting and nesting sites, due to sea-level rises will have significant impacts on dependent species. In relation to shorebirds and seabirds, Chambers *et. al.* (2005) note:

> *... As climatic zones move poleward and upward in elevation, changes in geographic ranges of mobile species such as birds are expected ...Predicted rises in sea level will affect coastal nesting birds as well as birds found in coastal wetlands or mangrove regions that may*

become inundated with sea water ... Species that use coastal habitats for other purposes, such as foraging or roosting, may also have to move elsewhere as sea levels rise.
...
...measures to reduce coastal erosion, which may be exacerbated by rises in sea level, has the potential to damage habitat of coastal dwelling species such as the Hooded Plover ...

The Element's resort recently sandbagged the banks of the estuary, adjacent to the sandflats used by Migratory Waders, in order to stop the recession of the sandflats onto their property. As the coastline recedes at every accelerating rates due to the Belongil rock walls, the sandflats may be squeezed into oblivion

The Plan mentions the importance of the Belongil estuary, stating *"Of particular significance is the upper beach berm adjacent to the Belongil Creek entrance which provides for shorebird foraging, roosting and breeding resources".* Though it makes no attempt to identify or consider likely impacts upon it.

It is grossly irresponsible that Byron Council has failed to acknowledge that their proposed rock walls are intended to redistribute erosion from Belongil beach onto the Belongil spit and estuary and failed to consider or assess the impacts this will have on the Shorebird roosting and nesting area, including on the three State endangered and 13 vulnerable waterbirds, 2 nationally critically endangered shorebirds, and the 22 migratory shorebirds and seabirds known to utilise the coastal part of the Belongil estuary. There can be no doubt that the Belongil walls will have a significant impact on threatened species which should have been assessed and considered in accordance with the CZMP Guidelines. A Species Impact Statement is required to be prepared under NSW laws, and the proposal must be referred to the Federal Environment Minister in accordance with the EPBC Act

Beaches

Beaches have significant economic, social, recreational and environmental values, and are of local regional and national significance.

Many waterbirds, including migratory waders, forage along beaches. The sand flats at the mouth of the Belongil estuary is a known breeding site for the vulnerable Pied Oystercatcher, which forages for pipis along the beach.

Worley Parsons (2013 Byron Bay Erosion Protection Structures – Risk Assessment), identifies:

Intertidal areas of sandy beaches provide a unique habitat for a wide diversity of meiofauna and macrofauna. Bacteria, protozoans, microalgae and meiofauna inhabit the small areas between sand grains, forming a distinct food web. Larger macroinvertebrate fauna (i.e. infauna), dominated by crustaceans (e.g. sand bubbler crabs, soldier crabs, ghost crabs), bivalve and gastropod molluscs (e.g. pippis, moon snails) and polychaete worms burrow actively in this zone, and can reach high abundances and biomass, particularly in dissipative to intermediate beach types (such as the Byron Bay embayment) in temperate zones (Defeo et al. 2009). Seawalls can lead to a loss of intertidal sandy beach habitat, particularly for those seawalls which are located relatively seaward on the beach profile and have only a narrow width of beach in front of them.

Sandy beach habitats provide a variety of ecosystem services as listed below. Any processes or activities that impact on the physical or ecological attributes of sandy beaches have the potential to alter or remove these important services.

- *Sediment storage and transport.*

- *Wave dissipation and associated buffering against extreme events (storms, tsunamis).*
- *Dynamic response to sea level rise (within limits).*
- *Breakdown of organic materials and pollutants.*
- *Water filtration and purification.*
- *Nutrient mineralisation and recycling.*
- *Water storage in dune aquifers and groundwater discharge through beaches.*
- *Maintenance of biodiversity and genetic resources.*
- *Nursery areas for juvenile fishes.*
- *Nesting sites for turtles and shorebirds.*
- *Prey resources for birds and terrestrial wildlife.*
- *Wrack provides an incubator to grasses and other plants which may help to anchor dunes.*
- *Scenic vistas and recreational opportunities.*
- *Bait and food organisms.*
- *Functional links between terrestrial and marine environments in the coastal zone.*

Sandy beach ecosystems worldwide are faced with a number of threats. Natural hazards such as storms and sea level rise, disruption to sand transport through the erection of artificial structures (such as the erosion protection structures within the Byron Bay embayment), occasional artificial stabilisation of dunes and beach scraping following storm events are among these that occur currently within the Byron Shire.

