Proposed Metropolitan Region Scheme Amendment 1280/41

Regarding Land at Point Peron

Hands Off Point Peron Inc. (HOPP) Submission

VOLUME 3

To the Governor of Western Australia

and

The Western Australian Planning Commission (WAPC)

13 November 2015

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Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 13

Planning report in relation to the proposed MRS amendment,
Dated 7 November 2015 by
Dr. Linley Lutton, urban planner

Proposed Metropolitan Region Scheme Amendment 1280/41

for the purpose of the proposed Mangles Bay Marina development

Planning Report

7 November 2015

Authored by Dr Linley Lutton, Adjunct Research Fellow, School of Earth and Environment, The University of Western Australia

Qualifications and experience of the author

Linley was awarded his PhD (UWA) in 1996 for his research into systematic design and design evaluation of the built environment. Prior to obtaining his PhD he undertook masters-level urban studies in the Geography Department, UWA. After completing his Bachelor of Architecture in 1980 he practiced as an architect but later turned his attention to specialise in urban planning.

He is an award-winning exponent of contemporary urban planning with an unusual combination of expertise in architecture, planning, and urban geography. In his 35 year career he has undertaken major urban planning projects in Western Australia and China and was commissioned in 2008 to write a guide for sustainable development in the near-coastal areas of Libya, North Africa. Linley's combination of skills gives him a balanced understanding of the physical, social and economic issues associated with good contemporary urban planning.

As an urban social geographer Linley has the necessary knowledge to understand how people use and respond to places. He often refers to himself as a 'human ecologist' because of his focus on the relationship between people and their environment. He has recently given a number of lectures on sense of place and sense of being to the Royal Australian and New Zealand College of Psychiatrists, and regularly gives public and professional lectures on a range of contemporary urban planning issues.

Linley has a well-earned reputation for his work associated with planning human habitations along Western Australia's unique coast. He has undertaken coastal planning projects at Albany, Esperance, Mandurah, Cottesloe, Jurien Bay, Dampier, Carnarvon, Coral Bay, Point Quobba, Monkey Mia, and Point Samson. He has a very clear understanding of the planning requirements associated with coastal locations.

Linley is currently an Adjunct Research Fellow at the School of Earth and Environment, UWA, where he researches and teaches urban design and planning.

Focus

This report focusses on discussing the proposed MRS amendment / Mangles Bay Marina proposal in terms of:

1. Its adherence to responsible coastal planning practices; and
2. Its compliance with the State's relevant coastal planning policies and guidelines.

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1. Proposed Development

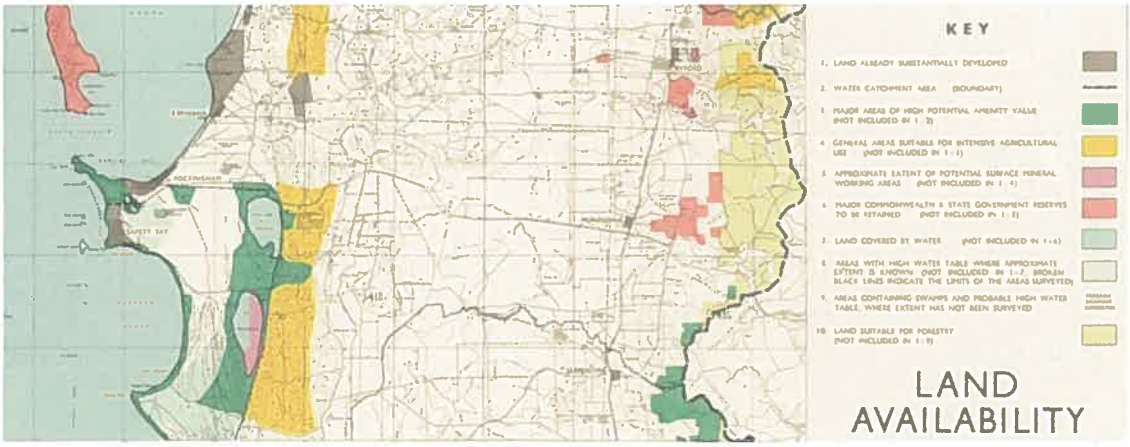
The WAPC has initiated an MRS Amendment to facilitate development of a marina-based tourist precinct on crown land at Point Peron[1]. The proposal is to construct and operate a single entrance onshore marina to accommodate between 411 and 450 boat pens and surrounding land development for tourism, commercial, residential and public open space[2].

The project was first mooted by the Department of Planning and Infrastructure in 2007. An alternative off-shore marina location was approved by the WAPC in 2012 at Wanliss Street, Rockingham.

The amendment report claims that the development generally satisfies the intent of State Planning Policy No 2.6.

2. Significance of the site in regional and coastal planning terms

The site is low-lying crown land and has been regarded for decades as a major area of high potential amenity value. Most of the land has been classified "Bush Forever" and falls within the Rockingham Lakes Regional Park, vested with the Conservation Commission and managed by the Department of Parks and Wildlife. Its value has been enshrined in this State Government map[3] which has guided for many years the selection of land suitable for urban development in the metropolitan area. Other than a continuous narrow coastal strip which comprises Perth's coastal dune system there is no other onshore coastal area in the metropolitan area with a recognised high potential amenity value until the coastline reaches Yanchep. It is therefore a truly unique and rare site in the metropolitan regional area.



A core principle of good planning, agreed by most competent urban planners, is to preserve and create amenity. This site currently makes a considerable contribution to the overall planning of Perth because

[1] The site of the proposed marina development is located at Cape Peron, which has over many years been commonly referred to as 'Point Peron'. In this report I use the expression 'Point Peron'.
[2] MRS amendment report page 1
[3] This map is a small segment taken from the state government Land Availability map, plate 7

of its unique amenity and sensibility and most importantly, because the broad community have unhindered access.

3. State Planning Policy No. 2 – Environment and Natural Resources

The state's Statement of Planning Policy No. 2, Environment and Natural Resources Policy, states that:

> *It is recognised that landscapes change in response to demands for primary products, recreation and tourism as well as for rural living. Furthermore, the values of the community with regard to landscapes also change over time. Accordingly, as the State grows, it will be increasingly important to ensure that those landscapes that are valued by the community are protected.*[4]

The community has clearly demonstrated its value for this particular coastal landscape and accordingly the WAPC should take this into account and not approve development on this site.

Furthermore, State Planning Policy No. 2 states that planning strategies, schemes and decision-making should:

> *Identify and safeguard landscapes with high geological, geomorphological or ecological values, as well as those of aesthetic, cultural or historical value to the community, and encourage the restoration of those that are degraded.*[5]
>
> *and,*
>
> *Consider the level or capacity of the landscape to absorb new activities and incorporate appropriate planning and building design and siting criteria to ensure that new development is consistent and sensitive to the character and quality of the landscape.*[6]

The site proposed for redevelopment clearly has high geomorphological, ecological, aesthetic, cultural and historic values and as such should be safeguarded. The proposed development shows no sensitivity at any level to the character and quality of the landscape and therefore is inconsistent with this section of State Planning Policy No 2.

The broad community values coastal amenity more than any other type of landscape. A survey of Perth's community in 2005 revealed that 77% of the community thought that the coast was a major contributor to Perth's character. Furthermore, 82% thought it was very or quite important that the coast offer a place to experience the natural environment. [7] The Mangles Bay Marina proposal is far from being a natural environment; on the contrary it would permanently destroy numerous hectares of natural

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[4] See section 5.9, Landscape, Paragraph 3 in Statement of Planning Policy No 2, Environment and Natural Resources Policy

[5] See section 5.9, (i)Landscape, in Statement of Planning Policy No 2, Environment and Natural Resources Policy

[6] See section 5.9,(ii) Landscape, in Statement of Planning Policy No 2, Environment and Natural Resources Policy

[7] See Visual Landscape Planning in Western Australia, a manual for evaluation, assessment, siting and design, p. 73.

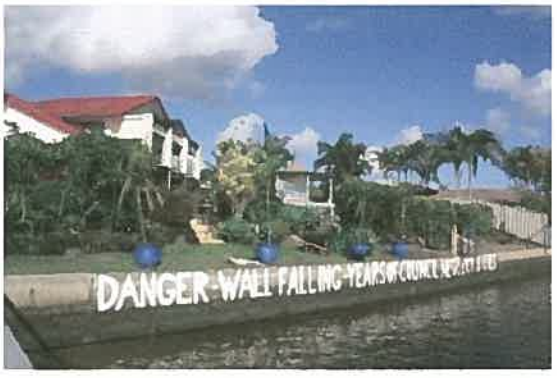
coastal bushland and irrevocably squander the opportunity to retain and enhance Point Peron as a high quality nature based coastal park.

4. The known hazards and risks of canal developments

Much of the proposal takes the form of a canal development. Western Australia differs from several other states in that it still allows canal developments. The most likely reason is that developers, whose interests are to make maximum returns on coastal developments, exert pressure on planning authorities to allow this type of development to continue. It is extremely unusual to propose a canal development which opens directly to the ocean. Most if not all canal developments are located off estuaries or rivers.

Canal developments are known to maximize coastal hazard vulnerability[8] and are now banned in other Australian states and discouraged in most developed countries. Climatologists predict that global warming will produce a rise in sea levels and an increase in the frequency and intensity of atmospheric conditions such as cyclones. Both issues present serious problems for coastal urbanisation.

A great risk associated with the long-term planning of canal developments is that the sea walls used to contain the canals do not have sufficient integrity to sustain the long-term impacts of coastal processes (up to 2110 as required in SPP 2.6). Canal developers have no long-term involvement in the repair and maintenance of canal revetments and the local authority, in this case the City of Rockingham, may not have the resources to respond adequately when needed. The images below are the consequence of canal wall failure in a Bribie Island canal development.



Preliminary indications are that the Mangles Bay site will be subjected to future inundation[9]. The walls used to edge the canals will therefore have to be of a substantial height to account for predicted rising sea levels, annual high tides and coastal surge.

In Australia, low lying areas such as Lakes Entrance and Apollo bay are examples where canal developments were proposed and rejected in the last decade due to concerns about future coastal

[8] See "Coastal Hazards", edited by C.W. Finkl (2013)

[9] See Coastal Vulnerability Study, Erosion and inundation hazard assessment report, commissioned by the Cockburn Sound Coastal Alliance, 2013

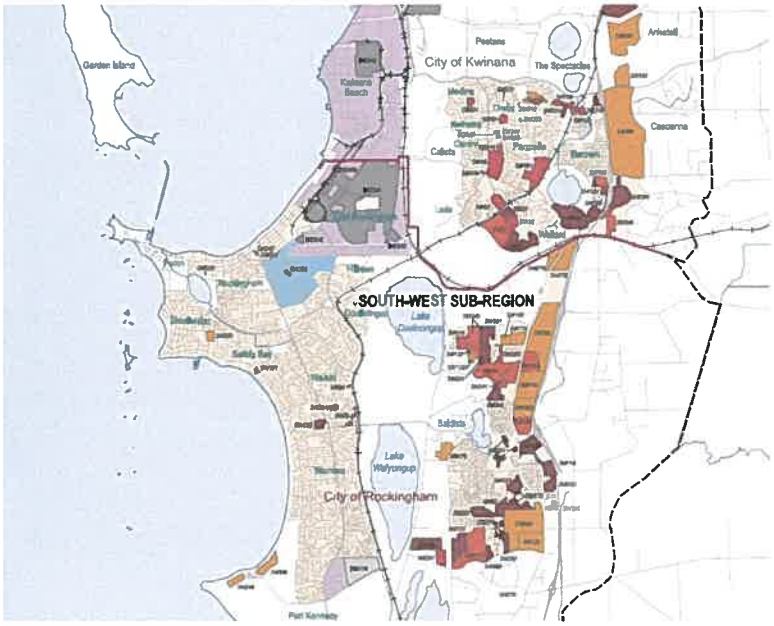
hazards. Ralph's Bay in Tasmania is a similar example to Mangles Bay where developers proposed a canal development in a conservation area and the proposal was rejected. The issues associated with Ralphs Bay are very similar to those with Mangles Bay and in 2010 a decision was made to reject the development on the following grounds:

- Ralphs Bay was valued as a Conservation Area;
- The sale of Crown Land to a developer for a damaging style of development was inappropriate;
- The natural values of Ralphs Bay needed protection, and;
- The will of the community needed to be heard and respected.[10]

The WAPC should see Ralphs Bay as an example to follow and avoid this proposed development at Point Peron.

5. Towards Perth and Peel @ 3.5 million

The MRS Amendment report cites the WAPC policy Draft Towards Perth and Peel @ 3.5 million as the context within which the amendment is being made. A major aim of this draft policy is to consolidate housing in existing urban areas. Citing the draft policy implies that redeveloping Point Peron for permanent housing is in keeping with the policy's intent. This map shows the area of land ready for housing adjacent to Rockingham. The areas marked dark red, light red and tan are areas approved for housing over the next decade[11]. The land area proposed for the marina development is inconsequential by comparison. The argument that the marina development is required to satisfy the need for housing as required under Draft Towards Perth and Peel @ 3.5 million cannot be substantiated.



[10] See Ralphs Bay Saved, National Environmental Law Review, 2010:01

[11] This is a portion of a map called Urban Land Development Outlook 2013/14 and was developed for the WAPC by the Department of Planning.

6. Compliance with SPP 2.6 – Coastal Planning

The Western Australian coastline is recognised by the state government as a significant asset and in heavily urbanised areas such as Perth it now seeks to ensure that current and future generations of Western Australians can benefit from the opportunities presented by the values and resources of the coastline. Accordingly the State Planning Policy No 2.6 (SPP 2.6) was established in 2003, and recently amended in 2013, for the following purpose:

> *To provide guidance for decision-making within the coastal zone including managing development and land use change; establishment of foreshore reserves; and to protect, conserve and enhance coastal values.* [12]

In relationship to other state government planning policies SPP 2.6 is viewed by the WAPC as the higher order and prevailing policy with respect to coastal planning matters.[13]

The stated objectives of SPP 2.6 are to[14]:

1. *ensure that the development and location of coastal facilities takes into account coastal processes, landform stability, coastal hazards, climate change and biophysical criteria;*
2. *ensure the identification of appropriate areas for the sustainable use of the coast for housing, tourism, recreation, ocean access, maritime industry, commercial and other activities;*
3. *provide for public coastal foreshore reserves and access to them on the coast; and*
4. *protect, conserve and enhance coastal zone values, particularly in areas of landscape, biodiversity and ecosystem integrity, indigenous and cultural significance.*

The MRS amendment report therefore must make reference to SPP 2.6, which it does but very briefly. It concludes that the proposed amendment complies with the general intent of SPP 2.6. The proposed development in fact departs from the intent of SPP 2.6 in a number of significant ways.

6.1 Objective 1 - Ensure that the development takes into account coastal processes

The Mangles Bay Marina site is low-lying and unlike the majority of the metropolitan coast line there is no fore dune which is the natural element protecting near-coastal land from coastal processes. High tide levels combined with SPP 2.6 current prediction that sea levels will rise by 0.9m by 2110[15] due to global warming are two factors which when combined with a storm surge effect will most likely cause serious inundation of the site. Preliminary findings of The Coastal Vulnerability Study, Erosion and Inundation Hazard Assessment Report, commissioned by the Cockburn Sound Coastal Alliance, 2013, indicates this to be the case. [16]

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[12] See SPP 2.6 section 2.4, The policy purpose, para. 1.
[13] See SPP 2.6 section 2.3, Relationship to other WAPC policies and guidelines.
[14] See SPP 2.6 section 4, Policy objectives.
[15] During the 100 year period between 2010 and 2110, and continue to rise after that at the rate of rise between 2090 and 2100 (refer SPP 2.6 annexure entitled Sea Level Change in Western Australia by Charlie Bicknell dated 2/02/2010)
[16] The vulnerability study, commissioned by the Cockburn Coastal Alliance, indicates that large areas of the Rockingham coastline fronting Cockburn Sound may be at high risk of inundation.

SPP 2.6 recommends avoidance of development in areas identified to be affected by coastal hazards. The State Coastal Planning Policy Guidelines recommend that development be avoided in areas within primary and fore dunes and low-lying coastal areas, such as Mangles Bay. [17]

The MRS amendment report refers to risk management strategies and states that 'the Avoid – Planned or Managed Retreat – Accommodate – Protect hierarchy would be used'[18] as a means for dealing with the impacts of coastal processes on the Mangles Bay site. These risk management strategies relate primarily to existing developments rather than new developments. Retreat, accommodate and protect strategies are not relevant for properly located new permanent developments because the developed sites should, according to SPP 2.6, be sufficiently set back from the coastline to prevent coastal actions impacting on the development.[19]

The MRS report states that the proponent undertook a coastal processes assessment in 2011 having regard to SPP 2.6, and is proposing a 20 m setback and associated mitigation measures[20]. The proponent's assessment was carried out in 2011 and SPP 2.6 was substantially rewritten in 2013. It would be very unlikely that a 20m setback in an area predicted to be subjected to inundation could be regarded as acceptable under SPP 2.6 as amended (this will be discussed further later in the report). Additionally, the vulnerability study referred to above, commissioned by the Cockburn Coastal Alliance which shows significant inundation of the Rockingham coastline, was not completed in 2011.

A comparison with other recent developments along the metropolitan coast may be useful. The images below show Quinns Beach, Butler and Alkimos. Quinns was developed well over a decade ago and followed the usual pattern of coastal development in the Perth metropolitan area. Butler is more recent and Alkimos is the latest to start development. Coastal setbacks for Quinns, Butler and Alkimos are approximately 60m, 120m and 200m respectively. [21]

Quinns

Butler

Alkimos

[17] See section 4.4.1, WAPC State Coastal Planning Policy Guidelines (2013)
[18] See page 4
[19] See SPP 2.6, Schedule 1, Calculation of coastal processes.
[20] See page 4
[21] These dimensions were scaled using Google Earth.

At the time when Quinns Beach was developed there was little appreciation by the state planners of the need to preserve coastal dune systems, even though most coasts in the rest of the urbanised world were at this time setting permanent developments well back from coastal edges. As more knowledge about rising ocean levels became available the state's planners were forced to reconsider the existing pattern of developing land so close to the ocean edge.

These are examples of development by the private sector and it can be seen in the cases of Alkimos and Butler that the developers are required to establish significant setbacks. The same standards need to apply for government initiated developments such as the Mangles Bay marina.

Some variations to coastal development provisions are recognised in SPP 2.6. Surf lifesaving clubs, defense facilities, short-term public recreation facilities and marinas for tourism and recreational boating may occur in areas defined to have a potential risk associated with coastal processes.[22]

SPP2.6 (as amended in 2013), states:

> *variations to coastal setbacks may include marinas for tourism and recreational boating facilities*[23].

It does not state that permanent residential and tourist-related accommodation, as proposed at Mangles Bay, are a permitted variation. In other words the boating-related facilities of a marina may be constructed close to the ocean, for obvious practical reasons, however any other facilities must be appropriately set back.

This does not appear to have occurred here, hence the proposal contravenes the policy. This non compliance may be due to the fact that the application of the appropriate setback would have a major impact on the feasibility of the project because income from the sale of near-ocean land for non-marina uses is the mechanism proposed to offset the high costs involved with marina construction. However this is not a valid justification for departing from the policy.

There is also recognition in SPP 2.6 that appropriate coastal nodes may need to occur within a coastal foreshore reserve provided they are located on stable areas and avoid areas of high natural landscape or resource value. SPP 2.6 Schedule 1 at 7.5 states:

> *The need for the provision of coastal nodes on the coast is recognised and should provide for a range of facilities to benefit the broader public. Such nodes may be developed within the coastal foreshore reserve but should only be located where identified in a strategic plan. Nodes should be located on stable areas; should have no negative impacts on the adjacent environment; and should avoid areas of high natural landscape or resource value.*

The MRS amendment report incorrectly refers to the Mangles Bay proposal as a coastal node. A coastal node is defined in SPP 2.6 as:

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[22] See SPP 2.6, Schedule 1, Section 7.
[23] See SPP 2.6, Schedule 1, Section 7.4.

> *a distinct and discrete built area that may be located within a coastal foreshore reserve. Excluding permanent residential development, it may vary in size from a group of recreational facilities to an area of commercial or tourism facilities or accommodation.*[24]

The Mangles Bay proposal is clearly not a discrete built area and cannot claim to be a coastal node, neither can it be classified as infill development as described in SPP 2.6.[25] The proposal is an extension of the existing urban fabric of Rockingham and does precisely what SPP 2.6 tries to discourage which is the creation of continuous development along the coast.[26]

Furthermore, even if it did fall within the definition of a coastal node, it would not comply with SPP 2.6 Schedule 1 at 7.5 set out above because it is not located on a stable area, it would have negative impacts on the adjacent environment and it would utilize, not avoid, an area of high natural landscape value.

6.2 Objective 2 - Ensure appropriate areas are identified for sustainable development

SPP 2.6 defines sustainability in the following way:

> *Sustainability means achieving as much as possible with as little as possible. This requires current generations to minimise consumption and imports on natural and other resources in order to continue their activities in the long-term and maintain future options. It involves wealth creation, while preserving our natural, biodiversity and ecosystem integrity and cultural heritage, for the benefit of current and future generations.*[27]

This definition is central to the problems with the Mangles Bay Marina proposal. The definition clearly states that wealth creation can be considered provided the natural integrity of the site is preserved for the benefit of current and future generations. The proposed development is at complete odds with this definition and on this ground alone the MRS amendment proposal should be rejected.

6.3 Objective 3 - Provide for coastal foreshore reserves

In addition to setting development back from the shoreline as a means for protecting them from coastal processes, SPP 2.6 also requires the establishment or retention of a coastal reserve.[28] The purpose of a coastal reserve is to:

> *Consider and protect significant natural features such as coastal habitats for their biodiversity, archaeological, ethnographic, geological, geo-morphological, visual or wilderness, biodiversity and ecosystem integrity, heritage, landscape, seascape, and visual landscape values; likely impacts of coastal hazards; and opportunities for public access, public recreation needs and safety to lives and property.*[29]

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[24] See SPP 2.6, Section 7, Definitions.
[25] See WAPC State Coastal Planning Policy Guidelines, Section 5
[26] See SPP 2.6, Section 5.2 (i)
[27] See SPP 2.6, Section 7, Definitions.
[28] See WAPC State Coastal Planning Policy Guidelines, Section 8
[29] See SPP 2.6, Section 5.9 (i)

Coastal setbacks required under SPP 2.6 have two functions. They must:

1. *act to mitigate for physical coastal processes, as discussed earlier; and,*
2. *provide a further setback for an appropriate foreshore reserve.*

The planning term of SPP 2.6 is 2110. The intent is that in 2110 coastal developments constructed today will have withstood long-term coastal processes, the shoreline will have risen and an appropriate foreshore reserve maintaining necessary public values and functions still exists.

The 20m coastal setback proposed for this development is clearly inadequate.

6.4 Objective 4 - Protect, conserve and enhance coastal zone values

In its current state the site offers ecological, cultural and social benefits to the broad community. The combination of a relatively intact natural environment, low-key community facilities in close proximity to the water, unrestricted continued access to a casual beach and an enticing visual landscape, both in prospect and aspect, all make this a unique place of high value to the broad community. If developed as proposed, all of these broad community benefits will be lost.

The rock breakwaters used to protect the entrance to the marina will break the continuity of the beach; the height of the revetments used to retain fill along the waterfront will completely alter any natural visual landscape; and, the entire beach front will give the impression of a privatised unnatural development. The images below with Mangles Bay as it is on the right demonstrate the type of impact the development would have on the appearance of the beachfront.

7. Compliance with SPP No 2.8 and SPP No 3

The stated aim of SPP No 2.8, Bushland Policy for the Perth Metropolitan Region is:

> *to provide a policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision-making.*

SPP No 2.8 states:

> *The policy recognises the protection and management of significant bushland areas as a fundamental consideration in the planning process, while also seeking to integrate and balance wider environmental, social and economic considerations. In general terms, the policy does not prevent development where it is consistent with the policy measures in this policy and other planning and environmental considerations.*
>
> and,
>
> *...this policy and Bush Forever recognise a target of at least 10 per cent of the original extent of each vegetation complex (as representative of ecological communities at the regional scale) for the Swan Coastal Plain portion of the Perth Metropolitan Region, which is recognised as a constrained area.*[30]

This policy needs to be considered in light of the growing international understanding of the role of natural urban greenspaces. Like so many policies developed by the WAPC, SPP No 2.8 references only Western Australian and some other state government publications to support its content. It has been well recorded for many years in many sources that the South West of Western Australia is among the most biodiverse area in the world. Much of the land in Perth's metropolitan area can claim this status and accordingly many sites in the metropolitan area are rated as Bush Forever sites. There is a large quantity of international literature describing the important symbiotic relationship between the natural environment and societal wellbeing.[31] In planning terms there is a considerable quantity of literature indicating how natural landscapes make a significant positive contribution to the environment in environmental and climatic terms.[32]

SPP 2.8 Appendix 1 and 2 need to be taken account of when assessing the acceptability or otherwise of a particular development proposal that would have an adverse impact on 'Bush Forever', such as the proposed Mangles Bay Marina development. Under the policy the destruction of the Bush Forever site 355 at Point Peron could only be justified if there is a highly compelling rationale and demonstrated need for the development at that specific site, and no practical way to avoid the loss. This is simply not the case. On the contrary:

- As discussed earlier in this report, the need for the proposed housing estate at this particular site has not been substantiated and cannot be justified. Any housing need can easily be met by building elsewhere, thus avoiding any adverse impact on this Bush Forever.

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[30] See SPP no 2.8, Section 4, Footnote 1

[31] See for example Kaplan. R, and Kaplan. S, 1989 The experience of nature: A psychological perspective, Cambridge University Press.

[32] See for example Benefits of Urban Green Space for Improving Urban Climate, Heidht, V. and Neef, M. Ecology, Planning, and Management of **Urban** Forests, 2008 - Springer

- The need to construct an inland marina at this particular location has not been demonstrated. On the contrary it is an unsuitable site to build a marina for a number of practical reasons, addressed below. There is also a risk that funding to build the marina may not be secured, resulting in the Bush Forever being sacrificed without the marina ever being built.

As discussed below there is an alternative, more suitable site to build a marina – at Wanliss Street.

Bush Forever site 355 appears in the Draft Perth Coastal Planning Strategy / December 2008 with the following description:

> *Point Peron and adjacent bushland occurs in this precinct and contains vegetation from the Quindalup complex. A threatened ecological community, Callitris preissii and/ or Melaleuca lanceolata forests and woodlands, has been identified at Point Peron. Two significant reptile species have been recorded in this precinct.*[33]

In the strategy, coastal areas are listed as precincts and Point Peron is listed as precinct 44. The strategy for precinct 44 includes the following key recommendations relevant to coastal planning:

1. *The recommended physical coastal processes setback category ranges from small (less than 65 metres) to large (greater than 120 metres); and*
2. *Develop and implement a coastal management plan.*

Both recommendations are at odds with the MRS amendment report. The current proposal is to permit a setback of 20m and to completely alter and destroy the naturalness of the coastline.

SPP No 3, Urban Growth and Settlement, defers to SPP 2.6 for principles for coastal planning however it reinforces the following overarching principle:

> *Coastal development needs to be carefully planned to ensure beaches, dunes, estuaries and coastal wetlands are protected, and the risk of storm damage and shoreline erosion is carefully managed...*[34]

The proposed MRS amendment is at odds with SPP No 3 objectives including:

- *To manage the growth and development of urban areas in response to the social and economic needs of the community and in recognition of relevant climatic, environmental and community values and constraints"*[35]*; and*
- *Protecting biodiversity and areas of environmental significance, and promoting the concept of an interlinked system of regional and local open space.*[36]

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[33] See Draft Perth Coastal Planning Strategy / December 2008, p. 54
[34] See SPP No3., Section 2.
[35] Section 3
[36] Section 5.3

8. Alternative sites

An alternative marina site is available at Wanliss Street. The alternative marina has received planning approval. The Cockburn Sound Management Council doesn't support the Mangles Bay Marina proposal but does support the Wanliss Street alternative. [37] The New Coastal Assets Branch of the Department for Planning and Infrastructure (2008) does not have a preference between Mangles Bay and Wanliss Street. [38] It is significant that The Cockburn Sound Management Council which has responsibility for monitoring and managing the condition of Cockburn Sound doesn't support the Mangles Bay proposal. The image below shows the two locations.

In planning terms the Wanliss Street site has the following advantages:

1. The site is centrally located and within 500m of most of the tourism, hospitality and apartment facilities already developed along Rockingham Beach Road;
2. It adheres to good planning practice which involves concentrating the type of facilities located around Wanliss Street;
3. The beach front has already been developed with a cultivated foreshore reserve therefore the new marina will not be distressing a pristine site;
4. The marina would be located in existing deep water and would not require any diminution of reserved public land;
5. Any future sea walls required to protect this part of Rockingham from inundation could be included in the development and would complement rather than detract from the existing visual landscape;

[37] See The Perth Recreational Boating Facilities Study 2008, summary of public submission, p. 63.
[38] See The Perth Recreational Boating Facilities Study 2008, Table 18, p. 48.

6. The appearance of a busy and visually prominent marina along this part of the coastline would make a significant positive contribution to the visual appeal of coastal Rockingham which in turn would attract visitors; and,
7. It is a low risk option in terms of its ability to withstand future coastal process because no major support facilities are proposed.

The Mangles Bay site by comparison has the following disadvantages:

1. It is located more than 2km from Rockingham's existing tourism, hospitality and apartment facilities;
2. It destroys a natural site;
3. It requires the taking of reserved public land;
4. It dilutes the opportunity to concentrate commercial facilities and will establish competition with existing traders and businesses, many of whom already struggle during the winter months;
5. It detracts from the existing visual landscape; and,
6. It is a high risk option in terms of both its capital financing and its ability to withstand future coastal process because major support facilities are proposed within sensible coastal setbacks.

9. The risk of rezoning in haste

A significant risk in this rezoning process is that the WAPC will hastily rezone the land and subsequently find detailed studies reveal the site is inappropriate for urban development. There is sufficient information presently available to suggest that this site is too low-lying to be used for urban uses and further detailed studies will most likely simply confirm this to be the case.

Appropriate setbacks required under SPP 2.6 (2013), when applied properly and responsibly on this site, will remove a large portion of land currently marked for permanent development. The result will be increased density on the remainder of the site as the developer seeks to achieve profit-making yields. The higher density will manifest itself in a built form usually found in more concentrated urbanized areas and totally out of character with the remainder of Point Peron.

A further and probably higher risk is that detailed studies done after the rezoning process will show that construction of the marina will not be feasible. Marinas are extremely costly to construct and when developed by private enterprise the margins required to generate a profit must be well protected. This particular marina would be especially expensive to build given the need to use wet excavation construction methods. Maintenance costs may also be very high. Perth is undergoing a very uncertain time with respect to residential property values and many projects are being placed on hold. The recent example of a marina proposal at Dampier shows that only after very detailed studies were undertaken was it discovered that the marina proposal was not feasible and the project was shelved. Another example is the marina development associated with the Albany waterfront development. This was a state government marina project completed 7 – 8 years ago and still there has been no take-up of tourism facilities in the development. Further examples where marinas have been proposed and have not eventuated due to high cost are Carnarvon and Bandy Creek near Esperance.

Once the land is zoned urban it will naturally become an attractor for housing and commercial development and the original focus for initiating the rezoning may be amended and the core rationale and objective of the MRS amendment – the delivery of a marina – abandoned. The draft South Metropolitan Peel Sub-Regional Planning Framework which forms part of the draft Towards Perth and Peel @ 3.5 Million already includes a map indicating this portion of Point Peron as urban expansion.[39]

10. Conclusions

The following summary of observations about the proposed MRS amendment and the Mangles Bay marina can be made:

1. The site has been recognised for many years to have high actual and potential amenity value and this has been enshrined in Perth's planning maps. This amenity will be lost if the development proceeds;
2. A major component of the development would be a housing subdivision, however no need for such housing in this location has been demonstrated and indeed no such need exists due to the abundance of other housing sites east of Rockingham;
3. The proposed development is extremely insensitive to the character and quality of the landscape therefore contravening the essential requirements of SPP No. 2 ;
4. The proposed development contravenes, and cannot be reconciled with, the objectives and purpose of SPP 2.6;
5. The development would be considered to be at high-risk in the long-term (2110 is the required planning term for coastal developments on the Western Australian coast);
6. The site is low-lying and has no protective fore dune system. It may therefore be subjected to future inundation (preliminary studies have validated this in the recent vulnerability study, commissioned by the Cockburn Coastal Alliance);
7. The development comprises a canal development linked to the marina which is in turn connected directly to the ocean. Canal developments mostly are located off estuarine systems which offer some protection from direct coastal processes. Canal developments are now prohibited in other Australian states and in most developed countries. It is doubtful that the City of Rockingham will have the resources or commitment in the long-term to maintain canal revetments;
8. Appropriate coastal setbacks are not provided. SPP No. 2.6 requires coastal setbacks to take account of the combined need to protect new development from coastal processes and to provide, in addition, an appropriate foreshore reserve. The proposal does not achieve this;
9. The development cannot be classified as a coastal node, as stated in the MRS report, nor can it be regarded as infill development which may be supported in coastal locations;
10. Even if it does fall within the definition of a coastal node it would be in direct conflict with the SPP 2.6 in relation to coastal nodes;
11. It is, on balance, in conflict with SPP No. 2.8 and 3;

[39] See draft South Metropolitan Peel Sub-Regional Planning Framework, Plan 1, p.17.

12. The visual landscape of the Mangles Bay beach will be seriously diminished by the construction of large breakwater structures;
13. The casual public access to the Mangles Bay beach will disappear;
14. The naturalness of the Mangles Bay coastline will be lost. Given that 82% of the general public, when surveyed, thought it was very or quite important that the coast offer a place to experience the natural environment this is a substantial loss in broad community terms;
15. The proposal runs contrary to sustainable development principles;
16. The proposal is at odds with the setbacks recommended in the Draft Perth Coastal Planning Strategy (2008);
17. There is a better alternative at Wanliss Street which is centrally located and will stimulate further community-oriented development. The Mangles Bay proposal in contrast is located 2km away from the existing core of development along Rockingham Beach Road and will dilute the opportunities for this central area to develop further;
18. The Cockburn Sound Management Council indicated in 2008 that it doesn't support the Mangles Bay proposal; and
19. There is a real risk that the marina will prove not to be feasible meaning that the core rationale and purpose of the MRS amendment – the construction of the marina – will not be achieved. This will leave the site zoned urban, if the MRS amendment is implemented, which will present a great temptation to develop the site for housing.

It is obvious from the above that the Mangles Bay marina development is detrimental in social and environmental terms and probably also in economic terms. It would be reasonable to argue that it will also dilute the opportunity for further centralised development along Rockingham Beach road due to its 'out-of-town' location. Its substantial lack of compliance with SPP 2.6 alone should be sufficient grounds for the WAPC to cease its rezoning activities.

In the author's opinion any diligent and fair minded planning assessment of this proposed MRS amendment would conclude that it amounts to bad planning and should not proceed.

However, the planning environment and ethos within which the rezoning application will be considered is very concerning and all of these observations could be rejected out of hand. In the author's experience over a lengthy period of time, state government planning bureaucrats have moved away from planning as a means to preserve and enrich amenity; the focus is now simply upon facilitation of development and provision of infrastructure. It could also be said that the state government has become a serial offender when it comes to manipulating and misconstruing planning policies and principles to facilitate its own developments. A pattern has emerged in recent years where planning decisions are made for political reasons or to support particular business needs rather than to ensure good planning outcomes and the community is almost always disempowered when they try to oppose these decisions. Reports on public submissions received by the WAPC, with respect to government-initiated projects, reveals the self-serving and dismissive manner in which relevant and pertinent public and professional comments are dealt with by bureaucrats.

This development's primary reason for being is, in essence, to provide boat penning facilities for around 500 privileged individuals who own expensive boats too large to be trailed. To sacrifice Point Peron and the Mangles Bay beach to facilitate this need is far too great a sacrifice and cannot be justified to serve the needs of so few. The value of the site is in its low-key naturalness, something which the broad community needs and values. There is a 'big picture' issue here and that involves the retention of a unique natural asset which happens to be on crown land. The 'big picture' is not about providing a marina. Marinas can be provided in many places but sites like Point Peron are now very rare along our metropolitan coast and if this site is developed the opportunity to maintain and enhance Point Peron as a high quality nature based coastal park would be lost and no other natural sites of equal value would remain along the metropolitan coastline.

