Champion Lakes Masterplan Development Lake Road Armadale

Western Australian Planning Commission and the City of Armadale

Report and recommendations of the Environmental Protection Authority

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Summary and recommendations

The Western Australian Planning Commission and the City of Armadale propose to develop a water-based recreation park incorporating an international rowing course and other facilities including a residential component on land situated on Lake Road in the City of Armadale. This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

The EPA decided that the following environmental factors relevant to the proposal required detailed evaluation in the report:

(a) Terrestrial flora:

- Vegetation complexes
- Threatened Ecological Communities
- Bush Forever site No 260, Weeds and Disease

(b) Fauna

(c) Wetlands

(d) Water quality

(e) Groundwater quantity

(f) Acid sulfate soils

(g) Noise

There were a number of other factors which were very relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

Conclusion

The EPA has considered the proposal by the Western Australian Planning Commission and the City of Armadale to develop a water-based recreation park incorporating an international rowing course and other facilities on land situated on Lake Road in the City of Armadale. Other uses for the 138 hectare site are urban land uses, sporting facilities, conservation area, an Aboriginal interpretive centre, conference facilities, short stay accommodation and some retail commercial uses.

The proposal will impact on approximately 4.65 hectares of one vegetation complex with less than 10% of the original extent (11,328 ha) remaining in the Perth Metropolitan Region (1,020 hectares), approximately 3.38 hectares of Threatened Ecological Communities, the site contains Bush Forever Site 260 and there is potential for the spread of weeds and disease. The proposal will impact on fauna habitat and have both beneficial and deleterious impact on fauna. The site has been, however, substantially cleared for agricultural purposes, the

remaining vegetation is in a degraded state and the proponent has committed to rehabilitate the vegetation throughout the site where it will be retained.

The EPA notes there is one area of potential acid sulfate soils, however, this can be managed through appropriate strategies during construction.

The EPA also notes that the proposal will impact fully on Wright Lake and that the major environmental issues associated with the proposal are the source of water supply for the waterbody and management of the water quality within it. The proponents have completed drilling investigations to establish the water supply for the waterbody, however, the results will need to be verified by the Water and Rivers Commission before the proposal can proceed. The proponent will also need to fully demonstrate that the water quality within the waterbody can be adequately managed and that any flushing will not have an adverse impact on the environment.

The EPA is satisfied that the proponents have undertaken to adopt all other practicable measures to minimise impacts and will implement a Wetland Mitigation Strategy to minimise impacts on wetlands and in particular Wright Lake. The proponents will also be required to develop a Water Supply Development Plan and a Water Quality Management Plan to address the water quality and quantity issues.

The EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation by the proponents of their commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the development of a water-based recreation park and other uses, including sporting facilities and residential development, on a site in the City of Armadale;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponents of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponents' commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the proponents' commitments and information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by the Western Australian Planning Commission and the City of Armadale to develop a water-based recreation park incorporating an international rowing course and other facilities on land situated on Lake Road in the City of Armadale is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) that the proponents shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) prepare and implement a Water Supply Development Plan;

(c) prepare and implement a Water Quality Management Plan; and

(d) prepare and implement a Wetland Mitigation Strategy.

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Appendices

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal by the Western Australian Planning Commission and the City of Armadale to develop a water-based recreation park incorporating an international rowing course and other facilities on land situated on Lake Road in the City of Armadale.

The proposed location is approximately 21 km southeast of Perth Central Business District and 4.5 km north of the Armadale Town Centre. The site is largely cleared having been previously used predominantly for agricultural purposes. Wright Lake, a seasonal wetland, is located on the north-east part of the site.

The site was identified as suitable for a major Perth international rowing course facility through strategic planning investigations which began in the late 1970's. The Canning River, currently used for rowing purposes, does not meet the requirements for an international course being exposed to prevailing winds and tidal fluctuations. In addition, the river site is narrow in places and other river users disturb the water surface.

In the 1980's the then State Planning Commission engaged consultants to identify a suitable site based on selection criteria. Seven sites were analysed in detail including the site at Wright Lake in Armadale. The Wright Lake area had been previously identified in strategic planning studies as suitable for a regional recreation park. The land was reserved for Parks and Recreation in the Metropolitan Region Scheme and most of the land subsequently acquired.

The international rowing course is the principal focus of the proposal having a course measuring 2150 metres long by 130 metres wide and 3.5 – 4.5 metres depth. To complement the rowing course, there will be a practice lake and a return channel to the rowing start line. In addition, there are proposed associated water uses of an artificial white water course, an island to contain rowing building and services infrastructure, a cable ski park and an aquatic and indoor sports centre.

It is estimated that the rowing course will require 2.31 GL (Gigalitres) of water to initially fill at a depth of 3.5 metres. Loss of water through evaporation, seepage and other uses will require an additional 0.79 to 1.42 GL/year to maintain the water level.

It is proposed that the rowing course, and other associated water facilities, will be excavated from Wright Lake in a south-westerly direction towards Southern River. The remainder of the site will be used for urban land uses, future sporting facilities, a conservation area near Southern River, an Aboriginal interpretive centre, conference facilities, short stay accommodation and some retail commercial uses.

Construction of the Tonkin Highway extension on land immediately adjacent to the site is seen as an opportunity to use the material excavated for the facility as fill for the highway. There are substantial financial benefits for this arrangement as the proposed water body area can be excavated by the contractor constructing the highway as well as providing the lake floor lining and contouring the banks to designed levels. Timing of the approvals are crucial to allow for the greatest financial benefit.

The proposal to develop the Champion Lakes Master Plan Development was referred to the EPA in September 2001 and a level of assessment was set at Public Environmental Review (PER) in order to ensure the proposal was appropriately designed, constructed and managed

to meet the EPA's environmental objectives. The PER was released for public review from 10 February to 24 March 2003. Final detailed design for the project has not yet commenced.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the environmental factors relevant to the proposal. The Conditions and Commitments to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 presents the EPA's conclusions and Section 6, the EPA's Recommendations.

Appendix 5 contains a summary of submissions and the proponents' response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process and which have been taken into account by the EPA appear in the report itself.

2. The proposal

The proposal is to develop a water-based recreation park incorporating an international rowing course and other facilities on land situated on Lake Road in the City of Armadale The site is approximately 138 hectares in size and lies between the proposed Tonkin Highway and Lake Road and stretches from Wright Lake in the north-east to Southern River in the south-west (Figure 1).

The proposal Master Plan includes the excavation of an area of approximately 53 hectares to a depth of 3.5 – 4.5 metres to form the basis of the rowing course and associated water bodies (Figure 2). It is anticipated that the excavated sand will be used in the construction of the Tonkin Highway which is immediately adjacent to the site, however, this will depend on the timing of approvals for the proposal. The excavation will impact on all of the bed of Wright Lake, parts of the land adjacent to the lake and land towards Southern River. The water area will be used for a rowing course built to international standards, a return lane for rowers and a warm up lake. The rowing course will have facilities along the edge for spectators as well as services infrastructure on an island. Another island will be created specifically for conservation purposes.

The remainder of the site is proposed to be used for residential purposes, other recreational facilities, conference and Aboriginal centres, shops, parking areas and conservation purposes. Detailed planning has not yet commenced for the remainder of the site and remains conceptual at this stage.