Supralittoral areas of sandy beaches (i.e. above the high tide mark) may provide important nesting areas for shorebirds and marine turtles. A number of marine turtles and shorebirds (many of which are threatened / protected species) are known to occur in the Byron Shire and have the potential to occur along the sandy beach stretches north and south of the Jonson Street works. Loggerhead turtles, green turtles and hawksbill turtles are known to occur in the Byron Bay area, as there are recorded sightings of these species on the Threatened Species Conservation Act online database. A large range of local and migratory shorebirds are known to occur in Byron Bay, especially using beach and dune habitats of the Belongil Estuary.

Threats to the shorebirds and turtles caused by the erosion protection structures include loss of nesting area due to coastal erosion, and dislodgement of twine from the haybales placed on the structures, potentially leading to leg entanglements. Leg entanglement can occur when fibrous material wraps around the leg or legs of shorebirds in such a way as to interfere with mobility or other functions, causing temporary impairment of function such as diminished anti-predator or foraging capacity, or permanent injury (Weston et al. 2009). Loose geotextile fragments dislodged from the erosion protection structures, such as has been observed at Manfred Street, may also pose a hazard to marine life, as the small fragments also consist of fibrous material that can cause injury to shorebirds.

Five marine turtles (loggerhead, green, leatherback, hawksbill and flatback) have been identified in NSW's waters, with resident groups of hawksbill, loggerhead and green turtles in the waters of northern New South Wales. Loggerhead turtle is listed as endangered and green and leatherback turtles are listed as vulnerable under the NSW Threatened Species Conservation Act 1995. All of these are identified as nationally threatened with extinction. Environment Australia (2003a) note:

Despite status varying from species to species and country-to-country, global decline of marine turtle populations has been recognised by the World Conservation Union (IUCN) through the assigning of Endangered status to all species except the hawksbill and

leatherback turtles, which are listed as Critically Endangered, and the flatback turtle, which is listed as data deficient.

Environment Australia (2003a) recognise:

There is sufficient information to identify a decline of 50 – 80 per cent over 10-15 years in the eastern Australian loggerhead population (Limpus and Reimer 1994). Limpus (1995) has found that in the 1976 and 1977 nesting seasons approximately 3500 loggerhead females nested on the Queensland coast, whereas 300 nested in 1997

Critical habitats for turtles are their natal beaches, particularly as turtles are programmed to nest on the beach where they hatched. Natal beaches are particularly vulnerable to sea-level rises where natural features and human structures, such as roads, seawalls, and buildings, leave no place for the turtles to nest as the sea rises. RAMSAR (2002) note:

Thus, erosion of sandy shorelines will be more likely given expected accelerated sea level rise over the coming decades. The possible loss of nesting habitat for marine turtles that are already under human pressure worldwide is one major consequence of such erosion or, indeed, of redeposition of sediments.

In addition to sea-level rise, increasing frequencies of extreme storm events flooding and eroding nests and increasing sand temperatures will reduce hatching success.

The CZMP claims:

With reference to Council's data base and the NSW Wildlife Atlas, there are no recorded marine turtles nesting on the beaches of the BBE. There are however records of nesting in the northern NSW region, including records of Loggerhead, Leatherback and Green Turtle nestings (DECCW, 2010) at Tallow Beach and near Lennox Head and Ballina (NPWS database in DECCW, 2010)

Green and Loggerhead turtles are known to nest on local beaches. In recent years I have been told of turtles observed nesting at Tallow Beach, Main Beach and Tyagrah Beach. Around 3 years ago baby turtles were observed crossing Main Beach heading for the surf in front of the surf club.

The proposed works will have significant impacts on beaches, the fauna that live within their sands, the fish and birds (including the Pied Oystercatcher) that feed on the sand fauna, and the birds and turtles that nest upon them, by accelerating erosion of key beaches and nesting areas, and causing coastal squeeze. It is grossly irresponsible for Council not to identify the likely impacts of their proposed works upon beaches and how they will mitigate impacts.