Now that the state government has lost its willingness and capacity to fund community projects such as marinas it relies on the private sector to provide them. In this case the government's perceived contribution is through making available crown land in the form of longstanding public reserve land at Point Peron. The fact that Point Peron with all its unique and desirable coastal qualities could be sacrificed in this way is an indication of how out of step the state government is with world trends where natural resources such as this would be highly prized and safeguarded. There is an alternative location for a marina of similar capacity and if the state government has the view that building a marina in Rockingham is necessary the best action to take would be for the state government to allocate funding to advance this alternative site in partnership with the developer and preserve Point Peron for future generations.

11. Request to address the WAPC

The author requests the opportunity to address the WAPC in relation to this report.

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 14

Report in relation to the proposed MRS amendment dated
10 November 2015 by Dr. Vic Semeniuk,
Wetlands Research Association,
and attached reports of Dr. Semeniuk
Dated 18 April 2012 and 25 September 2005

Wetlands Research Association Inc.

Registered No A1007876D

12 Monger St.,
Perth, W.A., 6000

Phone 0427473705
Fax 9227 3503

10th November 2015

Ambrose Cummins
Hands off Point Peron
c/- 26 Safety Bay Road
Rockingham, WA 6168

Dear Ambrose,

Letter Report to "Hands off Point Peron" regarding the proposed MRS amendment in relation to the proposed Mangles Bay Marina

This is a short letter report examining the effects of the proposed MRS amendment in relation to the proposed Mangles Bay Marina, and re-examining the effects of the proposed marina on the environment.

As background to this letter report, I confirm that I have considered the proposed MRS amendment, the purpose of which is to facilitate the proposed Mangles Bay Marina development. I also refer the reader to my previous report of 18th April 2012 (V & C Semeniuk Research Group 2012) which was a critical review of the PER for the proposed Mangles Bay Marina development.

In this letter report I will re-iterate relevant parts of what was covered in the report by the Wetlands Research Association (2005) and the V & C Semeniuk Research Group (2012) as well as focusing on the effect on the MRS amendment on the natural values of the Point Peron area.

Point Peron, as a coastal projection and limestone headland, is a combined natural sandy tombolo capturing a former limestone island-and-reef, and is a significant coastal landform in Western Australia. Over 7500 years ago, the coast began accreting from the limestone terrain some 10 km to the east, and progressed to capture the (then) offshore limestone island with a sandy tombolo (Searle *et al.* 1988). Complex sedimentological and transport patterns some 2000 years ago resulted in the formation of barred marine lagoon that was later to become the freshwater Lake Richmond, which was later still to develop the internationally significant 'stromatolites' dominantly along its northern shore.

The critical and key aspects of the Point Peron are as follows:

1. It is the best developed tombolo-cum-limestone-island complex along the Rottnest Shelf shore in Western Australia and, as such, has regional to State-wide in significance.
2. The stratigraphy, soils, groundwater and coastal setting of the terrain make the vegetation thereon unusual.
3. The vegetation of the Point Peron tombolo thereon is generally in good condition.
4. As a Bush Forever site Point Peron tombolo stands alone in the region and has State-wide to Regional significance.
5. The limestone island-and-reef and coastal landforms of Point Peron were first described by Fairbridge, and in terms of cultural geoheritage have regional significance (Brocx 2008).
6. The rocky platform, cliffs, and notches of the limestone reef in the shore zone of Point Peron were first described by Fairbridge as evidence of sea level history and hence have international significance (Brocx 2008).
7. Lake Richmond has formed in the local area as a result of complex transport and sedimentation patterns associated with the former limestone island-and-reef.
8. The stratigraphy of the sediments immediately eastward of the (now captured) limestone island-and-reef are medium sand, coarse sand , and limestone gravel in tongues and lenses pinching out eastwards (Searle *et al.* 1988); these sediment are the reason that the 'stromatolites' of Lake Richmond are hydrologically and hydrochemically maintained.

The 'stromatolites' of Lake Richmond are internationally significant. They are unlike the 'stromatolites' of Shark Bay, Lake Clifton, and Lake Thetis of Western Australia, and those of the Eyre Peninsula. Any proposed development in this area cannot afford to affect them. However, the developments proposed by the MRS amendment and construction of the marina run a very strong risk of adverse impacts on these features through changes in hydrology and in hydrochemistry. In my previous review (V & C Semeniuk Research Group 2012), I emphasised the vulnerability of these 'stromatolites' and highlighted the inadequacy of the hydrological studies undertaken for the PER to properly assess the hydrological and hydrochemical setting and the probable developmental impacts on these structures. It appeared that, in their responsive reports, the proponents for the development and the regulatory authorities did not have the experience to fully understand the problem nor to understand that it was important to have a robust (micro-) stratigraphy in order to assess possible impacts on the 'stromatolites'. In the first instance, the drilling and hydrological studies presented in the PER were not robust enough to provide critical information on the relationship of the 'stromatolites' to the stratigraphy of the limestone island-to-tombolo transition/relationship and to groundwater processes. For comparison, the hydrological and hydrochemical studies of similar terrain in the Becher area, conducted with detailed stratigraphy and hydrological and hydrochemical monitoring on a monthly basis over 11 years (C A Semeniuk 2007) is a robust study that should have been emulated in the Point Peron area. Information to that level of detail presented by C A Semeniuk (2007) is required to properly gauge the effects of any development on the 'stromatolites'. Thus, where features such as internationally significant 'stromatolites' are concerned, the hydrological and hydrochemical studies need to be thorough and robust, and they were not so in the PER. My prediction is that if infrastructural development and the marina proceed, we would be looking at the long-term degradation (involving decades) and loss of the 'stromatolites'.

In the light of the above, it is clear that while the terrain of Point Peron as a former limestone island and reef complex and its tombolo are significant for various components: from regionally to State-wide for its landforms and its vegetation, to international for its rocky shore geomorphology and for the nearby 'stromatolites', the proposed Mangles bay marina, and the proposed developments in the MRS amendment will compromise their integrity.

If development as proposed by the MRS amendment proceeds, the geomorphological and ecological values of the site would be compromised and devalued. Firstly, there would be of course clearing of vegetation and, secondly, hydrochemical and hydrologic alteration of the groundwater, with attendant effects on the vegetation and on the nearby 'stromatolites'.

As such, I proffer that the proposed development is not consistent with nor sensitive to the character and quality of the unique landscape of Point Peron.

Now to the matter of the degree of risk associated with the marina and canal development in terms of coastal processes and associated effects on the built infrastructure.

In the report by the V & C Semeniuk Research Group (2012), I emphasised several key components of the coastal system that provided insights into sediment transport along the coast in terms of transport complexity and in terms of volumes of sediment transport.

Examining how much sediment must have been transported into the Rockingham area by calculating the volume of Holocene sediment and dividing it by the years involved (over 500 years), provides a figure of 100,000 m^3 per year – this is incontrovertible.

Examining the historical unfolding of the former Peel harbour (now naturally filled in by coastal transport over 100 years ago) provides a figure of over 200,000 m^3 per year of sediment transport and accumulation in the appropriate sediment trapping environments Wetlands Research Association 2005) – this also is incontrovertible. A similar-sediment trapping environment will be located northwards of Point Peron and into the proposed marina. To corroborate that northerly-facing shores of cuspate forelands accumulate sediment from eroding southerly-facing shores of cuspate forelands, and from the general northwards transport of sediment along the shore of the Rottnest Shelf, examine the sedimentary dynamics of Point Becher. Here the northerly-facing shore of the cuspate foreland is accumulating sediment.

I trust the above letter report is to your satisfaction.

Yours sincerely,

Dr V Semeniuk

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Wetlands Research Association Inc. 2005. Environmental and scientific consequences of a marina at Point Peron. Report to Wetlands Conservation Society.

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18th April 2012

Preserve Point Peron Inc. and Hands Off Point Peron
c/- 26 Safety Bay Road
Rockingham, WA 6168

Attention: Ambrose Cummins

Review of the PER on the Mangles Bay Marina

Dear Ambrose,

This report is in response to the joint request from Preserve Point Peron Inc. and Hands Off Point Peron for scientific and environmental advice in relation to the consequences of constructing a marina at Mangles Bay, Point Peron area. It provides a scientific critique of the Public Environmental Review (PER) document entitled "Mangles Bay Marina Based Tourist Precinct". The "Mangles Bay Marina Based Tourist Precinct" PER will be referred to as the PER throughout this report. This critique report is structured as follows:

1. Natural history of the Point Peron area
2. Established scientific and heritage importance of the Point Peron area
3. Outline of the proposed marina
4. Overall critique of the PER
5. Critique of stratigraphy and hydrogeology
6. The significance of the stromatolites/thrombolites
7. Geoheritage significance of the Point Peron area
8. Sedimentation in the marina
9. Environmental consequences of the marina

Natural history of the Point Peron area

The Point Peron area is part of the double cusp Rockingham-Becher Cuspate Foreland system. It is the northern cusp, the larger cusp, the older cusp, and most complex cusp of the double cuspate foreland system (Searle *et al* 1988). Through stratigraphic and geomorphic studies, coring, and radiocarbon dating of the beach sediments and underlying seagrass-derived sediments, Searle *et al* (1988) show that the coast in this region began to accrete about 7000 years ago from a former limestone cliff situated 10 km inland from the present shore (Figure 1). The coast prograded as a wave dominated and hence sand-dominated shoaling-upward seagrass bank to beach-and-beachridge system, located in the protected lee of off shore limestone ridges, small islands and reefs, with the subaerial portion of the accumulation comprised of shore-parallel beach ridge system. The beach ridge systems record the history of the shoreline movements over the millennia. In local areas, the progradation of the coast extended as seaward projecting large cusps (the Becher Cusp), and elsewhere, the shore prograded to the extent that the offshore island at Point Peron was captured.

The Point Peron area itself is comprised of a limestone reef (a former limestone island that has been captured by a narrow cuspate foreland, or tombolo). The area thus comprises a limestone rocky shore and a narrow neck of sand (the tombolo). As such, the terrain of the Point Peron area is underlain by sand of dune/beachridge, beach, and seagrass origin, with limestone rocky shore at Point Peron itself. The stratigraphy of the area, outlined by Searle *et al* (1988), comprises dune sand (underlying the beachridges), sand and shelly sand (buried former beaches), and grey seagrass-sediment (enriched in iron sulphide). The reef-and-tombolo system separates Warnbro Sound to the south from Cockburn Sound to the north. Within the accretionary area of the tombolo, complex coastal processes some 2500 years ago resulted in the development of a deep water embayment which in becoming isolated from the sea became a freshwater lake, now called Lake Richmond. (figure 8 of Searle *et al* 1988).

Hydrologically, in general terms, the Point Peron area is underlain by unconfined groundwater of freshwater salinity. The shore is underlain by groundwater of marine salinity. C A Semeniuk (2007) in a drilling programme in the region, empirically established that the interface between marine and freshwater descends as a steep incline with marine groundwater at depths of 10 m some 25 m -30 m from the shore, and brackish water to near marine water at depths of 10 m some 40 m from the shore. Also, the complex limestone-and-sand stratigraphy results in freshwater occurring under the marine groundwater at the shore.

Established scientific and heritage importance of the Point Peron area

This cuspate foreland is the largest sedimentary coastal deposit on the southwestern Australian coast which, by nature of its formation, contains a 7,000 year Holocene history of seagrass-dominated sedimentation, sea level changes, shoreline and beachridge plain origin and development, calcrete development, rocky shore development, and climate history. It is the largest seagrass-sediment-derived seagrass bank, developed on a cuspate foreland, in the world (Semeniuk *et al* 1989). Another important feature of the cuspate foreland and its surface beachridge plain, which distinguishes it from plains and cuspate forelands in eastern Australia and globally, is that it is underlain by a calcareous quartzose sand, *i.e.*, the sand is relatively carbonate rich, which has implications for wetland evolution and hydrochemistry. It is against this background of coastal beachridge plain geohistory that beachridge development, wetland initiation, landscape evolution, and response to climatic variability were examined as described in a series of international papers by Fairbridge (1950, 1961), Semeniuk & Johnson (1985), Semeniuk & Searle (1985a), Semeniuk (1986), Searle *et al* (1988), Semeniuk *et al* (1989), and C A Semeniuk (2007).

The relevant critical/key features in the Point Peron area are:

1. stromatolites/thrombolites
2. the rocky shores
3. seagrass sediments in a cuspate foreland
4. Lake Richmond
5. the tombolo as part of the northern cusp
6. seagrasses and algae

These are described in Table 1 below, with reference to the level of significance.

Table 1: Relevant critical/key features in the Point Peron area

Feature	Description	Significance
Stromatolites/ thrombolites	stromatolites (also termed, in this region, thrombolites by some authors) along the shore of Lake Richmond are globally distinct and unique systems; they are relatively young (< 2500 years), and have formed in the hydrochemical setting of permanent freshwater that has a strong Ca^{2+} cation source from the surrounding dune sand terrain; they are located mainly on the northern shore of the lake, and encrust the relatively steep slope of the northern wall of the lake	Globally significant
limestone rocky shore	the rocky shores in the Point Peron area are of global geoheritage significance as they form the foundation work of Fairbridge's (1950, 1961) work on sea-level history that became a landmark and benchmark study for Holocene sealevel history research	Globally significant
seagrass sediments in a cuspate foreland	the seagrass to beach to beachridge transition occurring in the twin cuspate foreland in the Rockingham-Becher area is a globally unique system; seagrass banks are recorded as mud mounds in Florida, forming sand wedges in South Australia, forming muddy sand wedges at Shark Bay, and forming sand wedges in the Mediterranean Sea; generally elsewhere globally, where seagrasses are instrumental in forming sedimentary deposits they are not in a cuspate foreland setting (Semeniuk *et al* 1989); Semeniuk & Semeniuk (2000) point to the international geoheritage significance of the cuspate forelands of the coastal region around Perth, and in this context, the seagrass bank deposits at Rockingham present themselves as a globally unique and distinct seagrass bank system	Globally significant
Lake Richmond	this lake, the deepest natural freshwater lake in Western Australia, is a former marine embayment that was cut off from the open marine system by a barrier some 2300 years ago; its floor is 10 m deep, and is the stranded former tract of the Warnbro-Cockburn Sound which themselves today are 10 m deep; the lake is unique in the manner it formed, its sediments on its margins and floor (the floor containing Holocene shells of the former marine biota), its hydrochemical evolution (transforming from a marine embayment to a natural freshwater reservoir), and the stromatolites/thrombolites along its shore and steep walls	Nationally significant
The tombolo (part of northern cusp)	the complex history of the northern cusp of the twin cuspate system that captured a former offshore island/reef forming this tombolo is manifest in the landforms and beachridge patterns; as part of an internationally significant cuspate deposit, this tombolo as a geoheritage feature represents the last stage of evolution of accretion-and-island/reef-capture of a coastal evolutionary process; the landforms also record complex coastal interactions with periodic/cyclic climate changes	State-wide significance
seagrasses and algae	seagrasses, and macroalgae inhabiting the protected shallow environment of Mangles Bay and on the rocky shores are ecosystems of regional importance; the sheltered systems here are not replicated elsewhere	Regionally significant

Outline of the proposed marina
The marina at Point Peron is proposed to be cut into the limestone-and-sand parts of the tombolo complex at its northwestern end. The entrance to the proposed marina will front Mangles Bay. The marina itself will house boat pens, and these will be located at the eastern and south-eastern part of the cut. The marina complex and associated supporting infrastructures will involve modifying some 40-50% of the tombolo system.

Overall critique of the PER
There are a number of factual flaws in the PER:

The stratigraphy is incorrect lithologically (this will be amplified in a later section). Given the critical nature of the hydrogeological processes and products in maintaining Lake Richmond, this component of the PER is very unsatisfactory, and if development proceeds on the present information there is a real risk the salinity peripheral groundwater hydrodynamics of Lake Richmond will change and the globally significant stromatolites/thrombolites will be compromised.

Given the critical nature of the hydrological processes and products, there is too much reliance on groundwater modeling, and there are several problems with the modeling provided in the PER. Firstly, while modeling may be useful for water abstraction studies, or in environments that are not critically sensitive, the data in the PER are not rigorous or of a high enough standard to be used in modeling in such an environmentally sensitive area to ensure the protection of Lake Richmond and the stromatolites/thrombolites. Secondly, data for the modeling are derived from a particularly dry year, which will produce anomalous results. Thirdly, figure 8-9 of C A Semeniuk (2007) shows the significance of direct (empirical) measurements in a study of the effects of rainfall on groundwater levels, and how the water table differentially responded, phenomena that would not be made evident with simplistic water levels and with simplistic lithology used in groundwater modeling in this region.

The tips of cuspate forelands and of tombolos in southwestern Australia are oceanographically and sedimentologically one of the most complex coastal systems along the seaward Swan Coastal Plain. This has sediment transport implications for the immediate north-side of Point Peron and for the maintenance of seagrass beds on the north-side of Point Peron. This factor will impact on sedimentary filling of the marina, yet it is a factor little addressed in the PER. A robust sediment transport study must and should have been carried out for marina management purposes and for assessing the maintenance of seagrass beds.

Seagrass beds trap sediments that are mobilised as traction or suspended loads (sand and mud) traversing through their environment, but also generate sediment such as skeletal sand and mud. Once in the seagrass bed environment, the seagrass fronds baffle and bind mud into the substrate. That mud which might escape the trapping, baffling, and binding by sea grasses, within the wave-dominated coastal environment eventually finds its way to deep water below wave base (generally > 10 water depth) and accumulates as a mud sheet. *The effects of mud in the environment is underestimated in the PER.*

Also, as there are two locations of mud accumulation, there are deposits that range from sand to muddy sand to mud accumulating in this region – the clean sands accumulated in beaches and dunes, the sand, muddy sand and mud within the seagrass environment, and the mud accumulated in deep water basins. These have resulted in three types of stratigraphic units m this region (Searle *et al* 1988) that occur in a set shoaling sequence from deep to shallow water:

1. clean sands accumulated in beaches and dunes = Safety Bay Sand (originally defined by Passmore, amended by Semeniuk & Searle 1985c)

2. sand, muddy sand and mud within the seagrass environment = Becher Sand (defined by Semeniuk & Searle 1985b)

3. mud accumulated in deep water basins = Bridport Calcilutite (defined by Semeniuk & Searle 1987)

Clearly, the PER did not know of these stratigraphic subdivisions, or ignored them. At any rate, they are real stratigraphic subdivisions and have hydrogeological and environmental implications. It is a measure of the inadequacy of the stratigraphy of the PER that they have been omitted, and the extant environmental consequences and the consequences of exhuming fossil equivalents of these units of these stratigraphic units have not been addressed.

Critique of stratigraphy and hydrogeology
Firstly, bore logs on stratigraphy are poorly presented. They are of various scales and thus not readily comparable.

Secondly, I cannot accept the validity of the stratigraphy and lithology. Having myself drilled several hundred stratigraphic bores and emplaced some 150 piezometers in this area, and described and defined the stratigraphic units in this area, I find the stratigraphy to be over-simplified; and Lithologically incorrect (e.g., the identification of 'sandstone' in the logs, and the lack of muddy sand layers and lenses in the stratigraphic interval between -2 m AHD and ~ 10 m AHD, i.e., the level of the Becher Sand);

Thirdly, sampling lithology every one-metre will result in an over simplified stratigraphy and in loss of stratigraphic detail. Such detail is needed for hydrogeological interpretation and management.

These matters above are not innocuous because without detailed stratigraphy and good lithological description (see wetland stratigraphy in this region by C A Semeniuk 2007) there can be no foundation for good hydrogeological interpretation and management. The relationship of hydrological preferred pathways between Lake Richmond and the sea cannot be assessed if the seawater/freshwater interface is brought very close to Lake Richmond;

Fourthly, for many of the bores, there is slotting along the entire piezometer. This will tend to homogenize any of the various piezometric heads and aquifer flow rates deriving from the different stratigraphic layers. It means that the piezometric monitoring undertaken for the PER is too simplified for the complex stratigraphy present, and cannot be used with any confidence. Data provided in the PER suggests that the research necessary to seek out the piezometric complications, in order to fully understand the hydrogeology in this sub-region (especially around Lake Richmond) in order to safely determine that excavating a marina in sand will not compromise Lake Richmond, was not undertaken.

The stratigraphy around Lake Richmond will be complex because Lake Richmond itself formed as a barred lagoon along an oceanographically complex coast and as such it may be expected to have and be bordered by complex stratigraphy. This complex stratigraphy needs to be determined and the ensuing complex hydrogeology also needs to be determined if the seawater/freshwater interface is to be brought close to the Lake. **In this regard, the PER is wholly inadequate.**

Fifthly, a major flaw in the PER is the lack of hydrogeology to explain the maintenance of the stromatolites/thrombolites along the northside Lake Richmond. A major change of hydrological and hydrochemical structure in the northside Lake Richmond will alter the hydrological mechanisms that maintain the stromatolites/thrombolites, and these stromatolites/thrombolites are renowned globally unique features. A proper robust hydrogeological and hydrochemical study is a prerequisite to ensuring/determining whether altering the hydrology and hydrochemistry of groundwater by excavating a marina so close to Lake Richmond will not, or will, compromise the stromatolites/thrombolites.

I am of the opinion that the stratigraphy and hydrology undertaken in the PER are not of sufficient quality to assess and predict the impacts of altered hydrology on Lake Richmond and the stromatolites/thrombolites.

The prevalent occurrence of limestone fragments in the drill holes proximal to Mangles Bay is an interesting feature of the report. I doubt that there are limestone fragments in the sand (more likely they are to be platy calcareous algae fragments). My interpretation is that there has been a misidentification of carbonate grains, and this may signal a change in drillers, or drill core loggers, or even drill retrieval techniques. If I am correct, it shows the inconsistency of data collection across the area. If I am incorrect, it shows the rapid facies change that can occur within small scales stratigraphically. These rapid facies changes have not been addressed in the PER as intimated above, and they would be crucial to interpreting and managing hydrogeology.

Geoheritage significance of the Point Peron area

Brocx & Semeniuk (2007, 2009, 2011) set out criteria on how to recognise and evaluate sites of geoheritage significance (as distinct from those of biological significance). These criteria are becoming internationally accepted. In this context, there are two sites of global geoheritage significance in this region:

1. the stromatoloites/thrombolites, as freshwater structures, equivalent in importance to the Shark Bay stromatolites
2. the rocky shores of Point Peron, described by Fairbridge (1950)

In this context, there is one site of National geoheritage significance in this region – Lake Richmond itself.

Sedimentation in the marina

Sedimentation in the marina is a difficult matter to quantify. There is marked and complex sand transport that will find its way into a marina. In spite of the apparent sheltered mature of this coastal region, there is much sediment transport as traction load sand, shoreline in suspension, and as mud in suspension. Rates of transport presented below are based on stratigraphic evidence, transport rates from Semeniuk (1883, 1985), and historical information (Semeniuk & Semeniuk 2011).

Semeniuk & Semeniuk (2011) describe how the northern shore of Warnbro Sound, the location of the former Peel Harbour (surveyed by John Septimus Roe in 1839, and re-surveyed by Commander Archdeacon in 1878) that rapidly infilled with coastal sediments during the period 1839 to 1878 was an area of beach slacks, underlain by calcareous quartzose sand. This is the equivalent to the formation of Lake Richmond. I estimate that in years of low wave dominance sedimentation transport can be 5000 cubic metres per year. The average can be 100,000 cubic metres per year, and the extreme can be 200,000 cubic metres per year. This sand component can be transported

around the tip of Point Peron. Similar transport occurs around the tip of Point Becher (Semeniuk 1995).

Mud transport rates are calculated from stratigraphic evidence of rates of accumulation of 1000s of years. These point to transport rates at a MAXIMUM of 50 mm/year, and at a MINIMUM of 2.5 mm/year.

Environmental consequences of the marina
The construction of a marina in the Point Peron area will have several consequences. These are described briefly in terms of:

1. the construction phase impacts
2. operational phase impacts
3. maintenance phase impacts

Description of these phases is provided below. The significance of these impacts deriving from these phases is outlined in terms of the key natural features of the Point Peron region in Table 2 below.

The construction phase would involve excavation of the sand underlying the tombolo and dredging of the limestone at the mouth/entrance of the marina. The excavation of the sand will mobilise any fine grained material from the seagrass sediment (Semeniuk & Searle 1985b), and will bring into the zone of oxidation the formerly buried iron sulphide enriched sediments and formerly in the anoxic zone of the groundwater, with consequences firstly for turbidity in the area, and secondly in generating acid sulphate soils. The dredging of the limestone will mobilise fine grained sediment into the environment with consequences for turbidity in the area.

The operational phase will have two major impacts: seawater will intrude into the freshwater aquifer, and the nutrients and contaminants associated with marinas will flush directly into Mangles Bay and affect the biota, and will also become part of the shallow groundwater, and potentially affect the freshwater.

The accumulation of the cuspate foreland over 7000 years of its history involved the transport of some 100,000 m^3 of sand annually. While this superficially appears to have been stabilised, the potential still exists for large volumes of sediment to be mobilised, as evident in the history of Peel Harbour during the 1800s on the *south side* of the tombolo, which infilled with sediment within decades after it was first survey by Captain Roe (Forbes & Semeniuk in prep), suggesting some 100,000-220,000 m^3 of sand was transported annually in this coastal region. Opening an artificial inlet (the marine entrance) in this coastal region runs a strong risk of sedimentation filling the mouth of the proposed marina, and hence requirement of maintenance dredging. The maintenance phase impacts deriving from sedimentation and dredging would affect the local biota on the rocky shoes and seagrasses in Mangles Bay.
These are described in Table 2 overleaf, with reference to the level of significance of the critical/key features of the area.

I trust this information is to your satisfaction. If you require further information, or amplification of any of the above, please do not hesitate to contact me.

Yours sincerely

Dr V Semeniuk

Table 2: Significance of impacts on the critical/key features in the Point Peron area

Feature	Significance	Constructional phase	Operational phase	Maintenance phase
stromatolite/ thrombolites	Globally significant	None	Potential of seawater intrusion and contaminants run strong risk of entering and altering the lake hydrochemistry with the threat the stromatolites/thrombolites will not be maintained	None
limestone rocky shore	Globally significant	locally destroys an internationally important geoheritage feature	maintenance of cementation zone and freshwater seepage zone of rocky shores locally and permanently altered	None
seagrass sediments in a cuspate foreland	Globally significant	locally destroys an internationally important geoheritage feature of the end-stage of seagrass cuspate foreland sedimentation, *i.e.*, the tombolo stage	pollutants from marina will impact on seagrasses	marina dredging will impact on seagrasses
Lake Richmond	Nationally significant	None	Potential of seawater intrusion and contaminants run strong risk of entering and altering the lake hydrochemistry with the threat the stromatolites/thrombolites will not be maintained	None
The tombolo	State-wide significance	locally destroys an important geoheritage feature of the end-stage of seagrass cuspate foreland sedimentation, *i.e.*, the tombolo stage, and destroys the climate and landscape history contained therein (see Semeniuk 1995)	None	None
seagrasses and algae	Regionally significant	turbidity impacts on biota in the short terms	plumes of contaminates emanating from the marina will affect the biota	periodic dredging will affect biota as during construction phase

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25th September 2005

Dr P Jennings
President of the Wetlands Conservation Society
c/- Murdoch University
South St., Murdoch, 6150

Environmental and scientific consequences of a marina at Point Peron

Dear Dr Jennings,

This letter is in response to your request for scientific and environmental advice in relation to the consequences of constructing a marina at Point Peron. The letter is structured as follows:

1. Natural history of the Point Peron area
2. Established scientific and heritage importance of the Point Peron area
3. Outline of the proposed marina
4. Environmental consequences of the marina

Natural history of the Point Peron area

The Point Peron area is part of the double cusp Rockingham-Becher Cuspate Foreland system. It is the northern cusp, the larger cusp, the older cusp, and most complex cusp of the double cuspate foreland system (Searle *et al* 1988). Through stratigraphic and geomorphic studies, coring, and radiocarbon dating of the beach sediments and underlying seagrass-derived sediments, Searle *et al* (1988) show that the coast in this region began to accrete about 7000 years ago from a former limestone cliff situated 10 km inland from the present shore (Figure 1). The coast prograded as a wave dominated and hence sand-dominated shoaling-upward seagrass bank to beach-and-beachridge system, located in the protected lee of off shore limestone ridges, small islands and reefs, with the subaerial portion of the accumulation comprised of shore-parallel beach ridge system. The beach ridge systems record the history of the shoreline movements over the millenia. In local areas, the progradation of the coast extended as seaward projecting large cusps (the Becher Cusp), and elsewhere, the shore prograded to the extent that the offshore island at Point Peron was captured.

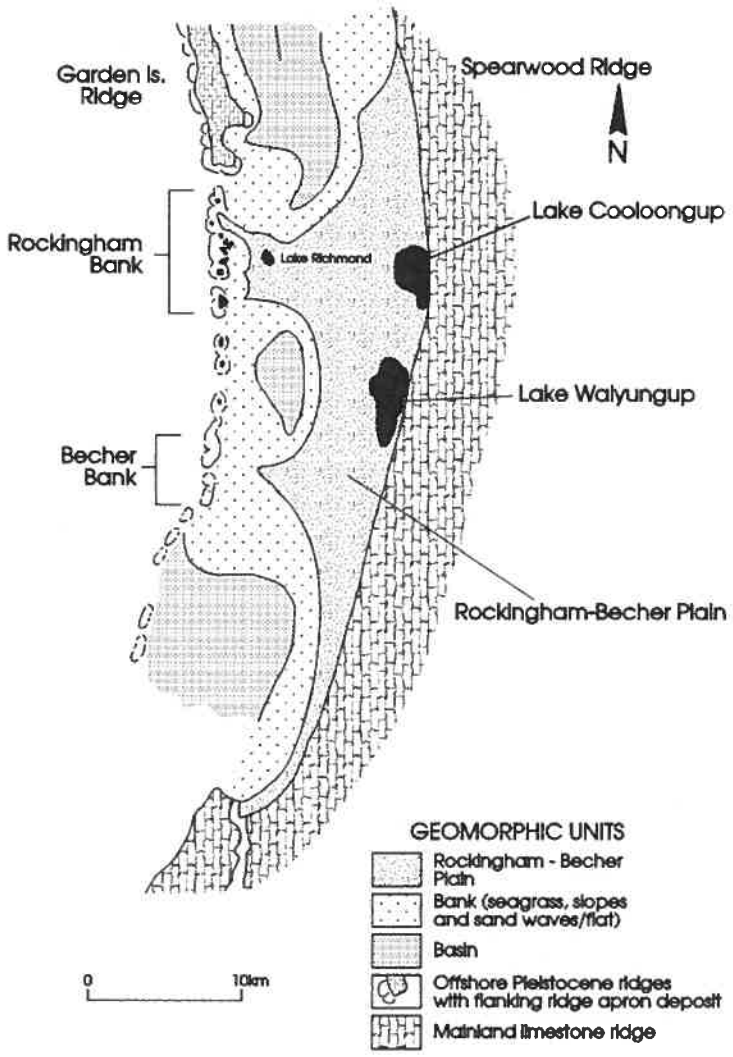

Figure 1: Geomorphic elements of the Rockingham-Becher Plain, showing width of Holocene beachridge, and the location of Lake Richmond in the northern part of the double cuspate foreland

The Point Peron area itself is comprised of a limestone reef (a former limestone island that has been captured by a narrow cuspate foreland, or tombolo). The area thus comprises a limestone rocky shore and a narrow neck of sand (the tombolo). As such the terrain of the Point Peron area is underlain by sand of dune/beachridge, beach, and seagrass origin, with limestone rocky shore at Point Peron itself. The stratigraphy of the area, outlined by Searle *et al* (1988), comprises dune sand (underlying the beachridges), sand and shelly sand (buried former beaches), and grey seagrass-sediment (enriched in iron sulphide). The reef-and-tombolo system separates Warnbro Sound to the south from Cockburn Sound to the north. Within the accretionary area of the tombolo, complex coastal processes some 2500 years ago resulted in the development of a deep water embayment which in becoming isolated from the sea became a freshwater lake, now called Lake Richmond. (figure 8 of Searle *et al* 1988).

Hydrologically, the Point Peron area is underlain by unconfined groundwater of freshwater salinity. The shore is underlain by groundwater of marine salinity. C A Semeniuk (2005) in a drilling programme in the region, empirically established that the interface between marine and freshwater descends as a steep incline with marine groundwater at depths of 10 m some 25 m - 30 m from the shore, and brackish water to near marine water at depths of 10 m some 40 m from the shore. Also, the complex limestone-and-sand stratigraphy resulted in freshwater occurring under the marine groundwater at the shore.

Established scientific and heritage importance of the Point Peron area

This cuspate foreland is the largest sedimentary coastal deposit on the southwestern Australian coast which, by nature of its formation, contains a 7,000 year Holocene history of seagrass-dominated sedimentation, sea level changes, shoreline and beachridge plain origin and development, calcrete development, rocky shore development, and climate history. It is the largest seagrass-sediment-derived seagrass bank, developed on a cuspate foreland, in the world (Semeniuk *et al* 1989). Another important feature of the cuspate foreland and its surface beachridge plain, which distinguishes it from plains and cuspate forelands in eastern Australia and globally, is that it is underlain by a calcareous quartzose sand, *i.e.*, the sand is relatively carbonate rich, which has implications for wetland evolution and hydrochemistry. It is against this background of coastal beachridge plain geohistory that beachridge development, wetland initiation, landscape evolution, and response to climatic variability were examined as described in a series of international papers by Fairbridge (1950, 1961), Semeniuk & Johnson (1985), Semeniuk & Searle (1985a), Semeniuk (1986), Searle *et al* (1988), Semeniuk *et al* (1989), and C A Semeniuk (2005).

The relevant critical/key features in the Point Peron area are:

1. stromatolites
2. the rocky shores
3. seagrass sediments in a cuspate foreland
4. Lake Richmond
5. the tombolo as part of the northern cusp
6. seagrasses and algae

These are described in Table 1 below, with reference to the level of significance.

Table 1: Relevant critical/key features in the Point Peron area

Feature	Description	Significance
stromatolites	the stromatolites (also termed thrombolites by some authors along the shore of Lake Richmond are globally distinct and unique systems; they are relatively young (< 2500 years), and have formed in the hydrochemical setting of permanent freshwater that has a strong Ca^{2+} cation source from the surrounding dune sand terrain; they are located mainly on the northern shore of the lake, and encrust the relatively steep slope of the northern wall of the lake	Globally significant
limestone rocky shore	the rocky shores in the Point Peron area are of global geoheritage significance as they form the foundation work of Fairbridge's (1950, 1961) work on sea-level history that became a landmark and benchmark study for Holocene sealevel history research	Globally significant
seagrass sediments in a cuspate foreland	the seagrass to beach to beachridge transition occurring in the twin cuspate foreland in the Rockingham-Becher area is a globally unique system; seagrass banks are recorded as mud mounds in Florida, forming sand wedges in South Australia, forming muddy sand wedges at Shark Bay, and forming sand wedges in the Mediterranean Sea; generally elsewhere globally, where seagrasses are instrumental in forming sedimentary deposits they are not in a cuspate foreland setting (Semeniuk *et al* 1989); Semeniuk & Semeniuk (2000) point to the international geoheritage significance of the cuspate forelands of the coastal region around Perth, and in this context, the seagrass bank deposits at Rockingham present themselves as a globally unique and distinct seagrass bank system	Globally significant
Lake Richmond	this lake, the deepest natural freshwater lake in Western Australia, is a former marine embayment that was cut off from the open marine system by a barrier some 2300 years ago; its floor is 10 m deep, and is the stranded former tract of the Warnbro-Cockburn Sound which themselves today are 10 m deep; the lake is unique in the manner it formed, its sediments on its margins and floor (the floor containing Holocene shells of the former marine biota), its hydrochemical evolution (transforming from a marine embayment to a natural freshwater reservoir), and the stromatolites along its shore and steep walls	Nationally significant
the tombolo (part of northern cusp)	the complex history of the northern cusp of the twin cuspate system that captured a former offshore island/reef forming this tombolo is manifest in the landforms and beachridge patterns; as part of a internally significant cuspate deposit, this tombolo as a geoheritage feature represents the last stage of evolution of accretion-and-island/reef-capture of a coastal evolutionary process; the landforms also record complex coastal interactions with periodic/cyclic climate changes, preserved in the beachridges, of the entire off ?????	State-wide significance
seagrasses and algae	seagrasses, and macroalgae inhabiting the protected shallow environment of Mangles Bay and on the rocky shores are ecosystems of regional importance; the sheltered systems here are not replicated elsewhere	Regionally significant

Outline of the proposed marina

The marina at Point Peron is proposed be cut into the limestone-and-sand parts of the tombolo complex at its northwestern end. The entrance to the proposed marina will front Mangles Bay. The marina itself will house 600 boat pens, and these will be located at the eastern and south-eastern part of the cut. The marina complex and associated supporting infrastructures will involve some 40-50% of the tombolo system.