Excavation is proposed to occur in a staged process starting at the north-east end south of Wright Lake. Dewatering will occur first into an area within Wright Lake which will then be excavated and the rest of the site will be progressively dewatered and excavated towards the Southern River end.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Sections 2 and 3 of the PER (Bowman Bishaw Gorham, 2003)

Table 1 – Summary of key proposal characteristics

Element	Description
Proposal Description	A water based recreational park incorporating an international rowing course, an island dedicated to rowing facilities, whitewater rafting facility, conference centre, shops, Aboriginal centre, cable ski and water park, short stay accommodation, indoor sport and aquatic centre, amphitheatre, conservation areas, parking areas, urban land uses, launch area and a residential development.
Total area of proposal	Approximately 138 hectares
Dimensions of rowing course	Approximately 2150 metres long x 135 metres wide, 3.5 – 4.5 metres deep
Dimension of artificial watercourse/rowing return lane	Notionally 535 metres long x 30 metres wide (subject to further detailed design)
Dimensions of warm up lake	Notionally 800 metres long x 200 metres wide (subject to further detailed design)
Total Water Area	Rowing course Approximately 29 hectares (fixed) Warm up lake and return lane – Notionally Approximately 24 hectares (subject to further detailed design – maximum area will not exceed 24 hectares)
Area set aside for conservation	21 hectares

Area for conference centre, shops, whitewater rafting course, cable ski and water park, short stay accommodation, indoor sport and aquatic centre, amphitheatre and Aboriginal centre	Notionally 16 hectares (subject to further detailed design)
Spectator area/ Start area	Notionally 8 hectares (subject to further detailed design)
Public Launch and Picnic Area	Notionally 0.6 hectares (subject to further detailed design)
Rowing Facility Island Area	Notionally 7 hectares (subject to further detailed design)
Event Day Parking Area	Notionally 9 hectares (subject to further detailed design)
Urban land uses	Notionally 21 hectares (subject to further detailed design)
Construction Duration	Approximately 18 months (rowing course only)

Since the release of the PER, the Fédération Internationale des Sociétés d'Aviron, or Federation of Rowing Associations (FISA) advised that the minimum width for an international rowing course had been changed from 130 metres to 135 metres. The Master Plan has been modified according to this requirement.

As the proponents have not undertaken any detailed planning of the layout of the facilities within the Master Plan, Table 1 has been modified to reflect this by indicating most areas notionally.

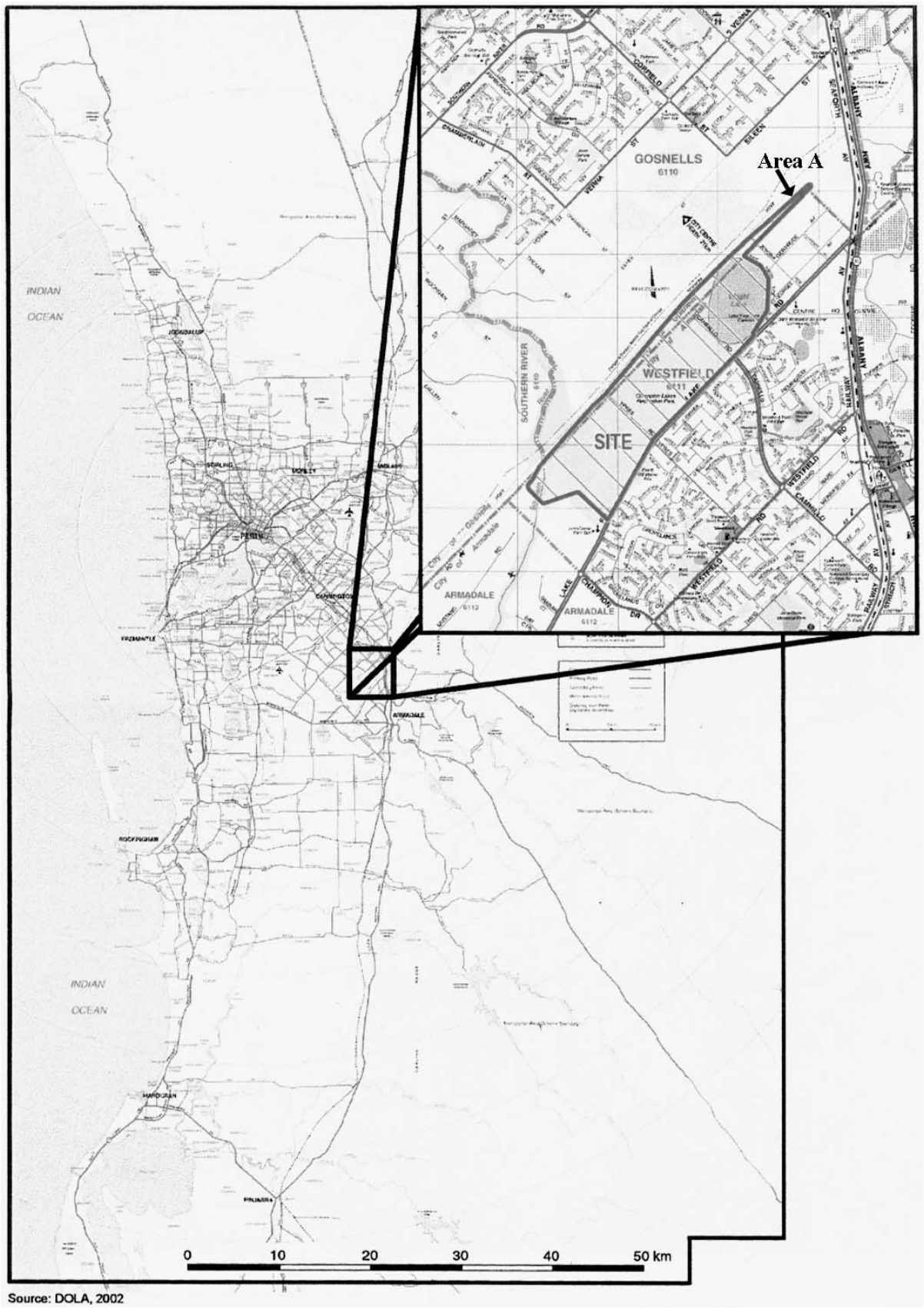

Figure 1: Site Location

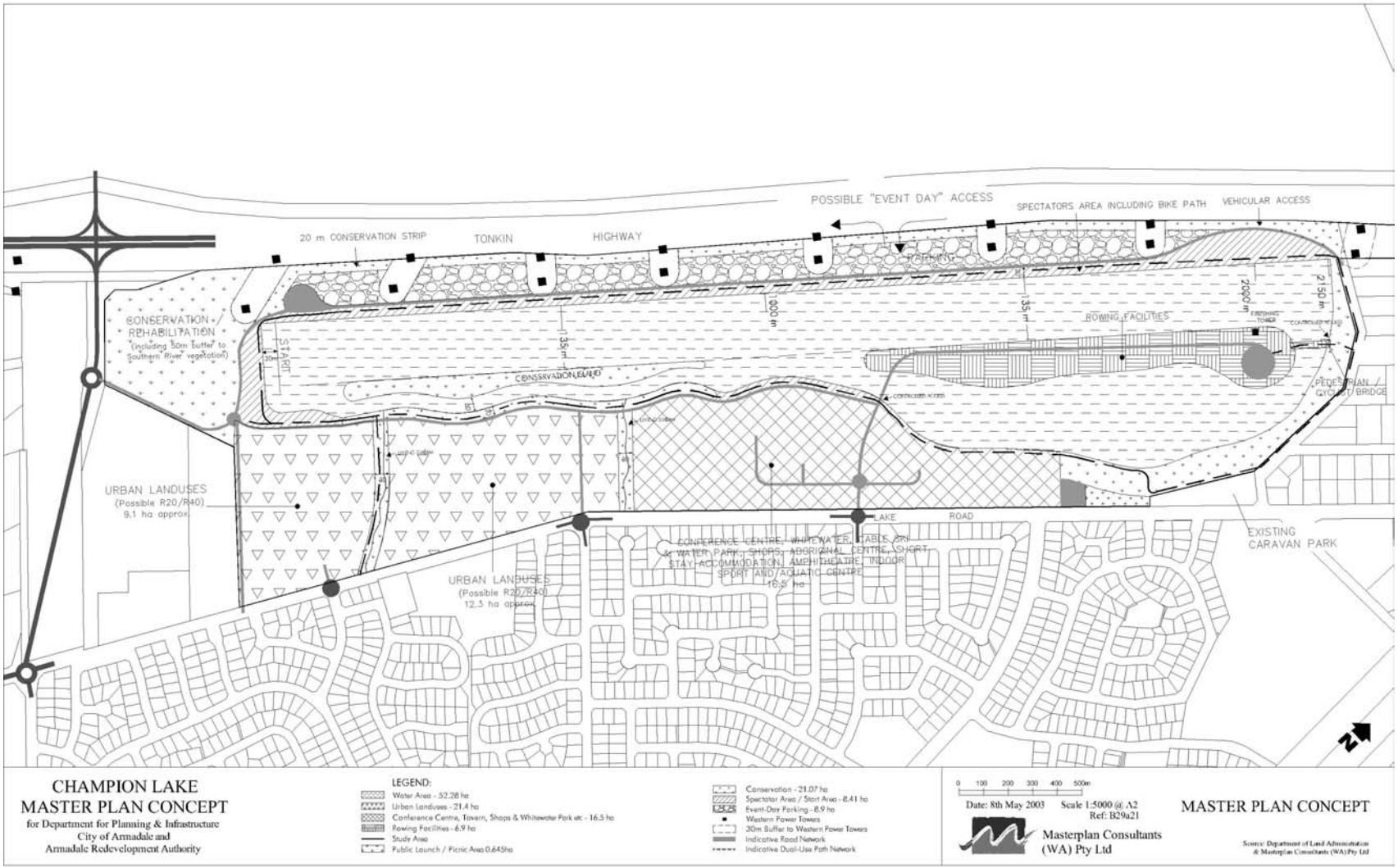

Figure 2: The Proposal

3. Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the relevant factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors are very relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