D1.4 Pressures and Management Issues

The Plan's consideration of threats and management issues is a tokenistic assessment that only gives lip-service to impacts associated with sea-level rise and coastal recession, particularly that associated with the adopted rock walls.

The Plan (Table 1) identifies as a threat (E14)

The narrowing or loss of coastal habitats and ecological communities as a result of coastal erosion / inundation, estuary entrance instability, long term recession and sea level rise.

and E15

Coastal protection works located on the dune may hinder the colonisation of dunal grasses and the formation of incipient dunes, affecting the colonisation of foredune and hind dune areas and / or the resilience of vegetation communities located in or adjacent to these zones.

Rock revetment works may alter the type, structure and diversity of coastal ecological communities, for example while works may provide for the colonisation of inter-tidal species, these may replace benthic infauna and the voids in the rocks may become habitat for rats and potentially predators such as snakes (WRL, 2016).

and E16

Anthropogenic climate change may have myriad impacts on marine biodiversity in NSW waters, for example, a strengthening of the East Australian Current and increased sea surface temperatures will cause further southern shifts in the distribution of fish, invertebrates, algae and microorganisms, impacting the structure and function of marine ecosystems.

Projected increases in storm and cyclone intensities may also result in exacerbated coastal erosion and inundation.

Present and future development may restrict the way in which coastal ecosystems adapt to climate change, through 'habitat squeeze' and diminished resilience.

There is no attempt to consider the threat that the Belongil rock walls cause by stopping the retreat of the beach, and accelerating erosion of, the beach in front of the walls. Or any consideration of the threat caused by accelerating erosion updrift as a result of the walls.

The token efforts to redress these impacts are a joke. The pretence is that Council is going to undertake an "adaptive" approach to future management, though they are not going to fund or monitor anything that will enable them to identify environmental impacts in front of or updrift from the intended works.

In Table 2 the Plan identifies as a medium unfunded priority:

Undertake a study of the BBE to identify important ecological communities, flora and fauna habitats that are being/or may be impacted by climate change impacts including habitat squeeze and/or loss.

and as an unfunded long priority:

Develop and implement a management plan that aims to increase the resilience of ecological habitats and communities in the context of the affects of climate change.

These are meaningless commitments.

The environmental consequences of the proposed works have not been considered or identified. There is no intent to undertake any monitoring program that will enable the environmental consequences of the proposed works to be identified and trends documented. There is no proposal to identify environmental triggers and thresholds that require specific responses (ie nourishment, removal of the walls). There is no commitment to, or program for, adaptive management, it is just a sham being used to justify the unjustifiable.

ICOLL

The Belongil estuary is an Intermittently Closed and Open Lake and Lagoon. ICOLLs are saline coastal waterbodies that have an intermittent connection to the ocean. One of the distinguishing features of an ICOLL are that they are not only governed by tidal movements as they intermittently closed off from the sea by sand bars which form when streamflows are low or longshore transport is high.

The natural height to which water would rise behind the sand bar at Belongil before it breached has been variously claimed as being 1.8, 2.3 and 2.6m, whatever height it reached it which would have resulted is a very extensive wetland system upstream. For the past three decades the mouth of the Belongil Estuary has been artificially manipulated, initially to open the estuary mouth when the water level behind reached a height of 1.2 m above MSL, which was reduced to 1.0 m above MSL in 2001.

The Belongil Estuary Study and Management Plan attempted to compromise between the desire of the Byron Bay Beach Resort to stop the stream eroding the dunes on which the Bayshore building was located and the need to avoid the 7(j) Scientific zone by creating the opening *"halfway between the bird protection area and the Byron Bay Beach Club ... at right angles to the beach".* . The timing and position of openings will have also affected the shorebird area around the mouth of the estuary, though these effects were not assessed. Council failed to undertake the required assessments in accordance with the *Environmental Planning and Assessment Act, 1979* and the *Water Management Act 2000*.

In 2002 the Belongil Estuary Opening group was formed to prepare the Belongil Creek Entrance Opening Strategy, based upon the objective:

> *To ensure that the estuary mouth is opened in such a way as to maintain the health and vigour of riparian vegetation, the biodiversity of aquatic organisms and meet the EPA water quality standards (ie protects aquatic ecosystems and allows safe swimming in the estuary).*

Fifteen years after changing the opening strategy, and 14 years after a Belongil Estuary Opening group was formed in 2002 to devise a Draft Strategy on behalf of Byron Council, the estuary is still being opened under conditional interim licences which require limited monitoring of some water quality and wetland vegetation parameters - the impacts on the shorebirds are ignored.