Environmental consequences of the marina

The construction of a marina in the Point Peron area will have several consequences. These are described briefly in terms of:

1. the construction phase impacts
2. operational phase impacts
3. maintenance phase impacts

Description of these phases is provided below. The significance of these impacts deriving from these phases are outlined in terms of the key natural features of the Point Peron region in Table 2 below.

The construction phase would involve excavation of the sand underlying the tombolo and dredging of the limestone at the mouth/entrance of the marina. The excavation of the sand will mobilise any fine grained material from the seagrass sediment (Semeniuk & Searle 1985b), and will bring into the zone of oxidation the formerly buried iron sulphide enriched sediments and formerly in the anoxic zone of the groundwater, with consequences firstly for turbidity in the area, and secondly in generating acid sulphate soils. The dredging of the limestone will mobilise fine grained sediment into environment with consequences for turbidity in the area.

The operational phase will have two major impacts: seawater will intrude into the freshwater aquifer, and the nutrients and contaminants associated with marinas will flush directly into Mangles Bay and affect the biota, and will also become part of the shallow groundwater. and potentially affect the freshwater.

The accumulation of the cuspate foreland over 7000 years of its history involved the transport of some 100,000 m^3 of sand annually. While this superficially appears to have been stabilised, the potential still exists for large volumes of sediment to be mobilised, as evident in the history of Peel Harbour during the 1800s on the *south side* of the tombolo, which infilled with sediment within decades after it was first survey by Captain Roe (Forbes & Semeniuk in prep), suggesting some 100,000-220,000 m^3 of sand was transported annually in this coastal region. Opening an artificial inlet (the marine entrance) in this coastal region runs a strong risk of sedimentation filling the mouth of the proposed marina, and hence requirement of maintenance dredging. The maintenance phase impacts deriving from sedimentation and dredging would affect the local biota on the rocky shoes and seagrasses in Mangles Bay.

These are described in Table 2 below, with reference to the level of significance of the critical/key features of the area.

Table 2: Significance of impacts on the critical/key features in the Point Peron area

Feature	Significance	Constructional phase	Operational phase	Maintenance phase
stromatolites	Globally significant	none	Potential of seawater intrusion and contaminants run strong risk of entering and altering the lake hydrochemistry with the threat the stromatolites will not be maintained	none
limestone rocky shore	Globally significant	locally destroys an internationally important geoheritage feature	maintenance of cementation zone and freshwater seepage zone of rocky shores locally and permanently altered	none
seagrass sediments in a cuspate foreland	Globally significant	locally destroys an internationally important geoheritage feature of the end-stage of seagrass cuspate foreland sedimentation, *i.e.*, the tombolo stage	none	none
Lake Richmond	Nationally significant	none	Potential of seawater intrusion and contaminants run strong risk of entering and altering the lake hydrochemistry with the threat the stromatolites will not be maintained	none
the tombolo	State-wide significance	locally destroys an important geoheritage feature of the end-stage of seagrass cuspate foreland sedimentation, *i.e.*, the tombolo stage, and destroys the climate and landscape history contained therein (see Semeniuk 1995)	None	none
seagrasses and algae	Regionally significant	turbidity impacts on biota in the short terms	plumes of contaminates emanating from the marina will affect the biota	periodic dredging will affect biota as during construction phase

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I trust this information is to your satisfaction. If you require further information, or amplification of any of the above, please do not hesitate to contact me.

Yours sincerely

Dr V Semeniuk

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 15

Tourism Report in relation to the proposed MRS amendment,
Mangles Bay Marina and proposed Cape Peron Coastal Park
Dated 8 November 2015, by
Dr. Georgette Leah Burns, environmental anthropologist
and tourism specialist

Tourism Report in relation to proposed Metropolitan Region Scheme Amendment 1280/41, Mangles Bay Marina and the proposed Cape Peron Coastal Park.

Prepared for Hands Off Point Peron Inc.

by

Dr Georgette Leah Burns

8 November 2015

Contact: leah.burns@griffith.edu.au

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List of Acronyms

HOPP - Hands Off Point Peron Inc.

MRS - Metropolitan Region Scheme

MRSA - Metropolitan Region Scheme Amendment

RLRP - Rockingham Lakes Regional Park

MBM – Mangles Bay Marina

WA DEC - Western Australian Department of Environment and Conservation

WAPC - Western Australian Planning Commission

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Figure One: Location of Mangles Bay Marina in Cockburn Sound (Cedar Woods 2015).....6

1. Background and Expertise

I am an environmental anthropologist who specializes in tourism, particularly wildlife tourism. My qualifications, detailed in my CV, include a BSc and MSc in Anthropology from the University of Western Australia, and a PhD in Tourism from Murdoch University. This educational background is coupled with 20 years work experience in the Faculty of Environmental Science at Griffith University, Brisbane, and 2.5 years in the Department of Rural Tourism at Hólar University College in Iceland.

I also have a long connection with the Rockingham and Cape Peron regions. As a child, I holidayed regularly both on Penguin Island and on the surrounding mainland. My family currently owns a beach house at Shoalwater Bay. Penguin Island was used a case study in my PhD thesis and subsequent book (Burns 2010) that investigated sustainable practices in managing wildlife tourism.

2. The Report

This report is presented in relation to the proposed Metropolitan Region Scheme (MRS) Amendment 1280/41 for land at Point Peron / Cape Peron (the Land), as described in the Amendment Report published by the Western Australian Planning Commission (WAPC) dated July 2015. The purpose of the proposed amendment is to facilitate the Mangles Bay Marina (MBM) development. Much of the Land covered in this amendment is located within the Rockingham Lakes Regional Park (RLRP).

This report was requested by Hands Off Point Peron Inc. (HOPP). In preparing this report I have carefully considered (a) the proposed MRS amendment and the proposed MBM development the amendment is designed to facilitate, and (b) the current status and use of the Land and the Cape Peron Coastal Park proposal.

The proposed Metropolitan Region Scheme (MRS) Amendment 1280/41 will be referred to as the MRSA throughout this report.

The terms "Point Peron" and "Cape Peron" are used synonymously in some documents and amongst public discourse. Throughout the report, the subject area will be referred to as Cape Peron.

This report describes the site and historical use of Cape Peron for recreational and tourism purposes, it also outlines the plans for the Mangles Bay Marina and the proposed Cape Peron Coastal Park. Potential for tourism in the region is then examined.

3. The Site

The Land included in the MRSA covers a total area of 105.34 hectares, which includes 43.16 hectares of land designated as 'Bush Forever' (Western Australia Planning Commission, July 2015). The proposal will restrict public access to a sizeable portion of Cape Peron through the construction of an inland marina and housing estate.

Cape Peron, bounded on the south by the Shoalwater Islands Marine Park, is notable for its breadth of coastal recreation opportunities and its scenic views.

The exposed southern shore of the Cape combines rugged limestone cliffs and reefs with sandy beaches. The northern shore, facing Garden Island and Cockburn Sound, is more sheltered. The Cape's accessibility and high scenic value make it a popular destination for visitors whose recreational and tourism activities include fishing, walking, diving, swimming and windsurfing (Urban Bushland Council WA 2015).

4. Historical Use of Cape Peron for Tourism and Recreation

Cape Peron has been a popular location for recreation for local residents for a very long time. There is no shortage of historical evidence to demonstrate how Cape Peron has been continuously used as a popular area of recreation for both local Rockingham residents and visitors. Some of this historical use, and the legislation around it, has been documented in a report by Ron Chapman (2015).

In the late nineteenth and early twentieth century, picnicking, walking and fishing were the primary recreational activities at Cape Peron (The Rockingham Historian 2003). Popularity of the destination continued to grow in the 1930s (West Australian 1933) and increasing demand for holidaying accommodation in the area led to designation of special camping and caravan areas (West Australian 1949) and leasing of areas to special needs groups. For example, in 1947, the Commonwealth leased an area of land on Point Peron to the Returned Sailors Soldiers and Airmen's Imperial League (RSL), who subsequently built a hall and cottages (Chapman 2015). From the 1950s a variety of organisations began to take advantage of the recreational facilities offered at Cape Peron (Chapman 2015).

In 1964 the Commonwealth transfer of approximately 443 acres at Point Peron to the State of Western Australia included conditions that the area be reserved for recreation and/or park lands (Chapman 2015:3). The Shire of Rockingham has demonstrated support for increased public recreation on the land since that time (e.g., Western Australia Parliamentary Debates 1973) and protection of natural resources within the Shire. In December 2000, an area of 93.55 hectares of land at Point Peron was designated as Bush Forever Site No. 355 (Bush Forever 2000). The Shoalwater Island Marine Park, bordering the Cape and also with the RLRP, is an A Class reserve (Burns 2006).

Cape Peron forms part of the RLRP, established by the Western Australian Department of Environment and Conservation (WA DEC) and reserved for conservation, recreation and landscape values with the central objective of providing people with mostly free, healthy and accessible recreational activities (DEC, 2006). The RLRP is currently guided by its 2010 Management Plan. The Plan highlights the outstanding conservation and recreational values of Cape Peron and confirms it as an integral and unique feature of the RLRP.

Cape Peron is the most visited site within the RLRP, with an estimated 120,000 visits per year (Rockingham Lakes Regional Park Management Plan 2010). In contrast, for 2000/2001 the total visitor number to Penguin Island was approximately 70,000 (Burns 2006). A 2005 survey showed that 68% of visitors to Cape Peron were local residents and 21% were from the broader Perth metropolitan area. Popular activities at Cape Peron identified in the survey

included fishing, swimming snorkeling, boating, windsurfing, jet-skiing, scuba diving, picnicking, walking and nature observation (Rockingham Lakes Regional Park Management Plan 2010).

5. Mangles Bay Marina (MBM)

Mangles Bay, on Cape Peron at the southern end of Cockburn Sound, has been the subject of a number of development proposals since the 1970s. Concept plans were first prepared for a marina development at the Mangles Bay site in 2005 that would include up to 500 boat pens and extensive canal development at Cape Peron to provide for increased residential housing and retail businesses (Cedar Woods 2015). Located immediately east of the Garden Island Causeway, the footprint of the proposed marina extends along the coast to Safety Bay Road and south to Memorial Drive (Figure One).

Figure One: Location of Mangles Bay Marina in Cockburn Sound (Cedar Woods 2015).

In September 2009, the Premier of Western Australia announced the State Government would take the Mangles Bay project to Phase Two and the State Government's land agency LandCorp appointed Cedar Woods Properties Limited as a development partner (Cedar Woods 2015). The Land is not zoned to enable the MBM to proceed, hence the proposal is now in the Structure Planning phase to rezone the land, as evident in the proposed Metropolitan Region Scheme Amendment 1280/41 (MRSA).

6. The Cape Peron Coastal Park

In May 2015, Rockingham coastal environment groups launched the 'Cape Peron Coastal Park Concept Plan' as an alternative to MBM (CPCPCP 2015). This plan aims to establish a world class coastal recreation, tourist and conservation park at Cape Peron. The Plan includes active recreational features for cycling, walking, snorkeling, diving, kayaking, boating and playing in adventure playgrounds. The Plan describes four key components of the Coastal Park:

i. A Nature-Based Recreational Park. A primary purpose of the park is to provide a nature-based recreational experience for Australians, including local and interstate visitors.

Figures from the Rockingham Lakes Regional Park 2010 Management Plan suggest these national visitors comprise 89% of the current visitors and thus inclusion of their needs is critical. Creation of the Coastal Park will benefit them socially.

ii. A Tourist-Attracting Coastal Park. While catering for the needs of Australians, the aim is also to create a tourist attraction that will draw state, national and international visitors.

In this component, the Park will increase the tourism profile of the region as a whole and consequently enhance economic benefits to the region.

iii. A Diverse Conservation Park. The concept of the Coastal Park is larger than just the Point Peron region. It encompasses other areas included in the RLRP, such as the ecologically unique Lake Richmond, as well as the Shoalwater Islands Marine Park on the southern border of Point Peron.

In this diversity the Park includes the protected Little Penguin on Penguin Island (Cannell 2012, Dann et al. 1996), rare and endemic Australian sea lions (Shaughnessy et al. 2005) on Seal Island, and other unique ecological features including three threatened communities: Rottnest Island Pines, Thrombolites and ten per cent of the world's remaining sedgeland (Semeniuk 2012).

iv. An Economically Viable Park. The Coastal Park aims to be economically self-supporting, offering both direct and indirect financial benefits to the local community.

Directly, the Park opens up the possibility of long term local tourism business opportunities through the establishment of, for example, bicycle and surf cat hire, and provision of a kiosk/café. Indirect, as popularity of the Coastal Park grows and more visitors are attracted, economic benefits are likely to flow to other, non-tourist, businesses in the region such as supermarkets and restaurants. Thus, local businesses and the Rockingham community in general are positioned to benefit economically from the establishment of the Park.

7. Future potential

The proximity and accessibility of the area included in the Cape Peron Coastal Park not just to Perth, the capital city of Western Australia, but also to the City of Rockingham, offers great potential for its social and economic success. The population of Metropolitan Perth including Peel is expected to reach 2.2 million

by 2031 representing 76% of the estimated State population of 2.9 million (Western Australian Planning Commission 2006). There is continued need to find suitable locations for nature-based recreation for this growing population.

Protected areas adjacent to metropolitan areas in Australia are estimated to have an annual growth in visitation of 16% to 17%, compared to just 4% for remote protected areas (DRE, 1996). This preference for nature-based recreation and tourism close to home appears to be growing (Laing et al. 2008).

The Cape Peron Coastal Park fits with Laing et al.'s (2008) definition of an 'urban fringe park' because urban development occurs adjacent to it. Urban fringe parks play a key role in community health and urban liveability and assist with raising awareness of the physical, mental and social wellbeing benefits of spending time in nature (Laing et al. 2008). It can also be argued that these parks are vital for our culture, providing access to nature for the urban community and thus helping to shape our attitudes, beliefs, values and norms about nature (Laing et al. 2008).

Different types of tourists are attracted to different activities (Cohen 1979); therefore, benefits to a region can be enhanced by offering a range of different tourism activities. However, diversity is needed not just to attract tourists but also to preserve and conserve natural features and prevent overcrowding. Pre-existing in Rockingham is a built up area of coastline containing restaurants and shops that attract tourists. It would be more economically and socially viable to build this area up to fulfill its full potential rather than begin another development, such as the MBM, further along the same coastline. Similarly, other marina and canal developments exist in Western Australia, such as in nearby Mandurah, and the Rockingham area is unlikely to benefit substantially in the long term by competing with those. Instead, it could focus on offering something different from Mandurah, such as that proposed by the Cape Peron Coastal Park.

The plan for the Cape Peron Coastal Park brings together a wide range of different tourist activities, many of which (such as ferry in Shoalwater Bay) are pre-existing, across a large area. The size of the area and scope of the activities is likely to offer sufficient diversity to prevent overcrowding. Plans for educational and interpretive material will assist to increase visitor knowledge of the need to conserve and preserve the natural features they experience.

Establishment of the MBM will restrict access to some of the Cape by zoning land as private. A marina is more costly to establish than the proposed Coastal Park, and will entail greater damage to the environment both in the construction phase and ongoing use of the marina. This is of critical concern to some species in the region. For example, the status of little penguins in the Shoalwater Islands Marine Park has remained a "serious concern" in recent annual reports by the Marine Parks and Reserves Authority (2014).

The MBM will bring less social and economic benefits to the local community than the Coastal Park. Its presence on the Cape will also decrease the chance of attracting international visitors, who are more interested in experiencing the unique natural features of the region than seeing another marina.

8. Conclusion

The establishment of a marina and canal development on Cape Peron will restrict public access to land and see the Rockingham Shire competing for the tourist market rather than offering diversity and something unique. The location of the MBM raises concerns about the continued viability of the nearby Little Penguin colony that is a significant drawcard to the region for national and international visitors alike.

Given the current use and status of the Land, and the existence of highly successful tourism and recreation businesses in the region, the proposal to integrate the land into a high quality Coastal Park encompassing Cape Peron, Lake Richmond and the Shoalwater Islands Marine Park offers a very positive way forward for the region. Unlike the MBM development, the Coastal Park secures the protection of areas of established social, historical and environmental importance while offering to share these with the public in a low cost manner that will provide economic and social benefits through the enhanced offering of nature-based tourism.

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West Australian 1933 Holiday Resorts: Rockingham and Garden Island, *West Australian*, 3 January, p.2.

West Australian 1949 'Holiday Facilities for Rockingham Campers', *West Australian*, 24 November, p.20.

Western Australian Planning Commission 2006 *Statement of planning policy no. 3. Urban growth and settlement.* Perth, Western Australia.

Attachments:

Burns, G.L. 2015. Full CV.

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Education

PhD Murdoch University, Western Australia 2008
Thesis title: *Lines in the Sand: An Anthropological Discourse on Wildlife Tourism.*
Supervisors: Assoc. Prof. Jim Macbeth and Prof. Susan Moore.

MSc University of Western Australia 1997
Masters degree by research. Thesis title: *From Coconuts to Cocktails: A sociocultural study of tourism on a Fijian Island.*
Supervisors: Prof. Robert Tonkinson and Prof. Sandy Toussaint.

BSc (Hons) University of Western Australia. 1989
Double major in Anthropology and Linguistics. Honours dissertation title: *'Friends and Crazy Tourists': Sherpa Perceptions and Experiences of Tourism.*

Academic Positions

Head, Department of Rural Tourism, Hólar University College, Iceland.	2014-
Associate Professor (Level D), Hólar University College, Iceland.	2013-
Head, Tourism Department, Icelandic Seal Centre, Iceland.	2013-
Senior Lecturer (Level C), Griffith University, QLD.	2012-2013
Lecturer (Level B), Griffith University, QLD.	2000-2011
Visiting Scholar, School of Social Science, University of Queensland, QLD.	2010
Visiting Fellow, School of Environment, Murdoch University, WA.	2009-2010
Lecturer (sessional), University of Queensland, QLD.	1998-1999
Associate Lecturer (Level A), Griffith University, QLD.	1996-1999
Tutor, University of Western Australia, WA.	1993-1995

Interests

A broad range of research interests are in the general area of Tourism including:

- Community Development
- Social Sustainability
- Tourism Ethics
- Cultural Tourism
- The Anthropology of Tourism
- Pacific Studies
- Ethnographic Research Methods
- Ecotourism and Sustainable Development

Teaching

Telemark University College, Norway Undergraduate: *Nature Qualities, Tourism and Guiding*	2015
University of Iceland, Iceland Undergraduate and Masters: *Tourism and Environment*	2015
Hólar University College, Iceland Undergraduate: *Rural Tourism*; *Qualitative Research Methods*; *Research and Tourism* Masters: *Trends and Traditions in Tourism Studies; Special Topics in Tourism*	2013-2015
Griffith University, QLD Undergraduate: *Nature-Based Tourism*; *Research Methods for the Social Sciences*; *Research and Statistical Methods*; *Anthropological Perspectives; Society, Culture and the Environment; Environmental Sociology; Development and Indigenous Peoples*; *Industry Affiliates Program* Honours: *Social Science Research Methods*; *Indigenous People and Conservation* Masters: *Indigenous People and Land Use*; *Environment and Development*; *Natural Resources Management and Cultural Context*	1996-2013
Volda University College, Norway Undergraduate: *Australian Cultural Immersion*	2003-2013
University of Queensland, QLD Masters: *Gender and Development*	1998-1999
University of Western Australia, WA Undergraduate: *Anthropology*	1993-1995

Teaching Awards

Excellent Medium Sized Course award. Dean of Teaching and Learning, Griffith University.	2012
Excellent Small Course award. Dean of Teaching and Learning, Griffith University.	2012
Best Course award. Griffith School of Environment, Head of School, Griffith University.	2011
Letter of Commendation. Dean of Teaching and Learning, Griffith University.	2013, 2012, 2010, 2009, 2007
Certificate of Commendation. Griffith Awards for Excellence in Teaching, Griffith University.	2000
Faculty Academic Staff Member Award. Griffith University.	1996

Grants

The Master Plan for Conservation of Nature and Utilization of Energy	Icelandic Ministry of Environment	150.000.000ISK ($AUD 1,400,000)	2015
Social Sustainability of Tourism in Iceland	Framkvæmdasjóður ferðamannastaða (Tourism Development) (national competitive)	4.300.000ISK ($AUD 40,000)	2015
Advancing Nature Based Tourism	Vaxtasamningur (Northwest Development Council), Iceland (national competitive)	6.000.000ISK ($AUD57,000)	2014
Hvítanes í Skötufirði (Developing a seal watching site)	Icelandic Tourism Board (national competitive)	2.444.860ISK ($AUD23,000)	2014
Human-Seal Interrelations	Nordic Research Council (NOS-HS) (international competitive)	238,527NOK ($AUD42,000)	2014-2015
Engaging Children with the Cultural Value of Seals	Menningarráð, Iceland (national competitive)	400.000ISK ($AUD3900)	2013-2014
Northwest Bird Trail	Vaxtasamningur (Northwest Development Council), Iceland (national competitive)	3.995.625ISK ($AUD37,000).	2013-2015
The Wild North Project	North Atlantic Tourism Association (international competitive)	186,720DKK ($AUD35,000)	2013-2014
Development and Indigenous Peoples	Internal Course Development Griffith University	$AUD6000	2012
Indigenous Cultural Heritage Project	Pro-Vice Chancellor Fund Griffith University	$AUD12,011	2011
Environment and Development	Internal Course Development Griffith University	$AUD5000	2011
Australian Animal Studies Group 4th Biennial Conference	Voiceless (national competitive)	$AUD10,000	2010
Australian Animal Studies Group 4th Biennial Conference	Internal Conference Sponsorship Griffith University	$AUD12,000	2010
The Effects of Changing Genetic Paradigms on the Development of Gene Technology Policy	Kickstart (internal competitive) Griffith University	$AUD5000	2008
Assessing Student Preferences for Duration and Timing of Courses	Team Teaching Grant (internal competitive) Griffith University	$AUD10,000	2002-2003
Assessing Host Community Involvement in Australian Wildlife Tourism	CRC for Sustainable Tourism (national competitive)	$AUD3000	1998-1999

Postgraduate Student Supervision

Student	*Topic*	*Outcome*	*Year*
PhD			
Paula Lewis	An Investigation into Human-Wildlife Co-existence and management plans concerning Dingoes and Coyotes	Ongoing	2013-
Miriam Kunde	Ex-situ and In-situ Conservation Approach for the Malayan Sun Bear	Ongoing	2013-
Sally Healy	Australian Consumers' Knowledge of Animal Agricultural Practices	Ongoing	2011-
Kathleen Varvaro	Human Dimensions in Wildlife Management: Defining and measuring value orientations in Australia	Transferred	2011-2012
Renee Chapman	Human-Wildlife Interactions (Birds)	Completed	2011-2015
Karen Hytten	Factors shaping the Australian Government's response to climate change, and barriers preventing a more effective response	Completed	2005-2013
Masters			
Egill Thorstensen	Comparative analysis of the effects of large scale industry on tourism business in Skagafjordur, Iceland	Ongoing	2015-
Maree Treadwell	Valuing Flying Foxes: education, attitudes and impacts	Ongoing	2015-
Sarah Marschall	Interpretation in Wildlife Tourism: Assessing the effectiveness of signage to modify visitor's behaviour at a seal watching site in Iceland	Completed	2014-2015
Jóhann Thorbjonsson	Anthropogenic impacts of SCUBA Divers in the Silfra freshwater fissure, Iceland	Submitted	2014-2015
Marie Legatelois	Interactions between environments, stakeholders and tourists at Latrabjarg cliff, Iceland	Completed	2013-2014
Ihab Shawki Erian	The impact of knowledge about livestock production systems on attitudes and behavior towards animals	Ongoing	2013-
Nenenteiti Teriki	Sustainable use of the environment in Kiribati	D	2011
Penny Everingham	Natural Resource Utilisation in Cambodia	D	2002/2003
Peter Ettema	Collaborative Management of Natural Resources in NZ	D	2002
Darryl Potter	Captive Breeding for Conservation	HD	2001/2002
Honours			
Rebecca Dowdy	Valuing Dingoes for Tourism on Fraser Island	2A	2013
Chanelle Wheeler-Jones	Coal Seam Gas: Agreement making with indigenous people.	1st Class	2013
Tegan Dawes	Managing Shark Tourism for Conservation	2A	2012
Grace Field	Land Clearing and Vegetation Management in QLD	1st Class	2011
Christine Lee	Sustainable Economics in Bhutan	2A	2011
Moshumi Smith	Sustainable Management of Jenolan Caves, NSW	1st Class	2007
Karen Hytten	Social Construction of Dingoes and their Management	1st Class	2003-2004
Jason Edgar	Audio-sonic deterrents for Dingoes	1st Class	2003-2004
Robert Appleby	Statistical Analysis of Human-Dingo Interactions	2A	2003
Elliott Orr	Ecotourism and Indigenous People in QLD	2A	2001-2002
Dane Yeoman	Employment Policy in Byron Bay	3	2001
Geoff Buchanan	Indigenous Heritage Conservation in QLD	2A	1999-2000
BA Thesis			
Anna Margrét Jakobsdóttir	Social Sustainability of Tourism in East Iceland	Completed	2014-2015

Membership of Professional Bodies

Curtin Business School Tourism Research Cluster	2014-
International Society for Anthrozoology	2014-
Animals and Society Institute	2011-
Australian Animal Studies Group	2010-
Wildlife Tourism Australia	2002-
Australian Anthropological Society	1995-

Publications

Books

Burns, G.L. and Paterson, M. (eds) 2014 *Engaging with Animals: interpretations of a shared existence*. Sydney: Sydney University Press.

Burns, G.L. 2010 *Dingoes, Penguins and People: Engaging Anthropology to Reconstruct the Management of Wildlife Tourism Interactions*. Saarsbrucken: Lambert Academic Publishing

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Book Chapters

Burns, G.L. 2015 Ethics in Tourism. Chapter 8 in C.M. Hall, S. Gossling and D. Scott (eds), *The Routledge Handbook of Tourism and Sustainability*. Routledge. ISBN: 978-0-415-66248-2 (hbk), ISBN: 978-0-203-07233-2 (ebk). Pp 117-126.

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Journal Articles

Lewis, P-M., **Burns, G.L.** and Jones, D. Response and responsibility: Humans as apex predators and ethical actors in a changing societal environment. *Food Webs*. Submitted June 2015.

Óqvist, E.L., Granquist, S., **Burns, G.L.** and Angerbjörn, A. Seal Watching: An investigation of codes of conduct. *Tourism in Marine Environments*. Submitted May 2015.

Wheeler-Jones, C., Howlett, C., Seini, M. and **Burns, G.L.** 2015 Media constructions of Aboriginality: Implications for engagement with coal seam gas development in Australia. *Australian Geographer*, 46(2):165-181.

Field, G., **Burns, G.L.** and Dale, P. 2012 Managing Vegetation Clearing in the South East Queensland Urban Footprint. *Local Government Law Journal*, 17:215-230.

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Burns, G.L. 2011 Book Review of Tourism and National Parks: International Perspectives on Development, Histories and Change, published by Routledge in 2009, edited by Warwick Frost and C Michael Hall. *Annals of Leisure Tourism*, 14(4): 395-396.

Burns, G.L. 2011 Book Review of The Framed World: Tourism, tourists and photography, 2009, edited by Mike Robinson and David Picard. *Anthropological Forum*, 21(1): 83-83.

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Conference Proceedings

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Burns, G.L. 2001 When Wildlife Tourism Goes Wrong: stakeholder issues on Fraser Island. CRC Sustainable Tourism Pty Ltd. Web page conference publication.

Other Publications

Unrefereed publications

Reports for ITB 2015

Midgely, S. and **Burns, G.L.** 2014 Sustainable Wildlife Tourism: Guidelines and advice for sustainable wildlife tourism in Iceland, Greenland, Faroe Islands and Norway.

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Healy, S. and **Burns, G.L.** 2013 Coles are the piggy in the middle of animal welfare confrontation. *The Conversation.* June 2013.

Burns, G.L. 2006 The Most Controversial Bridge Project in Australia. In P. Williams and R. Sinha (eds), *Mission Possible: Engineering for the Environment.* Jaipur: Pointer. Pp 119-120.

Appleby, R.G., **Burns, G.L.**, McBroom, D. and Jones, D. 2004 The Fraser Island Dingo Incident Report Database: A preliminary examination. Report prepared for Queensland Parks and Wildlife Service.

Burns, G.L. and Howlett, C. 2003 Staying Ahead: the case for indigenous studies in Environmental Science. Paper prepared for the AES professional advisory board at Griffith University.

Burns, G.L. 2001 Tourism at Strathgordon, Tasmania: a preliminary report. Report prepared for HydroTasmania in November 2001.

Burns, G.L. et. al. 1999 Stuart Oil Shale Stage 2 Draft Environmental Impact Statement. Report for the Queensland Conservation Council, prepared by a group based in AES at Griffith University.

Newspaper Interviews

15 August 2014 Bændabladid. Iceland. http://www.bbl.is/folk/deildarstjoraskipti-i-ferdamaladeild/1402

8 November 2012 Courier Mail Interview regarding research on Fraser Island Dingoes.

Television Interviews

05 October 2012 7.30 Report. ABC current affairs program "Fraser Island dingo plan under review"

Radio Interviews

16 May 2007 QUT news radio. Interviewed about student activism related to environmental issues.

07 May 2007 Interviewed by freelance journalist about human-dingo interactions on Fraser Island.

December 2003 Local Brisbane radio station (4BC) - live talkback show on my Fraser Island research.

July 2003 ABC Far North radio station - live interview about the changes to Dingo legislation.

November 2001 The World Today. ABC Radio. Interview on Dingoes and tourism broadcast on national radio.

I have reviewed manuscripts for the following journals:

Tourism Management, Journal of Ecotourism, Journal of Environmental Policy and Planning, Anthropological Forum, Annals of Tourism Research, Tourism Recreation Research, Mots Pluriels, Australian Zoologist, The Australian Journal of Anthropology, Anthropologica, Animal Studies Journal, Scandinavian Journal of Hospitality and Tourism, Journal of Australian Studies, Carbonates and Evaporites, Development Southern Africa.

Associate Editor: Special edition on ethics in the *Journal of Ecotourism.* 2011.

I am on the **editorial board** of the *Animal Studies Journal* (2012-2015).

Invited Lectures and Conference Presentations

Valuing Landscape: A perspective from tourism. Þjóðarspegillinn: Conference on Social Sciences, Iceland. October 30. Co-author: Laufey Haraldsdóttir. 2015

Managing Seal Watching: An investigation of codes of conduct for tourist behaviour. 24th Nordic Symposium on Hospitality and Tourism, Iceland. Þjóðarspegillinn: Conference on Social Sciences, Iceland. October 30. *Co-authors: Elin Lilja Öqvist, Sandra Granquist and Andres Angerbjörn.* 2015

Interpretation in Wildlife Tourism: Assessing the effectiveness of signage to modify visitor behaviour at a seal watching site in Iceland. 24th Nordic Symposium on Hospitality and Tourism, Iceland. October 1-3. Co-authors: Sarah Marschall and Sandra Granquist. 2015

Seal Watching: An investigation of Codes of Conduct. 7th European Mammalogy Conference. Stockholm, Sweden. August 17-21. Co-authors: Elin Lilja Öqvist, Sandra Granquist and Anders Angerbjörn. 2015

A Tale of Two Species on Two Continents: Urban canid management - can compassionate conservation contribute? Compassionate Conservation, Vancouver, Canada. July 28-31. Co-authors: Paula-Marie Lewis and Darryl Jones. 2015

Seals and Tourists in Iceland: Interdisciplinary perspectives towards holistic understandings of wildlife tourism. Tourism in the Arctic Workshop, Iceland. June 1-4. 2015

Seals and People: Balancing the sustainability of wildlife tourism in rural Iceland. Lecture at the Icelandic Seal Center for visiting students from the University of British Columbia. May 19, 2015. 2015

From Dingoes to Seals: Exploring the Ethics of Managing Wildlife Tourism. Department Seminar. Telemark University College, Norway. February 25. 2015

Human-Seal Interrelations in Northern Europe: Cultural values and perceptions. Human-Seal Interrelations - Exploratory workshops on faunal history and exploitation of seals in Northern Europe. Stockholm University, Sweden. 13-15 November. 2014

I Saw The Sign: Modifying visitor behaviour at a Seal Watching Site. Þjóðarspegillinn XV: Conference on Social Sciences. Reykjavik, Iceland. 30 October. Co-authors: Sarah Marschall and Sandra Granquist. 2014

Ethically managing wildlife tourism in Iceland. Þjóðarspegillinn XV: Conference on Social Sciences. Reykjavik, Iceland. 30 October. 2014

Codes of conduct: Managing interactions between visitors and wildlife in natural areas. Monitoring and Management of Visitors in Recreational and Protected Areas. Tallin, Estonia. August 20-23. Co-author: Sandra Granquist. 2014

Animals and Tourism: An ethical scrutiny of relationships between tourists and wildlife. Invited lecture. University of Veterinary Medicine, Vienna, 22 July. 2014

Human Coyote Co-existence and Innovative Management Options: A case study in the city of Boulder, CO, USA. ISAZ 2014 - Animals and Humans Together: Integration in Society. University of Vienna, July. Co-authors: Paula Lewis, Jim Smart, Darryl Jones. http://posters.isaz.net/posterDisplay.php?posterID=123 2014

Animals and Tourism: An ethical scrutiny of relationships between tourists and wildlife. ISAZ 2014 - Animals and Humans Together: Integration in Society. University of Vienna, 19-21 July. http://posters.isaz.net/posterDisplay.php?posterID=130 2014

Coding the Future: using codes of conduct to manage wildlife tourism in Iceland. 8th Conference on Icelandic society. Hólar University College, Iceland. 15 -16. May. 2014

Animals as Tourism Objects: Ethically Refocusing the relationships between tourists ad wildlife. Landsyn Conference. Hvanneyri, Iceland, March 7. 2014

Tourism, Anthropology and Me: the road to Holar. Departmental Seminar, Holar University College, Iceland. October 9. 2013

Towards embedding university-wide sustainability teaching. Australian Campuses Towards Sustainability conference. Sydney. September 25-27. Co-authors: Henry Skates, Michael Howes, Catherine Howlett, Jim Smart, Peter Daniels. 2013

Visitor perceptions of dingoes on Fraser Island. 5th Biennial Fraser Island Conference. Brisbane, August 8. Co-authors: Rebecca Dowdy, Jim Smart, Darryl Jones. 2013

Managing shark tourism to enhance conservation: The Grey Nurse Shark in Eastern Australia. Life in the Anthropocene. Sydney University, 8-10 July. Co-authors: Tegan Dawes, Lilia Bernede. 2013

Funded Keynote: *Sharing the Planet: Ethical principles for interacting with non-human species.* The Australian Veterinary Forensics, Law and Animal Conference (Gold Coast, Australia) December 12-13. 2012

Invited keynote speaker: *Fraser Island Dingo Management Stakeholder Workshop*. Maryborough, 4 October. 2012

Developing and managing wildlife tourism for sustainability. Invited paper prepared for Keynote lecture at Outdoors Finland Wildlife Tourism Workshop. Metsahallitus, Finland. August 2012. Co-authors: Sue Moore, Kate Rodger, Rod Quartermaine 2012

Managing Wildlife Tourism: an ethics approach to human-wildlife interactions. 3rd National Wildlife Tourism Association Workshop. Currumbin Wildlife Sanctuary, Gold Coast. 15-18 May. 2012

Invited Workshop: *Environmental Ethics and Wildlife Tourism.* 3rd National Wildlife Tourism Association Workshop. Currumbin Wildlife Sanctuary, Gold Coast. 15-18 May. 2012

An Ecocentric Approach to Managing People in Parks. People in Parks: Managing the Environmental Impacts of Visitors. International Symposium. Gold Coast, Australia. 19 November. 2011

Should dingoes die? Principles for engaging ecocentric ethics in wildlife tourism management Australian Animal Studies Group Conference, Brisbane. 14 July. Co-authors: Susan Moore, Jim Macbeth. 2011