It is the EPA's opinion that the following environmental factors relevant to the proposal require detailed evaluation in this report:

(a) Terrestrial flora:

- Vegetation complexes
- Threatened Ecological Communities
- Bush Forever site No 260, Weeds and Disease

(b) Fauna

(c) Wetlands

(d) Water quality

(e) Groundwater quantity

(f) Acid sulfate soils

(g) Noise

The above relevant factors were identified from the EPA's consideration and review of all environmental factors generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the relevant environmental factors and their assessment are contained in Sections 3.1 - 3.7. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

3.1 Terrestrial Flora

3.1.1 Vegetation Complexes

Description

Although the PER does not quantify the impact on vegetation complexes, the proponents have advised that the proposal will impact approximately 4.65 hectares of Forrestfield vegetation complex out of a total of approximately 8.49 hectares on the site, and approximately 4.31 hectares of Southern River vegetation complex out of a total of approximately 7.82 hectares within the study area. The PER describes the current condition of the area as approximately 88% cleared.

Submissions

The City of Gosnells expressed concern that lowering of the watertable, other than from the dewatering during construction, would impact on the vegetation. Drawdown with respect to Southern River and groundwater dependent ecosystems were also of concern. The Department of Conservation and Land Management (DCLM) indicated that the Forrestfield and Southern River Complexes are not currently well reserved and therefore their retention wherever possible should be considered a high priority. DCLM supported the commitment to retain and rehabilitate a conservation area within the Champion Lakes project area and also encouraged the retention of any additional areas of remnant vegetation during the detailed design process.

A submission from the public highlighted that an area of good bushland north of Wright Lake should have been discussed in the report. This area was evaluated by Malcolm Trudgeon in his report to the City of Gosnells "A Survey of Remnant Vegetation in the City of Gosnells west of the Darling Scarp" and has been noted to contain many birds and grey kangaroos.

Assessment

The area considered for assessment of this factor is the study area as indicated in Figure 1.

The EPA's environmental objective for this factor is maintain the abundance, species diversity, geographic distribution and productivity of vegetation.

One of the *Bush Forever* (Govt WA 2000) policy statements is that there will be a general presumption against clearing of bushland containing vegetation complexes of which there is less than 10% remaining on the Swan Coastal Plain portion of the Perth Metropolitan Region (PMR). The Forrestfield and Southern River complexes have 9% and 17% vegetation left in the PMR respectively. *Bush Forever* protection of these complexes was aimed at 5% and 10% respectively, however, it is important that the maximum area of native vegetation is retained as these figures are not high.

The vegetation condition ratings on the site are generally degraded to completely degraded (Figure 3).

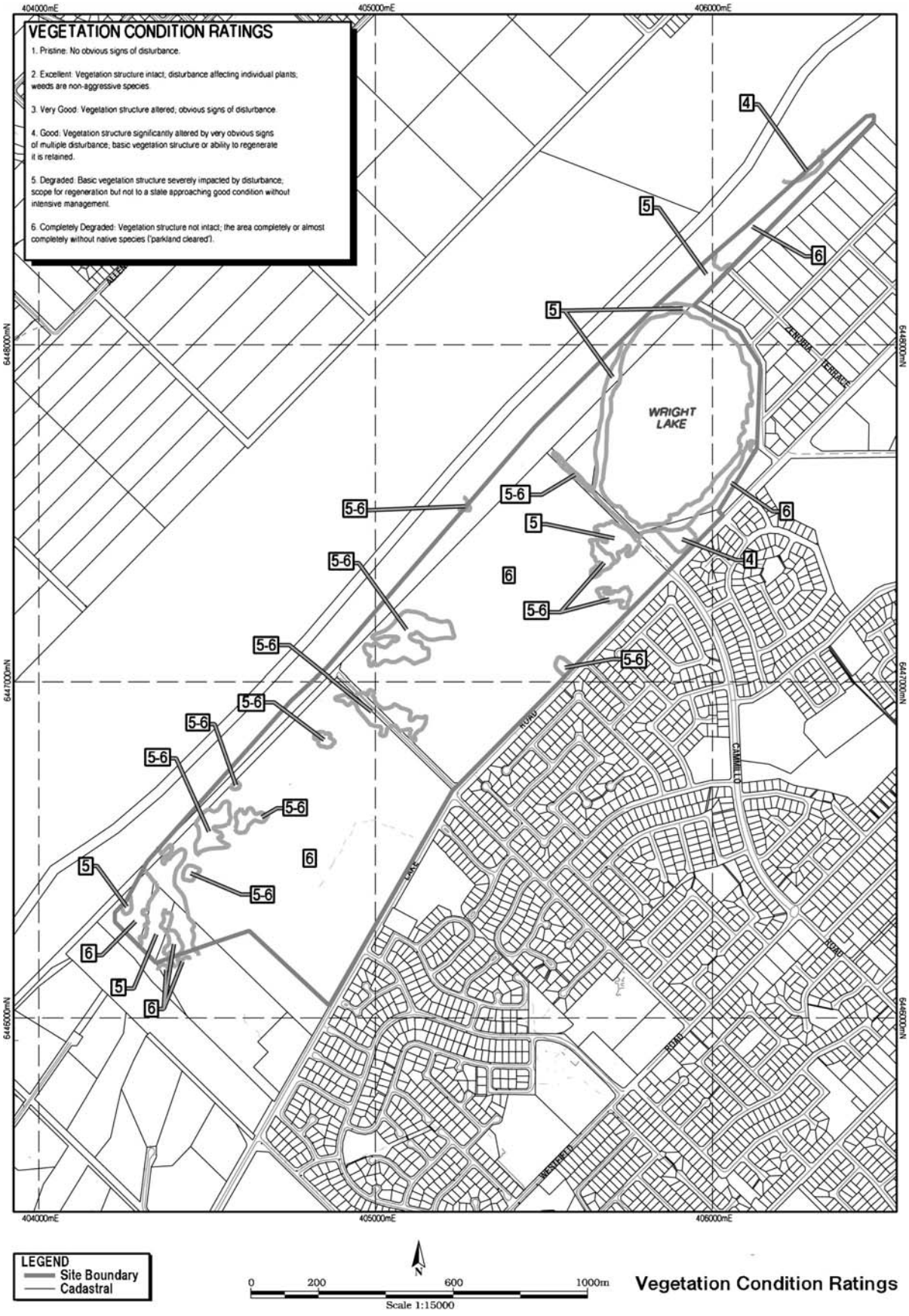

Figure 3: Vegetation Condition Ratings

The proponents propose to retain approximately 7.4 hectares of remnant vegetation within the site and to set aside approximately 21 hectares for the purposes of a conservation reserve in Bush Forever Site 260 adjacent to Southern River. In addition, the proponents have committed to prepare a Construction Environmental Management Plan and a Foreshore Management and Revegetation Plan (FMRP). The area of vegetation outside the site raised in the public submission does not form part of the proposal, is zoned for Urban purposes in the Metropolitan Region Scheme and is in private ownership. It is understood the vegetation is not in very good condition, however, its influence on the study area and its potential significance has been noted. The EPA will consider the environmental values of this area at the subdivision stage.

The proponents have responded that they will investigate DCLM's submission regarding protecting vegetation further in detailed planning and design including replanting.

The EPA Service Unit's Conservation Branch has advised that it is important that any rehabilitation of Bush Forever Site 260 adjacent to Southern River uses seed collected from the site or, if not available, from the nearest available site. The proponents have committed to amending the FMRP to ensure seed is collected before any excavation takes place and that monitoring of the success of the rehabilitation will be carried out for a long term period to the satisfaction of DCLM.