The Belongil Estuary Seabird and Shorebird Management Plan (Byron Bird Buddies 2007) notes:

> *The location of the opening will also affect the potential breeding habitat. Naturally the estuary mouth is trained by a north-west littoral drift and would usually open to the north, though the opening strategy has been to reduce potential erosion of the Bayshore building by opening the estuary near the historic fenced bird breeding area. The Bayshore building has now been removed and consideration needs to be given to undertaking any artificial opening in the vicinity of where it would naturally occur. This may allow for greater development of the sand spit, increase the protection from predators for the open sandy areas and enhance its suitability for nesting.*

Section 4.1. the Coastal Zone Management Plan Guidelines identify the need to describe " *projected climate change impacts on estuary health (section 55C(f) of the Coastal Protection Act 1979), based on council's adopted sea level rise projections or range of projections*" and the need to include an entrance management policy for ICOLLs. The CZMP Guidelines also specify:

> *4.2.5 ICOLL entrance management policy*

Where a CZMP is prepared for an ICOLL, it is to include an entrance management policy. The policy is to identify if a council intends to artificially manage the entrance. If so, the policy is to include triggers for actions to manage the opening of the entrance, which were developed considering the impacts of entrance opening on:

- *flood levels and tidal inundation*
- *estuary health, including inundation of fringing wetlands and water quality, and*
- *community uses of the estuary.*

The policy should achieve a reasonable balance between these considerations, and should also consider the longer term impacts of climate change on entrance management.

The changes in coastal recession resulting from the retention and upgrading of the Belongil rock walls, and the accelerating erosion updrift, are going to have a significant effect on the nature, structure and opening of the Belongil ICOLL. After 15 years since changing the estuary opening there is still no entrance management policy and there is no consideration what-so-ever of how changes to the estuary resulting from the rock walls are likely to affect the estuary opening over the next few decades. Council needs to prepare the long-overdue Belongil Creek Entrance Opening Strategy, which accounts for the likely effect of the impact of the proposed rock walls, to comply with the CZMP Guidelines 4.1. and 4.2.5 requirement to prepare an ICOLL entrance management policy. as part of the CZMP.

The Coastal Policy 1997 identifies objectives and associated strategic actions, including:

***1.1.7**. Seagrass, mangrove, saltmarsh and other wetland associated species will be conserved and managed as valuable components of the coastal ecosystem by effectively implementing existing controls (eg SEPP 14, Fish Habitat Protection Plans, Ramsar listing of important wetlands) and through controlling runoff, sedimentation and other water quality impacts.*

***1.1.10**. Local environmental plans for areas adjacent to marine parks will be required to include appropriate provisions which give effect to the objectives and management provisions contained in marine park zoning plans and operational plans.*

1.4. To manage the coastline and estuarine environments in the public interest to ensure their health and vitality.

***1.4.5**. Development proposals on the coastline and offshore, which are threatened by coastal hazards or where they pose a threat to the physical well being of the coastline subject to the provisions of the Coastal Protection Act, 1979 will be approved subject to conditions which minimize impacts or rejected where they pose an unacceptable threat to the physical well being of the coastline.*

***1.4.7**. Development proposals in or adjacent to estuaries will only be approved where conditions can be imposed which minimise potential impacts to the extent that they are acceptable under the Rivers and Foreshores Improvement Act, 1948 and Fisheries Management Act, 1994.*

Development proposals in or adjacent to estuaries will be rejected where they have the potential to adversely impact on the physical amenity or ecology of the estuaries to the extent that they are unacceptable under the Rivers and Foreshores Improvement Act, 1948 and Fisheries Management Act, 1994.