Knowledge: the missing link in predicting attitudes towards animals. Australian Animal Studies Group Conference, Brisbane. 15 July 2011. Co-authors: Sally Healy, Gail Tulloch, Steven White. 2011

Sustaining what? The Ethics of managing wildlife-tourism interactions. CAUTHE conference, Hobart. 10 February. Co-authors: Susan Moore, Jim Macbeth. 2010

Managing Wildlife for People or People for Wildlife? Animals and Society Conference, Hobart, Tasmania. 20 July. 2007

Dingo Dualisms. Animals and Society Conference, Hobart, Tasmania. 20 July. Co-author: Karen Hytten. 2007

Managing Wildlife Tourism on Fraser Island. Conference on Managing the Integrity of Fraser Island. University of the Sunshine Coast. 8 September. 2006

Dingo, Dunes and Denizens: managing human-animal interactions in wildlife tourism settings. Animals and Society Conference, University of Western Australia. 22 July. 2005

Environmental Science and Anthropology: Coming of Age in Australia. Australian Ecopolitics Association Seminar, Griffith University. 24 August. 2004

To Feed or Not to Feed? What is the Answer? Fraser Island 'Bird Week', Kingfisher Bay Resort. May 2003 and May 2004. 2003, 2004

Anthropology and Environmental Science: Opportunities and Challenges in the Australian Context. Invited presentation at the Australian Anthropological Society conference, Sydney University. 20 October. 2003

Tourism and Anthropology: Past Contributions and Future Theoretical Challenges. International Sociological Association Conference, Brisbane, 6 July. 2002

Birds and Tourism. Fraser Island 'Bird Week', Kingfisher Bay Resort, QLD. 14 May. 2002

Community as Tourism Object: associated disciplinary understandings. CAUTHE 2002. Tourism on the Edge. Perth, WA. 28 February. 2002

When Wildlife Tourism Goes Wrong: Stakeholder Issues on Fraser Island. Sustainable Wildlife Tourism Convention. Tasmania. 10 November. 2001

Doing Community Research. Guest lecture in undergraduate Sustainable Tourism subject. Murdoch University, WA. 2001

What is Community? Social Science Tourism Seminar Series. Murdoch University, WA. 2001

Anthropology and Tourism: Challenges for People, Places and Wildlife. Australian Anthropological Society Conference. University of Western Australia, WA. September. 2000

Anthropology, Tourism and Me: An Introduction. Social Science Tourism Seminar Series. Murdoch University, Perth, WA 2000

Doing it for Themselves: Indigenous Fijians take on the tourism industry. Pacific Science Association Congress. University of New South Wales, NSW. 1999

Indigenous Responses to Tourism in Fiji: What is happening? Australian Anthropological Society Conference. ANU, Canberra. 1998

Ecotourism as a form of Natural Resource Management. How successful is it? Discourse Seminar Series. Queensland University of Technology.	1998
The Relevance of Tourism and Anthropology to Environmental Science. Australian School of Environmental Studies, Seminar. Griffith University, QLD	1997
Tourism in Fiji: What is happening? Pacific Science Association Inter-Congress. University of the South Pacific, Fiji.	1997
A Sociocultural Study of Tourism on a Fijian Island Postgraduate Seminar, Anthropology Department. University of Western Australia.	1995
The Anthropology of Fijian Tourism. Guest lecture, Department of Social Sciences. Edith Cowan University, WA.	1993
From Coconuts to Cocktails: A study of tourism impacts on Beqa. Joint Departmental Seminar for Visiting Scholars, SSED, University of the South Pacific, Fiji.	1992

Leadership and Administrative Experience

Position	*Responsibility*	*Year*
Regional Representative for Australia. IUAES Commission on the Anthropology of Tourism.	Representing and promoting the interests and activities of the Commission as the contact person in Australia.	2015-
Head of Board. Tourism Services. Hólar, Iceland.	Responsible for fiscal and other management of tourism services (food, accommodation, facilities) in the town of Hólar, Iceland.	2015
Member of Organising Committee. 24th Nordic Symposium on Tourism and Hospitality.	Selection of panels, and overall running of international conference held in October 2015.	2015
Grant Reviewer. University of Iceland.	Reviewing grant applications.	2015
Department Head. Department of Rural Tourism, Hólar University College, Iceland.	Daily operations of the Department, including strategic development, course and curricula programming, finances, human resources and facilities.	2014-2015
Management Team Member. Hólar University College (HUC), Iceland.	One of five top administrators at HUC, including the Rector and four department heads, ultimately responsible for running the University.	2014-2015
Board Member. Icelandic Tourism Research Centre, Iceland.	Managing the direction of research and finances in this national Centre.	2014-2015
Board Member. Tourism Services. Hólar, Iceland.	Guiding management of tourism services (food, accommodation, facilities) in the town of Hólar, Iceland.	2014-2015
Chair and Secretary of Department Review Committee. Department of Rural Tourism, Hólar University College, Iceland	Organising quality review of the department, liaising with external reviewers, staff and students, and preparing final report for the Ministry of Education	2014-2015
Member of Organising Committee. 8th Conference on Icelandic society. Hólar University College, Hjaltadal, 15 -16. May.	Selection of presenters, and overall running of event, for national conference.	2014
Department Head. Tourism Research. Icelandic Seal Center, Iceland.	Managing staff and strategic direction of research in the Centre.	2013-2015
Deputy Cluster Coordinator, Australia's Past and Future Research Cluster, Environmental Futures Research Institute, Griffith University	On management team responsible for running the Institute, and responsible for managing staff and strategic direction of research.	2012-2014
Vice Chairperson. Animals and Society Study Group (Australia).	Elected position to national committee. Second in charge to Chairperson, running the study group and organising meetings.	2012-2013

Elected Member, Griffith School of Environment, School Committee	Committee met 3-4 times per year to discuss matters relevant to the School.	2011-2012
Member, Industry Affiliates Program (IAP) Academic Review Group	Group internally reviewing the Griffith University IAP. Reports to the Review Committee.	2011
Member, Industry Affiliates Program (IAP) Review Committee	Committee internally reviewing the Griffith University IAP.	2011
Committee Member and Meetings Chair, Animals and Society Study Group (Australia)	Committee met monthly to discuss matters relevant to the Group. Responsible for chairing meetings.	2011
Chairperson, 4th Animals and Society Study Group (Australia) Conference	Selection of presenters, and overall running of event, for national conference held in Brisbane in July 2011.	2010 - 2011
Committee Member, Animals and Society Study Group (Australia)	Committee met monthly to discuss matters relevant to the Group.	2010
Elected Member, Griffith School of Environment, School Committee	Committee met 3-4 times per year to discuss matters relevant to the School.	2007 - 2008
Voluntary Member, Australian School of Environmental Studies, Social Committee	Committee organised 1-2 social events (e.g., picnics, bands, dinners) for staff and students per semester	2004, 2008
Nominated Member, Australian School of Environmental Studies, Futures Committee	Committee met 3-4 times per year to discuss teaching and research directions for the School.	2002 - 2004
Elected Member, Australian School of Environmental Studies, School Committee	Committee met 3-4 times per year to discuss matters relevant to the School.	2001 - 2004
Elected Member, Faculty of Environmental Sciences, Staff Committee	Committee met 3-4 times per year to discuss staffing matters such as promotions and confirmations.	2001 - 2004
Elected Member, Faculty Environmental Sciences, Equity Committee	Responsible for determining policy and decisions pertaining to equity issues in the Faculty,	2000 - 2004
'First Year Mentor' for Environmental Sciences Faculty at Griffith University.	This role involved student pastoral care, intensive knowledge and application of administrative procedures.	1997

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 16

Report in relation to the proposed MRS amendment
Dated 16 October 2015
By Adjunct Professor George Burns, clinical psychologist

REPORT OF ADJUNCT PROFESSOR GEORGE BURNS

FOR SUBMISSION TO THE WESTERN AUSTRALIAN PLANNING COMMISSION (WAPC)
RE: Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

16 October 2015

In preparing this report I wish to advise that I have carefully considered:

a. The proposed MRS amendment and the proposed Mangles Bay Marina (MBM) development the amendment is designed to facilitate,
b. The current status and use of the land subject to the proposed MRS amendments (the Land), and
c. The Cape Peron Coastal Park (CPCP) proposal.

By way of background, I write this report from a professional life time as a clinical psychologist, adjunct professor of psychology and author of seven books, including one book (Nature-Guided Therapy), several book chapters and many journal articles on the topic of the health and psychological benefits of Human-Nature contact. It is a topic on which I am frequently invited to teach internationally. A copy of my CV is attached.

The relevant research and other sources that have informed my opinions come from a wide variety of cross-disciplinary fields. This includes not only environmental psychology, ecopsychology and clinical psychology but also town planning, architecture, social geography, anthropology, evolutionary medicine, public health and other fields of research and thought. The references cited in this submission are but a small example of the volume of evidence to support the opinions expressed.

The Likely Impacts on Community Health and Well-being of Each of the Two Alternatives (MBM and CPCP)

1. **The likely impacts on community health and well-being of the rezoning for the Mangles Bay Marina or other urban development**

The research is clear: As populations and urban density increases mental health issues rise at an exponential rate. Although city living has many advantages, rapidly increasing urbanization has major health implications. Rates of schizophrenia increase significantly for people born and raised in cities compared to those born and raised in less heavily populated districts (Krabbendam & van Os, 2005; Mortensen, et al, 1999; Pedersen et al, 2001; van Os, et al, 2004). Living in cities significantly increases the rates of depression and anxiety disorders (Dye, 2008; Peen, et al, 2010). Lederbogen et al (2011) state, "More than half of the world's population now lives in cities, making the creation of a healthy urban environment a major policy priority."

While increasing urbanization has negative health and mental health consequences for people raised and living in human-constructed environments, the reverse is also true. Access to natural environments has many positive health and mental health benefits. Carter and Horwitz (2014) in a study of green space useability and health across four suburbs in Perth concluded that access to parks and green spaces within residential neighbourhoods has been shown to be an important pathway to generating better physical and mental health for individuals and communities. Urban parks and green spaces provide places for sport and active recreation, places to relax and enjoy solitude, places to meet other people and socialise and places that evoke feelings of connection to the natural world.

Carter and Horwitz (2014) defined several important variables of green public space to personal and community well-being. First, proximity to nearby play and social spaces was associated with better mental health, perhaps through increased opportunity for social interaction. Second, the retention of green space and bushland was associated with better physical function, hypothesizing that the size and diversity of landscape increased opportunities to be physically active for longer in a larger space. Third, green space useability was associated with better general health and vitality, encouraging and enabling regular visitation which, in itself, was associated with greater vitality. The green places that interviewees described as being most beneficial were 'somewhere that you can go if you need to get out in nature' with wildlife, birds, trees and a sense of 'freshness' where they could escape the noise and busyness of the city. These are the very features that Cape Peron already has – along with seascapes and sunsets – and are incorporated in the Cape Peron Coastal Park concept plan but will be lost to a MBM type rezoning.

Worldwide, particularly in 'developed', highly urbanized societies, we are experiencing a rapid escalation in the rates of depression. Is there any better reason for the WAPC to be addressing questions in its future planning decisions such as: How can we create an environment that will best facilitate the health and happiness of our citizens? How can we preserve and provide access to those environments that best facilitate our citizens' physical and mental well-being?

Verlande, Fry & Tveit (2007) found that simply viewing natural landscapes (such as the CPCP) gave a stronger positive health effect compared to built urban landscapes (such as the MBM) in three areas: short-term recovery from stress or mental fatigue, faster physical recovery from illness and long-term overall improvement on people's health and well-being. Built urban landscapes, by comparison, had less positive and, in some cases, negative effect on health.

Carter and Horwitz (2014) recommend, "Professionals working in health promotion, green space planning and design, urban conservation, local area planning and residential development will need to collaborate to ensure greater useability of urban green spaces." I encourage the WAPC to consider this evidence in planning for people and public health and well-being.

2. The likely impacts on community health and well-being of the Cape Peron Coastal Park

Research shows clearly that human access to and contact with undeveloped natural environments has many physical, psychological, cultural, spiritual and social benefits. Contact with nature is healing, recuperative, restorative, stress-reducing, and depression-reducing (Burns, 1998, 2005). Contact with nature enhances well-being and happiness and we have good evidence that happy people are healthier, live longer and enjoy a greater quality of life. The happier people are the less they are likely to experience depression, anxiety, stress or anger. They engage in fewer acts of violence or antisocial behaviours, and enjoy better social relationships. They contribute to society in economic, social, moral, spiritual and psychological terms, and are less of a burden to health services, social welfare agencies or police and justice systems. In turn, they are less of a burden to the state and national economy. Ensuring access to pristine natural environments is one way of helping to ensure individual and community well-being, and the associated health, social and economic benefits.

2.1 Nature Contact Benefits Physical Well-being

A significant body of research over the past few decades has enabled us to affirm that interactions with nature improve our physical well-being and may help prevent disease.

First, contact with nature promotes healthy patterns of behavior and thus serves a preventative role against the onset of health problems (Russell & Mehrabian, 1976; Ulrich, Dimburg & Driver, 1991; Hansmann, Hug, & Seeland, 2007).

Second, nature contact serves a health-enhancing, disease-preventing role in that our bodies generally function more healthily in nature settings (Kaplan, 1995; Kaplan & Kaplan, 1996).

Third, nature contact is not just preventative but can also be healing. Hansmann, Hug, & Seeland (2007) found that people visiting an urban forest and a city park experienced a recovery ratio for pre-existing headaches of 52%. Indices such as heart rate, skin conductance, blood pressure and muscle tension, show movements in positive physiological directions when people are exposed to nature (Ulrich et al., 1991; Ottosson and Grahn, 2005a, 2005b, 2008).

Finally, higher levels of physical well-being may be a secondary gain from the greater psychological well-being derived from nature contact. We have good evidence that psychologically robust, happy, positive and optimistic people generally have higher levels of physical well-being, suffer less severe illness, live longer and - if they do become ill - have better recovery rates (Danner, Snowdon and Freisen, 2001; Maruta, Colligan, Malinchoc and Offord, 2000; Ostir, Markides, Black and Goodwin, 2000; Valliant, 2002).

The State Planning Strategy 2050 states the following 'Key Factors' for social infrastructure (p. 86): "If an additional 40% of the Australian population engaged in regular, moderate and effective exercise, an estimated net benefit of $6.5 million per day would result from the reduced costs associated with heart disease, back pain, increased workplace productivity and reduced absenteeism.

"People who use public open spaces are three times more likely to achieve recommended levels of physical activity than those who do not use the spaces.

"Walking an extra hour a week represents 40% of the average person's physical activity target and it halves the risk of being overweight."

If the direct health benefits alone are not a sufficiently strong enough argument for preserving accessible natural environments such as Cape Peron, then the secondary gains in significantly reduced health, medical and hospital costs to the community surely is.

2.2 The Natural Environment Enhances Psychological Well-being

Again there is good evidence that nature contact evokes emotional, cognitive and behavioral responses that are conducive to happiness and contentment. At the emotional level, human interaction with nature can enhance states of positive feelings, provide a buffer against emotional distress, serve a preventative role in the area of mental health, restore emotional well-being, and have an "undoing" effect on negative emotions (Fredrickson, 2000, 2005). In fact, visiting an urban forest or city park can reduce stress levels by up to 87%, and enhance feelings of well-being by 40% (Hansmann, Hug, & Seeland, 2007).

At the cognitive level, people tend to concentrate better in natural environments while children suffering Attention Deficit Disorder have better focus of attention, completion of tasks, and following of instructions (Taylor, Kuo and Sullivan, 2001). People find themselves more mindful and focused in natural environments and there is growing evidence of the benefits of mindfulness on human well-being (Kabat-Zinn, 2006, 2009; Teasdale, Williams, Segal & Kabat-Zinn, 2007).

At the behavioural level, interacting with nature can increase more health-oriented behaviours and eliminate less healthy behaviours such as those related to smoking, alcohol, drugs and overeating (Greenway, 1995).

State Planning Strategy 2050, in discussing Health and Wellbeing (p.96), states, "Retaining natural bushland and coastal areas that are accessible is essential to human health and a sense of wellbeing.

"People are often attracted to spaces and places with iconic landscapes, unique histories, exciting activities or which provide an overall calming influence. These spaces and places offer people inspiration, stress relief, aesthetic values and a sense of spirituality and belonging."

It adds a key fact: "Nature and access to natural environments can reduce the impact of life-stress on children and help them deal with adversity. The greater their exposure to nature, the greater the benefits."

Can there be any better reason to preserve Cape Peron as an attractive, accessible coastal park than to preserve the well-being of our future generations?

2.3 Nature Interaction Benefits Social Well-being

Many studies have explored the health and social well-being status of people living in high density urban public housing developments. Those residents who preferred and frequented treed public spaces – as compared to those who spent more time in treeless areas - spoke more to other people, communicated better, were more likely to know their neighbours by name, and reported feeling a greater sense of community (Kuo & Sullivan, 2001; Taylor, Wiley, Kuo & Sullivan, 1998). These researchers also discovered something that all urban planners should be aware of: a view of nature can negate negative social behaviors. Domestic violence - whether toward adult partners or children – was significantly lower when families had a window view of nature (Kuo & Sullivan, 2001).

2.4 Interactions with Nature Assist Spiritual Well-being

Spiritual beliefs and cultural values are often tied closely to nature. In nature people commonly experience a feeling of connectedness with forces bigger and more powerful than ourselves. In nature we may encounter experiences of transformation, develop inner reflection and contemplation, facilitate personal growth, build a sense of spiritual well-being, or experience feelings of wholeness and belonging (Heintzman, 2000; Williams and Harvey, 2001). In fact, one of the things known from research into happiness is that spirituality rates as one of the high correlates of a life well-lived (Valliant, 2002).

3. How Does This Research Evidence Apply to the Cape Peron Coastal Park

3.1 Cape Peron offers the very types of human-nature interactions that researchers have demonstrated are essential to human well-being. Positive physical and emotional benefits increase with the length of time and the level of activity that people engage in while in urban nature areas (Hansmann, Hug, & Seeland, 2007). Cape Peron provides the activities these researchers described as 'less strenuous' (e.g. walking, relaxing, sightseeing, watching sunsets) and 'more active' - that provide greater benefit - (e.g., jogging, cycling, swimming, snorkeling, scuba diving, playing beach games). This research highlights the need to preserve environments

where people can (a) have access to nature, (b) spend time in nature, and (c) have the opportunity to engage actively in a natural environment. Cape Peron already accommodates all of this but will be severely limited to provide these essential opportunities for individual and community health and well-being if the Land is rezoned as urban and utilized for the proposed MBM development.

3.2 Research in environmental psychology suggests that people's desire for contact with nature serves an important adaptive function, namely, psychological restoration. Given this, Van Den Berg, Hartig & Staats (2007) claim we need to design communities that balance settlement density with satisfactory access to nature experience because urban nature is a design option that promotes urban sustainability. In the Rockingham region, this design option currently exists in Cape Peron. To lose it to the proposed MBM development would be a very backward step for both urban sustainability and human health and well-being.

3.3 The greater the diversity of nature, the greater the diversity of sensory experiences the environment provides for the person interacting with it, the greater the health and restorative benefits people derive from it (Burns, 1998, 2005). Cape Peron provides uniquely diverse nature experiences from treed areas, undulating landscape, coastal views, seascapes, various rock formations, beaches, wildlife in the dolphins, sealions and passing whales, and a variety of terrestrial and marine birdlife and other wildlife. It also allows for a broad diversity of activities as mentioned above. This maximizes the benefits of the human-nature contact significantly more than a flat, grassed suburban park and again needs to be preserved for this reason.

3.4 Our Perth city planners had great foresight in preserving King's Park as one of the world's largest inner capital city parks. Take a weekend walk there and it is apparent how the park contributes to and facilitates family activities, community interactions, recreational participation, and feelings of well-being that enrich individuals, families and community for the residents of the state as well as visiting tourists. While not as large, and different in many ways, the principal of preserving Cape Peron as a nature preserve for locals and visitors will equally enrich the community in the City of Rockingham and beyond. Preservation of it now will be acknowledged and appreciated by future generations in much the same way as King's Park is.

3.5 Cape Peron and the Shoalwater A Class Marine Sanctuary on its southern side is the only such coastal park in the whole of the greater Perth region – or, indeed, the whole of Western Australia. It allows residents of our state, and visitors, to view and interact with marine animals and birdlife in a way that is unique to this particular park – and that adds to human well-being. The area allows for wildlife tourism in which people can interact with both nature and unique marine life as it is the habitat for dolphins, sealions, pelicans, penguins, sea eagles and many other species.

3.6 With the population of Rockingham forecast to increase from around 100,000 to 178,000 in twenty years, the need to preserve natural urban green areas such as Cape Peron will become more critical as already referenced (Van Den Berg, Hartig & Staats, 2007; Hansmann, Hug, & Seeland, 2007). As populations increase and people become more urbanized we need more nature access, not less, and therefore need to act now to preserve Cape Peron.

3.7 In 2012, I was an invited participant in a United Nations (New York) High Level Meeting at which all 193 member nations of the UN unanimously voted for adopting a more holistic approach to development in preference to the world's current economic paradigm based predominantly on financial indicators. The High Level Meeting included some of the world's top scientists and thinkers from many disciplines, Heads of State, Nobel Laureates, business representatives, civil and religious leaders. It was agreed, "Achieving this vision (of a new developmental paradigm based on well-being more than monetary gain) requires that we recognize our interdependence with nature and with each other. It requires a healthy balance among thriving natural, human, social, cultural, and built assets. We recognize that these assets depend on the natural world, and that natural capital is generally non-substitutable. Sustainability therefore requires that we live off the interest generated by natural capital without depleting the capital itself." When all 193 member nations of the UN agree that we should not be selling off our natural assets but rather retaining them and learning to benefit from the interest generated by those assets, it would seem prudent for the WAPC to be considering and incorporating these universally international-agreed principles into its planning decisions for Cape Peron.

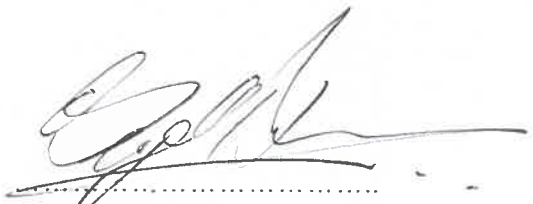
Summary

Helping keep people healthy, well and happy through contact with nature has distinct community, ecological and economic benefits. Cape Peron can uniquely meet the needs that the research clearly shows people have in interacting with nature. To sell off this is unique environmental asset for short-term financial gain is contrary to international thinking as expressed at the above-mentioned United Nations meeting. We simply cannot afford – at many crucial levels - to lose this very special park for the health, happiness and well-being of the people of Rockingham, Western Australia … and of the world.

I request the WAPC to consider and incorporate the above comprehensive and conclusive evidence-based material for preserving Cape Peron as a natural resource for individual and community health and well-being.

Request for opportunity to address the WAPC

I request the opportunity to give an oral presentation to the WAPC in relation to this report.



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George W Burns
Adjunct Professor of Psychology
Curriculum Vitae

QUALIFICATIONS:

Bachelor of Arts (Honours)
University of Melbourne 1968 (Double Major in Psychology)

Fellow, West Australian Society for Medical Hypnosis 1976

Diploma of Clinical Hypnosis 1991

Registered Clinical Psychologist 1975 to present
(Psychology Board of Australia)

Adjunct Professor of Psychology, 2010 to present

PAST AND PRESENT PROFESSIONAL AFFILIATIONS:

President West Australian Society for Medical Hypnosis 1979-1981

Senior Tutor West Australian Society for Medical Hypnosis 1982-1984

Member International Society of Hypnosis

Member American Society of Clinical Hypnosis

Member Australian Psychological Society Ltd.

Member College of Clinical Psychologists, A.P.S

Member Division of Independent Practising Psychologists, A.P.S.

Foundation Member
The Institute of Private Clinical Psychologists of Australia

State Chairperson
The Institute of Private Clinical Psychologists of Australia, 1979-1985

National Chairperson
The Institute of Private Clinical Psychologists of Australia, 1982-1985

Approved Consultant in Clinical Hypnosis
The American Society for Clinical Hypnosis, 1994 to present

Member Scientific Panel, National Asbestos Diseases Research Foundation, 1996-1999

Guest Editor Milton H Erickson Newsletter (USA), 1999 to 2002

Editorial Advisory Group
Psychotherapy In Australia, 1999 to 2010

Member The Australian Practitioners Advisory Board, the 1st and 2nd Australian Positive Psychology and Wellbeing Conferences

CURRENT POSITIONS:

Adjunct Professor of Psychology, 2010 to present
Cairnmillar Institute
School of Psychology, Counselling and Psychotherapy
Melbourne

Director, The Milton H Erickson Institute of WA, 1984 to present

Reviewer, The Journal of Positive Psychology, 2008 to present

Reviewer, The Journal of Constructivist Psychology, 2013 to present

Editorial Board Member, International Journal of Wellbeing, 2010 to present

PREVIOUS APPOINTMENTS:

Psychologist Mental Health Services, Tasmania. 1968-1970

Psychologist Mental Health Services, WA. 1970-1972

Psychologist Department of Corrections, WA. 1972-1975

Clinical Psychologist Department of Social Security, WA. 1974-1979

Honorary Consulting Clinical Psychologist
Royal Perth Hospital. 1974-1976

Lecturer in Psychology
Western Australian Institute of Technology.
Dental Therapy School. 1975-1977

Clinical Tutor Murdoch University. 1980-1981

Clinical Psychologist Kalamunda District Hospital. 1979-1983

Approved Counsellor Western Australia Reproductive Technology Council. Several years to 1999

Guest Lecturer Master's level course in Clinical Hypnosis, Curtin University of Technology. Several years to 2000

Adjunct Senior Lecturer, 2004 to 2013
School of Psychology

Edith Cowan University
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Clinical Psychologist in private practice, 1974 to 2010

Volunteer Clinical Psychologist
Jigme Dorji Wangchuck National Referral Hospital, Ministry of Health, Bhutan
2007, 2010, 2012, 2013 (up to 3 months per visit)

Invited Participant High Level United Nations Meeting, New York
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George's books have been translated into 16 languages. He has also published articles on hypnosis, psychology, psychobiology, traditional medicines and travel in several magazines.

INTERESTS:

George is a keen adventurer traveler. He has visited every continent, including Antarctica and set foot on some of the world's tallest mountains. He has a love for the Himalaya, having visited Nepal eight times, Tibet on three occasions, and Bhutan twelve times as a study tour leader, counsellor trainer and volunteer clinical psychologist. As well as writing, his recreational interests include high mountain trekking, water sports, and experiencing different cultures. He has studied the mind/body healing aspects of traditional medical systems in several countries and in his travels has collected many cross-cultural stories that he has adapted into his clinical practice. He is a devoted grandfather, enjoying the opportunities to rediscover the joy of childhood playfulness.

CONFERENCE AND MEDIA APPEARANCES:

George W. Burns is a frequent conference presenter, keynote lecturer and workshop trainer who has lectured and conducted workshops in North America, Europe, Africa, Asia and throughout Australia.

He had a regular radio talkback program (for some 35 years), and is frequently consulted as a spokesperson by television, radio and the printed press. His work has been featured in newspaper and magazine articles as well as on television, both nationally and internationally.

At the 1999 Congress on Ericksonian Psychotherapy and Hypnotherapy in Phoenix Arizona delegates rated his workshop as the Number One Presentation. Among his many conference presentations, he was on the Invited Faculty for the 2004, 2007 and 2011 Ericksonian Congresses, the First and Second Australian Conferences on Positive Psychology (2008 & 2010) and the First World Congress on Positive Psychology in Philadelphia (2010). Given his contribution to the psychology of well-being he was an invited participant to a High Level United Nations Meeting in 2012 on creating a new world development paradigm based on happiness and well-being rather than solely on economics.

He has been described by colleagues as "among the world's best therapists" and a "global thought leader."

These days he spends up to 3 months per annum working overseas as a volunteer clinical psychologist in 'developing' countries.

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 17

Submission in relation to the proposed MRS amendment,
Dated 20 October 2015,
By Keren Geddes, senior child and adolescent clinical psychologist

SUBMISSION TO THE WESTERN AUSTRALIAN PLANNING COMMISSION (WAPC)
RE: Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submitted by Keren Geddes, Senior Child and Adolescent Clinical Psychologist
20th October 2015

In making this submission, I wish to advise that I have seen the proposed MRS amendment and the proposed Mangles Bay Marina (MBM) development the amendment is designed to facilitate, am aware of the current status and use of the land subject to the proposed MRS amendments (the Land), and have studied the Cape Peron Coastal Park (CPCP) proposal.

By way of background, I am a Senior Clinical Psychologist working with children, adolescents and their families. My clientele come mainly from disadvantaged, low socio-economic families and have significant issues of trauma. I have worked specifically with this population of young people for the last 10 years and have extensively researched treatment models for young people who have experienced severe trauma, publishing several articles in the field. My research expertise lies in the area of developmental trauma and how children and adolescents learn to regulate and manage emotional distress resulting from their traumatic experiences. This research is currently submitted for the award of a PhD.

I make my submission out of deep concern for the proposed changes at Cape Peron. With growing population numbers in the Rockingham/Kwinana area, reduced sizes of residential lots where kids have reduced contact with nature, and increasing issues of mental health and substance abuse, children need more access to nature rather than less. There is clear evidence that contact with nature enhances health and well-being (see the report dated 16 October 2015 prepared and submitted by Adjunct Prof George Burns; Also Burns, 1998; 2005; 2009).

My review of the literature, own research in the area and experience of working with children and adolescents, leads me to strongly concur with the statement in the State Planning Strategy 2050 that says, "Nature and access to natural environments can reduce the impact of life-stress on children and help them deal with adversity. The greater their exposure to nature, the greater the benefits (p.96)."

The rationale underpinning my agreement with the above statement is as follows: We know that trauma effects brain development with a particularly potent impact on young children (Ford, 2005; Geddes & Dziurawiec, 2007a, Geddes, Dziurawiec & Lee, 2013; 2015; van Der Kolk, 2005, van der Kolk, Pelcovitz, Roth, Mandel, McFarlane & Herman, 1996). We also know these effects can be carried throughout the life span (van Der Kolk, 2005) and underlie much of the mental health and drug related conditions and indeed, crimes, occurring at ever increasing rates within our community (Geddes, 2007b; van der Kolk, Perry & Herman, 1991). Since the 1990's

brain-imaging tools have started to show us what actually happens inside the brains of traumatized people. This has proven essential to understanding not only the damage inflicted by trauma but also to guide us in ways of formulating new avenues of repair. What the latest research tells us is very clear, that in order to repair itself the brain needs to attend to positive and calming sensory input (van der Kolk, 2014). This is because when trauma is experienced the terror that is felt is stored not in words but in speechlessness. That terror is held, quite literally within the body. The release of terror experiences, is therefore, facilitated by accessing non-verbal means of sensory input and this in turn leads to a re-wiring of the brain allowing it to gradually repair itself (Ford, 2005; van der Kolk & Fisler, 1994). What could be more important than this when thinking of the lives and futures of these vulnerable young people? As Dr Bessel van Der Kolk (2014, p 401), professor of psychiatry and clinical director of The Trauma Centre at Justice Research Institute in New York states, "Childhood trauma, including abuse and neglect, is probably the single most important public health challenge….a challenge that has the potential to be largely resolved by appropriate prevention and intervention." Helping these children to create a life worth living is a major focus of my work and obviously something I feel passionate about. That passion has been guided by evidenced-based research and this directs the way I work with these children and adolescents. The evidence is indisputable: Traumatized children will benefit from positive sensory interactions with the natural environment (see Van der Kolk, 2014).

In my own work with this clinical population of young people in the Rockingham region, I therapeutically make use of, or plan to make use of, Cape Peron in the following ways:

1. Development of a nature-guided group therapy programme in conjunction with the education department and staff at the Point Peron camp facility to work with young children with post-traumatic stress disorder.
2. A sensory awareness programme for individual children and adolescents presenting with acute symptoms of complex trauma. Clinicians will be working individually with children/adolescents who are highly dysregulated and are unable to attend school regularly due to behaviour management issues.
3. Parent group: working with anxious parents who struggle to manage their children due to their own emotional distress and trauma-related experiences through the use of nature-guided walks and sensory exercises.
4. Staff development: specifically addressing the well documented issue of compassion-fatigue by conducting mindfulness-based exercises in nature.

The loss of a significant area of Cape Peron, including Bush Forever Site 355, a large section of the beachfront and potential risk to the three Threatened Ecological Communities will be a significant detrimental loss not only in terms of therapeutic benefits to young people with complex mental health problems but also in the early prevention of mental health problems for all young people if they are to become fit and functional adult members of our society.

In contrast, the Cape Peron Coastal Park proposal will offer much to enhance the health and well being of our children, youth, families and community. I have studied the CPCP proposal carefully, considered it in the light of current research, and engaged in many conversations with colleagues about its potential contribution to mental health. The conclusion is consensual: with its youth recreational areas, family recreational areas, children's adventure playground, Tuart walkways and gardens, walk and cycle links to Lake Richmond and the sea, access to an abundance of bird and marine life - along with all the inherent natural features that already exist at Cape Peron - the Cape Peron Coastal Park proposal is *essential* if we are to maximise mental health and well being, prevent mental illness, and treat mental health issues (as described above) in the child and adolescent populations of our community. Its implementation will be a *major* cost-effective contribution to community health and well being.

I ask WAPC to seriously consider rejecting the proposed MRS amendment and instead declare Cape Peron as an A class reserve for the sake of the health and well being of our current and future generations.

I request the opportunity to address the WAPC in regard to this matter.

Keren Geddes

Clinical Psychologist

BA (Hons), MA Applied Psychology (Clinical), Doctor of Philosophy candidate.

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20th October 2015

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Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 18

Open letter to Commonwealth Environment Minister Greg Hunt
Dated 19 December 2014 in relation to concerns about
The impact of the proposed Mangles Bay Marina
And canal development on the Little Penguin,
From 27 eminent members of the academic, conservation
And tourism community

An Open Letter to Minister Greg Hunt

The Hon Greg Hunt MP
Minister for Environment
PO Box 6022
House of Representatives
Parliament House
Canberra ACT 2600

19 December 2014

Dear Minister Hunt,

We the undersigned represent the scientific, academic, conservation and tourism community working directly with Little Penguin (or 'fairy penguin') colonies and/or their natural habitats across Australia, and in some cases internationally.

We write to raise our strongest concerns over your recent approval and your department's failure to assess and include the Little Penguin (*Eudyptula minor*) in the proposed Mangles Bay Marina and Canal development project on 2 October 2014 (EPBC Decision 2010/5659) by proponents Cedar Woods and Landcorp (WA Government).

We are especially concerned that your decision failed to include impacts on the Little Penguin due to a decision taken on 27 October 2010 to exclude this federally protected marine species from the federal assessment process.

By way of national context, four developments currently threaten the Little Penguin: the St Kilda Breakwater Extension (VIC); the Kangaroo Island Sea Wall (SA); the Port Spencer Development (SA); and the Mangles Bay Marina Development (WA).

There are two iconic Little Penguin colonies living in close proximity to the Mangles Bay Marina and Canal development: the *Garden Island Colony* and the *Penguin Island Colony*. The Penguin Island colony is the largest known breeding colony in WA and in 1996 was given the highest conservation status of 256 colonies of Little Penguins around Australia (Dann et al. 1996).

We write to request your urgent reconsideration of the decision to approve this project.

Under section 78 of the *Environmental Protection Biodiversity Conservation Act 1999* you have the power to reconsider a decision if there is evidence of:

- Substantial new information that was not considered when the original decision was made (paragraph 78(1)(a))
- Substantial change in circumstances which are highly likely to cause adverse impacts of the action on a protected matter (paragraph 78(1)(aa))

We have compiled 12 such examples as grounds to reconsider and revoke your decision:

1. Since 2007, **the Little Penguin population on Penguin Island has experienced a drastic reduction with the overall population during the breeding season dropping by half.** This is considered to be a direct result of decreasing rates of breeding pairs returning to the island to attempt to breed, most likely due to reduced food availability (Cannell, 2012). In the longer term, this will impact the number of young penguins available to recruit back into their natal colony.