The proponents have also committed to prepare and implement a Detailed Planning and Design Strategy which will aim, inter alia, to protect as much remnant vegetation as possible in the detailed design of the proposal.

Given that the amount of vegetation currently on the site is sparse and in generally poor condition, the fact that the proponent intends to rehabilitate and protect an expanded area of vegetation near Southern River and retain as much of the remnants as possible in the detailed design of the project, the proposed vegetation clearing is considered acceptable.

The EPA considers the issues of vegetation complexes have been adequately addressed and can meet the EPA objectives for this factor provided all practicable measures are taken to retain remnant vegetation in the Detailed Planning and Design Strategy, local seed is used where possible in rehabilitation and the management plans are satisfactorily implemented.

3.1.2 Threatened Ecological Communities

Description

The PER indicated that the proposal will impact on a maximum of 3.38 hectares of possible Threatened Ecological Communities (TEC). The presence of the TECs was tentatively inferred from the six Floristic Community Types Communities identified on the site.

The Consultant advised that the submission regarding JsX+ vegetation in the vicinity of Wright Lake highlighted an error in the PER report and that it should have read (page 29) that 2.6 hectares of FCT 20b within the whole site would be cleared. The area of JsX+ referred to is addressed as part of the FCT 20b community.

Submissions

The City of Gosnells considered that the clearing of a worst case scenario of 3.38ha of possible Threatened Ecological communities (TEC's) in Good to Completely Degraded condition, including 2.6ha of JsX+ vegetation type in Community FCT 20b adjacent to Wright Lake, is unacceptable. Further investigation and clarification of the possible status of the TEC's should occur prior to any loss of important biodiversity. As pointed out above, the figure of 2.6 ha of JsX+ in the PER is not accurate.

The Armadale Gosnells Landcare Group recommended that the 1.3ha of JsX+ vegetation type that is to be cleared be revegetated elsewhere in the reserve.

DCLM identified that the two TEC's proposed to be cleared as FCT 3b *Eucalyptus calophylla – E. marginata* woodlands on sandy clay soils (Vulnerable) and 20b Eastern *Banksia attenuata and/or E. marginata* woodlands (Endangered)and advised that they are threatened as a result of the high clearing rates applied to the eastern side of the Swan Coastal Plain in the past. Although the presence of these communities is only inferred due to their degraded condition they still have conservation significance at both a local and regional level.

DCLM also recommended that in order to provide a balance for the clearing of these areas the proponent should make a commitment to provide additional protection or improvement to other areas of FCT 3b and 20b. DCLM recommended an appropriate offset be provided such as the purchase and reservation of freehold or unreserved land containing the same FCT's or by the proponent undertaking weed control and rehabilitation on reserved land which contains these FCT's.

Assessment

The EPA environmental objective for this factor is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation.

The proposal will impact on a maximum of 3.38 hectares of Threatened Ecological Communities (TECs). The area of JsX+ referred to is addressed as part of the FCT 20b community.

The PER indicates that representation of six Floristic Community Types (FCT) were inferred, however, this is not certain as the vegetation lacks native understorey and ground layer vegetation. Two of these FCTs are Endangered (10a and 20b). Table 1 indicates the summary of potential impact to TECs.

Table 2: Summary of potential impacts to Threatened Ecological Communities

Floristic Community Type	Approximate area of vegetation retained in conservation in hectares	Approximate area of vegetation proposed to be cleared
FCT 3b	0	0.78
FCT 8	0.14	0
FCT 10a	0.17	0
FCT 20b	1.30	2.60
Total	**1.61**	**3.38**

FCTs 10a and 8 are proposed to be retained in conservation areas while a total area of 2.6 hectares of FCT 20b is proposed to be cleared.

In response to the DCLM suggestion that an appropriate offset should be provided to mitigate for clearing FCTs 3b and 20b, the proponents have submitted that their Consultant botanist, Dr Weston, advised that the presence of TECs cannot be determined with any scientifically accepted accuracy within the Masterplan area and that it is therefore unreasonable to request that they purchase or manage vegetation outside of the site as part of a Vegetation Mitigation Strategy. DCLM concurs with this conclusion following an inspection of the site.

Dr Weston has agreed that the JsX+ stand of vegetation between Wright Lake and Lake Road is probably a representation of 20b and that, because the condition of this vegetation is assessed as good, it means that it has conservation significance at both local and regional levels. The proponents have advised that the area has native plants in its understorey, more than any other bushland in the study area, and does not appear to be represented in any of the ten Bush Forever sites in Figure 6 of the PER.

This area is currently shown as being located between a picnic area and a carpark which could affect its long term viability (Figure 4). With a change of design, however, these facilities could be located elsewhere within the study area, possibly close to the waterbody within the proposed Conference Centre and associated facilities area. If the JsX+ area were to be fenced off, potential for its regeneration would be enhanced. The proponents have committed to preparing and implementing a Detailed Planning and Design Strategy which will incorporate changes to the design in this locality and to amend the Foreshore Management and Revegetation Plan to reflect this. Protection of the JsX+ area will be addressed in the Detailed Planning and Design Strategy to the satisfaction of the Department of the Environment on the advice of DCLM.

The EPA considers the issue of Threatened Ecological Communities has been adequately addressed and can meet the EPA objectives for this factor provided the area of JsX+ is retained as far as possible and this is adequately addressed in the Detailed Planning and Design Strategy.

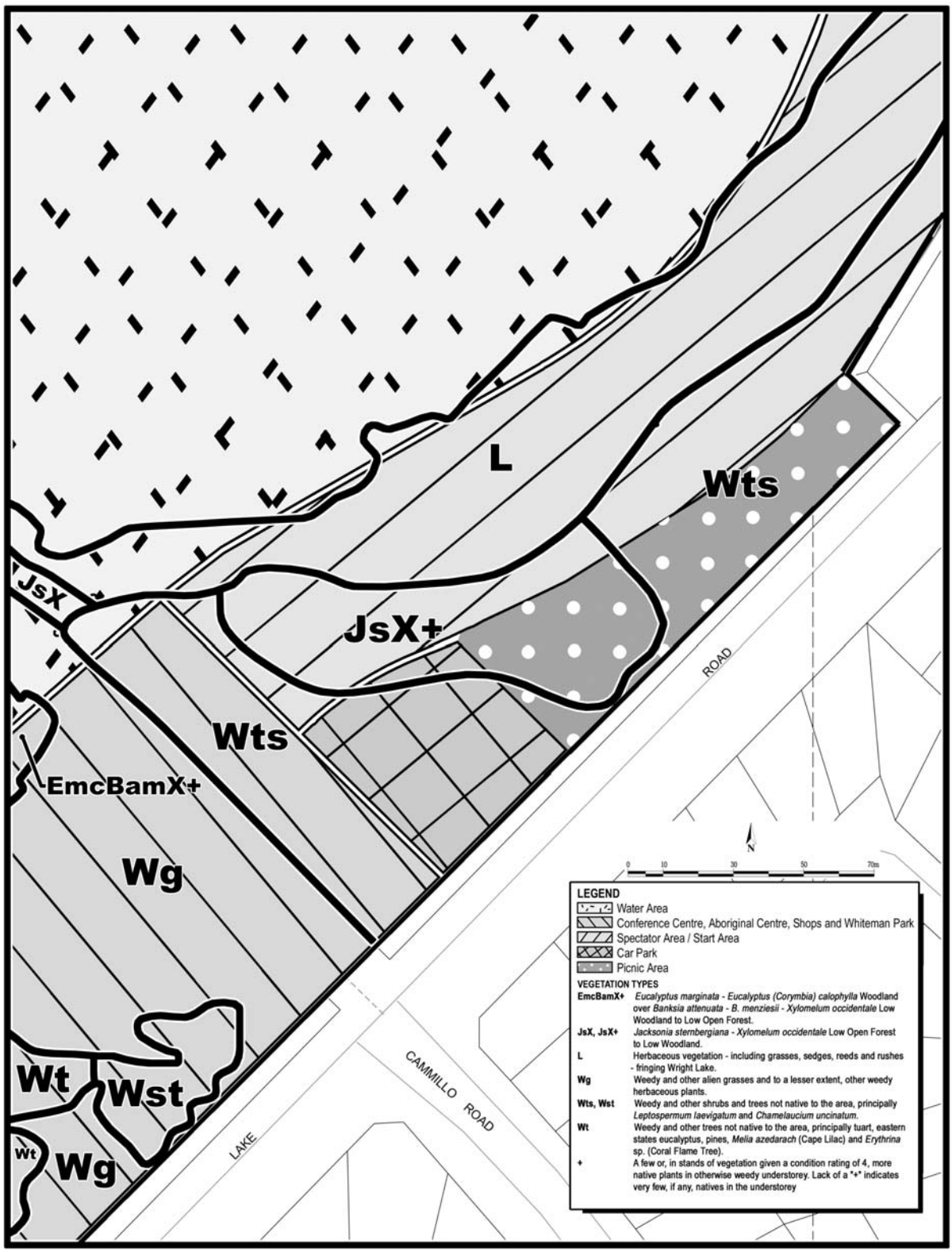

Figure 4: Threatened Ecological Community in the Vicinity of Wright Lake

3.1.3 Bush Forever Site 260, Weeds and Disease

Description

The site contains one-third of the Bush Forever Site 260 – Southern River and Adjoining Bushland, Westfield, in the south-west corner of the site.