NSW Fisheries Policy and Guidelines Aquatic Habitat Management and Fish Conservation 1999 in 1.2 General Policies for the Conservation of Fish, Marine Vegetation and Aquatic Habitats, gives 12 general policies, including:

> *a. Fish and their aquatic habitats are important natural resources, and impacts on these resources must be assessed, in all development and planning procedures, using a precautionary approach.*
>
> *…*
>
> *e. Terrestrial areas adjoining freshwater, estuarine and coastal habitats should be carefully managed in order to minimise land-use impacts on these aquatic habitats. As a precautionary approach, foreshore buffer zones at least 50 m wide should be established and maintained, with their natural features and vegetation preserved. Such buffer zones may need to be fenced or marked by signs. The width of these buffer zones may need to be increased to 100 m or more where they are adjacent to ecologically sensitive areas.*

The proposal to transfer erosion from Belongil Beach onto the mouth of the estuary, and the construction of what will effectively become an estuary training wall, will significantly alter hydrological processes and how the ICOLL functions.

DEC (www.threatenedspecies.environment.nsw.gov.au) identify altered hydrological regimes and/or drainage as threatening processes for Australasian Bittern, Black-necked Stork, Brolga, Bush-hen, Great Knot, Greater Sand-plover, Lesser Sand-plover, Little Tern, Pied Oyster Catcher, Sanderling, Sooty Oystercatcher, and Terek Sandpiper. Maintenance and restoration of natural hydrological regimes are identified as recovery actions for all these species (except Australasian Bittern).

The key threatening process declaration under the *Threatened Species Conservation Act 1995* for 'Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands' states:

> *Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands is recognised as a major factor contributing to loss of biological diversity and ecological function in aquatic ecosystems, including floodplains. Alteration to natural flow regimes can occur through reducing or increasing flows, altering seasonality of flows, changing the frequency, duration, magnitude, timing, predictability and variability of flow events, altering surface and subsurface water levels and changing the rate of rise or fall of water levels ... Natural flow regimes are determined by the climate, run-off, catchment size and geomorphology without the impacts of dams, weirs, extraction and river management.*
>
> *...*
>
> *Alteration of natural flow regimes in rivers and streams and their floodplains and wetlands has a variety of impacts which include:*
>
> - *Reduction of habitat due to change in area, frequency and duration of flooding of floodplains and terminal wetlands*
>
> *...*
>
> - *Riparian zone degradation through altered flow patterns*
>
> *...*
>
> - *Loss or disruption of ecological function*
>
> *Survival of ecological communities relies on the maintenance of ecological processes, species life cycles and their interactions. Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands may disrupt these processes. For example, deeper more permanent water or shallower less permanent water will change the physical,*

chemical and biological conditions that in turn will alter the biota. Species composition and the presence of particular life cycle stages will be changed. Disruption of ecological processes may continue long after initial flow alteration, causing continued decline in biological diversity.

The State Water Management Outcomes Plan, prepared in accordance with the *Water Management Act 2000*, states:

All management plans developed under the provisions of the Water Management Act 2000 will be framed to be consistent with those targets that are relevant to a particular plan, and to the longer term outcomes, and should indicate the degree to which they will contribute to them. … care must be taken to ensure that licences and approvals do not detract from the achievement of the SWMOP outcomes and targets, but as far as possible, positively contribute towards their achievement.

The State Water Management Outcomes Plan establishes 12 River Flow Objectives (RFOs), of particular relevance are:

RFO 3 Protect important rises in water levels
RFO 4 Maintain wetland and floodplain inundation
RFO 6 Maintain natural flow variability
RFO 7 Maintain natural rates of change in water levels
RFO 12 Maintain or rehabilitate estuarine processes and habitats

The State Water Management Outcomes Plan sets a variety of five year targets, including:

Target 27

Frequency of artificial manipulations of coastal lagoon entrances reduced, and management strategies to improve natural flow dynamics recognising their consequences on ecosystems and social assets

Why is it needed?

- *To maintain natural salinity regimes of coastal lagoons*
- *To improve patterns of water inundation in coastal wetlands (RFO 12)*

What are the expected outcomes?

- *Primary ecological production maintained or improved*
- *Degraded wetlands improved and significant wetlands protected and restored*
- *Diversity and abundance of native aquatic animals and plants protected and restored*

Byron Council's proposed Coastal rock walls and groynes are considered to have impacts that contravene the State Water Management Outcomes Plan, constitute threatening processes for numerous threatened species, and contribute to the Key Threatening Processes of "Alter Natural Flow Regimes Of Rivers And Streams". The failure to consider and redress many likely impacts is in contravention of the Coastal Policy 1997.