   Specifically, new and yet to be published survey data revealed by Dr Belinda Cannell on the ABC 730 WA program "Saving the Penguins" (Ainsworth, 2014), revealed that since 2007 the Penguin Island Little Penguin breeding population has dropped by almost 40% (from approximately 1600 to approximately 1000 during comparable times in their breeding cycle). This reduction in penguins attempting to breed is most likely due to a reduction in fish abundance close to the colony potentially caused by warming of ocean temperatures - which has impacted on fisheries and likely moved them further south, and also coastal development (Cannell, 2012).

2. Unpublished GPS location tracking data - used with permission (Appendix 1) has revealed **the proposed development site is currently a foraging activity hotspot.** Of all the foraging areas in Cockburn Sound, **the breeding pairs are almost feeding exclusively in the Mangles Bay area when they are feeding chicks** (Cannell, 2012).

3. The **breeding pairs of the Garden Island Penguin colony feed exclusively in Cockburn Sound, often in the seagrass meadow directly adjacent to the proposed construction site** (See Appendix 1). Some breeding penguins from Penguin Island also feed in Mangles Bay and other areas of Cockburn Sound.

4. There has been **significant cumulative loss of seagrass meadows of 77% since 1967** in the greater Cockburn Sound area (in which Mangles Bay is located) with the remaining meadows in state of severe decline (Verduin & Sinclair, 2013). **The proposed removal of a further 5.6ha of seagrass will completely bisect the main remaining seagrass meadow in Cockburn Sound** and some researchers attest bisection could see the seagrass decimated altogether in Mangles Bay (bisection has maximum negative impact on a viable habitat). New research shows the ameliorative measure proposed by the proponent (to replant additional seagrass) uses a method that has been widely criticised by leading experts, particularly those raised in

submissions on the Mangles Bay PER (Strategen, 2013. p115). **Even if it were successful, the transplant sites will take seven to ten years to develop to full coverage,** according the proponent (Strategen, 2013. p42).

5. The 2012 Federal Marine Bioregional Plan for the South-West Marine Region (prepared under the *Environment Protection and Biodiversity Conservation Act 1999*) noted the importance of the EPBC-listed marine species to the region, and **called for the Perth population of Little Penguins to be treated as a priority for conservation.**

6. **Dredging will occur during the Little Penguin breeding season, when the penguins are reliant on the Mangles Bay area for food.** The timing of a first peak number of egg lay is generally in June and a second peak in September, and on average a quarter of the colony will be feeding chicks from June to August. (Cannell unpublished data 2013, Cannell Appeal Form 2013, Cannell additional information sent to the Appeals Convener 2013). The EPA provided approval conditions contrary to data provided by Dr Cannell and instead made it an approval condition that dredging occur in precisely the time when a substantial proportion of penguins will be feeding chicks.

7. A 2013-2014 study using satellite tags shows **some Penguin Island penguins are swimming as far as Margaret River to feed during incubation periods** (roughly a 520 km round trip), with trip durations up to three times longer than normal. This data is consistent with previous findings from 2008 (Ainsworth, 2014) which was also a year with above average sea surface temperatures.

8. **In the second half of 2011, Little Penguin deaths reached four times the normal level,** with one of the causes of mortality attributed to starvation as a direct result of decreasing fish stocks – which were tied to prolonged and above average sea surface temperature and potentially coastal development (Ainsworth, 2014).

9. Recreational activities in Cockburn Sound, Warnbro Sound and Comet Bay such as boating and jet skiing are already impacting on the colonies, with experts recently saying **boat strikes are contributing to one third of penguin deaths. A new marina with an additional 500 boats could devastate both colonies** (Ainsworth, 2014).

10. An investigation in June 2013 found **penguins in the Mangles Bay area contain mercury at concentrations above levels considered safe.** The studies profiling heavy metal exposure in seabirds using their feathers have both indicated that the southern end of Cockburn Sound, and in particular Mangles Bay, may be providing the conditions for mercury bio-accumulation in the marine food-chain, with both the Little Penguins that forage at the southern end of Cockburn Sound and Caspian Terns that fish in that area when breeding show elevated levels of mercury in their feathers, with some individuals of both seabirds having mercury levels (as measured in feathers)

above the level considered safe for marine birds of 5 mg/kg (Dunlop, McNeill & Cannell, 2013).

11. **The proposed Mangles Bay Marina and Canal development could elevate the existing mercury contamination hazard in at least two ways.** Firstly, the dredging program may release methyl-mercury into the water column causing a spike in contamination in fish and other marine life. Secondly, the settling organic matter in the dredged channel, and in the poorly-flushed, blind-ending canal development, is likely to further enhance the conditions for mercury methylation by bacteria in the long-term. This would present a threat to the commercial & recreational fisheries in Cockburn Sound and to the local aquaculture industry (Paddenburg, 2011; Dunlop, McNeill & Cannell, 2013).

12. One of Australia's most eminent penguin experts with more than 20 years' research experience, Dr Belinda Cannell, recently stated that **the Mangles Bay Marina will have a likely impact on the viability of the Garden Island colony through dredging, removal of sea grass, potential impacts on fish abundance and increased risk of propeller strike**.

Each item above provides a clear example of grounds for reconsideration under s78, namely new information that was not considered when the original decision was made in 2010 to exclude the Little Penguin from assessment, and clear examples of a change in circumstances that will impact adversely on the Little Penguin.

We repeat our sincere request for urgent reconsideration of your decision to approve the Mangles Bay Marina at Point Peron.

We also acknowledge considerable community opposition to the Mangles Bay marina and the great affection and care the Point Peron community feel for their iconic penguins, which are as much an important tourist attraction as part of their local identity.

For the Penguins,

Signed:

1. **Dr Belinda Cannell**	Assistant Professor School of Animal Biology University of Western Australia and Research Associate School of Veterinary and Life Sciences Murdoch University	WA

One of Australia's most eminent penguin experts with more than 20 years' research experience, Dr Belinda Cannell, actively monitors the Western Australian little Penguin colony. Dr Cannell continues to research and publish data on the Penguin and Garden Island Penguin Colonies.

2.	**Mayor Graham Philp**	Mayor, City of Victor Harbor and Chair, Save Granite Island Penguins, Victor Harbor *Little Penguins in the vicinity of Victor Harbor are almost extinct.. They have dropped from 5,000 birds on three different Islands to 30 birds on Granite Island. West Island and Wright Island are now extinct. We have been lobbying our State Government to implement strategies to save our penguins.*	SA
3.	**Dr André Chiaradia**	Research Scientist Penguin Specialist Group International Union for Conservation of Nature (IUCN)	VIC
4.	**Dr Yolanda van Heezik**	Senior Lecturer in Zoology Department of Zoology University of Otago	New Zealand
5.	**Dr Peter Dann**	Research Associate Melbourne University and University of NSW	VIC/NSW
6.	**Dr J N Dunlop**	Chair, BirdLife Western Australia	WA
7.	**Angelika Treichler**	Coordinator and Founding Member Manly Volunteer Penguin Wardens, Volunteer Penguin Protectors, Manly Beach *Angelika Treichler is the founding member of the community led Manly Volunteer Penguin Wardens, which has saved the last remaining Australian mainland Little Penguin colony. The Penguin Wardens actively patrol the Manly area and protect the Little Penguin colony from human contact and dangerous – often fatal, pet dog interference. Four of the following signatories are currently active penguin wardens.*	NSW
8.	**Patricia Michel**	Penguin Protector Manly Volunteer Penguin Wardens	NSW
9.	**Anne McCloghry**	Penguin Protector Manly Volunteer Penguin Wardens	NSW
10.	**Chris McCloghry**	Penguin Protector	NSW

	Manly Volunteer Penguin Wardens	
11. **Marie Alricsdotter**	Penguin Protector Manly Volunteer Penguin Wardens	NSW
12. **Anne Davie**	President Phillip Island Conservation Society Inc.	VIC
13. **Zoe Bainbridge**	PhD Candidate (JCU/CSIRO) Centre for Tropical Water & Aquatic Ecosystem Research James Cook University (QLD)	WA/QLD
14. **Catherine Cooper**	Principle Environmental Scientist Lomandra Environmental (Pty Ltd)	WA
15. **Dr Kym Campbell**	Resident in Veterinary Anatomic Pathology School of Veterinary and Life Sciences Murdoch University	WA
16. **Dr Elizabeth Sinclair**	Research Associate Professor School of Plant Biology University of Western Australia	WA
17. **Dr Eric J Woehler**	Associate, Marine and Antarctic Futures Centre Institute for Marine and Antarctic Studies (IMAS), University of Tasmania and Convenor, BirdLife Tasmania	TAS
18. **Sandra Vogel**	PhD Candidate Evolution & Ecology Research Centre (E&ERC) University of New South Wales	NSW
19. **Dr Barbara Wienecke**	Research Scientist Australian Antarctic Division	TAS
20. **Professor Stuart Bradley**	Emeritus Professor School of Veterinary and Life Sciences Murdoch University	WA
21. **Perviz Marker**	PhD Candidate School of Biological Sciences	TAS

	Faculty of Science, Engineering and Technology University of Tasmania	
22. **Dr Beth Schultz AO**	Advisory Group, WA Forest Alliance	WA
23. **Piers Verstegen**	Director Conservation Council of Western Australia	WA
24. **Jenita Enevoldsen**	State Director The Wilderness Society WA Inc. Western Australia	WA
25. **Dr Lorraine Marshall**	Vice Chair Birdlife Western Australian	WA
26. **Ross Marshall**	Member, Birdlife Western Australia	WA
27. **Professor George Burns**	Adjunct Professor of Psychology Nature and Human Wellbeing Cairnmillar Institute, Melbourne	VIC

References

Cannell, B. (2012). *Fine Scale Habitat Use by Little Penguins in Cockburn Sound.* (Unpublished). Penguin Consulting, Murdoch, WA.

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Strategen Environmental Consultants (2013). Detailed Responses to Matters Raised in Submissions on the Mangles Bay Per (Prepared for on Behalf of Cedar Woods). Retrieved from http://www.bushlandperth.org.au/campaigns/hands-off-point-peron

Verduin, J., & Sinclair, E. (2013). Seagrass Meadow Restoration Trial Using Transplants – Cockburn Sound, Western Australia. Retrieved from http://site.emrprojectsummaries.org/category/coastal-marine

Legislation

Environment Protection and Biodiversity Conservation Act 1999 (Cth) Declaration under section 248: List of Marine Species http://www.comlaw.gov.au/Details/F2008B00465)

Appendices

Appendix 1

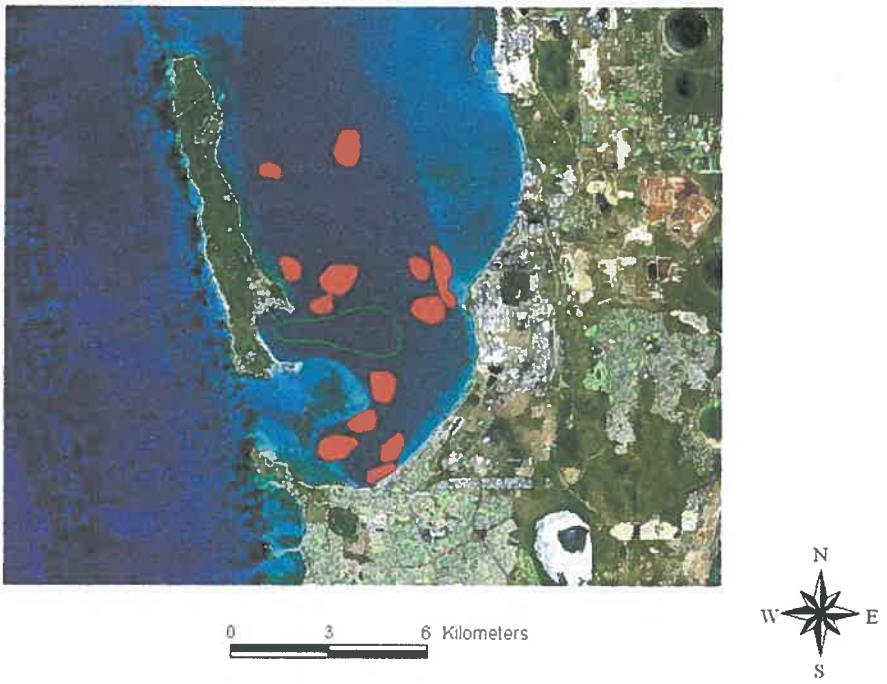

Figure 1 - Hotspots of foraging activity during incubation or chick rearing (red) and directed movement from the colony (green) in 2012, from Cannell, B. (2012). *Fine Scale Habitat Use by Little Penguins in Cockburn Sound.* (Unpublished). Penguin Consulting, Murdoch, WA.

Appendix 2

Figure 2 – *Proposed Mangles bay Marina development site. Retrieved from - Strategen Environmental Consultants (2013). Mangles Bay Marina Based Tourist Precinct, Public Environmental Review (Prepared for on Behalf of Cedar Woods).*

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 19

Submission to the EPA regarding the Mangles Bay Marina
Proposal dated 23 April 2012 by the
Cockburn Sound Management Council

Government of **Western Australia**
Department of **Environment and Conservation**

Your ref:
Our ref: CS45_2011/12
Enquiries: Dr Tom Rose
Phone: 9591 3827
Fax: 9528 5387
Email: Tom.rose@dec.wa.gov.au
Geoffrey.botting@dec.wa.gov.au

Dr Paul Vogel
Chairman
Environmental Protection Authority
Locked Bay 33 Cloisters Square
PERTH WA 6850

submissions@epa.wa.gov.au

Attention: Ms Leanne Thompson

Dear Sir

MANGLES BAY MARINA BASED TOURIST PRECINCT – PUBLIC ENVIRONMENTAL REVIEW – COCKBURN SOUND MANAGEMENT COUNCIL SUBMISSSION

I am writing to provide the response of the Cockburn Sound Management Council (CSMC), and more detailed supporting comments prepared by the Officers of the Council, to the Mangles Bay Marina Based Tourist Precinct – Public Environmental Review. This submission is made within the framework of the *State Environmental (Cockburn Sound) Policy 2005* (SEP) and the CSMC's *Environmental Management Plan 2005* (EMP).

Because the terrestrial and marine components of this proposed development are located in a very sensitive and critical area of Cockburn Sound and its immediate surrounds, the proposal and PER are of significant interest to the CSMC. They contain substantial acreage of remaining seagrasses and are adjacent to a rare community of thrombolites situated in an uncommonly deep fresh water wetland.

A summary of the CSMC's PER submission is in Attachment 1 and the detailed supporting submission is in Attachment 2. This last attachment has been prepared by CSMC staff, in consultation with independent external consultants and other members of the CSMC.

For further information or clarification please contact me on 0414-360-212, Dr Tom Rose on 9591-3827 or Mr Geoff Botting on 9591-3807.

Yours sincerely

Professor Kateryna Longley
Chair
Cockburn Sound Management Council

23 April 2012

cc: Director General Dept of Environment and Conservation -Keiran McNamara

Attachment 1 – CSMC PER Submission
Attachment 2 – CSMC Officer Detailed Submission

Cockburn Sound Management Council – PER Submission

Overview

The Cockburn Sound Management Council (CSMC) considers that the proposed marina is poorly located and the preferred design potentially threatens future water quality in the marina and nearby Mangles Bay. The CSMC is also concerned about the quality of data used to validate and calibrate critical groundwater and marina water quality-hydrodynamic-sediment models. The proposal poses a potentially serious risk to adjacent seagrasses and groundwater dynamics affecting Lake Richmond and its iconic thrombolites. The CSMC suggests that because of these issues, any environmental assessment of the proposal is undertaken with respect to the SEP and relevant existing CSMC reports on Cockburn Sound, and the CSMC would expect that assessment of the proposal be as rigorous as those undertaken for other major projects in the Cockburn Sound region.

The CSMC is not confident that enough data has been collected to adequately and comprehensively calibrate and validate groundwater and the cluster of models used in the Marine Modelling Study that assessed the potential groundwater and water quality impacts of this development There is a general lack of explanation for the use of some calibration data (e.g. in groundwater using 1984-85 data), and insufficient explanation of hydrodynamic interactions in a critical interface area (i.e. the north western groundwater interface between Lake Richmond and the marina edge closest to the lake, and the potential nutrient and phytoplankton build-up in the distal waters of the marina). CSMC expects that the proponents should provide robust information to permit reliable assessment of the proposal.

The CSMC is concerned about the precedent associated with the strategic issue of trading off relatively degraded Bush Forever and remnant coastal vegetation (approximately 60% of the land will be removed) in a sensitive coastal area within a region that has already lost substantial native coastal and aquatic vegetation. The proponent's rationale is that this is necessary for infrastructure needed to cater for recreational boating, and also to achieve better management of the remaining land. There is an argument counter to this reasoning.

The CSMC notes that there are already approved plans to construct a nearby marina (Port Rockingham Marina) and that there is a developing boating facility at the Woodman Point Recreational Boating Precinct. In the absence of recent and specific strategic assessments of boating facilities in Cockburn Sound it is difficult to confirm the need for these additional boating facilities (the 2008 Perth Recreational Boating Facility Study (2009) did not recognise Port Rockingham marina nor consult with CSMC and other stakeholder groups in is boating needs assessment).

The PER provides information that suggests demand for the number of proposed pens to moor large recreational boats in the marina will not be met until later this decade or beyond. This is because of the planned construction of the Port Rockingham marina with an estimated 500 pens and future boat stacking capacity at Woodman Point.

The proposed marina will adversely affect an extremely productive although stressed area of the Sound, e.g. through poor quality of marina-derived water (i.e. phytoplankton and potential nutrient export) and likely increases in boat strikes on fauna. There may also be a potential negative impact on fish nursery production and other environmental values supporting a range of existing users in Cockburn Sound.

CSMC notes that the historical detailed options for a Point Peron – Mangles Bay marina development have not been referred to in this current proposal. These options were outlined through a consultative stakeholder community and local government steering group between 2004 and 2005 and provided to the Strategic Environmental Review (SER) for this proposal

in 2006. The CSMC understands that the option outlining a single entrance was then deemed the least desirable option because of potential poor water quality in a closed marina. The preferred option showed a second entrance near the Point Peron Boat Ramp through the Garden Island causeway. This also created better flushing. The new proposal relies wholly on the most problematic option of a single entrance marina. While proponents have reduced the number of canal fingers and have altered depths to help address this, the proposed marina design still presents a threat of poor flushing and potential build-up of poor quality water.

These points are emphasised because they highlight likely conflict with the CSMC's *Environmental Management Plan for Cockburn Sound and its Catchment 2005*, and the *State Environmental (Cockburn Sound) Policy 2005* and with the strategic objectives of the State Planning Policy 2.6 – *State Coastal Planning Policy Guidelines.*

Data and reports utilised for PER

The CSMC acknowledges the quantity of studies and investigations that were used to inform and structure the PER. However, a large majority of the reports provide snapshots and there are no long-term data sets which go beyond one year, particularly for groundwater and the nearby marine environment. Neither groundwater nor hydrodynamic data fully captures seasonal differences, particularly for the summer and winter-spring periods. There is also a lack of external peer review of critical reports in the PER, particularly for marina-dredging-sediment model component. The limited Rockwater Review for groundwater is noted but the PER and associated appendices do not indicate any other peer reviews of those reports.

Lack of quantitative data

CSMC found it difficult to assess marine impacts because of the lack of current quantitative data on marine flora and fauna. Given the sensitive and highly productive nursery habitat found in this area, calculations of animal standing crops and biomass would have enabled impacts on the fauna and productivity to be better assessed. For example, there is a lack of data on fish standing crops for the most abundant and recreationally important species utilising the shallows of Mangles Bay, e.g. King George whiting, blue manna crab, forage fish etc. It is recognised that a quantitative assessment of the impact of losing approximately 7ha of habitat (ca 6ha of seagrass and 1ha of sand) and having potentially degraded adjacent habitat areas (i.e. extended moderately degraded halos) would be difficult to achieve. Nevertheless the point needs to be made that without this, it is difficult to make an informed assessment of impacts on food chains.

There is also a lack of contemporary quantitative information to help clarify the contribution that increased phytoplankton production (resulting in poor water quality and higher turbidity levels) will have on background water quality in Mangles Bay. For example, the PER does not provide defensible estimates of volumes or mass calculations to give assessors a sense how much will contribute toward higher light attenuation, increased phytoplankton production and halo affects. Although the PER states that it does not consider that poor water quality will be exported from the marina, it acknowledges the potentially problematic reduced flushing rates and probable long-term accumulation of nutrients and phytoplankton detritus in the marina.

Value and advocacy statements found in PER

While the CSMC recognises that the EPA cannot assess economic values of the proposal, it wishes to express its concern that this environmental assessment document contains a large number of value and advocacy statements made about the proposal. This makes an objective environmental review difficult. Assessment is clouded by an 'environment versus development' argument. For example, a number of statements are made about the inherent

economic value of this development to the local regional economy, yet there is no explanation or reference to economic documents to support claims of economic multipliers that will provide benefits to the local area and community, (e.g. see the last line of page 5 and first two lines of page 6) or recognition of counter arguments to these claims e.g. level and quality of temporary and permanent employment and decentralised commercial districts.

There are a number of references in the PER that state that the major purpose for the development is to provide marina and boating facilities to address the lack of and demand for these facilities in the Rockingham area. (E.g. page 6). However, 50% or more of the area to be developed will be for private residential and commercial facilities. CSMC considers that if it were only for marina and boat facilities the Port Rockingham marina proposal, which is almost solely focussed on those needs, is in a more suitable nearby location.

Lastly, the proponent makes statements on positive outcomes of the development, including increasing recreational and tourism values for the Mangles Bay and Rockingham areas (refer to Section 16.6 p.379). These comments on positive outcomes to recreation and tourism do not appear to be relevant to the environmental outcomes that are the focus of this section of the PER. Also, the adverse implications for existing economic entities (industry, aquaculture, fisheries and recreation) that already have tight environment conditions of approval to meet under the Environmental Protection Act 1986 have not been considered. Thus, the CSMC suggests that the regional interpretations do not appear to be comprehensive and the proponents therefore should provide additional information to support their statements.

Concern for regional degradation and permanent loss of natural resources to justify development

The CSMC notes that the Point Peron area and Bush Forever estate, if properly managed, protected and enhanced with access trails, education infrastructure and rehabilitation, could become a stronger tourism drawcard than it currently is. The CSMC is concerned that remaining areas of bushland and original geomorphic, landscape and vegetation types typical of the southern metropolitan region are so degraded that a development which will remove two thirds of the estate is being justified in terms of directing adequate management funds for the remaining third of the estate.

Similarly, if existing boatyards and fishing and recreational clubs were licensed and encouraged to follow best practice for boat maintenance and storage and to use water sensitive landscaping and design, then assessments of the foreshore with these land uses would be more positive without the necessity for wholesale removal, radical change and large scale development. The CSMC considers that the EPA should take into account the implications of the proposal for the integrity of the environmental values that have been identified in Government reports and formally endorsed to protect these values.

Regional planning proposal duplication and lack of applied strategic planning

The nearby Port Rockingham Marina has received environmental and planning approval (e.g. EPA and WAPC). This marina proposed to have 500 boat pens available for public lease. The availability of these pen moorings would reduce the merits of the argument to locate a second marina in a more sensitive environmental area.

The CSMC has consistently argued for a more strategic approach to marina proposals so that marinas could be planned and located to meet future needs in this area. With the Woodman Point Recreational Boating Precinct well developed, the CSMC is concerned that this third marina- boating facility in such a location may exceed boat pen requirements for

many years while potentially compromising an extremely productive habitat area critical for seagrass, fish and animal production in Cockburn Sound.

Adequacy of Environmental Offsets

Some of the positive environmental outcomes identified as 'offsets' (e.g. mooring scar seagrass re-colonisation) will occur through natural regeneration regardless of development. The CSMC does not consider that a 1:1 ratio is adequate for seagrass replacement. The ratio of proposed direct and indirect offsets will need careful negotiation and greater consideration by the EPA.

Since the Sound has already lost approximately 80% of its original seagrasses, and the Mangles Bay meadows are extremely stressed, as measured through the CSMC's annual seagrass monitoring and application of the SEP's EQC document, we would argue that a greater replacement ratio is required. A survey of similar situations in Australia and overseas indicates offsets in similar environmental settings have required 3:1 or greater replacement of lost seagrasses.

While the CSMC recognises that the proposed development did not cause the past decline in environmental quality of Cockburn Sound, it considers the proponent should contribute to the recovery of this environmental quality. The placement of seagrass restoration meadows on nearby Southern Flats is appropriate, although more acreage would be required given the potential risks of failure and strong probability of poor water quality caused by the marina in Mangles Bay.

Attachment 2 –
Cockburn Sound Management Council Officer – Detailed Submission:

1. Introduction
The proponents have not provided evidence to substantiate the economic benefits (refer to pp. 2 & 6). There are a number of advocacy statements alluding to the economic benefits of the development should it proceed with indications that economic and social benefits will be dealt with in the planning approval process. Assessors are therefore unable to review economic and social costs and benefits until the planning process is undertaken. This does not allow informed consideration of costs in relation to benefits at this stage.

2. Overview of Existing Environment – Land Tenure
Statements about land tenure may be misleading because change of land use and vestment or ownership of land titles has not been confirmed. This is particularly relevant for Commonwealth lands and special purpose zonings for lands vested to state agencies.

3. Description of Proposal
In section 3.1.1 (p.20) there is no summary provided specifying the range of submissions made for the SER. A summary would give context to the original concerns or issues as outlined in the SER of 2006.

In discussion of key infrastructure, there is little information about the impact of the relocation of the Lake Richmond-Mangles Bay main drain to Hymus Street and what impact this could have on swimming and recreation there.

In section 3.3 there is a reference to "opportunities for a combined marina and land development". Our understanding is that there has been recognition of the need for marina and mooring facilities, but not necessarily land development.

In section 3.4.1 on marina and canal construction, an outline is provided of the proposed staged development. We have concerns that the degree of clearing and levelling that will precede the beginning of stages 1 and 2 and possibly 3, will leave a large amount of cleared vacant and degraded land until in-fill development occurs. This would need to be very carefully managed and sequenced in the short term to avoid leaving non-functional, dusty and weed infested uncleared land that would lead to community complaints and, in the long term, so that this sensitive area is not left with an environmental scar.

4. Stakeholder Consultation
An objective of the CSMC's EMP is to ensure harmonious multiple uses of Cockburn Sound and its immediate environs, based on effective consultation with stakeholders.

5. Framework for Environmental Impact Assessment of Proposal
In section 5.3 (Table 6) statements are made to address the applicability of the proposal to the principles of environmental protection. However, we note that recreational and environmental attributes could be enhanced by better public access and a modest rehabilitation plan that would provide trails and other amenities and improved management, at much lower cost than in the development proposal outlined in the PER. In other words, the development is not the only means of improving this area.

There is insufficient attention to terrestrial ecosystem services that are currently provided by the habitat areas that will be lost through development. Some are relatively high quality and

some are semi-degraded. A quantitative assessment of these losses would help to enable the true environmental impacts of the proposal to be gauged.

6. Groundwater Impact Assessment

We have concerns with the data used to model the altered saltwater/freshwater inter-face near Lake Richmond. This has led to lack of confidence in the reliability of model predictions. Our main concern is based on a lack of explanation or rationale for the most critical north-western interface between Lake Richmond and the adjacent distal end of the proposed marina. Sampling has not described the heterogeneity of the Safety Bay sands and Tamala limestone, particularly with regard to hydraulic conductivity, complex differential flows at different depths and possibly salinity differences.

In summary, this concern is based on the use of bore data from samples that pierced both Safety Bay sand and Tamala limestone, and the use of 1984-85 data to help calibrate the groundwater model. The former because of the non-use of nested bores (i.e. piezometers) at various depths, and the latter because there is no explanation as to the validity of the data from those historical years compared to current times. The recent bore network data set is also too short in duration and it may not have captured conditions of a non-severe drought year as occurred in 2010-2011. Another year of sampling would have provided groundwater monitoring data that is not affected by severe drought conditions. This would have provided greater ambient average values and strengthened conclusions.

Specific comments

- Although a number of technical aspects of the modelling are poorly documented, especially the description of model boundary conditions, the results and conclusions seem to be reasonable.

- The numerical modelling is based on a consistent conceptual model, appropriate modelling codes have been used, and the conclusions appear to be valid, even though there is minimal explanation of results in the report.

- Estimates of risk due to proposed construction of the Mangles Bay Marina (MBM) and Sepia Depression Ocean Outfall Landline (SDOOL) are focussed mainly on prediction of changes in water table elevation and groundwater salinity and associated changes in water level and salinity in Lake Richmond. This focus is considered to be appropriate.

- Large dewatering impacts from construction of the MBM are avoided by the proposed wet excavation method, and dewatering for the SDOOL is relatively shallow and temporary. Predicted permanent groundwater changes can be attributed to realignment of the shoreline (0 m elevation seawater boundary) in the MBM area where there is a maximum potential decline of mean water table elevation of approximately 0.5 m; elsewhere within the project area the expected water table decline is smaller.

- We suggest that additional analysis of the modelling results is required to explain why the predicted long-term lowering of the water level in Lake Richmond (0.038 m decline) is small compared to the lowering of the water table within the MBM (0.5 m decline at the closest point to Lake Richmond). The predicted decline of the lake level may be reasonable; however, no explanation is given in the report to provide confidence in this result.

- Two issues relating to model calibration data are noted. Thirty-year-old measurements of water table elevation from 1984-85 are used to calibrate the model without analysis of their suitability as calibration targets under existing groundwater conditions. Furthermore, measurements of groundwater salinity in seven monitoring wells that are screened in both the Safety Bay Sand (SBS) and Tamala Limestone (TL) aquifers are used, even though these measurements are unlikely to represent conditions in both of these aquifers because of the connection that has been made between them.

- A possible additional risk is the potential for temporary ingress of saline groundwater from the TL aquifer into the SBS aquifer during trench dewatering for construction of the SDOOL, which could occur if there are local connections between the aquifers through local discontinuities in the aquitard that is believed to separate these aquifers.

Data relevance and analysis

- In the peer review by Rockwater (2011), ERM (2011, PDF-p.80) it is stated that: "it can be confirmed that wells MB01, 03, 05, 07, 10, 11 and 12 have not only cross connected the two aquifer systems, but have been screened entirely through both systems – as such, groundwater data from these wells should be discounted." On this basis the water level data are disregarded and water levels predicted by the SEAWAT model are calibrated against older water table measurements from 1984-85. However, salinity measurements in these wells are subsequently used to generate calibration statistics and evaluate the model performance. Specifically, ERM (2011, p.19) explains that: "The model calibration results presented in Annex D, Table 3 have exceeded those models (sic.) that have been accepted by EPA in Western Australia. The developed SEAWAT model is therefore suitable for simulations of the proposed SDOOL and MBM construction and operation." This statement fails to recognise that the calibration results in Table 3 are based on salinity measurements in eleven monitoring wells, which include the seven wells screened through both aquifers.

- The simulated water table is calibrated against measurements of water table elevation collected at different times during 1984-85 (ERM 2011, p.18). Table 3 of Annex D (ERM 2011, PDF-p.142) indicates that individual water level measurements in each well were interpreted as representing the high, mean or low water level condition at that location dependent on the time of year when the measurement was made. The report does not discuss whether these 30-year-old water table data are considered to be representative of existing groundwater conditions in the project area and on what basis. Therefore, it is unclear whether they provide suitable targets for the model calibration.

Applicability of the models

- The choice of model codes is considered to be appropriate.

- An analytic model is used to identify the location of a no flow boundary (a water table flow divide) about 4 km east of the project area. At this distance the boundary is not expected to influence groundwater flow in the project area. The model is not used to predict groundwater level or salinity for the MBM and SDOOL construction.

- The SEAWAT modelling code is suitable for the variable density modelling conducted in the project area. The modelling is focused on predicting the water level

and saltwater interface location in the SBS aquifer. This is a sandy formation that is appropriately modelled using a conventional porous medium model.

- Although the TL aquifer contains dual porosity that can make groundwater flow and transport simulations less certain, it contains mostly saline groundwater in the project area and does not directly interact with the MBM, SDOOL or Lake Richmond. Therefore, specialised modelling of dual porosity in the TL aquifer is not necessary for prediction of MBM and SDOOL impacts in the SBS aquifer.

Modelling conclusions

The key conclusions from modelling (ERM 2011, p.21) are considered in order below.

- "Lake Richmond water levels during MBM construction will be reduced by 0.032 m"

The predicted lowering of water level in Lake Richmond appears to be due to lowering of the water level to mean sea level within the wet excavation area, even though the model boundary conditions used to represent the proposed sheet piling and wet excavation method are not explained in the report. The predicted lake level decline of 0.032 m during MBM construction is effectively the same as the predicted permanent lowering of the lake level by 0.032 m after completion of the MBM. On this basis the conclusion seems reasonable. Further notes on the predicted water level decline in Lake Richmond are provided below.

- "Lake Richmond water levels during SDOOL construction will be reduced by 0.24 m."

This prediction seems reasonable but would be easier to assess if the simulated dewatering volume for the section of trench at the northern margin of Lake Richmond had been reported and compared with the volume of water required to lower the lake level by 0.24 m. This would provide a consistency check on the water balance. The predicted lowering of the water table in the trench to approximately -1.1 m AHD (ERM 2011, Figure 14) is inconsistent with the stated minimum trench dewatering level of -1.56 m AHD (ERM 2011, p.3). Predicted water table drawdown on the southern side of the trench is moderated by additional recharge from Lake Richmond, which is consistent with the prediction of a lower lake level during dewatering.

- "Lake Richmond water levels during combined MBM and SDOOL construction will be reduced by 0.25 m."

As above, this prediction seems reasonable but the dewatering volume is not reported or checked against the simulated lowering of the water table elevation (a decrease in aquifer storage) and of the level in Lake Richmond (a decrease in surface water storage). The predicted decline in lake level of 0.25 m for the combination of MBM and SDOOL construction is slightly larger than the sum of the predicted individual impacts on the lake from MBM construction (0.032 m water level decline) and SDOOL construction (0.24 m water level decline). This seems reasonable and indicates that more water is drawn from the lake into the dewatered trench during combined construction because less groundwater drains into the trench from the northern side where the water table is lowered by the MBM construction.

- "Lake Richmond water levels during the long term (after all construction is complete) will be reduced by 0.038 m"

The existing mean water table elevation in the area of the MBM varies from around 0.1 m AHD at the shoreline to approximately 0.5 m AHD at the southern end of the MBM. A mean

water table decline of up to 0.5 m is therefore predicted at the closest point of the MBM to Lake Richmond, which is approximately 500 m away. The predicted decline of lake level of 0.038 m is around 7-8% of the maximum potential mean water table decline of 0.5 m at the MBM. This seems to be quite small and is without explanation in the report; therefore, we suggest additional analysis and explanation of the modelling to provide more confidence in the predicted impact on Lake Richmond. There is insufficient information in the report to make a thorough assessment of this result but some thoughts are provided below.

The margin of Lake Richmond is approximately 800 m from the existing shoreline, both to the north of the lake (Mangles Bay shoreline) and to the west of the lake (Shoalwater Bay shoreline). The closest point of the MBM will therefore be approximately 300 m closer to the lake than the existing shoreline; or in other words, the coastal boundary (0 m water table contour) will be around one-third closer at this location. Why then does the construction of the MBM have a negligible predicted impact on the lake level?

Water table contours in Figures 6, 7 and 8 (ERM 2011) suggest that Lake Richmond fluctuates seasonally between a groundwater "flow-through" pattern and a groundwater "discharge" pattern. The real and predicted interaction between the lake and the aquifer is three-dimensional. Not only are the groundwater capture and release zones of the lake (that part of the aquifer contributing groundwater discharge to the lake, and the part that receives recharge from the lake, respectively), wider than the lake but they are also deeper than the lake. Lake Richmond is uncharacteristically deep compared to most lakes on the Swan Coastal Plain (the lakebed extends to a maximum depth of approximately -15 m AHD, which is approximately 70% of the aquifer depth). The capture and release zones of the lake are very likely to extend to the full depth of the SBS aquifer.

One possible explanation for the modelling results is that the lake water level is influenced more by the inflow of groundwater from the upstream capture zone to the southeast than by the shoreline boundary conditions, or perhaps it is influenced more by evaporation and evapotranspiration in the lake than by discharge to the remote coastal boundary.