The proposed development avoids direct impacts on Bush Forever Site 260, and included plans to increase the overall area and condition of the native vegetation.

Submissions

The City of Gosnells highlighted that the potential environmental impacts to Bush Forever Site No. 260 must also include the proposed lowering of the watertable, beyond that stated from dewatering during construction.

The City of Gosnells identified that any successful weed control strategy must include a revegetation component, or be allied to a revegetation strategy, to be successful. These two strategies must be integrally linked

Assessment

The EPA's environmental objective for this factor is to maintain the abundance, species diversity, geographic distribution and productivity of vegetation and to ensure that regionally significant flora and vegetation are adequately protected from the spread of weeds and diseases, including dieback.

The PER indicated Bush Forever Site 260 will not be adversely impacted by the proposal and that rehabilitation and protection of the area during construction would be an environmental benefit.

With regard to the potential impact of dewatering on this site, the proponents have advised that long term impacts from groundwater abstraction are likely to be minimal because the water is proposed to be extracted from the deep Yarragadee aquifer. It is expected that confining layers will exist between the Yarragadee and the overlying aquifers limiting the potential drawdown on the surface vegetation.

It is expected the exploratory bore which commenced on 28 April 2003 into the Yarragadee aquifer will provide further information on the aquifers beneath the site. The drawdown modelling, which was predicted to be 2cm per year over a period of 25 years, will be re-calibrated to provide an accurate prediction of potential impacts and drawdown. The proponent expects this will be less than the initial worst-case scenario modelling.

Rehabilitation of the Bush Forever site with species from the site has been addressed in Section 3.1.1.

The project area has largely been cleared and subject to a variety of agricultural practices in the past and has a significant weed problem. The PER identified 15 species of Priority 1 weeds, 10 species of Priority 2 weeds and 34 Priority 3 weeds. Six of the 90 weed species are on the Agriculture Protection Board's April 2002 list of Declared Plants. The PER indicates that weed management will be addressed in the overarching Environmental Management System.

In response to the City of Gosnells comment that a successful weed control strategy must include a revegetation component to be successful, the proponents have highlighted their commitment to preparing a detailed Foreshore Management and Revegetation Plan which will include both a weed control programme and revegetation provisions.

Protection of the areas of remnant vegetation to be retained within the site is vital during the construction of the waterbody and other facilities. The proponents have committed to preparing a Construction Management Plan which includes a Weed and Disease Management Program.

This program will also cover the management of dieback which has been identified as possibly affecting the whole site apart from three stands of vegetation, two of which will be retained.

In addition to the above two management plans, weeds will also be addressed in the over-arching Environmental Management System.

Summary

Having particular regard to the:

(a) the small area and condition of the affected vegetation;

(b) the advice of the Consultant botanist Dr Weston and the Department of Conservation and Land Management regarding the Threatened Ecological Communities;

(c) the fact that the proposal will have positive environmental benefits for Bush Forever Site 260;

(d) the expected results from the exploratory bore confirming drawdown predictions; and

(e) the proponent's commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objectives for this factor.

3.2 Fauna

Description

The PER indicates that the proposal will fully impact on the lake bed of Wright Lake, changing the lake from a seasonally indundated brackish wetland to a less saline permanent waterbody. The proposal will also impact on approximately 16.5 hectares of degraded remnant vegetation and cleared land previously subject to a range of farmland activities which currently provides fauna habitat.

Submissions

The City of Gosnells commented that there should be consideration of a cat-exclusion area for adjacent new urban subdivisions and that the Master Plan Concept does not provide sufficient wildlife corridors. The City also commented on the use of felled trees from the site as roosting poles or habitat within the conservation areas and open water and that migratory bird habitat may be affected during works as a result of dewatering. It was suggested this could be addressed through timing or staging of works.

The City suggested serious consideration must be given to the statement in the PER that impacts associated with the development around Wright Lake may be difficult to manage and changes to fauna assemblages will be inevitable, and expressed concerns with regard to the Quenda including loss of habitat, the fact that they are likely to recolonise the area and should be translocated in close consultation with DCLM.

The City also expressed concern regarding the loss of the aquatic fauna within the lake during dewatering and post-construction of the facility. Similar concerns were expressed in a submission from the Gosnells Armadale Landcare Group.

DCLM identified that the proposed development may lead to disturbance and loss of native fauna that currently utilise the area with particular relevance to a number of bird species that utilise the Wright Lake area. The Department and a member of the public also submitted that development of the Wright Lake area may lead to changes in the composition and number of waterbirds that currently utilise the site. DCLM noted that Wright Lake is relatively species poor when compared to a Ramsar wetland such as Forrestdale Lake, however, it still provides valuable habitat for a number of waterbirds (Section 4.7.3.3, pg. 44 of the PER) and that it is important thought is given to maintaining a mixture of habitat types to allow different waterbird species to continue using the area.

DCLM also advised that it may be appropriate to undertake monitoring of the area for the first two years after project completion to give an indication as to the type and mix of waterbirds utilising it.

The Wetlands Conservation Society expressed concern that the large, artificial waterbody created by this proposal will not be suitable as wildlife habitat as it will be dredged and there will be frequent disturbance by boats and spectators.

Assessment

The area considered for assessment of this factor is the study area as in Figure 1.

The EPA's environmental objective for this factor is maintain the species abundance, diversity and geographical distribution of fauna and to protect Specially Protected (Threatened) Fauna and Priority Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950.*

The PER makes it clear there will be changes to the fauna habitat as a result of the proposal and that there will be some benefits as well as disbenefits. The report, (Bamford 2003), accompanying the PER, identifies the most significant fauna habitat as Wright Lake, the adjacent upland areas and the portion of remnant vegetation in the southern part of the project area in the vicinity of Southern River.

Wright Lake currently supports moderate numbers of waterbirds when seasonally inundated including small numbers of migratory species (Bamford, 2003). The PER indicates that the waterbird counts are not exceptional (829) compared to Lake Forrestdale (over 30,000) but that it has local importance. Remnant vegetation would also support waterbirds and dryland birds. The Great Egret has been seen on Wright Lake and the Quenda was recorded during the site inspection by Bamford.

The PER indicates that the changes to Wright Lake will result in a complexity of impacts, both beneficial and deleterious. It predicts that making Wright Lake deeper and permanent with decreased salinity will alter some vegetation and the aquatic invertebrate fauna. This could have the impact of favouring migratory shorebirds over some other waterbirds, such as ducks, because of a lack of shallow water as the lake dries out in summer.

The proposal will completely alter Wright Lake and will introduce more people into the area with the potential for disturbance to any wildlife which might use the waterbody. The proponents have indicated they will undertake monitoring of aquatic fauna and waterbirds

over a period of at least two years from completion of the rowing course and, if a significant decrease in the biodiversity and abundance of fauna occurs in the waterbody compared to Wright Lake before the development, further offset requirements will be implemented within the Wetland Mitigation Strategy.

The EPA considers it will be difficult to modify the habitat after construction and that more consideration should be given to providing suitable habitat during construction. The Detailed Planning and Design Strategy should examine a number of options such as more islands in the proposed warm up area of the lake to provide more protected areas, greater areas of seasonal shallow water for waders and construction of a wetland area in the elongated finger to the north-west of Wright Lake or in land which may be purchased by the WAPC for the Champion Drive extension south of the project site. The matter will also be addressed in the Wetland Mitigation Strategy condition the EPA will recommend be imposed on the proposal. This is further addressed in Section 3.3.

The EPA Service Unit's Conservation Branch noted that the values of the saline invertebrates in Wright Lake had not been established adequately and that there did not appear to be any research to determine this with some certainty. Wright Lake is not considered to be significantly different from other wetlands of the eastern side of the Swan Coastal Plain (Davis, pers comm.) and the species composition will change as the water becomes more saline towards the end of summer. Dr Davis, Murdoch University, is not aware of any specific research conducted into this aspect of the lake and it was impossible to establish this in 2002 as the lake dried up relatively early. Wright Lake had not been classified as a high conservation wetland in the first instance by WRC, has not been actively managed and species composition and the wetland health has most likely declined over time as a result of development

The DCLM has advised it does not consider the proposal will impact significantly on the listed migratory species, the Wanderer Butterfly and the Great Egret, known to occur in this area. Because of the presence of these migratory species, the City of Armadale referred the Development Application for the sand extraction to Environment Australia with regard to the *Environment Protection and Biodiversity Act 1999.* Environment Australia has subsequently advised that the proposal is not a controlled action.

The proponents have undertaken to provide a total of over 52 ha of open water with 21 ha of adjacent conservation area with plantings along the rowing course and other sections to encourage a natural food web to become established, encourage control of domestic pets and to trap and pass Quendas to DCLM for appropriate relocation. The proponents have also undertaken to provide shallow water areas within the waterbody to provide for particular migratory birds preferences.

Given that the site currently does not have very high fauna values due to limited remnant vegetation and the poor condition of Wright Lake, the replacement of a shallow seasonal wetland will have both positive and negative impacts on fauna, and that the proponents have committed to provide as much wildlife habitat as possible within the development, the change to a permanent waterbody is considered acceptable.

It is therefore considered that the issue of Terrestrial fauna has been adequately addressed and the EPA objectives can be met subject to a condition being imposed to prepare a Wetland

Mitigation Strategy which will include greater wildlife habitat within and around the rowing course.

Summary

Having particular regard to the:

(a) The requirement for a condition for the preparation of a Wetland Mitigation Strategy (see Section 3.3 below); and

(b) the proponent's commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.3 Wetlands

Description

The PER indicates the proposal will impact on a total of 1.75 hectares of Conservation Category Wetlands (CCW), 59.08 hectares of Resource Enhancement (RE) Wetlands and 36.45 hectares of Multiple Use (MU) Wetlands replacing them with 52.28 hectares of permanent open waterbody with adjacent conservation areas totalling 73.35 hectares. The key wetland in the project area is Wright Lake which is classified as a RE Wetland with a wetland area of 19.43 hectares and fringing vegetation of 4.63 hectares totalling 24.06 hectares.

Submissions

The Water and Rivers Commission expressed concern that the PER did not use its Wetland Mitigation Criteria and did not consider the proposed alteration of the ephemeral Wright Lake and dampland to a permanent, lined constructed waterbody as appropriate or acceptable mitigation for the loss of natural systems within the development area.

The Wetlands Conservation Society indicated that this proposal will completely transform the local environment and destroy over 30 hectares of natural wetland and several hectares of good quality bushland. The Society considered the proponent had made no real attempt to replace these lost values and functions with anything comparable from a wildlife habitat perspective.

Assessment

The area considered for assessment of this factor is the study area as in Figure 1.

The EPA's environmental objective for this factor is to maintain the integrity, functions and environmental values of wetlands.

It was argued in the PER that the other RE wetland on the site (in the cleared area towards the south side of the site) has limited ecological value and could probably be re-evaluated as MU (Figure 5) The EPA accepts this possibility because of the limited environmental values of this wetland area due to its degraded condition.

The proponents have used the draft EPA 2001 *A Policy Framework for the Establishment of Wetland Banking Instruments in Western Australia* in the PER, however, this assessment has

drawn on the more recent Wetland Mitigation Strategy adopted by the EPA for the Tonkin Highway assessment (EPA, 2002) (Figure 6).

Under that Mitigation Strategy, which is the preferred WRC position on wetland mitigation, mitigation for a RE wetland is acquisition or restoration of another RE wetland and buffer or buffers/corridors and vesting and covenanting with appropriate body. Because the functions and values of Wright Lake will change rather than disappear, this issue should address whether those changes will provide similar values and functions as exist today and, if not, options for acquisition or restoration of another similar category wetland.

The current wetland functions of Wright Lake are that it has an important local drainage function and supports relatively small numbers of waterbirds. It is a seasonal wetland which becomes very saline as water levels decline. The saline levels are regarded as unusually high for a lake so far inland from the coast. It has been ranked in the 'bottom third' of wetlands of the particular wetland suite (Hill et al. 1996) and does not appear on any list as being significant. As outlined in Section 3.2, the condition of the lake and its surrounds is generally poor and there is no active management.

The proponents have indicated they do not intend to acquire or restore wetlands outside the site, however, they have committed to prepare a Wetland Mitigation Strategy. The proponents have agreed to include community consultation in the Wetland Mitigation Strategy as requested by WRC.

The EPA considers, however, the proponents have not provided adequate mitigation for the loss of the Wright Lake wetland and recommends the preparation of a Wetland Mitigation Strategy as a condition to mitigate against the loss of the habitat provided by the seasonal wetland, to preserve the seasonal values of the water bird habitat, to provide a habitat for aquatic invertebrates and crustaceans (including an appropriate lake lining) and to protect on-site vegetation.

There are some options to include appropriate wildlife habitat in the warm up lane part of the proposed waterbody which would involve the construction of shallow water areas as well as introduce appropriate fringing vegetation and appropriately vegetated transition zones for wildlife habitat.

The EPA also suggests the proponent should explore the possibility of linking with the Mains Roads Western Australia commitment to the wetland mitigation strategy associated with the Tonkin Highway project.

The EPA considers that measures which could be acceptable for the strategy are rehabilitation of the remnant vegetation and creation of a wetland habitat within the elongated strip of land to the north-west adjacent to the Tonkin Highway extension, the creation of more natural habitat where possible along the rowing course edge adjacent to the Tonkin Highway and potential wetland habitat or rehabilitation within land which will be acquired by the WAPC for the Champion Drive extension south of the site. These measures would be in addition to those outlined in Section 3.2 regarding the creation of shallow seasonal habitat within the waterbody and possibly a new island or island refuge in addition to that proposed. The EPA has met with the Wetlands Conservation Society which has concurred with this approach.

The EPA therefore recommends that a condition be applied requiring the proponent to prepare a Wetland Mitigation Strategy which will provide mitigation for the loss of wetlands associated with the proposal to its satisfaction.

Summary

Having particular regard to the:

(a) the requirement for a condition for the preparation of a Wetland Mitigation Strategy

(b) the advice of Water and Rivers Commission; and

(c) the proponent's commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that additional mitigation measures are provided for the loss of the Wright Lake wetland to the satisfaction of the EPA through a Wetland Mitigation Strategy condition.