- "Saltwater intrusion is expected to be confined to the vicinity of the MBM during MBM construction and post construction"

This conclusion is consistent with existing saltwater intrusion in the Safety Bay sands, which is restricted to shoreline areas. The base of the Safety Bay sands in the location of the marina is located at a depth of approximately -20 m AHD. Based on the Ghyben-Herzberg approximation and an assumption that sea water density is 2.5% higher than fresh water density, a water table elevation of around 0.5 m AHD is sufficient to hold out sea water at this depth and therefore the maximum potential extent of saltwater intrusion at the base of the SBS (i.e. the location of the toe of a seawater wedge) is expected to coincide approximately with the mean 0.5 m water table contour. The predicted future mean water table contours are not presented in the report (only the low water level conditions are shown in Figure 17) so it is not possible to compare the predicted extent of saltwater intrusion in Figure 23 against this criterion; however, the prediction appears to be reasonable.

- "Saltwater intrusion is not discernibly affected by SDOOL construction"

This conclusion is considered to be reasonable on the basis that the predicted zone of water table decline does not extend to the existing region of saltwater intrusion along the shoreline and the dewatering drawdown is temporary.

- "Salinity levels in Lake Richmond are not expected to change discernibly during both combined and separate MBM and SDOOL construction and operation"

This conclusion is consistent with the prediction of a small 0.038 m decline of lake level. The position of the saltwater interface in the SBS aquifer is controlled principally by the water table elevation. Additional intrusion of the saltwater interface due to the MBM and DSOOL construction is therefore only expected in areas where the mean water table elevation is permanently lowered to below around 0.5 m AHD.

Estimation of risk

- Assessment of risks associated with groundwater changes includes lowering of water levels in bores and in Lake Richmond, and additional associated saltwater intrusion into groundwater bores and Lake Richmond.

- One possible additional risk not considered in the modelling report is the potential for temporary ingress of saline groundwater from the TL aquifer into the SBS aquifer during trench dewatering for the SDOOL. This could occur if local connections exist between the aquifers as a result of local discontinuities in the aquitard. An assumption is made throughout the modelling that the aquitard is continuous within the project area but this might not be the case.

Additional modelling information

A number of technical aspects of the modelling are poorly documented in the modelling report. For completeness a brief list of technical information lacking in the reporting is given below.

- The thicknesses of the main hydrostratigraphic unit (SBS, aquitard and TL) and the elevations of their upper and lower boundaries are not described. It is evident from Figures 5 and 10 (ERM 2011) that the units are probably modelled as having uniform thickness and horizontal contacts. It appears that the SBS-aquitard contact occurs at a depth of approximately -22 m AHD and the aquitard-TL contact occurs at a depth of approximately -25 m AHD.

- There is no discussion regarding the sensitivity of predicted groundwater salinity and the saltwater interface position to variation of the assumed dispersion parameters.

- The method used to simulate Lake Richmond is not described. Specifically:
    1. How is the lake water body represented?

    2. What are the recharge boundary conditions for the lake and how are they implemented; do they include direct rainfall, rainfall runoff and surface water inflow from the drain inlets?

    3. What are the discharge boundary conditions for the lake and how are they implemented; do they include evaporation and surface water outflow to Cockburn Sound?

- The model boundary conditions used to represent the marina during and following sheet piling, temporary wall construction and wet excavation are not described.

- Similarly, the model boundary conditions used to represent trench dewatering for the construction of the SDOOL are not described.

- The time-varying groundwater recharge rate is also not described; for example, it is not clear whether seasonal variation of the groundwater recharge is assumed to be identical each year or varies each year according to seasonal rainfall.

Provision of additional information about the model may not change model predictions, but would make it easier for stakeholders and assessors to understand the basis for predictions.

7. Surface Water Impact Assessment
Section 7.3 (p.96), it is important to emphasise that any discharge to the ocean must meet ANZECC guidelines and not exceed SEP EQC guidelines and values. This is an issue that must be addressed in the Construction Environmental Management Plan (CEMP) and will require more than one to two samples, rather more frequent sampling during dewatering or discharge in order to show that all guidelines have been met or have met contingency criteria.

8. Terrestrial Flora and Vegetation Impact Assessment
Section 8.6 (p.131) notes parties to be consulted with in regard to future terrestrial offset packages. This area lies within the CSMC management boundary and the CSMC should be included in the list to be involved in any future offsets discussions and negotiations.

We draw attention to the fact that degraded natural habitat can be rehabilitated and restored without major development and can offer lasting value to the community.

The PER would be more informative if mass or volume measurements were made on cleared vegetation biomass. This would help calibrate carbon release and carbon storage loss from the existing vegetation.

9. Terrestrial Fauna Impact Assessment
In section 9.7 (p.170) statements are made that the proposal will not impact significantly on potential Barnaby's and Baudin's Cockatoo habitat. However, the community has reported in the past and currently reports increased sightings of these birds in Shoalwater and nearby coastal Rockingham where there are copses of trees, including Tuart and Banksia, and mid storey shrubs. Information from the Western Australian Museum also indicates that as habitat in the scarp, jarrah and Wheatbelt woodlands decline, coastal habitat becomes more valuable, particularly for feeding and roosting. We would not support a loss of habitat that supports these rapidly declining bird populations and recommends that addressing this issue be part of any offset package.

10.1 Marine Water and Sediment Quality Impact Assessment
We note with interest that the WAPC Policy DC 1:8 states '*that if source water does not meet general water quality guideline requirements, a canal estate for that location is considered inappropriate*'. Statements in the PER, and in particular in this section, conclude that water quality in the marina will be considerably worse than in adjacent marine waters in Mangles Bay, which is already of poor quality. Because Marina water is likely to be exported, water quality in the nearby bay could be further affected.

It is stated that the marina waters will experience twice the level of chlorophyll '*a*' up to 4 times the DIN concentrations expected outside of the canal. It would thus appear that there will be water quality issues.

Any additional stress created by poor water quality on the remaining seagrass meadows could be sufficient to create conditions leading to substantial long-term seagrass loss in this vitally important ecological corner of Cockburn Sound.

There are no physiological measures of "stress" in the adjacent Mangles Bay seagrass area, closest to the areas that will receive marina water discharges. This would enable assessment of the extra stress poor water quality discharges will have on already stressed seagrass meadows and to improve understanding of the impact of the small increases in localised poor water quality. It is therefore not known whether they will trigger a tipping point or extensive seagrass meadow death.
The operational management plan for the marina will need to incorporate measures, summarised in bullet points at the bottom of page 223 (section 10.6.2), and ensure that the future management body/entity will be fully responsible for their implementation.

Marine Water Modelling Review of PER
BACKGROUND
The capability of any well-formulated model is dependent on the quality and quantity of information that is used to calibrate and validate a model. The quality of a metocean or water quality dataset is dependent on the appropriate preparation and deployment of instrumentation to obtain a variety of interdependent data parameters whilst the appropriate quantity of data information should reflect consideration of the duration of simulations to be undertaken and the time-scales over which relevant hydrodynamic or biological features occur.

In order to gain confidence in model outputs it is necessary to obtain two independent data sets. One data set is used to calibrate a model whilst the second data set is used to validate the calibrated model, to ensure that the calibration is valid.

The modelling underpinning the water quality predictions of the Mangles Bay study, namely the hydrodynamic model, was not calibrated against a separate dataset as indicated by the following statement from the technical report (APASA 2011):

'It was not the intention of this study to develop a fully calibrated model of Cockburn Sound, as such a task was outside the scope of this project, and largely unnecessary with respect to achieving the aims of this work.'

The metocean data acquired for this study was used to validate the predictions of the un-calibrated model for some but not all time periods simulated. Whilst the authors of the technical report (APASA 2011) are of the view that a calibration was largely unnecessary, they do not explain why. We consider that this approach reduces confidence in the model results.

MODELLING
Modelling Scope
The marine modelling was carried out by APASA but supported by a groundwater model developed by ERM.

A hydrodynamic model was set up by APASA using the Environmental Fluid Dynamics Code with the purpose of investigating the flushing performance of the marina waters for the proposed Mangles Bay Marina.

A SWAN wave model in conjunction with a hydrodynamic model and a sediment model was constructed to predict the effect of waves on settlement and re-suspension of dredged sediments.

A passive tracer model was applied in conjunction with the hydrodynamic model to predict the dilution effects of dissolved inorganic nitrogen (DIN) from groundwater intrusion

expected inside the marina. An equilibrium box model was subsequently applied to convert DIN levels to chlorophyll levels.

The model framework used (excluding the box model) has been applied to many coastal and marine projects globally and is considered to consist of professional tools that are fit-for-purpose, including assessments of marine dredging programmes.

10.2 Hydrodynamic Model

Model Setup

The hydrodynamic model grid is 3D curvilinear and orthogonal in the horizontal with six sigma layers in the vertical. The domain size is 25 km north/south along the coast by 17 km east/west, encompassing Cockburn Sound and extending offshore to approximately 35 m water depth. The horizontal grid resolution varies from 8-10 m within the marina and up to 450 m at the outer edges of the domain located outside Cockburn Sound. The bathymetry relies on information derived from the CMAP database supplemented with additional, unspecified data.

From this information the following can be concluded:

- The domain and grid sizing is appropriate for the intended purpose. The model boundaries have been placed sufficiently far away from the area of interest, Mangles Bay, to ensure that no boundary effect reach this area. Furthermore, the grid resolution of 8-10 m in the area of interest is appropriate for examining smaller-scale effects within the proposed marina whilst ensuring efficient computation time. It is, however, noted that some of the marina arms are very narrow and may only contain 1-2 grid cells across the arms.

- After discussion with a number of modellers there is a strong sentiment that CMAP data may deviate from reality to an extent where accurate resolution of hydrodynamic features is compromised. As such, it is encouraging that additional project-specific data was reported to be used although the quality and quantity of this data is not described. A visual investigation of the bathymetry presented in Fig. 5.1 of the APASA report shows that care has been placed in ensuring that small-scale features that may have implications for water circulation, such as the openings across the causeway, have been described.

Data Collection

In order to validate the hydrodynamic model, three separate ACDP deployments were carried out during February to April 2011 at 3-4 m depth (rel MSL) of approximately 2-4 weeks duration each. It was later discovered that the ADCP during the first deployment had been dragged onto its side, potentially compromising the quality of the data collection. The two remaining stationary deployments were carried out at distinct locations between 25/2-11/03 2011 and 11/3-07/04 2011, respectively. In addition, on four separate dates between 10/02-2011 and 07/04-2011, a number of drogues (14 in total) were deployed for about 1-2 hours in the upper meter of the water column.

By analysing historical metocean data, three distinct hydrodynamic regimes were identified for Cockburn Sound: winter/spring, summer and autumn. The differences between these regimes are largely due to differences in the wind-driven circulation. Wind information was derived continuously from a BOM station at Garden Island. 7-10 years of winds were analysed and a representative year was selected for each of the seasons to be simulated.

- The observed data used for validation of the hydrodynamic model only covered three days of the three month summer simulation, five weeks of the three month autumn simulation and none of the winter/spring period. The lack of data coverage means that there is little support from measurements for the interpretation of sediment plume and water quality predictions. This raises some concern, particularly regarding the winter results as this is when the largest accumulation of DIN is observed and is also the only season when dredging is simulated (due to planned execution of dredging in winter).
- There is an underlying assumption that only wind drives inter-annual variation in water circulation, since only wind data were analysed for multiple years to derive representative wind information for the three hydrodynamic regimes to be simulated. Other forcing conditions were derived based on data from a single year. There is, however, no data representation to show that 2011 forcing data was representative of general conditions, which would help qualify this assumption.

- All fourteen drogues were deployed in the upper meter and can only be used to validate surface currents. The drogue paths show variable correspondence with the modelled trajectories suggesting that the model does not always resolve-small scale hydrodynamic movement adequately.

- It has been appropriately acknowledged that wind is less at Mangles Bay than at Garden Island and local wind data collected specifically for this project have been included in the sensitivity testing.

Model Performance

A quantitative measure of the performance of a hydrodynamic model was applied to ascertain the agreement between field and modelled measures of current speed, current direction and water level. This 'Index of Agreement' (IOA) ranges between 0-1 where 0 indicates no agreement and 1 indicates agreement between all measured and field observations. With limited guideline as to what IOA value delineates a 'good' model, 0.5 has been used.

The following is noted:

- Current speed has the lowest IOA (down to 0.58). Since the flow field constitutes the basis for all the results and conclusions presented this is a clear indication of model uncertainty in this study.

- Model performance was best if the boundary conditions were set using water levels from Fremantle, which is located well inside the modelling domain, rather than a tidal model. This could be due to the enclosed nature of Cockburn Sound making it difficult to reproduce the flow into and out of the Sound using a tidal model.

- The hydrodynamic model was successful at representing many hydrodynamic features of Mangles Bay and Cockburn Sound. However, as acknowledged by APASA, some short-term hydrodynamic features, as well as tidal features driven by the complex topography and resulting flow conditions near the causeway adjacent to Mangles Bay, are not resolved adequately. The conclusion that the flow conditions adjacent to the proposed marina in Mangles Bay are 'suitably represented' may therefore be an overstatement.

Flushing Results

The efficiency of flushing inside the marina has been assessed by introducing a tracer dye in the marina. The e-folding time, i.e. the time it takes to dilute the tracer dye to 37% of the initial level, determined at four locations at the innermost ends of the marina arms as well as a single location at the marina entrance, has been used to represent the flushing time of the marina.

From the results presented in the technical report (APASA 2011) the following can be concluded:

- The tides as well as the winds govern the flushing efficiency. As such, the flushing results are associated with some uncertainty given the proximity to the causeway and the associated problems with reproducing some tidal features in this area, as indicated in the above section.

- The flushing time range of 7-10 days seems low given the intricate and narrow water ways of the marina plan. Officers acknowledge that a statement has been included in the PER which highlights that the marina has been designed specifically to enhance flushing capability. This assertion has not been qualified further.

- Although the flushing time measure used in this study indicates that most of the marina will have been flushed (to 37%) within 7-10 days, this does not mean that levels of nutrients or contaminants released continuously within the marina will be low. This depends on the strength of the discharges.

- Incomplete flushing of a non-continuous discharge will occur over any one tidal cycle implying that elevated nutrients levels may persist for extended periods of time, in turn providing opportunity for build-up of organic material or even algal blooms.

The technical report (APASA 2011) further states that:

'Flushing is expected to be sufficiently effective to prevent the gradual build-up of concentrations over time. This suggests that the risk of adverse escalations is relatively low, based on the assumptions made and the input data provided for this study.'

- This conclusion is difficult to understand. Any degree of flushing will eventually cause the concentrations to reach quasi-stable levels. Only if there is no water exchange at all can build-up possibly continue forever. It is at what level the concentration stabilizes that is important to water quality. A long flushing time will however prolong the time it takes to reach a stable level.

- It appears this statement is not supported by Fig. 8.1 in the technical report (APASA 2011). This figure clearly shows that during the 30-day analysis period for each seasonal case, nutrient concentrations are generally stable but clearly elevated compared with background levels. From this it can be concluded that flushing is not sufficient to reduce nutrient concentrations to background levels except at the marina entrance. The statement in the report, which is echoed in the PER, therefore appears incorrect and as an overly positive conclusion.

10.3 Sediment Model

The purpose of the sediment model is to simulate the fate of sediment particles that are released to the water column as a result of dredging activity. Sediment models are not easily calibrated or validated as knowledge about processes governing sediment dispersal and re-suspension is not as developed as for hydrodynamic processes. Process descriptions and model coefficients are often based on the experience of the modeller. In

addition, validation of a dredging model can only occur after dredging has actually commenced.

Model Setup
The sediment model was designed to simulate a dredging programme that varied in space and time over the nine week dredge operation in winter. The time variable position of a single cutter-suction dredger was included as was the daily downtime. Determining the spill rate of a dredger is a point of uncertainty and often relies on the experience of the modeller. For the present study, a spill rate of 0.3% was used based on the experience of APASA (Fitzgerald et al. 2008). Furthermore, a total dredging volume of 40,000 m^3 was simulated.

From this information the following can be concluded:

- It appears that due care has been placed in developing a model setup that describes the dredging operations including timing, equipment, spill sources etc.

- It is however, unclear why APASA refers to Fitzpatrick et al. (2008) as a 'validation' of their sediment modelling approach, specifically the spill rate of 0.3% of gross production. Fitzpatrick et al. (2008), although mentioning that they did perform validation, show no data to that effect that can be evaluated. Also, Officers have been advised by experienced modellers that 0.3% is a fairly low estimate compared with other projects undertaken in other areas of WA.

- There is a discrepancy in the reported volume of dredge material between the APASA report and the PER which could potentially be an issue if this is indicative of a change in dredge operations between the production of the technical report and the PER.

Data Collection
Sediment characteristics applied in the model were based on sediment sampling conducted along the proposed channel in to the marina. Samples were taken at four locations along the channel and up to three depths, and the particle size distributions (PSD) were determined across five particle size categories ranging from clay (0-7 m) to coarse sand (>130 µm). The overwhelming majority (>65%, most between 85 and 95%) of sediments across all samples were coarse sand.

- The sampling design (number of locations and depths) for sediment characteristics is appropriate, given the relatively restricted spatial extent of the dredge operations and the homogeneity observed across all samples irrespective of location and depth.

- The likely behaviour of the mainly coarse dredge sediments released is rapid settlement and reduced re-suspension. The extent of dredge plumes is therefore expected to be restricted with some acceleration of sediment spread being caused by the elevated flow through the southern entrance of the causeway in the vicinity of the dredge site and the highly buoyant nature of some of the silts and clays common to this area.

Model results
Sediment dispersal was simulated for a range of climatic scenarios during winter with results reported in total suspended sediment concentration (TSSC). The modelling only simulated the spread of dredge sediments and did not include background levels of sediments.
The following can be noted:

- Ambient sediment levels are difficult to model and the omission of this information is in line with all other dredge modelling undertaken in WA. The impact zone thresholds have been derived in appreciation of this fact and are given as TSSC thresholds for the dredge operation excluding background levels.

- The model should be able to predict deposition but this is not reported in the technical APASA report or in the PER. This is likely to be because the impact criteria are designed for TSSC. However, given the large proportion of sediments that will deposit quickly as well as the significant presence of seagrass in Mangles Bay (over 100 ha?) it may have been prudent to also assess the degree of deposition in the local area.

10.4 Water Quality Model

Water quality is routinely measured in Cockburn Sound and Mangles Bay and a calibrated and validated water quality model is potentially a powerful tool for predictions of impact from developments such as the proposed marina. It is also important to note that Mangles Bay is zoned for high ecological protection. Over the years, water quality in Mangles Bay has repeatedly failed to meet the water quality criteria set for this area.

Model Setup

As an indicator of expected impacts to the water quality in Mangles Bay the concentration of a single nutrient, dissolved inorganic nitrogen (DIN), was modelled as a conservative tracer. The sources of DIN modelled were determined from groundwater intrusions resulting from the proposed construction works with a constant background concentration in the whole modelling domain of 6µg/l. Water quality was only modelled for conditions of the completed marina and not for the construction phase where light attenuation effects of suspended dredge sediments could influence water quality.

The drain from Lake Richmond which currently is oriented toward the area of the proposed marina does not appear to have been factored into the model setup for water quality. This is probably because the drain is planned to be diverted as part of the marina development.

The approach taken to ascertain impacts to water quality from the proposed marina are in accordance with the initial scoping document by Strategen (2011).

Implicit with this approach are the following assumptions:

- DIN concentration is an indicator of water quality.

- Groundwater intrusions are the only sources of DIN resulting from the development. No nutrients are released from sediments inside the marina.

- DIN is advected by water movement and is never biologically or bio-geochemically transformed.

The PER further describes how an equilibrium (box) model has been used to convert the predicted DIN levels into chlorophyll concentration making it possible to compare the model results against a biological water quality parameter regularly monitored in Cockburn Sound and Mangles Bay. The input parameters to the equilibrium model were constants that included:

- Volume of marina waters
- DIN load from groundwater

- DIN load from sediments over the entire area of the marina
- E-folding flushing time
- Conversion efficiency of DIN to chlorophyll
- DIN concentration in source waters (Mangles Bay), and
- Chlorophyll concentrations in source waters (Mangles Bay).

The following can be concluded:

- The assumptions implicit in the model are clearly not realistic. Importantly, however, the assumptions are seemingly not clearly qualified in the technical report (APASA 2011) or the PER.

- It is surprising that a more vigorous approach which included biological and biogeochemical processes was not applied, especially given the routine water quality data sampled in Cockburn Sound and Mangles Bay which is appropriate for calibration and validation of baseline information. A more developed model could also include the effects of light attenuation from suspended dredge sediments.

- It seems that the build-up of chlorophyll and potential mineralisation of organic matter is not adequately addressed given the sensitivity of the area as well as the site's history of exceeding water quality thresholds.

- Groundwater intrusions resulting from excavation inside the proposed marina are the only sources of nutrients evaluated. Storm water from Lake Richmond and future hard-stand and gardens is not assessed even though they are potentially another significant source of nutrient loading during rainfall events. We acknowledge that the plan is to divert the drain from Lake Richmond east of the proposed marine with a drain outlet directly into Cockburn Sound, but notes that these other sources are not discussed.

- The box model does not include physical or temporal resolution of the environment (although e-folding time to some extent can be considered to represent this). The box model does not include biological process descriptions beyond the conversion factor from DIN to chlorophyll. This does not allow in-depth understanding of the build-up and mineralisation of organic material and possible downstream effects on oxygen levels in the marina. The box model approach therefore represents a very simplified description of the ecological implications of altered DIN conditions, one that may misrepresent future conditions.

Data Collection

Groundwater flow rates into the area of the marina were determined from a groundwater model carried out by ERM which is not included here. The results of this model were included in the water quality model as average seasonal values. The nutrient concentrations were determined as average seasonal values derived from a range of bore samples for coastal stations along the Mangles Bay foreshore. These were also carried out by ERM.

The following can be noted:

- Inter-seasonal variation in groundwater and nutrient load is not resolved. The information used may be adequate for describing differences among the three hydrodynamic regimes covered in the study. However, it would not suffice if short-term extreme events, such as downpours which may influence ground water intrusion levels, were to occur during or after construction. In such cases, nutrient

load may be elevated compared with the scenario specifications outlined in this study.

Model results

DIN concentrations resulting from groundwater nutrient release into the marina were simulated for a range of ambient scenarios for each season using a passive tracer.

The results can be summarised as follows:

- DIN concentrations are lowest in summer followed by autumn and then winter. Within each season, DIN concentrations are lowest at the marina entrance where flushing is faster compared with locations within the marina.

- Peak predicted DIN concentration levels are 9 times greater than background but generally 4 times greater than background with highest concentrations modelled for the winter season. Although these inorganic nutrient levels are very high compared with ambient levels, build-up of organic compounds is likely to be less in winter which is an ameliorating factor for the ecological impact of these results.

- The results of the box model approach show that double the ambient chlorophyll levels may easily be reached during all seasons (PER, Table 39). We not able to assess whether this is a conservative estimate, but simply note that the results are very uncertain in terms of chlorophyll export from the marina.

It is clear that the very simple approach used does not allow accurate insight into the ecological effects of the proposed development. It should also be noted that the water quality cannot be fully described by modelling a single nutrient.

10.5 SUMMARY

The data underpinning the hydrodynamic model is sparse and does not represent all seasons simulated, especially winter, which is critically important, as this is when dredging occurs and the highest DIN levels are simulated. Sediment characterisation has been done adequately especially considering the restricted area of dredging and the homogeneity observed across all spatially distinct samples. The nutrient load information was derived from a groundwater model not reviewed here combined with borehole sampling of nutrient concentration in the vicinity of the proposed development site. None of the ambient water quality information present in abundance for Cockburn Sound was used to calibrate a water quality model that included biological or biogeochemical processes, a method that may have been more appropriate given the sensitivity and recreational value of the area.

The model framework used is well-known and generally accepted. The hydrodynamic and sediment models include relevant description of processes expected to govern water circulation and sediment dispersal. The hydrodynamic model performance is limited by the relatively sparse input data and the low level of calibration. The description of the sediment model setup appears to be limited by qualifying the model coefficient settings, specifically spill rate of the cutter-suction dredger. It is surprising that deposition was not included in the impact assessment, given the occurrence of sensitive seagrass habitats in the near vicinity of the planned dredging activities.

The flushing time reported in the PER and technical report (APASA 2011) is not directly relevant for extrapolating how quickly nutrient loads would dilute. The flushing time was assessed based on a dye introduced in a single point in time, whereas the nutrient load, in reality, is continuous.

The water quality model is limited by the very simple approach of modelling dilution of a single nutrient and not including biological or biogeochemical processes. This does not allow dynamic predictions of build-up of organic material and potential associated problems with dissolved oxygen. The flow rate input information derives from a groundwater model which is not reviewed here, as well as sampling of DIN concentrations from borehole samples, enabling only average seasonal values to be modelled. These do not take intra-seasonal variation into account.

The technical report appears open and honest about the limitations of the models. However, the conclusions drawn seem overly confident which is also mirrored in the associated impact assessment in the PER. The PER states, as does the technical report (APASA 2011), that the water quality results do not support a gradual build-up of nutrients in the marina over time.

For all the reasons outlined above, this may be an indication of inadequate data rather than a favourable result. The presented stable DIN levels inside the marina are clearly above background levels most of the time, except perhaps for a few occasions in autumn. The degree to which these predicted levels constitute a problem is difficult to assess, as they are not compared to the natural variability of the background levels. It should be noted that since water quality is already an issue in the area in question, increased levels cannot be neglected and may qualify the results further.

There is an extensive water quality data set for the Mangles Bay locality based on annual monitoring undertaken by the CSMC. It is not clear how much or if any of this information was used and it appears that guideline and standard figures have been misinterpreted as EQC document table values are used rather than the long-term running medians as per the EQC methodology. The SEP and its accompanying technical documents instruct users to calculate guidelines and standards based on long-term running medians when enough data is available for their calculations. This has not been done and as a result future water quality is likely to be worse in terms of exceedances based on current running medians by several units. This is because ambient water quality based on chlorophyll '*a*' and Light Attenuation (LAC) is generally improving at the Warnbro Sound reference site but not within southern Cockburn Sound. For example, CSMC updated EQC methodologies and data results show high and medium protection values for chlorophyll '*a*' for 2011 are 0.6 and 1.2 compared to the original SEP EQC table values used in the PER which are 0.8 and 1.3 respectively.

These potential miscalculations suggest water quality in the marina could be worse based comparisons to the Warnbro reference site. Refer to p224-225 that states 'the proposal will not result in any lessening of water quality in Mangles Bay, and that EQC for those environmental indicators that are presently met will continue to be met'. This may be true for physical-chemical measurements of salinity, pH and temperature but not for chlorophyll and light attenuation.

11. Coastal Processes Impact Assessment

We note the reliance on buried seawalls and control groynes to manage operational sediment compartments. Their use, while reasonable, can lead to unpredicted areas of erosion and accretion because of storm events. Based on this, we note that there may be a hidden, potentially costly long-term maintenance obligation that needs to be encompassed by the management plan, e.g. sand haulage, seawall repair and sea level rise defence planning (i.e. for climate change).

12. Benthic Primary Producer Habitat Impact Assessment

We are uncertain about the basis of numbers used to describe the mooring scars and associated seagrass loss in Mangles Bay (Table 51 pp 258). Not all scars are easily

identified through aerial imagery. The field that is still within 'Mangles Bay' has a number of scars toward Hymus Street and deeper waters and these appear not to have been included. Existing seagrass scars that are currently not adjacent or centred on existing moorings have not been assessed for seagrass regrowth which goes to the core assumption that seagrass rehabilitation is a matter of time i.e. 5 to 7 years. Many of these scars have been in existence for much longer periods of time (e.g. barge scars) and this indicates that regrowth may be less than stated in the PER. This has implications for environmental offsets and seagrass loss and restoration.
The PER indicates that survival in test plots that were previously mooring scars had 48.9% (i.e. approx 50%) survival after 12 months of monitoring. Longer monitoring is required to substantiate "successful re-colonisation" or sprig replanting.

It is our understanding that all illegal moorings have been removed over the last two years since the area was gazetted as a Mooring Control Area (MCA). It is also the understanding that all moorings will be required to install environmentally sensitive non-seagrass destructive moorings over the next few years.

Mangles Bay seagrasses are already severely stressed. The PER indicates that there would be only a marginal increase in turbidity associated with dredging and while the work of Collier *et al* (2009) indicates *P. sinuosa* can tolerate long periods of shading, it is unknown if existing seagrass meadows can tolerate further stress due to dredging or with future potential export of phytoplankton related turbidity from the proposed marina. There is no qualitative or quantitative data provided by the proponents to indicate ambient levels of physiological health in the resident stressed seagrass meadows.

Seagrass transplantation and rehabilitation statements made in the PER are appropriate. However, it is strongly recommended that more than 6ha needs to be replaced because of the problems of seagrass survival and surrounding water quality as well as other interacting biological and physical factors which could affect replanting success. There should be clarification of this issue in either environmental offset discussions or in related environment management plans and proponent environmental commitments.

The CSMC and Officers strongly supports greater multiples than 1:1 replacement of seagrass because of the need to contribute to strategic aims of increasing seagrass coverage in Cockburn Sound i.e. as outlined to meet the EPA's EAG No.3 – Strategic Aims.

13. Marine Fauna Impact Assessment
In Chapter 13 a number of facts and issues relating to potential marine faunal impacts need to be expanded and clarified. For example, Section 13 (p.276) under Commonwealth Protection through the EPBC Act, does not list the ROKAMBA (Republic of Korea – Australia Migratory Bird Agreement).

In general there is a lack of quantitative data, and in particular, standing crop biomass or productivity information to gain a sense of possible impacts to the food chain or higher order predators caused by the total loss of approximately 7ha of habitat (sand and seagrass). For example a review of an Honours and PhD data by Wildsmith in the early 2000's indicates approximately 50,000 individuals of polychaete and crustacean infauna per m^2 (not epibenthos) is found in seagrass areas close to Mangles Bay beaches. If this represents 500 grams of wet biomass per m^2 then approximately 35 tonnes of infauna wet biomass could potentially be removed from 7ha of seagrass and sandy areas due to the proposed development.

The preceding calculation is conservative as it does not include large epifauna or other benthic invertebrates (epibenthic). It does indicate though that 3.5 tonnes of forage fish will

potentially be removed from the area based on a 10% trophic efficiency value. This would suggest that 350kg of large predators such as penguins and fish would be reduced by the removal of this habitat. This is an example of how a quantitative environmental impact assessment for the location could help provide insights into the environmental impacts. This example should not be misused because up-to-date site specific monitoring data has not been taken in proposed affected areas including halo areas.

It would have been helpful in Section 13.3.2 to have the data summarised in a table to show the findings of a range of benthic and invertebrate surveys for shallow water habitat in Cockburn Sound carried out between 1978 and 2008. There is no discussion of how much the abundance and biomass may change because of the marina.

It was difficult to assess marine impacts because of the lack of current quantitative data on marine flora and fauna. Given the sensitive and highly productive nursery habitat found in this area, calculations of animal standing crops and biomass would have enabled impacts on the fauna and productivity to be better assessed. For example, there is a lack of data on fish standing crops for the most abundant and recreationally important species utilising the shallows of Mangles Bay, e.g. King George whiting, blue manna crab, forage fish etc. Furthermore, a quantitative assessment of the impact of losing approximately 7ha of habitat (ca 6ha of seagrass and 1ha of sand) and having potentially degraded adjacent habitat areas (i.e. extended moderately degraded halos) is not provided. This makes it difficult to make an objective assessment of impacts on food chains, food availability and the general supporting habitat for a range of ecosystem inhabitants such as piscivorous birds and recreational popular fish predators, as well as for cetaceans. There is insufficient evidence to eliminate this concern.

The issue of boat strikes to little penguins, and to a lesser extent, to dolphins is a relevant and a growing risk. It is expected there will be substantial increases in boating activity in Mangles Bay following the development of this marina aside from background increases in use created by catchment population growth.

We believe the marina will result in more than "some increase" in recreational boat traffic in Cockburn Sound and the SIMP. There are no supporting calculations or documentation to estimate the increase in quantitative terms.

In Section 13.3.5 it is noted that Fremantle Ports undertook an Introduced Marine Pests (IMPs) baseline study that included Cockburn Sound. There is no discussion of the emerging issue of recent invasions by the "snotty tunicate" *Didemnum perlucidum* and the Asian Green Mussel *Perna veridis*. The result is a sense that the section on marine pests is superficial.

Section 13.4 (p.293) understates the strong possibility of poor water quality, nutrient enrichment and bottom anoxia as well as the accumulation of metals and antifoulant biocides in the sediment of the marina. However, we agree that noise impacts will be a low probability risk to cetaceans and other fauna.

We understands that there are guidelines (e.g. *National Bio-fouling Management Guidelines for Recreational Vessels*, January 2009) that can be applied to recreational vessels during the operation phase of the marina, contrary to the statement made in paragraph 13.4.3 (p.294). There will be a need for a management protocol to address overseas, interstate and intrastate vessel arrivals using the marina facility. This will help better manage possible infestation and establishment of IMPs.

We consider that the workshop used to undertake a risk assessment on direct and indirect marina fauna was too limited to have ensured a full discussion of the risks and there were too few experts-participants with knowledge on water quality and other potential risk issues to marine fauna.

However, overall, we have the view that introduced marine pests and noise are unlikely to be high risk issues of importance and consider them to be minimal.

In relation to the statement in Section 13.5.3 (p.296) that the marina is likely to contribute only a small proportion of increased recreational fishing pressure compared to that predicted due to population increase, we consider that the marina will focus boat activity and help channel increased fishing pressure in Cockburn Sound, the SIMP and greater southern metropolitan coastal waters.

There is a lack of relevant information on the sources of recreational boat pressure. In Table 61 (p.297) there are no numbers provided for peak times at the Cruising Yacht Club and Mangles Bay Fishing Club ramps. A few hours of monitoring over several summer weekends would have helped provide robust estimates in this Table.

We would like to know on what basis the estimation of 1% increase in the number of vessels able to access Cockburn Sound and the SIMP in the next 10 to 15 years was derived, as stated in several sections of the PER (particularly Section 13.5).

The discussion of chemical contamination and bioaccumulation (Section 13.5.7 p.299) is not sufficiently detailed to describe sources and estimate impacts on local marine fauna.

Management measures, performance standards and approaches to address cumulative impacts are difficult issues that need to be thoroughly and properly developed with appropriate offsets identified that are proportional to their importance. For those issues relevant to the Departments of Fisheries and Environment and Conservation, it will be a challenge to implement meaningful offsets to account for impacts to fauna.

In Section 13.7.6 and 13.7.7 (pp. 302-303), there is little discussion of contaminant accumulation in marina sediments or cycling within the enclosed water body of the marina. Further, no actual marina inspection process is outlined that will address the detection of marine pests or high levels of fouling organisms on vessels in the marina. This is an issue that will need to be a component of future marina management plans.

14. Matters of National Environmental Significance Impact Assessment

It is important to note that the reason Lake Richmond is not designated as a wetland of international or national importance is because the Ramsar convention defines these wetlands in terms of migratory bird use rather than in terms of the presence of ancient living forms. It is also the site of three nationally listed Threatened Ecological Communities (TECs).

In Section 14.4.2 (p.338) consideration should be given to the feasibility of transplanting *Lomandra* grass plugs to include possible buried GSM larvae before clearing the land that contains GSM habitat. This could be a CEMP component.

We note that both Carnaby's and Baudin's Cockatoos are observed in the locality, particularly in tree and Banksia copses found in Shoalwater and Old Rockingham.

15. Aboriginal and European Heritage Impact Assessment

We cannot comment on this aspect.

16. Recreation and Public Access Impact Assessment
In Section 16.3 (p.373) the discussion of long-term minimisation impact options does not take into account the cost of losing over 46ha of public domain land (Bush forever and Regional Park land). Although the PER lists a number of benefits of the project, many of these could be provided without the development.

The options section does not adequately explain why a marina should be located in this sensitive area compared to other locations in Cockburn Sound.

Discussion of predicted boat trailer and other recreational boat usage, with and without the marina, in Section 16.4.3, needs to clarify predicted boat numbers.

17. Conservation and Impact Assessment
Section 17.1.2 (p.381) describes the environmental objectives of the Rockingham Lakes Regional Parks (RLRP). These run counter to the proposed marina development in general in that they necessitate the loss of very sensitive habitat.

The flora mitigation to address impacts on Bush Forever and RLRP will be beneficial. Weed control, provenance seed collection and a range of the other undertakings outlined on page 391 would enhance this locality, independent of any development proposal.

18. Visual Amenity Impact Assessment
This is primarily a planning issue.

The visual amenity survey could have included a view point from the lookout near the Anchorage overlooking Lake Richmond to provide a realistic idea of a medium to long-term viewscape looking toward the northwest and Point Peron.