Figure 5: Wetland Types and Management Categories

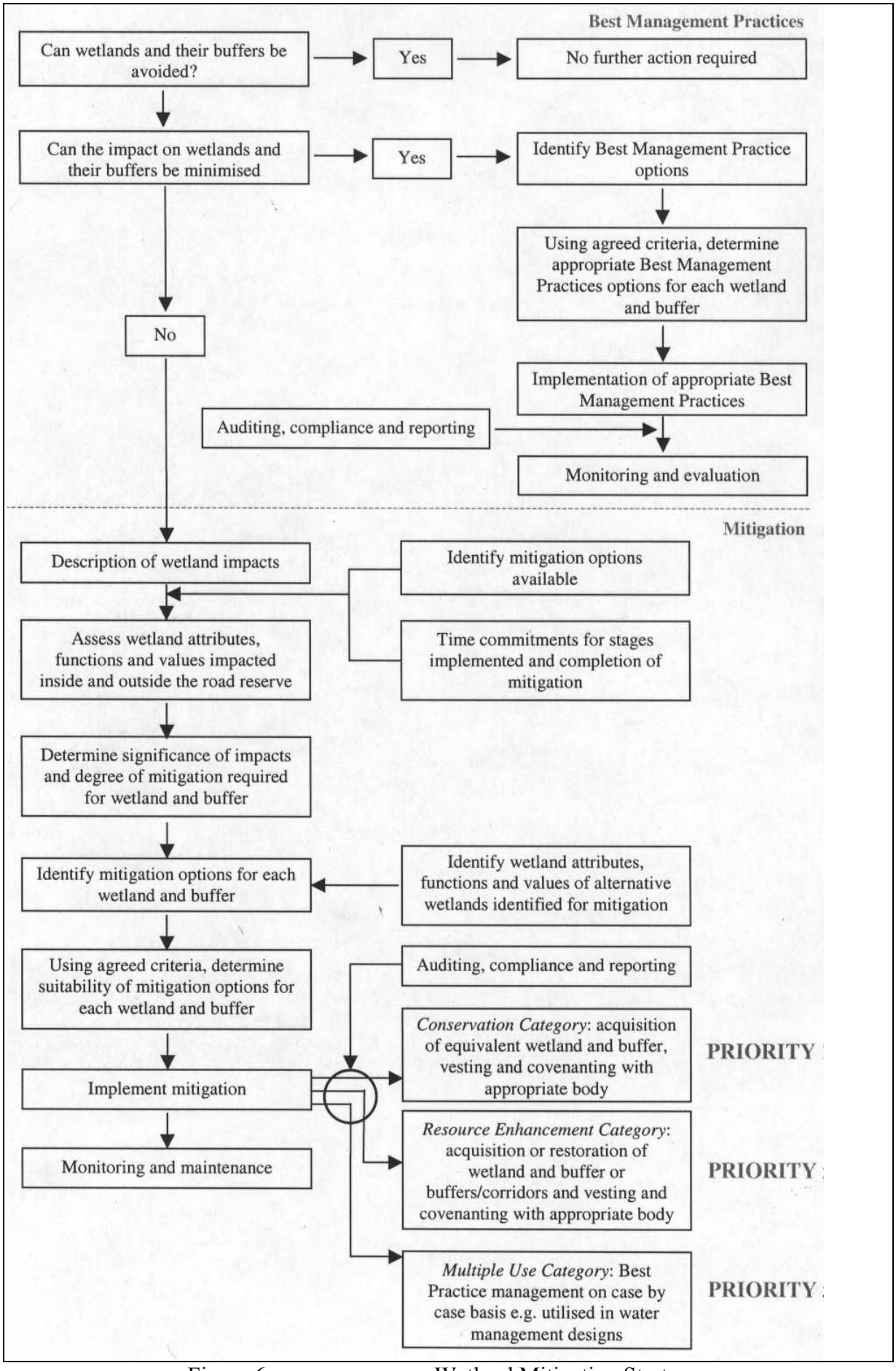

Figure 6: Wetland Mitigation Strategy

3.4 Water Quality

Description

The PER indicates the project area is underlain by groundwater which exceeds the ANZECC/ARMCANZ (2000) trigger values for nutrients and that Wright Lake itself is underlain by highly saline groundwater. The high nutrient values indicate that a water body constructed outside the natural wetland areas in direct hydraulic connection with or topped up by shallow groundwater could potentially become eutrophic, particularly in summer months. The proponents have indicated that a lined waterbody is the preferred option as this will prevent contact with the shallow superficial aquifer.

Submissions

The City of Gosnells stressed the need for well designed and managed Living Streams to perform wildlife corridor or habitat functions and expressed concern at the potential disposal of poor quality water to Southern River.

The Water and Rivers Commission (WRC) expressed concerns about the potential for the growth of nuisance and potential toxic species, particularly if any nutrient enrichment occurs through bird faeces and stormwater run-off, and that any flushing operations will largely be determined by the yet unknown groundwater salinity but will nevertheless need to be to the satisfaction of the WRC.

With regard to the potential for discharge of brackish water into the Southern River, WRC expressed concern that this would have an adverse impact on the ecology of the system, even if discharged during winter when the concentration would be more dilute.

WRC also noted that it is critical that the proposed liner is managed and well maintained over the life of the project to ensure that leakage or failure does not occur. It pointed out that the PER did not outline how the liner will be managed or, in the event of failure, how it will be repaired or replaced if required. WRC recommended that a number of shallow monitoring bores will need to be constructed around the lakes with regular monitoring to determine if any leakage is occurring and from where. If it is determined that leakage is occurring, a process needs to be developed and implemented to limit the impacts of the leakage and if necessary, repair the liner. It was also the WRC preference that the rowing course be lined with a synthetic liner, rather than clay, to isolate the waterbody from the superficial aquifer and prevent brackish water from seeping into Southern River.

WRC considered a detailed water quality management plan should be prepared and implemented.

The Wetlands Conservation Society considered that the proposed artificial waterbody has the potential to cause serious salinity problems in the local area and that algal blooms are likely and it is not clear that the proponents have the necessary skills to manage such a complex artificial ecosystem in the long term. The Society considered there is a need for a post-construction environmental management plan.

The Society also recommended a minimum buffer of 50m around the whole of the waterbody from urban development and car parking.

DCLM also expressed concern about protection of the Southern River and considered it important that appropriate catchment management measures are implemented as part of the development with a monitoring program forming part of the overall Drainage Nutrient Irrigation and Water Quality Plan.

The Gosnells Armadale Landcare Group raised concerns that Southern River has low levels of salinity while Wright Lake is expected to have high levels of salinity due to evaporation and that overflow in the event of flooding will contaminate Southern River. The Group also suggested that rather than discharging water that does not meet the recreational criteria to the Southern River, it should instead be placed in an infiltration basin.

Assessment

The area considered for assessment of this factor is the study area as in Figure 1 as well as the Southern River.

The EPA's environmental objective for this factor is to ensure that the beneficial uses of surface water can be maintained, consistent with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) and to maintain or improve the quality of groundwater to ensure existing and potential uses are protected.

Investigations described in the PER have revealed that shallow groundwater quality parameters exceed the ANZECC/ARMCANZ (2000) trigger values for nutrients. The most likely cause is past and current land uses including an existing duck farm and a former piggery. The high nutrient values indicate that a water body constructed outside the natural wetland areas in direct hydraulic connection with or topped up by groundwater could potentially become eutrophic particularly in summer months.

Testing of the groundwater beneath Wright Lake in December 2002 revealed a highly saline plume moving in the direction of regional groundwater flow to the north-east. The proponents have indicated that a lined waterbody is the preferred option which will prevent contact with the superficial aquifer.

The water for the waterbody is proposed to be extracted from the Yarragadee aquifer, however, information regarding the water quality and quantity have yet to be fully confirmed. The proponents have included a number of management plans which will address this issue, however, the EPA considers that it will be necessary to impose a condition on the proposal requiring that it cannot be implemented until satisfactory water quality results have been obtained from the drilling programme. Further hydrogeological modelling will occur when results are available and a report will be submitted to WRC prior to application of a groundwater extraction licence.

The major issue associated with water quality is management within the International Rowing Course (IRC) itself and water which may be discharged to the groundwater or Southern River. Management within the waterbody will depend to some extent on the quality of the water which can be sourced from the Yarragadee aquifer which is not yet known, however, it appears likely the water will be brackish. The PER examined the issue of a lined waterbody versus an unlined body and concluded a lined waterbody would produce the best results. It has not yet been decided whether a clay or synthetic liner will be used. This decision will depend on the results of groundwater investigations.

Other ways in which water quality can be affected include contamination from the superficial aquifer which a lined waterbody would address, management of stormwater into the IRC, use of appropriate fringing vegetation and monitoring of the condition of that vegetation. Management of the adjoining development area through minimal nutrient application and export is also proposed.

It is proposed that water quality within the waterbody will be managed through ongoing monitoring of water quality and the use of contingency plans if required. These are outlined in the overall Drainage Nutrient Irrigation and Water Quality Management Plan (DNIWQMP) and the individual DNIWQMPs which will be prepared to the satisfaction of the Water and Rivers Commission in consultation with the Armadale Gosnells Landcare Group.

Broad water quality objectives will be set which will avoid the creation of algal blooms, floating material, unpleasant odours, be capable of supporting fringing vegetation and human contact. Contingency plans for poor water quality include identification and elimination of the source of pollution if possible, collecting of plant material, physical aeration and biological or chemical treatments. If affected by algal blooms, water would not be discharged to nearby river systems.