19. Road Traffic Impact Assessment
Road traffic will create extreme congestion, dust, safety and access issues for between 2 to 4 years. This will be a very difficult issue to manage and could exacerbate contaminant inputs into Mangles Bay and Lake Richmond from heavy vehicle usage and road run-off.

20. Contaminated Sites and Acid Sulfate Soils Impact
Possible existing areas of sediment contamination in the vicinity of the Cruising Yacht Club, Mangles Bay Fishing Club and holiday camps should be tested adequately with enough replication to ensure that environmental guidelines are adhered to and met, if soil remediation is required.

21. Other Environmental Factors Impact Assessment
It would be desirable for voids that become exposed due to construction to be assessed for stygofauna or troglofauna. Appropriate quality of water should be used for dust suppression (fresh versus saline) and items such as absorbency mats and bunding should be utilised for the storage of any material and plant that may leak or create environmental contamination by accident or storage.

22. Environmental Measures and Controls
See 21 above.

23. Environmental Offsets Strategy
Offsets will also need to ensure the beneficial multiple uses of Cockburn Sound and its nearby environs are maintained and re-balanced to account for this proposed marina development.

We hold the view that there are no appropriate offsets that would compensate for a loss of thrombolites due to deterioration in water depths and the water quality of Lake Richmond. The thrombolites are a priceless and irreplaceable local asset, arguably the last 'healthy' colony in the region and they must not be put at risk.

Offsets for seagrass and terrestrial vegetation need to be substantial and have regional significance. The ratio of proposed direct and indirect offsets will need careful and balanced negotiation. For example, few specific proposals are provided to compensate for the loss of 70ha of prime coastal land from the conservation estate. It is not appropriate for these proposals to be left to be discussed at a later date, as the proponents propose, when there will no longer be the opportunity for public input.

In summary, Chapter 23 is short on detail and states (p440) that "it is intended that a detailed offsets strategy, once agreed with the DEC, DoP and DSEWPaC, will be provided to the EPA at the time of submission of the Summary and Response to Public Submissions on the PER". CSMC has responsibility, with the DEC and OEPA, for the environmental health of Cockburn Sound. It is therefore appropriate for the CSMC to have the opportunity to comment in detail on the proposals.

Miscellaneous Comments in Summary

While we realise that the EPA cannot take into consideration economic values in its assessment of this proposal, the CSMC Officers were disappointed the proponents have not provided evidence to substantiate statements about economic benefits compared to environmental losses. Assessors are therefore unable to properly consider economic and social costs and benefits until the planning process is undertaken after environmental approval if it is given.

Community enquiries and advice to the CSMC office suggest that there may be gaps in consultation with key stakeholders (e.g. Naragebup Environment Centre, a major stakeholder adjacent to Lake Richmond; the Conservation Council, who have a major interest in Bush Forever; Threatened Ecological Communities and Regional Parks; and the Aviation and Interior Works social club/caravan park, established in the 1950's by the Commonwealth Government, located on the Mangles Bay foreshore).

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 20

Review of the Mangles Bay Marina proposal (undated)
by Dr. Mike van Keulen, Murdoch University

Review of Mangles Bay Marina Based Tourism Precinct – Public Environmental Review

Prepared for *Preserve Point Peron* and *Hands Off Point Peron*
by

Dr Mike van Keulen
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Dr Mike van Keulen

Dr Mike van Keulen is Senior Lecturer in Plant Sciences and Marine Biology and Academic Chair of the Marine Science program at Murdoch University. His research interests are in seagrass ecology and rehabilitation and the ecology of coral reefs. Mike has over 25 years of research experience in seagrass ecology and more than 15 years of research experience in seagrass rehabilitation, producing numerous scientific publications in the field. He is internationally sought after for advice on seagrass rehabilitation projects. Mike has worked extensively in the Shoalwater Bay and Cockburn Sound region and played a senior role in the seagrass rehabilitation work undertaken through the collaborative Seagrass Research and Rehabilitation Programme. His team at Murdoch University has completed the largest and most successful seagrass transplantation project in Australia.

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Introduction

The Mangles Bay Marina Based Tourist Precinct proposal, previously known as the Cape Peron Tourist Precinct project, has had a long history and has undergone a number of iterations before presentation in its current form. Identified environmental constraints have been a major consideration for this proposal since its inception and, aside from the overarching economic considerations, have determined the viability of previous iterations of the project. The major environmental constraints have been consistently identified as:

- seagrass loss and water quality impacts from construction and long-term impacts of the operation of the marina
- impacts on Lake Richmond and associated ecological communities from changed hydrogeology
- loss of terrestrial vegetation and fragmentation of the ecosystem on the proposal site

(EPA, 2006)

The current PER process was set by the EPA when the proposal was referred to it in September 2010.

Dr Mike van Keulen was engaged jointly by the community groups *Preserve Point Peron* and *Hands of Point Peron* to undertake a scientific review of the PER document to help inform the groups' submissions to the EPA. This report will follow the basic structure of the PER.

The scope of the research commissioned by *Preserve Point Peron* and *Hands of Point Peron* was to advise:

1. Whether the proposal described in the PER poses any serious or unacceptable risks to the environment;
2. Whether there are any significant flaws in the PER's description and analysis of (a) the proposal's environmental impacts and risks and (b) the measures proposed to offset, minimise and/or manage such impacts and risks;
3. Whether sufficient research and analysis has been conducted in order to evaluate the environmental impacts and risks of the project. If not, what additional research is necessary;
4. Any other matters considered relevant to the environmental impact assessment of the proposal.

General overview of the PER

The introduction of the PER documents provides a history of proposed developments for the Mangles Bay region from the early 1970s to the present proposal. The introduction includes a rationale for the development proposal and outlines key issues that resulted in deferment of the proposal to the present time. A summary of the environmental assessment processes that are being followed is presented, including preparation of a Strategic Environmental Review for EPA evaluation in 2006 and the key environmental issues identified by the EPA. The body of the PER comprises a series of chapters addressing the various environmental impacts the project is expected to have and how these impacts might be expected to be minimised.

The key sections are:

- Terrestrial environment (including groundwater, surface water, flora and vegetation, terrestrial fauna and conservation areas).
- Marine environment (including water quality, coastal processes, benthic primary producer habitat and marine fauna).
- Matters of National Environmental Significance.
- Social surrounds (including recreation and public access, Aboriginal and European heritage and visual amenity).
- Other Environmental Factors (including traffic, contaminated sites and acid sulfate soils and construction impacts of dust, noise and waste).

This report will focus particularly on key impacts of the proposed Mangles Bay Marina Based Tourist Precinct on the marine environment; however other aspects of the proposal will be addressed as appropriate.

Groundwater impact and Lake Richmond

The proponent has undertaken groundwater modelling to determine the level of impact of the proposed development on Lake Richmond. The impacts include potential salt water (marine) intrusion into the groundwater, potential impacts from dewatering during construction, changes in surface water levels in Lake Richmond during construction and operationally after construction, surface drainage from the proposed development after construction.

While the buffer proposed appears adequate to account for potential salt water intrusion, based on estimates of groundwater flow, there are a number of contingencies that have not been considered. Foremost among these is the potential for sea level rise, which would be expected to push the coastal salt wedge inland, potentially affecting the lake. There appears to be considerable variability in groundwater flow rate in the area and this raises doubts about the reliability of the modelling predictions. There is also potential for salt water intrusion to affect the root zone of coastal vegetation, which may affect the long term health and survival of coastal trees and compromise the integrity of the retained bushland within the development and the proposed reorganisation of bush areas.

Concerns about potential impacts from dewatering during the construction phase appear to have been met by adopting a wet excavation method, which will minimise the need for dewatering.

Modelling by the proponents indicates that the proposed marina development itself will be responsible for a reduction in water level of up to 0.038 m during operation post construction. While this may be within tolerances for the shoreline communities of Lake Richmond, it is not possible to isolate the proposed marina development from realignment and duplication of the Sepia Depression Ocean Outlet Landline (SDOOL) by the Water Corporation; the proposed marina development cannot proceed without realignment of the SDOOL. The combined marina and SDOOL developments are predicted to affect water levels in Lake Richmond by 0.25 m during the construction phase (Environmental Resources Management Australia, 2011), which may impact the shoreline communities in the lake, including the thrombolites.

Drainage from the new development does not appear to have been adequately considered. The destination of surface runoff has not been identified and may influence the Lake and groundwater; the significant land clearing and building proposed may affect groundwater recharge rates and therefore groundwater flow rates (and possibly direction). Additional contaminants can be predicted to enter the groundwater and/or drainage from surface runoff; these will likely end up in Lake Richmond or Mangles Bay.

A significant omission from discussions is the potential for climate change impacts on groundwater flow. With rainfall in the southwest of Western Australia already reduced and predicted to continue to fall (Climate Commission, 2011), groundwater recharge rates will decline in future years. This will exacerbate any potential salt water intrusion impacts. Sea level rises of up to 1 m are predicted by 2100 (Department of Climate Change, 2009), with recorded sea level rises in southern Western Australia being higher than the global average. At these predicted rates, enhanced salt water intrusion into the groundwater will be considerably greater than predicted based on present models and the integrity of Lake Richmond may be expected to be compromised.

As a minimum, consideration should be made of the likely impacts of a 1 m sea level rise on groundwater flows and salt water intrusion; this is likely to require additional research, as there is considerable uncertainty over the existing groundwater modelling.

Terrestrial Flora and Fauna impact

Considerable land clearing of bushland is proposed as the development proceeds, including significant areas that are listed as Bush Forever sites. The proponents have suggested that a lot of the existing Bush Forever land is degraded and can be replaced with land currently cleared and allocated elsewhere. Restoration of degraded bush would appear to be a much simpler approach than complete restoration of previously cleared and developed land. The risks associated with further disrupting the existing bush are significant; fragmentation of the existing bush corridors risk displacing native fauna, with little option for nearby resettlement.

A further consideration is the potential for the development to disrupt the hydrology of the bushland; changes to local drainage can result in changes to micro-habitats which host pockets of specific flora and fauna. Changes in groundwater conditions, resulting from increased salt water intrusion, will be expected to impact the root zones of coastal trees, affecting tree health and consequently the integrity of coastal vegetated ecosystems. This will be exacerbated by future sea level rises. More accurate groundwater modelling that takes into consideration predicted sea level rises will help in understanding the likely impacts on coastal vegetation; the information obtained thus far appears inadequate to fully predict these impacts.

Marine water and sediment quality

The proposal will have a number of impacts on the marine environment of Mangles Bay; these include direct impacts due to dredging, land reclamation and breakwater construction as well as indirect impacts due to resuspension of sedimentary pollutants and long term changes in water quality due to the presence of the marina itself.

Sediment resuspension

Dredging, land reclamation and breakwater construction are anticipated to result in sediment resuspension for considerable periods of time as the marina is developed. While measures are proposed to be installed to minimise impacts due to suspended sediments from construction, some leakage of sediment plumes during spoil transport and drainage is inevitable. It is likely that seepage of fine sediments from constructed breakwaters and reclaimed land will occur over an extended period after construction is complete, as was observed after construction of the causeway for the boating facility at Coral Bay (unpublished data); this would be expected to contribute to local sediment load for some time post construction.

Dredging can result in the release of pollutants bound in the sediment, potentially including nutrients and toxic compounds, some of which can be retained in sediments for extended periods after initial contamination. Even low levels of contamination can be a problem as a number of common pollutants are bio-accumulators and will multiply to high levels as they move up the food chain. Cockburn Sound has a long history of pollution as a result of a range of industrial activities and pollution from groundwater sources. The poor flushing of Cockburn Sound has led to the accumulation of fine organic sediments in Mangles Bay. The heavy use of Mangles Bay as a mooring location over several decades may have contributed to an increase in organotin compounds, some of which may have settled deep into the sediment. PAHs, PCBs and pesticides are all known to have been released into Cockburn Sound in the past; many of these have long residence times in marine sediments and may be released during the dredging process.

The access channel is proposed to be dredged to a depth of 4 m through the existing seagrass meadow. Samples were taken from mooring scars within the seagrass meadow rather than among the seagrass to avoid additional seagrass loss during the sampling process. The mooring scars are better flushed than the seagrass meadow and it is likely that any contaminants will have been flushed out of the sediment that was collected. This is also reflected in the low percentage of fines reported in the sediment samples (Oceanica, 2012). For these reasons it is felt that the sampling process for sediments does not adequately represent the likely level of sedimentary contamination at the site.

Destabilisation of sediments

The Mangles Bay seagrass meadow is dominated by fine organic sediments; it is likely that this is one of the key reasons for the relatively poor overall health of seagrasses in this area compared to elsewhere in Cockburn Sound (see the section on seagrasses later in this report). The dredged access channel will bisect the already fragile seagrass meadow in Mangles Bay, changing the topography and local flow characteristics. The shallow nature of the surrounding meadow may result in enhanced drainage flow into the channel; the possible impacts of this are unknown. It is anticipated that the low density sediment that the seagrasses are growing in will be more vulnerable to resuspension as a result of the new channel, increasing the risk of erosion and further loss of the abutting seagrass meadow.

Long-term disturbance can be expected in the form of wash from boats entering and exiting the marina via the access channel; this would particularly be a problem if larger boats are anticipated where the draft occupies a relatively large portion of the channel. The marina is proposed to be able to accommodate larger yachts and commercial vessels and these may produce sufficient drag as they traverse the channel to disturb the bottom and adjacent sediments. The low density of sediments and lack of stability may also result in sediment slumping into the channel from the adjacent seagrass meadows, with consequent implications for continued erosion of the seagrass meadow and also for maintenance dredging. The channel forms a deep point in the middle of the seagrass meadow and it is anticipated that seagrass wrack will accumulate in it, potentially causing a nuisance for boaters.

Water quality

The waters in Mangles Bay are already acknowledged as of relatively poor water quality, with chlorophyll *a* levels consistently higher than environmental quality standards (Oceanica, 2012) and have been so for some time (Western Australian Auditor General, 2010). It has been postulated that this is the result of nutrient inputs from groundwater and the Lake Richmond overflow drain, exacerbated by the poor flushing of this part of Cockburn Sound (Western Australian Auditor General, 2010). Poor water quality is likely to contribute to the poor seagrass health observed in the Mangles Bay area, by increasing turbidity.

By enclosing waters within a marina of this nature, water quality is acknowledged to deteriorate, with enhanced nutrients and chlorophyll *a* levels leading to stagnation and possible reductions in dissolved oxygen in very poorly flushed systems. The proponents expect nutrients that come into the marina via groundwater to be partially taken up by phytoplankton, with the result that chlorophyll *a* levels in the proposed marina are expected to be approximately twice that of the adjacent waters in Mangles Bay. While modelled flushing rates are quoted by the proponents as adequate to prevent build up of nutrients or contaminants (Strategen, 2012), the modelled times appear to be sufficient to allow significant development of phytoplankton blooms: 4-13 days depending on location within the marina and time of year (APASA, 2011). This is of particular concern during the warm and calm autumn months, when conditions are ideal for phytoplankton growth. Rapid build up of phytoplankton populations can result in excessive dissolved oxygen demand, particularly a concern in the warm waters experienced in Perth during summer. The outcome of this process is likely to be the release of very low quality water onto the already vulnerable adjacent seagrass meadows.

Coastal processes

The proposal to build a marina at Mangles Bay adds to an already significantly disturbed environment that is under continued stress. The construction of the Garden Island causeway in the early 1970s initiated a major disruption to longshore sand movement, with areas of erosion on the eastern side of the causeway and accretion on the western side (Department of Transport, 2009). The survival of the beach along Mangles Bay is likely due to a combination of the sheltered nature of that part of Cockburn Sound and the stabilising influence of the extensive seagrass growth close to shore.

Construction of the proposed marina and access channel through the seagrass meadow could result in destabilisation of the seagrass meadow in Mangles Bay and the release of fine sediments which have accumulated in the bay. In the longer term, wash from boat traffic through the access channel could result in additional destabilisation of sediment and the bisected seagrass meadow, making the system vulnerable to erosion during winter storms. Initial erosion of the seagrass could extend to tens of metres from the channel; however in the longer term more widespread losses could occur and lead to the loss of the seagrass meadow as a contiguous structure. If the seagrass meadow is lost from Mangles Bay the sediment adjacent to the shoreline may become destabilised and coastal erosion would be a distinct possibility.

Global climate change impacts have not been addressed. Results from a wide range of modelling exercises suggests that sea level rises of up to 1 m may be reasonably expected by 2100. Southern Western Australia has been experiencing greater levels of sea level rise than the global average and large areas of the southwest coastline are under threat of regular inundation and coastal erosion (Department of Climate Change, 2009). No acknowledgement has been made of likely global climate change impacts and this is a major short-coming in any planning of coastal developments; particularly in southern Western Australia, where the sedimentary coastlines are likely to be more significantly affected than elsewhere.

Benthic Primary Producer Habitat

The access channel for the marina will be dredged to a depth of 4.0 m through the existing seagrass meadow. The proposal will involve the direct removal of 5.36 ha of seagrass with a further 0.3 ha estimated to be lost due to halo effects around breakwaters. The proponents are proposing to offset these losses by rehabilitating seagrass habitat at other locations within Cockburn Sound.

There are several issues of concern resulting from these activities; including the direct loss of seagrass habitat, sediment destabilisation, the rehabilitation process and drainage impacts on adjacent seagrass meadows. There are also concerns about epiphyte loads resulting from increased nutrient outflow via the marina channel.

Direct loss of seagrass habitat

The proposal will effectively result in the loss of 5.66 ha of seagrass out of the existing meadows in eastern Mangles Bay. The seagrass meadows in this part of Cockburn Sound have been identified as having reduced health, with lower shoot density than would be expected elsewhere in the region. The report on Benthic Primary Producer Habitat (Oceanica 2012) uses the CSMC report cards as a basis for its observations on site health; however the Auditor General's report on environmental management of Cockburn Sound identified errors and inconsistencies in the seagrass monitoring programme commissioned by CSMC (Western Australian Auditor General, 2010). This included incorrect calculations of long term shoot density trends against a reference site in Warnbro Sound, which was found to be also declining. Seagrass health in Mangles Bay was singled out as an issue for concern by the Auditor General, having been consistently below the EQS set by the State Environmental Policy for Cockburn Sound for several years (Western Australian Auditor General, 2010). It is clear that the CSMC report cards for the last several years cannot be relied on as a baseline reference for seagrass health in Mangles Bay.

It is believed the poor seagrass health conditions in Mangles Bay are largely the result of circulation patterns in Cockburn Sound as modified by the presence of the Garden Island causeway since the early 1970s. The consequent reduction in flushing of Cockburn Sound has resulted in the Mangles Bay effectively being a sink for fine sediments (and pollutants generated within the Sound). The settlement of fine sediment particles onto seagrass leaves in Mangles Bay very probably reduces the amount of light available for photosynthesis, compromising the overall health of the seagrasses. Historical pollution of Cockburn Sound included significant quantities of nutrients and metals, which are believed to have accumulated in the sediments of the Mangles Bay area. As a consequence, seagrass health in Mangles Bay has been consistently poorer than elsewhere in the region (Waddington and Meeuwig, 2010).

Regular monitoring commissioned by the Cockburn Sound Management Council (Cockburn Sound Management Council, 2009) shows that shoot densities in Mangles Bay are consistently lower than elsewhere in Cockburn Sound and epiphyte loads are higher than elsewhere. Shoot densities in the area have remained relatively stable over the last several years although there has been an overall decline since the monitoring programme was

established in 2005; seagrass meadow health at Mangles Bay must be considered compromised and vulnerable to disturbance.

Seagrass shoot densities have on occasion fallen below 50% of the EQS target (Western Australian Auditor General, 2010); studies on seagrass density declines have suggested that if the shoot density drops to 25% or less of natural (reference) meadow density, the structural integrity of the meadow becomes compromised and catastrophic loss may result from erosion due to hydrodynamic disturbance (van Keulen, 1998). Negative impacts on water quality or disturbance to sediment can be expected to undermine the stability of the meadows and potentially lead to catastrophic loss. At this point it is anticipated that events such as elevated chlorophyll *a* levels, elevated nutrient levels causing increased epiphyte loads, increased light attenuation due to turbidity plumes, and changes in hydrology, as might be expected to result from dredging the access channel to the marina, could all trigger a collapse in the remaining seagrass population in Mangles Bay. With sustained environmental impacts on the seagrass ecosystem it is likely that the majority of the seagrass meadow in Mangles Bay will become fragmented and lost, leaving only scattered small clumps of remnant vegetation.

Sediment dynamics of the Mangles Bay seagrass habitat

Cockburn Sound is a relatively sheltered embayment with circulation restricted by the surrounding geomorphology, including Cape Peron, Southern Flats, Garden Island, Woodman Point and Parmelia Bank. This generally results in a wind-driven circulation pattern that varies seasonally; the nature of the circulation in Cockburn Sound means that the sheltered area that includes Mangles Bay experiences reduced flushing. As water flow decreases, finer sediment fractions can drop out of the water column; fine organic material is less dense than most suspended sediment and is more likely to be transported until it reaches areas of deposition, such as Mangles Bay. As a result, this region of Cockburn Sound is a major sink for fine sediments, nutrients and other pollutants sourced from the rest of Cockburn Sound, in particular the industrialised eastern sill.

The fine organic sediments in Mangles Bay form a relatively unstable substrate for seagrass growth and it is likely that this, together with high epiphyte loads caused by relatively high ambient nutrient levels, is responsible for the relatively poor seagrass growth in the area. The loose nature of the sediments in Mangles Bay also presents a risk to the long-term stability of the seagrass meadows in the area; the seagrasses are not well-anchored and are susceptible to mechanical disturbance. Any additional disturbance caused by dredging the access channel may be sufficient to destabilise the seagrass, resulting in a wider zone of influence than currently predicted and ultimately fragmentation of the entire meadow.

The wash from additional boating traffic travelling along the access channel can be expected to compromise the stability of the seagrass meadows abutting the channel. This may result in accelerated erosion of the already unstable seagrass along the channel, leading to a destabilisation of the channel margins. Apart from the higher than anticipated loss of seagrass, this also has implications for the frequency of maintenance dredging, as sediment may slump into the channel.

Seagrass rehabilitation proposal

The EPA has established a policy of no net loss of seagrasses for Cockburn Sound in light of the extensive loss of seagrass over the past 50 years (EPA, 1998). The proponent proposes to

offset the loss of seagrass by a seagrass replanting programme that would combine replanting existing mooring scars in Mangles Bay (up to 3 ha available) with replanting other areas in Cockburn Sound (areas adjacent to the existing Seagrass Research and Rehabilitation Programme transplant site on Southern Flats have been proposed).

Pilot transplantation experiments into mooring scars by the Marine and Freshwater Research Laboratory for Oceanica Consulting (Oceanica, 2012) suggest that survival of these transplants is poor, with less than 50% overall survival after 12 months. The poor results of these pilot experiments has been attributed to poor light conditions due to turbidity, bioturbation and low water flow over the site; these are the same conditions that have compromised the health of the surrounding seagrass meadows in Mangles Bay. Replanting the mooring scars at Mangles Bay is likely to be problematic at best as the transplantation process is stressful to the seagrass and requires good conditions at the recipient site to allow rapid recovery of the transplanted plants. A key principle for successful seagrass rehabilitation is that the underlying problem causing seagrass loss should be removed before transplanting can be considered (Fonseca et al., 1998). In this instance, the natural seagrass meadow in Mangles Bay is in an unhealthy state due to low water quality and poor sediment condition and rehabilitation operations should not be considered until the condition of the recipient site improves. This will require improvements in water quality and sediment stability, both of which are long-term concerns for Mangles Bay. A research programme is required to determine appropriate methods for improving water quality in Mangles Bay, followed by research to examine how the existing seagrass can be stabilised.

The large-scale seagrass rehabilitation programme on Southern Flats has resulted in the transplantation of 3 ha of seagrass over a period of five years; the programme is considered the most successful in Australia, with overall survival of around 70-80% (Verduin et al., 2011). However parts of the Southern Flats site were not able to be successfully replanted for unknown reasons (possibly sediment or nutrient related), despite repeated attempts. Storm damage reduced survival and damaged sections had to be replanted. Transplantation was only successful after extensive experimentation and refinement of techniques over many years.

One of the issues encountered during the transplantation programme was the need to increase the density of transplants from 1 m spacing between transplant units to 0.5 m spacing. This was found to be necessary to achieve target shoot densities within the required timeframe set in the Ministerial Conditions for the project and arises from the need to have adequate shoot densities to achieve a return of ecosystem functionality. Ecosystem functions for seagrass meadows include overall productivity, support for associated organisms and physical factors that include seabed stability and internal support for continued meadow growth and colonisation. Increasing transplant shoot density greatly increases the effort required and will significantly add to the overall cost of the proposed offset programme. Estimates of costs for transplanting seagrass in Western Australia are between $84,000 and $168,000 per hectare, depending on spacing of transplants (Paling et al., 2009).

To be sure of long term success in seagrass transplantation, monitoring is required for an extended period (five years is considered a minimum and ten years would be a more realistic target). The transplanted seagrass appears to be vulnerable to storm damage for a considerable period after planting, presumably due to the lack of a mature rhizosphere that helps to stabilise the entire meadow. The cost quoted by Paling et al. (2009) does not include monitoring costs.

While seagrass rehabilitation of seagrasses to other locations in Cockburn Sound may be an offset option for the proponents, the proposal to revegetate the mooring scars in Mangles Bay is unlikely to be successful. The proposed marina development will effectively reduce the amount of seagrass in Mangles Bay and will bisect the existing meadow, fragmenting the existing habitat. This has implications for the community structure as a whole, with risks of further fragmentation and impacts on foraging activities by larger animals like penguins and dolphins.

Marine Fauna

The marine fauna of the Mangles Bay area face a number of threats as a result of the proposed development. The PER documents and supporting appendices highlight some of these. Of particular concern is the reduction and fragmentation of foraging areas for larger marine fauna, in particular dolphins and penguins.

The proposal will result in the direct removal of almost six hectares of seagrass in an area where seagrass health is already compromised. Removal of this amount of habitat will place pressure on the larger fauna by reducing the amount of foraging area (and presumably the amount of prey). The proposed access channel will bisect the seagrass meadow in Mangles Bay, which is acknowledged to be an important shelter and nursery area for various fish and invertebrate species (McLean, 2012); some of these are key prey organisms of penguins and dolphins (Cannell, 2012). Both these groups feed on the edges of the seagrass meadow and it is likely that fragmentation of this habitat will make foraging more difficult. With increased boat traffic along the new channel there will also be an increased risk of boat strikes on marine fauna trying to feed across the two halves of the seagrass meadow.

In its 1998 statement on environmental management of Cockburn Sound the EPA declared that, while each of several developments proposed for Cockburn Sound at that time (which included the Mangles Bay Marina) was likely to remove only a relatively small amount of seagrass, combined these developments would be responsible for significant seagrass habitat loss (EPA, 1998). This is particularly a problem for larger fauna that travel widely to feed. The loss or fragmentation of feeding areas will be expected to compromise the broader viability of Cockburn Sound for foraging by populations of these marine fauna.

The expected increase in boating traffic through the area will result in increased likelihood of interactions between humans and larger marine fauna. This includes both the risk of accidental boat strikes and direct human-animal interactions (attempted physical contact and feeding). Both forms of interaction clearly put the marine fauna at risk.

Summary and Conclusions

The PER for the Mangles Bay Marine Based Tourism Precinct has a number of flaws and omissions that should be addressed as a matter of urgency. Key issues that require further research and consideration are:

Groundwater impact and Lake Richmond

- Impacts of climate change and sea level rise (combining to reduce groundwater recharge and therefore flow rates and additional salt water intrusion); this requires extensive research;
- Lack of acknowledgement of salt water intrusion impacts on root zones of terrestrial vegetation;
- The projected draw down of the level of Lake Richmond by the combined marina construction and realignment and duplication of the Water Corporation SDOOL has not been adequately acknowledged by the proponents; it is not possible to examine the marina impact without also considering the SDOOL impact as the marina cannot be developed without realignment of the SDOOL;
- Surface drainage implications from the marina have not been addressed; it is anticipated that surface runoff will largely end up in Lake Richmond or Mangles Bay.

Terrestrial Flora and Fauna impact

- Significant risks are attached to clearing existing bushland and revegetating currently cleared areas; substituting existing bushland, even if degraded, with currently cleared land to be revegetated seems an inherently cumbersome approach and likely to produce a poor result;
- There has been no discussion of likely hydrological changes to terrestrial vegetation; in particular, the implications of changes to salt water intrusion into the root zones of trees may have significant impacts on vegetation health and long term viability;
- There has been no discussion of the likely impacts sea level rise on groundwater and salt water intrusion and the impacts on coastal vegetation in the development footprint.

Marine water and sediment quality

- The proponents have underestimated the likely level and impact of sediment resuspension associated with the dredging, land reclamation and breakwater construction aspects of the development;
- Sampling for potential contaminants in the sediments of Mangles Bay was flawed; samples were collected from existing mooring scars within the seagrass meadow, which would be better flushed and therefore likely to contain reduced levels of contaminants than sediments stabilised by seagrass;
- The access channel will be dredged through a seagrass meadow that is already compromised by the presence of high levels of fine organic sediments, potentially destabilising the remaining seagrass and surrounding sediments;
- Additional boat wash associated with increased boating traffic is likely to impact the edges of the access channel, with the risk of further destabilising the fine organic sediments that occur in Mangles Bay; the impacts of boat traffic through a narrow channel through a seagrass meadow are unknown and require further research;

- The low density organic sediments in Mangles Bay are more likely to resuspend after development with increased likelihood of slumping of the edges of the channel; this is likely to be exacerbated with the influx of larger vessels, as expected by the proponents;
- Flushing models predict flushing times of the marina at between 4 and 13 days; this is particularly of concern during warm calm periods and could result in deoxygenation of the water following plankton bloom events;
- Water quality in Mangles Bay is already below target EQS; marinas are acknowledged to increase the likelihood of phytoplankton blooms, contributing to the efflux of contaminated water into the adjacent bay.

Coastal processes

- The shoreline of Mangles Bay is already significantly disturbed, with reduced flushing due to the Garden Island causeway resulting in the health of seagrass being compromised;
- Additional dredging of the access channel will further compromise the seagrass meadow, bisecting it and leading to potential loss of a contiguous seagrass meadow; this in turn could result in accelerated coastal erosion;
- There has been no mention of sea level changes resulting from global climate change; some of the highest rates of sea level rise have been reported from southern Western Australia and the Rockingham region is likely to experience significant impacts from sea level changes in the next two decades.

Benthic Primary Producer Habitat

- The proposal will remove over 5.5 ha of seagrass from the already vulnerable Mangles Bay seagrass meadow; seagrasses in Mangles Bay have consistently shown reduced shoot density and enhanced epiphyte cover compared to other locations in the region;
- High levels of fine organic sediment in the water column settle on the seagrass leaves, resulting in a likely reduction in light available for photosynthesis; the impacts of this level of sedimentation requires further research;
- The proponents are relying on the flawed seagrass shoot density report cards produced by the Cockburn Sound Management Council as a baseline reference for seagrass health estimates; it appears that shoot densities have fallen below 50% of the EQS on occasion and evidence suggests that falling to 25% may trigger a structural collapse of the meadow;
- The proposed access channel will bisect the existing seagrass meadow, compromising productivity, ecosystem functions that include sheltered nursery habitat, foraging grounds for larger marine fauna and sediment stability;
- Other impacts from the marina, including suspended sediments from construction, reduced quality water flowing out of the marina and disturbance from boat traffic are all expected to impact heavily on the already vulnerable seagrass;
- The sediments that have accumulated around the seagrasses in Mangles Bay carry a large proportion of fine organic sediment, making the entire meadow relatively unstable and vulnerable to physical erosion, including the disturbances from dredging and boat wash once the channel is operational;
- Pilot transplantation into the mooring scars in Mangles Bay has been relatively unsuccessful compared to other transplantation exercises in the region; this is likely due to the poor sediment and water quality conditions in Mangles Bay;

- The successful large-scale transplantation programme recently completed on Southern Flats should not be seen as a panacea for offsets in this instance; transplantation into Mangles Bay is likely to have a poor outcome due to existing environmental quality issues;
- Transplantation on Southern Flats has been experimental and techniques have improved over time; best results have been obtained using 0.5 m spacing between transplants, although some areas have remained problematic for transplantation;
- Monitoring of transplanted seagrass should be carried out for a minimum of 5 years and up to 10 years; this is particularly important in large-scale transplants where differences in fine-scale environmental conditions can result in considerable variability on transplantation success;
- Cost estimates for seagrass transplantation at 0.5 m spacing are of the order of $168,000 per hectare (2009 $ values), which does not include monitoring costs.

Marine Fauna

- A number of species of larger marine fauna (dolphins and penguins) are known to forage for food in or around the seagrass meadow in Mangles Bay;
- Fragmentation of the seagrass meadow will reduce the ecological functionality of the meadow, with possible reductions in overall productivity, nursery and shelter functions and sediment stability;
- The loss of seagrass in Mangles Bay will further degrade the value of Cockburn Sound as a sustainable feeding ground for larger marine fauna;
- Associated with the increased boat traffic around the proposed marina is increased risk of vessel strikes on marine fauna and an increased risk of harmful human interactions.

The PER document for the Mangles Bay Marina Based Tourism Precinct has addressed some of the traditional concerns raised for previous development projects in this region; however there is no escaping the fact that Mangles Bay and the Point Peron region represents a vulnerable ecosystem that will be irreversibly changed by any major development of this nature.

The impact of the marina development on the marine environment of Mangles Bay is significant, with risks to the important seagrass habitat in the bay; this will have flow-on effects on larger marine fauna as well as posing a risk to sediment (and so shoreline) stability. The on-shore components of the project will have consequences for the terrestrial environment and wetlands, including inadequately forecast impacts on Lake Richmond. Land clearing and excavation will have major impacts on the terrestrial vegetation, compromising the ecological value of the remaining coastal vegetation in this area.

It is disappointing that the proponents have not addressed any aspect of global climate change, in particular sea level rise, that has been widely forecast to occur within the next 20-30 years. The southwest of Western Australia is particularly vulnerable to predicted sea level rises; the sedimentary coastline makes it very susceptible to coastal erosion measured and sea level rises over the past 20 years have been higher here than in most other parts of Australia. Sea level rise is likely to have a major environmental impact on most aspects of the proposed development, including marine habitats and coastal stability, terrestrial environments and groundwater quality and Lake Richmond. When several government agencies have expressed serious concerns about the imminent impacts of sea level rise within a few years, it is very

disturbing that the proponents of such a significant coastal development have not acknowledged it, let alone planned for its impacts.

The Mangles Bay and Point Peron region is already highly disturbed and vulnerable to further impacts from development; the Mangles Bay Marina Based Tourism Precinct presents a significant risk to both marine and terrestrial environments. Mangles Bay is not suitable for a development of this nature, given the nature and extent of the environmental problems that would accompany it.

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Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 21

Submission on the proposed Mangles Bay Marina PER (updated) by Dr JN Dunlop, Naragebup Marine Working Group

SUBMISSION ON THE 'MANGLES BAY MARINA BASED TOURIST PRECINCT' PUBLIC ENVIRONMENTAL REVIEW

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The Naragebup Marine Working Group has investigated the coastal and marine aspects of the Mangles Bay PER. Our comments relate to the assessment of marine water and sediment quality impacts (Section 10 and Appendices), coastal processes and climate change impacts (Section 11) and fisheries and marine fauna (Section 13). Generally the material presented in the main PER document obscured much of the more credible material available in the Appendices. This was especially so in relation to the peer review of the hydrological modeling.

MARINE WATER & SEDIMENT QUALITY IMPACT ASSESSMENT

Proponent's Sampling

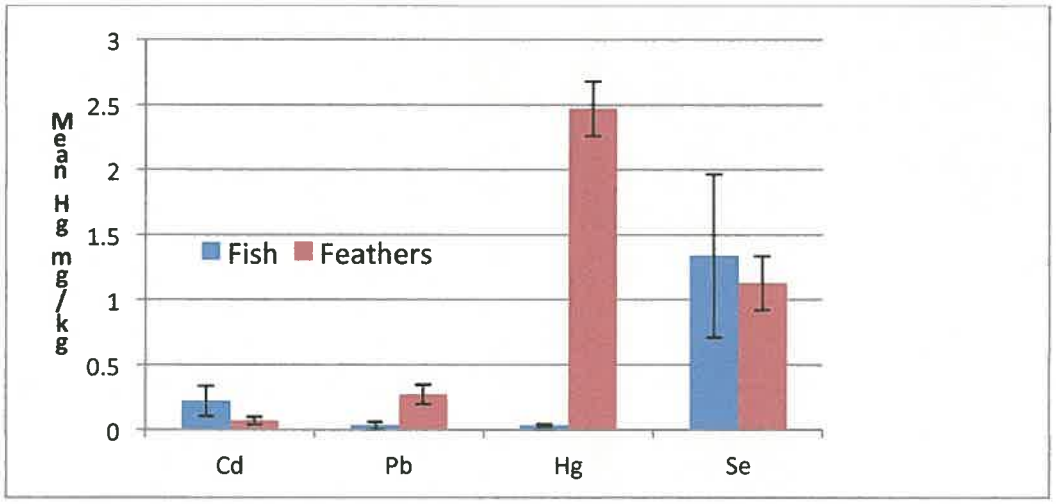
This project will require the initial dredging of 50 000 m^3 of sediment and then ongoing maintenance dredging depending on the rate of sedimentation (the latter has not been assessed). All the water sampling undertaken by the proponent showed low levels of metals, with mercury (Hg) levels below the detection limits. Two sediment samples from the dredge path showed detectable levels of Hg (both at site 3).

It should be noted that the proponents chose to sample the sediment in mooring scars cleared of seagrass meadow and probably with much reduced content of fine particles and organic matter. Since many contaminants bind to these components it is likely that this sampling does not provide a reasonable profile of the contaminant risk (given that approximately 6Ha of intact seagrass will be excavated directly, or will be subsequently destabilized by decay, as the result of the dredging program). The detection limits for Hg in sediment are also not good enough to assess the risk because of the capacity of this metal to bio-magnify in higher order consumers.

Mercury Contamination in Cockburn Sound

The Sentinel Penguins project (Conservation Council WA Citizen Science Program) has been using Little Penguin feathers to profile and monitor heavy metal levels in coastal waters around south-Western Australia. We have monitored colonies at Esperance (Bay of Isles), Albany (King George Sound), Penguin Island (Warnbro Sound – Comet Bay) and Cockburn Sound (Garden Island). Little Penguins transfer metals in their feathers during the moult however the proportion of the bodily burden sequestered depends on the metal. The figure

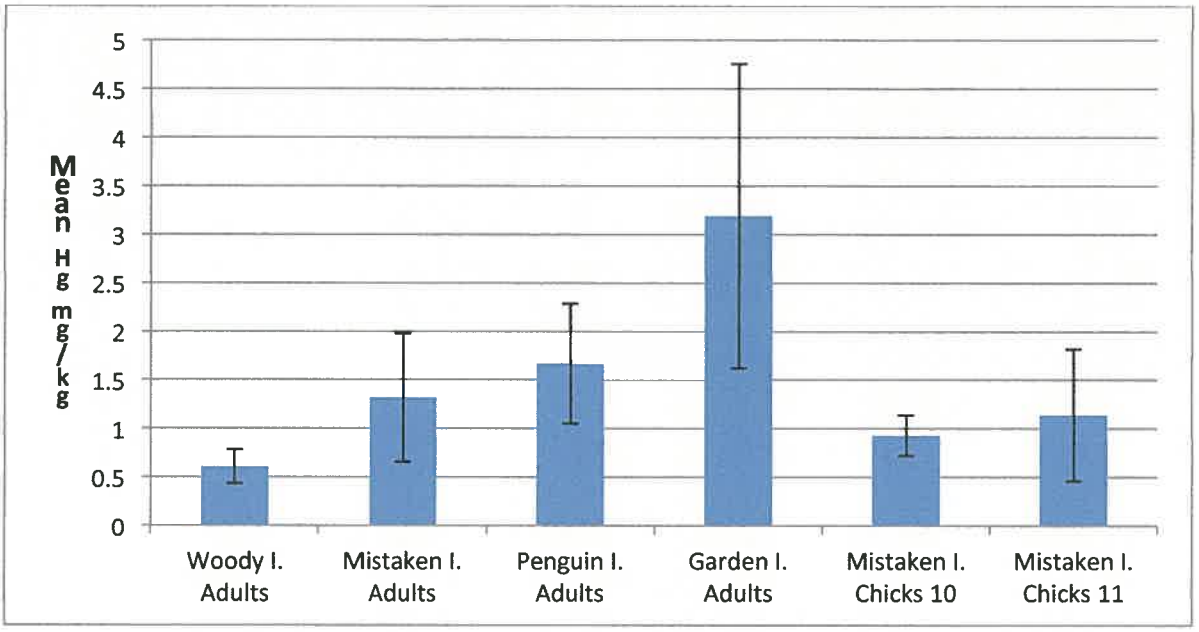
below compares the concentrations of Cd, Pb, Hg and Se in the adult moult feathers of captive Little Penguins fed a consistent diet with known levels of metal contamination.



The concentrations (mg/kg) of cadmium (Cd), lead (Pb), mercury (Hg) and selenium (Se) in the moult feathers of captive adult Little Penguins fed a consistent diet with measured levels of the same metals.

This analysis indicates that Cd levels in penguin feathers do not strongly reflect exposure, that Pb bio-accumulates, that Se is found in feathers at similar concentrations to that in the prey and that Hg bio-magnifies by a factor of more than 40 from prey fish to predator. Seabird feathers are therefore very useful for finding Hg contamination at levels that are below the detection limits available for water and sediment sampling. Small increases in organic Hg (methy-mercury) in food-chains have the potential to impact on the health of marine top-predators such as seabirds, dolphins and pinnipeds.

Recent results indicate that the Little Penguins breeding on Garden Island in Cockburn Sound and foraging along the Kwinana Shelf and in Mangles Bay (Cannell 2011 – Appendix of the PER) have elevated Hg levels in their feathers compared with other colonies in south-western Australia.



The mercury concentrations (mg/kg) in adult moult or chick (mesoptile down) feather samples taken from Little Penguin colonies breeding on coastal islands around south-western Australia.

The mean Hg concentration for 10 samples collected from the Garden Island colony (between 2007 & 2010) was 3.19 mg/kg, with 2 birds in the sample approaching, and one over, the suggested threshold for health impacts in coastal seabirds (i.e. 5mg/kg in feathers, Burger & Gochfeld 2004). This suggests that mercury contamination may be a hitherto undetected issue in forage fishes in the southern half of Cockburn Sound, including the Mangles Bay area.

The sources of the elevated Hg in the food chain in this area are unknown. They may be the result of historical discharges (e.g. CSBP), recent undetected industrial contamination, storm-water (run-off from bituminized surfaces) or localized precipitation from air pollution (e.g. burning of fossil fuels). In order to enter the food chain and therefore bio-magnify into penguins the inorganic Hg contamination needs to be converted to organic forms by anaerobic bacteria. These are most likely to be found in waters or sediments subject to periods of de-oxygenation.

The circulation in Cockburn Sound (interacting with the Garden Island Causeway) leads to the Mangles Bay region being the least mixed area within Cockburn Sound. It is in effect a major sink for suspended fine sediment particles and for contaminants (Department of Environmental Protection 1996). It is also the receiving environment for storm-water through the Lake Richmond main drain, an exit area for buoyant groundwater and abuts an area used for boat maintenance. The current condition of the seagrass meadows (e.g. epiphyte growth) is indicative of significant eutrophication stress, although the situation appears to have stabilized over recent years.

Anoxic conditions in the organic sediments of Mangles Bay would be expected from time to time, and these sediments may serve as a focus for Hg methylation and bio-transfer to the southern waters of Cockburn Sound.

Dredging in Mangles Bay could produce a significant Hg contamination hazard, particularly for localized top predators like the Garden Island Little Penguins. Assessment of this hazard would require sampling Hg in the resident biota of the Mangles Bay seagrass meadow, preferably choosing indicators from different trophic levels.

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COASTAL PROCESSES IMPACT ASSESSMENT

Climate Change (Section 11.1.7)

This PER perpetuates an ignorant approach to climate change impacts in keeping with the current government policy. Not surprising given the inconvenient reality that now confronts us with respect to existing and future coastal development.

The proponent indicates that the project will be designed (or modified over time?) using the State Coastal Planning Policy of 0.9m of sea-level rise by 2010. The proponent suggests that their adaptation strategy groynes, seawalls and beach nourishment, none of which will address the penetration of the seawater wedge and the rising groundwater level. In any event the design of the engineering has not been included in this PER even though all will have environmental impacts that will be the consequence of the development. **The penetration of the marine groundwater and its interaction with the aquifers (using 0.9m rise in sea-level) should have been undertaken as part of this PER**. It is particularly pertinent with respect to the future of the aquatic ecosystem in Lake Richmond.

There is little doubt that the construction of inland marina and canal system will amplify the impact of rising sea-levels. Using a static sea-level rise of 0.9m also greatly under-estimates the impact of climate change on the coastal geomorphology of Point Peron and trends localized trends in sea-temperature, sea-level rise and storm events in the region.

The project will be constructed on an extremely young and potentially unstable land-form. Point Peron forms the northern point of a cuspate foreland where sand-bars and then lines of dunes reclaim the ocean behind high sections of the reef or islands along the Garden

Island limestone ridge. The westerly swell waves are defracted around these barriers, cancelling their energy, and allowing the marine sediments carried to drop out and accumulate. Much of the sandy isthmus of Point Peron is a recently established tombolo behind a limestone island (the Cape) captured initially by a sandbar and now a dune field. Tombolos are inherently unstable and small changes in reef height (e.g. due to erosion) can cause major shifts in their extent and location.

The anticipated sea-level rise will significantly reduce the swell protection that maintains this landform. The most likely initial scenario may be that that the promontory erodes on its southern side re-establishing the limestone Cape as an island**. There is no evidence the project has been designed with these sorts of changes being considered.**

Background sea-temperatures in the waters off south-western Australia are rising more rapidly than in most other parts of the world (Pearce & Feng 2007). Thermal expansion of marine waters at a regional level will enhance the average global change in sea-level adopted by the State Coastal Planning Policy. On top of that we are seeing extreme oceanographic events such as the super unprecedented Leeuwin Current strength caused by the super *La Nina* event of 2010 /11 producing super-normal sea-levels and major biological perturbations all along the west coast of Western Australia (Pearce *et al.* 2011). An increase in extreme events, including an increase in storm intensity from the increased southward penetration of tropical cyclones, can be expected and need to be a genuine consideration in the assessment of coastal engineering project, particularly those that provide for the inland penetration of marine waters. **Again it is clear that applying a static 0.9m of sea-level rise to project design and assessment is unrealistic.**

The offshore reef structure of the Garden Island ridge also has the capacity to focus and amplify tsunami waves (this effect was very evident in Shoalwater Bay following the Boxing Day tsunami. The presence of the Garden Island causeway could further enhance this risk in a nearby marina / canal development. Marinas in WA have already demonstrated their vulnerability to tsunamis generated by earthquakes in south-east Asia.

References

PEARCE A. & FENG, M. 2007. Observations of warming on the Western Australian continental shelf. *Marine and Freshwater Research* 58: 194.

PEARCE, A., LENANTON, R., JACKSON, G., MOORE, J., FENG, M. & GAUGHAN, D. (2011). The 'marine heat wave' off Western Australia during the summer of 2010/11. Fisheries Research Report No. 222. Department of Fisheries, Western Australia. 40pp.

MARINE FAUNA IMPACT ASSESSMENT

Section 13 of the PER accurately summarizes the long-established research that indicates that Mangles Bay as a sheltered seagrass environment is an important fish nursery, at least on the scale of Cockburn Sound. For some species e.g. King George Whiting it may be critical nursery habitat for much of the west and even south coast. The area supports stocks of the principal commercial and recreational fish species and critical non-exploited forage fishes such as anchovies, the principle prey species for the Little Penguins from the Garden Island colony. Mangles Bay is used as a reference site to determine the annual recruitment strength of a range of targeted fish species precisely because of it functional importance.

The seagrass meadow in Mangles Bay is a fundamental component of the nursery, providing cover for small fish and crustaceans and food resources based on the productivity of its algal and detrital food chains. This meadow is one of the few surviving in Cockburn Sound and the its extent and condition has been compromised by the excessive growth of epiphytic algae. The excess nutrient loading has probably originated through inputs from groundwater and the Lake Richmond main drain (Cockburn Sound Management Council report cards).

Monitoring suggests that the condition of the seagrass in the area may have stabilized in recent years (although this conclusion may be the result of erroneous monitoring reporting by the Cockburn Sound Management Council) but the last significant meadow within the Sound probably remains close to its ecological tipping point. The question is could it possibly survive the increased stresses (short and long-term) that will result from the implementation of this project.

If implemented the project proponents estimate that 5.65 Ha of seagrass will be lost through direct excavation and smothering during the dredging program. Cockburn Sound's cumulative loss threshold for seagrass has already been vastly exceeded (EPA Benthic Producer Guideline). No further seagrass loss is therefore permissible. In theory that should be a fatal flaw for this project. The capacity to replant perennial seagrass in the Mangles Bay environment is untested and speculative. Initial attempts by the proponent to do so are failing (see Appendix 'Oceanica Baseline Data Report' Section 2.2.2) and in any event, even if eventually successful, the transplanting process will take many years (at least 7 according to Oceanica) **over which time populations of fish and dependent marine wildlife will have declined.** The only justifiable approach to the Benthic Producer Guideline would be for the Government to withhold approval until the proponent can verify the establishment at least 6Ha of new, stable and fully developed seagrass meadow (including all functioning biotic components).

If implemented the dredging of 50 000m^3 of sediment much of it currently under seagrass meadow. Apart from the relatively short term impacts of increased turbidity, this activity is likely to release sufficient nutrients to trigger a major bloom of epiphytic algae and phytoplankton. Given the ongoing survival of the Mangles Bay seagrass is already close to its

tipping point this event may be enough to trigger its final demise. The dredging will also release other contaminants into the fish nursery and potentially enhance an existing mercury hazard (see comments on Section 10) in the penguin food-chain in the southern part of Cockburn Sound.

In the longer term, the project, if implemented, would expose Mangles Bay to chronic low level exposure to the eutrophic, and potentially anoxic, water exiting the marina. Again this is a threat to the Mangles Bay seagrass meadow and consequently to the fish and wildlife populations dependent on it.

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 22

Letters from the City of Rockingham dated
3 December 2013, 3 December 2014, 5 June 2015
and 6 August 2015

Our Ref: LUP/827-07 - D13/126260

Your Ref: 809-2-28-17 (RSL/0389/1)

Enquiries to: Mr Tristan Fernandes/Mr Jeff Bradbury

COPY

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3rd December 2013

Secretary
Western Australian Planning Commission
Locked Bag 2506
PERTH WA 6001

Attn: Anthony Muscara

Dear Sir/Madam

Re: Proposed MRS Amendment - Mangles Bay Marina Preliminary Comment

I refer to your correspondence dated 18th September 2013 seeking preliminary comment in respect of a proposed Metropolitan Region Scheme (MRS) Amendment to support the Mangles Bay Marina.

It is noted that the proposal has yet to be determined by the Hon. Minister for Environment following the completion of the Public Environmental Review and advice provided to the Minister by the Office of the Environmental Protection Authority.

Notwithstanding the above, the City has now completed a preliminary review of the MRS Amendment documentation and recommends that the following matters be addressed to the satisfaction of the Western Australian Planning Commission prior to the MRS Amendment being initiated: -

1. Sea Level Rise

   Insufficient justification has been provided against the policy requirements set under State Planning Policy 2.6 - State Coastal Planning Policy (SPP 2.6) (amended July 2013) to address potential sea level rise.

   The policy requirements of SPP2.6 are required to be applied at the earliest appropriate stage of any planning process. In this regard, SPP 2.6 prescribes the preparation and implementation of a Foreshore Management Plan for this scale of development which has not been prepared.

   The proposal provides for a foreshore setback of 20m, which is based upon the following assumptions: -

   (i) Constructing a buried seawall and beach renourishment (from the Point Peron sand trap);

   (ii) Stable shoreline with 0m net erosion trend since 1988 and installation of buried sea wall to protect against erosion; and

   (iii) Sea level rise defence – unspecified coastal defensive structures and active beach management.

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In the absence of a risk assessment, the required setback outlined by SPP2.6 is 162m.

The measures proposed do not consider the adaptation framework hierarchy outlined in SPP 2.6 and have not identified how development of the proposed 'Urban' zoned land can respond to the adaptation framework but to only implement protective measures against sea level rise.

Also, the information provided does not outline who is responsible to implement works to protect the development to the effects of sea level rise.

2. Waterways Manager

No information is provided regarding any agreement for the future waterways manager for the Mangles Bay Marina. This is not consistent with the requirements of Development Control Policy 1.8 - *Canal Estates and Artificial Waterway Developments*.

3. Zoning

(i) Without prejudice to the decision of the Minister for Environment for the proposal, the City recommends that the WAPC consider implementing an 'Urban Deferred' zoning in lieu of an 'Urban' zone (as proposed within the Amendment request) in light of the various environmental conditions and monitoring recommended within the PER. An 'Urban Deferred' zoning can provide sufficient certainty for the project whilst permitting any further environmental work being completed prior to any potential development of the site.

Should the WAPC support the implementation of an 'Urban Deferred' zoning, it is the City's request that it be consulted when the WAPC seeks to lift Urban Deferment.

It is the City's view that the feasibility of the marina needs to be guaranteed following the completion any work required through environmental conditions, prior to development commencing. Given the basis of the proposal is to deliver a marina; any associated development of the land based component should be linked to this outcome.

It is also recommended a Deed of Agreement be entered into between the City and the State Government to set the terms for the use of the site for a Marina and tourist based destination.

(ii) Lot 1786 Hymus Street does not form part of the MRS Amendment and it is recommended that it be considered to be incorporated as part of this Amendment from 'Port Installations' to 'Public Purpose' or 'Special Use' which is consistent with the use of the land. Land abutting the 'Waterways' reservation which is zoned 'Port Installations' is also recommended to be rezoned to 'Parks and Recreation'.

4. Traffic

The Traffic Report does not sufficiently outline the implications of the development to the broader regional and local movement network as the focus of the document relates only to its immediate vicinity.

The City's assessment of the Traffic Report has determined the modelling does not appropriately account for traffic currently using local roads to access Garden Island. The modelling also does not account for growth in employment at HMAS Stirling or further infill development. These factors, combined with the introduction of a marina and tourist based precinct will contribute further to existing congestion to local streets.

Parkin Street and Safety Bay Road are currently performing the role of a regional transport route and it is recommended that the WAPC considers the viability of the Garden Island Highway to be constructed to service the development and traffic accessing Garden Island.

The City is concerned that the section of the 'Other Regional Road' reserve abutting Lake Richmond may not be built in light of the sensitive environmental nature of the land. The implications of not building the Garden Island Highway to the local and regional road network have not been rationalised within the Amendment documentation and this matter is recommended to be carefully considered by the WAPC.

It is also unclear from a regional planning perspective whether key access roads should be considered for reclassification to an 'Other Regional Road' status. This matter should be considered as part of the MRS Amendment as access to Garden Island and the proposed Marina are a linked regional traffic issue. It is recommended this be investigated by the WAPC in consultation with the Department of Transport and the City.

If you wish to discuss the above, please do not hesitate to contact Mr Jeff Bradbury or Mr Tristan Fernandes

Yours faithfully

COPY

R M JEANS
DIRECTOR, PLANNING
& DEVELOPMENT SERVICES

Our Ref: LUP/820-04; D14/140852
Your Ref: Petition No. 64
Enquiries to: Mr Ricci

COPY

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3rd December 2014

Hon Simon O'Brien MLC
Chairman
Standing Committee on Environment and Public Affairs
Parliament House
PERTH WA 6000

Dear Mr O'Brien

Re: Petition No.64 - Canal Estate Developments

I refer to your letter dated the 24th November 2014 inviting the City to comment on the above.

The Petition addresses a number of matters outside the jurisdiction and influence of the City, particularly the claims relating to the environmental consequences of canal developments.

In the case of the proposed 'Mangles Bay Marina', you will be aware that the project has secured approval under the relevant State and Commonwealth environmental legislation where many of the environmental consequences identified in the Petition were investigated and deemed to have been satisfactorily addressed.

The matter to which the City can respond is the 'Burden on Local Government' arising from the ongoing responsibility for public land within the 'Mangles Bay Marina' project area, most notably the management of the waterway. *Development Control Policy 1.8 - Canal Estates and Artificial Waterway Developments* (DC 1.8) requires that the developer and City enter into a Deed of Agreement relating to a number of matters including management of the waterway prior to the land being rezoned.

DC 1.8 also states that the local government will need to be 'satisfied regarding the economic viability of the proposal and its financial capacity to meet ongoing water and canal wall-monitoring and maintenance costs'.

The proponent for the 'Mangles Bay Marina' has provided information that seeks to demonstrate the financial implications associated with the City managing the waterway. From the City's assessment of the proponent's financial modelling, and through research it has undertaken, the City is not prepared to accept waterways management.

Until (and if) the City is satisfied that the management of the marina will not expose the City to inappropriate financial risk, and all the elements of the management are fully understood, it will not enter into the requisite Deed of Agreement. The City has stated its position to the proponent.

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Finally, please also find attached a letter from the City to Western Australian Planning Commission which identifies those matters that warrant resolution through the zoning processes under the Metropolitan Region Scheme.

Thank you for the opportunity to comment and should you have any enquiries, please do not hesitate to contact Mr Peter Ricci

Yours faithfully

ANDREW HAMMOND
CHIEF EXECUTIVE OFFICER

Our Ref: LUP/820-04; D15/69263

Your Ref:

Enquiries to: Mr Ricci

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5th June 2015

Mr A Cummins
13 Ray Street
ROCKINGHAM WA 6168

Dear Mr Cummins

Re: Public Question Time - Proposed 'Mangles Bay Marina'

I refer to your questions raised at the ordinary Meeting of Council on the 26th May 2015, which were taken on notice by Mayor Sammels, and provide the following response.

1. *Given that the construction of the marina and canals would be extremely costly and that finance has not yet been secured, does the City consider there is a substantial risk that the marina and canals will prove to be not feasible?*

Response

The City has not formed a view on the feasibility of the project.

2. *What feasibility studies (if any) have been carried out to date in relation to the marina and canals and have these studies been provided to the City?*

Response

The City is not aware of any feasibility studies.

3. *Is the City concerned that the proponent may obtain approvals that allow it to clear, subdivide and sell some of the land, and then be unable or unwilling to fund the construction of the marina and canals?*

Response

Yes.

4. *Does the City intend to take decisive steps to prevent any development of the site without a guarantee of the marina's feasibility? If so, what steps? If not, why not?*

Response

The City will seek to ensure that the marina component is delivered bearing in mind that it is not the ultimate approval authority for the rezoning, Local Structure Plan and subdivision of the project area.

5. *Why does the City consider that the feasibility of the marina only needs to be guaranteed 'following the completion (of) any work required through environmental conditions…"?*

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Why isn't the City pressing for the feasibility to be assessed and guaranteed now, so as to avoid the risk of wasting public resources on approval processes for a proposal that may prove not to be feasible?

Response

The City has raised this matter with the proponent, however, it has no authority to require the proponent to undertake this task.

6. *What would the City regard as a satisfactory 'guarantee' of the marina's feasibility? Who would need to provide such guarantee? Would it be legally enforceable? Would it require approval of construction finance?*

Response

The City is open to all potential mechanisms that will mandate the delivery of the marina, however, the form and enforceability of the potential mechanisms is yet to be resolved.

7. *Has the proponent advised the City how long it anticipates it would take to complete the construction of the marina and canals? Is the City aware that LandCorp has recently said it may take up to 20 years?*

Response

The City has not been advised of the likely construction duration of the proposed marina and it is not aware of Landcorp's statement in this regard.

Yours faithfully

R M JEANS
DIRECTOR, PLANNING
& DEVELOPMENT SERVICES

Our Ref: LUP/820-07; D15/98134

Your Ref:

Enquiries to:

6th August 2015

Mr Paul Sadlier
Managing Director
Cedar Woods Properties Limited
PO Box 788
WEST PERTH WA 6872

Dear Mr Sadlier

Re: 'Mangles Bay Marina'

In recent months, the City has taken receipt of documentation on behalf of Cedar Woods Properties Limited that seeks amendments to its Town Planning Scheme and a Local Structure Plan in support of the 'Mangles Bay Marina' project.

The documents have been lodged for initial assessment in anticipation of the Metropolitan Region Scheme rezoning amendment progressing.

Although there is no statutory obligation for the City to engage in these processes, it has agreed to do so in the spirit of moving the planning process forward. The City has also facilitated an amendment to its Town Planning Scheme to enable a rezoning amendment and Local Structure Plan to be advertised concurrently, with the 'Mangles Bay Marina' project being a catalyst for this change.

Throughout the City's discussions with Cedar Woods Properties Limited and its representatives, and through its input into processes such as the Metropolitan Region Scheme amendment (pre-initiation), a number of fundamental concerns have been raised, as follows:

(i) **Infrastructure Staging** - commitments to the provision of key infrastructure early and throughout the project, most notably the marina water body.

In this regard, the City has consistently requested that measures be put in place to guarantee the delivery of the marina water body with the first stage of development. It has also been expressed that the City is open to consider the most appropriate mechanism/s to achieve this outcome.

There is no evidence that there has been progress on this matter.

(ii) **Waterways Management** - Western Australian Planning Commission *Development Control Policy No. 1.8 – Canal Estates and Artificial Waterways Development* ('DC1.8') states that the deed of agreement pertaining to waterways management is a 'prerequisite to rezoning'.

By letter dated the 15th June 2015, the City invited Cedar Woods Properties Limited to commence the process towards preparing the deed of agreement. No response has been received to this request.

(iii) **Coastal Setback/Foreshore Management Plan** - the City is not satisfied that the requirements of *State Planning Policy 2.6 – State Coastal Planning Policy* ('SPP 2.6') have been addressed in determining the coastal setback.

In this regard, the Public Environmental Review, that preceded Ministerial Statement No. 974, did not adequately address the criteria within SPP 2.6 under 'Schedule One – Calculation of Coastal Processes'.

As a result, the City has expressed the view that the proposed width of the foreshore reservation has not been adequately justified.

Notwithstanding the questions surrounding the extent of the foreshore reservation, there has also been discussion about when a foreshore management plan should be prepared and lodged. SPP 2.6 requires that the foreshore management plan be prepared at the first and most appropriate stage of the planning process which the City contends is the local structure planning process.

The apparent lack of progress on these issues is concerning and undermines the City's confidence in the project. As a result, I have instructed Planning Services to cease its preliminary consideration of the proposed Town Planning Scheme Amendment and Local Structure Plan until there is resolution to the above matters.

Should you wish to discuss the above or have any enquiries, please do not hesitate to contact me.

Yours faithfully

ANDREW HAMMOND
CHIEF EXECUTIVE OFFICER

cc. Mr Frank Marra, Chief Executive Officer, Landcorp
Ms Samantha Thompson, Director, Taylor Burrell Barnett

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 23

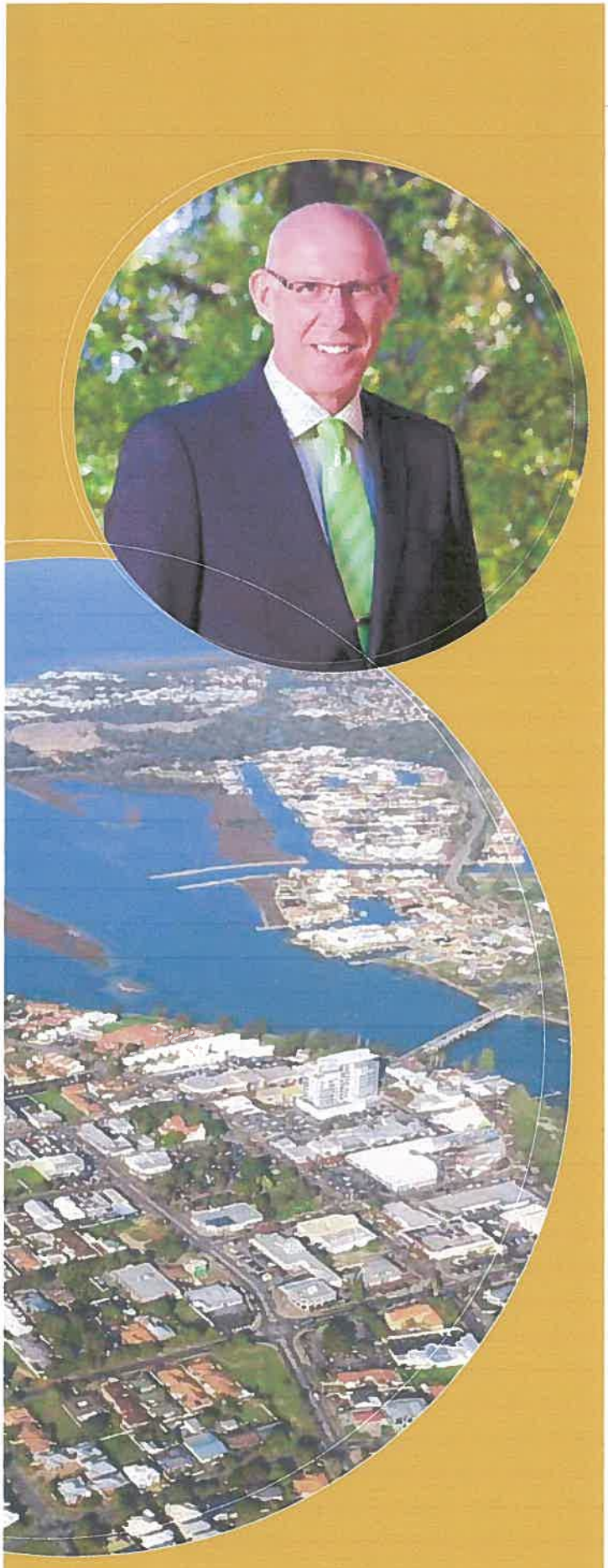
EPA strategic advice to the Minister for Environment
July 2015 – chairman's forword

PERTH AND PEEL @ 3.5 MILLION

Environmental impacts, risks and remedies

Interim strategic advice of the Environmental Protection Authority to the Minister for Environment under section 16(e) of the *Environmental Protection Act 1986*

July 2015



Chairman's foreword

Western Australia has a remarkable environmental endowment of rich marine and terrestrial ecosystems spread over a vast geographic area. These ecosystems have developed in relative isolation over millions of years and their associated flora and fauna are highly specialised for the environments in which they live.

Most of our population lives in the Perth and Peel regions, which sit within one of the world's 34 biodiversity hotspots.

While interaction with our natural environment is an important part of the Western Australian lifestyle, it wears the scars of 186 years of European settlement.

There has been extensive clearing of native vegetation and the habitat it provides for many species. Today, only 29 per cent remains of the original extent of vegetation on the Swan Coastal Plain portion of the Perth and Peel regions. Of this, just over a quarter is in some form of conservation tenure. A number of the original species that were present in the Perth-Peel area at the time of settlement have already disappeared from the region, including twelve mammals, and many of the plants are now restricted and threatened with extinction.

The quality of our rivers and estuaries has deteriorated and many of the wetlands on which a wide variety of flora and fauna depend have been filled or degraded.

However, while mistakes have undoubtedly been made, Western Australia also has a history of taking bold steps to protect and repair our natural endowment.

For example, in the 1890s, our leaders had the foresight to protect the inner city natural bushland we now know as King's Park. An address to the Natural History Society by Sir John Forrest (its outgoing President) was reported thus:

> ...a reserve of suitable land should be made, before it was too late, for the preservation and cultivation of the native flora and fauna before they were destroyed. It might seem too soon for such a reservation to be made, yet, remembering how rapidly these new countries progressed and developed, and that what might be easy now would become difficult or impossible a few years hence... †

† *Daily News*, 2 October 1892

‡ *The West Australian*, 24 October 1912

In 1912, Walter Kingsmill MLC took the progressive step of introducing legislation to protect native flora in Western Australia, described at the time as "the only one of its kind in Australasia"[4].

In the 1920s, Premier Collier announced the establishment of a national park at Greenmount, now known as John Forrest National Park.

In the 1930s the State moved to create the large Yanchep National Park and introduce regulations to protect its flora and fauna. It also protected Canning Weir, Point Walter, Heirisson Island and Serpentine Falls to maintain the people's connection to nature.

In 1950s, Government established a body to oversee the protection of the Swan River from its many sources of pollution and also introduced the *Wildlife Conservation Act 1950* which continues to this day.

In 1971, the Western Australian Government established an Environmental Protection Authority with the job of using its "best endeavours to protect the environment and to prevent, control and abate pollution and environmental harm".

In 1992, Western Australia signed up to Australia's National Strategy for Ecologically Sustainable Development which defines ecologically sustainable development as: "using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased".

In recent decades, the Peel-Yalgorup system (1990), Forrestdale and Thomsons Lakes (1990) and Becher Point wetlands (2001) have been listed as internationally important Ramsar wetlands.

With the Perth and Peel regions likely to accommodate a population of 3.5 million in coming decades, the environment faces its greatest challenge.

The environment is a valuable commodity to society. In itself, it sustains life, providing us with the fresh water we drink, the clean air we breathe and the soils in which we grow our food. It supports our physical and mental health and well-being through its beauty and encourages our sense of adventure. It inspires our poetry and our culture. It connects us to the past, the present and the future. It supports our economy through the natural resources it provides.

Every material item we possess or consume began as part of our environment. We are inextricably part of our environment and have the ability to positively or negatively influence it.

If we are to give life to the principles of ecologically sustainable development, then we must place an appropriate weight on environmental values in decision making.

The EPA is acutely aware of the current and likely future pressures on the environment of the Perth and Peel regions, and its own responsibility to provide advice to the Minister for Environment as to how these can be managed over the long term.

However, this is not advice for one Minister, one Government, or one generation.

It is advice for our present and future leaders.

We must take bold steps to build on our environmental successes and openly acknowledge - and remedy - our failures so that future generations can see and experience our complex, fragile and unique environment.

Dr Paul Vogel

Chairman

Environmental Protection Authority

Proposed Metropolitan Region Scheme (MRS) Amendment 1280/41

Submission of Hands Off Point Peron Inc. (HOPP)
to the Western Australian Planning Commission (WAPC)
13 November 2015

ATTACHMENT 24

Sound Telegraph article "Fishers fear marina fallout"
21 October 2015

SOUND Telegraph

Wednesday, October 21, 2015
A West Australian Newspapers publication

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The seagrass meadows of Mangles Bay are an important fish nursery which the fishing industry warns could be lost in the development of the proposed marina. INSET: Cedar Woods and LandCorp have released the first artist's impression of the proposed Mangles Bay Marina. Main picture: Michael Parr

Fishers fear marina fallout

Clare Negus

WA's commercial fishing lobby has warned construction of the Mangles Bay Marina could destroy a crucial fish nursery and crash the Cockburn Sound crab fishery.

The marina's proponents, Cedar Woods and LandCorp, have played down concerns, saying the development would meet the stringent conditions set by the Environmental Protection Authority in the approvals process. Cedar Woods claims the 500-pen marina and associated housing and tourism developments at Cape Peron would inject $1.3 billion into Rockingham's economy, but the WA Fishing Industry Council has warned it would likely destroy the area's last remaining seagrass.

WAFIC chief executive John Harrison said crab and finfish operators would be dramatically affected by the marina.

Mr Harrison said the Cockburn Sound crab fishery had already been closed twice during the past decade, most recently in 2014.

"Before the most recent closure, the seagrass area in question near the southern end of Mangles Bay was the most productive area for crabs, accounting for between 80 and 90 per cent of the commercial catch of some fishers," he said.

More than 5ha of Mangles Bay's seagrass is expected to be lost in the development, but Cedar Woods State manager Ben Rosser said double the amount of seagrass lost would be replanted and established.

Data on the past 10 years of juvenile fish sampling by the Department of Fisheries, obtained by Greens MP Lynn MacLaren last month, showed Mangles Bay was a fish nursery of Statewide significance.

Ms MacLaren blasted the EPA for not responding to the fishing industry's concerns.

"Remove the Mangles Bay nursery area by proceeding with this controversial marina and entire populations of certain WA fish species, in particular King George whiting, may crash," she said.

Crab fisher Aaron Martin said there was no guarantee fish stocks would relocate.

"Previous attempts to regrow seagrass by Cockburn Cement didn't work in the long term," he said.

More on the marina proposal — pages 22-23.