It is proposed to control the salinity in the IRC to maintain the wetland habitat created through flushing of approximately 0.19GL/year or 0.52ML/day into either the Southern River or disposal into the Yarragadee or Leederville aquifer. Discharge to the Southern River will only be considered during winter peaks and would be subject to the agreement of the WRC. WRC expressed concern that the freshwater species in the river would be impacted as the Southern River is fresh. The proponents have calculated that the addition of 0.52ML/day of water to an average base flow of 17ML/day would raise the current salinity range of 200 – 600 mg/L to 300 – 700 mg/L which, it is argued, is still regarded as "fresh". WRC is agreeable to the addition of words in the commitment which will require any release to be consistent with the objectives of the Water and Rivers Commission's 'Canning River System Environmental Water Provisions Project'.

The preferred disposal option will be dependant on the results of the test drilling and hydrogeological assessment, which is ongoing.

It is proposed to use small quantities of water (150ML/year abstraction was modelled but is more than expected quantities) from the Leederville aquifer to irrigate the Public Open Space. Given that this water contains nutrients, it is expected this will reduce fertiliser requirements and therefore assist in the water quality of the IRC. The proponent also intends to use Water Sensitive Urban Design principles for the urban development and design the Living Streams component so that it meets its environmental and drainage functions to retain nutrients on site.

The proponents have indicated that the preferred option for the waterbody liner is clay, which they indicate will be required to meet strict geotechnical specifications and auditing during construction. Clay was preferred because of its availability on site. The proponents have now also advised, in the Response to Submissions, that the geotechnical testing of the source clay will be undertaken to prove it is capable of acceptable long-term performance. It is suggested bentonite can be mixed with the clay if a less permeable material is needed.

A series of monitoring bores will be constructed around the rowing course, a minimum being 10 – 12 bores in two circles surrounding the waterbody with comparisons between the two sets of bores indicating potential seepage. The proponents have explained that bentonite is a powder which expands significantly when immersed in water. Holes or perforations in the clay liner may be identified by monitoring bores and this can be sealed by using bentonite to fill any gaps.

The proponents have committed to include a design for the liner as part of the Construction Management Plan which demonstrates that it can achieve adequate permeability rating to control any leaching into or out of the lake. The EPA considers that unless it can be demonstrated with a high degree of confidence that a clay liner at the site can achieve sufficiently low permeability, a synthetic liner should be used.

Given the commitments by the proponent, it is therefore considered the EPA's objectives for water quality can be met provided the lake is properly lined and results of the exploratory bore and the findings of the subsequent hydrogeological modelling show that the groundwater quality is suitable and that criteria is established for the water quality within the waterbody. The EPA recommends a condition, however, that a Water Quality Management Plan be prepared and implemented to address the water quality issue.

This management plan should identify the water resource and its water quality and a strategy for managing water of an unsuitable quality either at its source or through evaporation and eutrophication together with a strategy for flushing the waterbody to the satisfaction of the EPA on the advice of the Water and Rivers Commission.

Summary

Having particular regard to the:

(c) The exploratory drilling programme

(d) The advice of the Water and Rivers Commission; and

(e) The proponent's commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that a condition is imposed requiring the preparation and implementation of a Water Quality Management Plan and that the IRC is properly lined.

3.5 Groundwater Quantity

Description

The PER estimates the waterbody for the IRC will require 2.31 GL of water to fill an area of 52.3 hectares to a depth of 3.5 metres. The proponents modelled the expected use of 0.79 GL/year and the worst case use of 1.42 GL/year to make up for evaporation loss from the IRC using the steady state groundwater modelling provided by the WRC – Perth Region Aquifer Modelling System (PRAMS) for a time period of 25 years.

Submissions

The Water and Rivers Commission questioned the proposed use of the superficial aquifer for irrigating areas of public open space because the water may be of poor quality and be of

insufficient quantity. It advised that all WRC criteria would need to be addressed before a groundwater licence was granted for irrigation requirements.

The WRC and the Armadale Gosnells Landcare Group raised the issue of climate change, questioning the modelled effects because the PER did not consider the impacts predicted for the southwest of Western Australia by CSIRO climate change modelling.

Concern was also expressed by the WRC regarding the effect of drawdown on surface water dependent systems as the Southern River is also influenced by surface water and suggested there is a need for further work in relation to the proposed exploration work. Environmental Water Provisions are currently being set for the Southern River including detailed ecological studies, flow modelling and community consultation on this issue. It was considered that any predicted impacts on the flow of this river require certainty so as not to jeopardise this project.

WRC also advised the proponent would be required to undertake additional modelling incorporating the Yarragadee test bore drilling results to predict drawdown, as well as a comprehensive 'operating strategy', and meet all the Commission criteria before being issued with a licence to take water from the Yarragadee aquifer.

Concerns regarding the potential impacts dewatering will place on local superficial groundwater users was also expressed by WRC and it was recommended the proponent prepare a detailed dewatering management plan.

The WRC advised the use of stormwater should not be seen as a primary source of top up water, as this may lead to inappropriate stormwater designs that deliver pollutants directly to the water body and that stormwater management should be based on the Commission's draft Position Statement for Urban Stormwater Management.

The Armadale Gosnells Landcare Group suggested that the parkland areas be designed to avoid the need for any irrigation and that suitable native grasses and plants could be used in the design. The Group also expressed concern about the impact the drawdown would have on groundwater users and the Southern River with a potential impact of stopping its flow. Concern was also expressed about the effect of dewatering by lowering the water table in the short term over summer compounding the effects of drought and causing further stress or death to the remnant vegetation.

The City of Gosnells pointed out that lowering of the watertable could be of benefit to adjoining subdivisions, as localised stormwater infiltration would be more effective. It also commented on the use of water from the proposed residential areas in the development and that diverting runoff to the rowing course could leave the Southern and Canning rivers without stormwater input and reduced localised infiltration.

The Canning Catchment Coordination Group expressed concern that waterways and wetlands are under great stress already from the prolonged drought and the use of a huge amount of water could have both short and long term impacts. The Group also advised caution because of the reliance on modelling and questioned the water use given the current water crisis.

Development Planning Strategies indicated that it is not satisfied that the project will not change the local hydrological conditions on the adjoining urban land and suggested that

further studies should be carried out to establish the impacts of the IRC on hydrology of the area.

Assessment

The area considered for assessment of this factor is the study area as in Figure 1 and the surrounding area as well as the Canning and Southern Rivers.

The EPA's environmental objective for this factor is to maintain the quantity of groundwater to ensure existing and potential uses are protected.

The proponents have been issued with an exploration licence to drill into the Yarragadee aquifer to determine whether adequate water supplies of appropriate quality and quantity are available for use in the waterbody. A report on the findings will be forwarded to the WRC prior to submitting an application to extract water. An extraction licence will require the approval of the WRC.

The proponents have indicated that drawdown is unlikely to occur because it is likely that confining layers exist between the Yarragadee and Leederville aquifers which were not incorporated into the model. Interim drilling results confirm this view. If the climate becomes drier, or Perth experiences a severe drought, it is anticipated the IRC could be maintained at a lower level requiring less pumping.

The proponents have advised that, with regard to the effects of the dewatering process during construction on local superficial groundwater users, a separate licence to dewater will be required prior to commencement of construction and it has committed to prepare a comprehensive dewatering management plan to the satisfaction of the WRC, as part of the Construction Management Plan. The proponents have also committed to preparing an operating strategy to be approved by WRC prior to issue of the groundwater abstraction licence.

Stormwater is seen as a secondary source of top up water, with the primary source being the Yarragadee aquifer. It is proposed to infiltrate road runoff back into the superficial aquifer and for rain water to be collected and piped into the IRC. Water harvesting from future urban development to the north is a possibility for further water contributions.

The proponent responded to the concern about the use of water for a recreational facility while Perth suffers a water shortage by indicating that the intended water sources of dewatering on site and the Yarragadee aquifers are not potable and therefore the proposal will not have any impact on drinking water supply.

Given the commitments by the proponent, it is therefore considered the EPA's objectives for groundwater quantity can be met provided the results of the exploratory bore and the findings of the subsequent hydrogeological modelling are satisfactory and that a water extraction licence is subsequently issued by WRC.

Summary

Having particular regard to the:

(f) The requirement for a water extraction licence to be approved by Water and Rivers Commission; and

(g) The proponent's commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided that the Water and Rivers Commission issues a water extraction licence based on satisfactory results of the exploratory bore and the findings of the subsequent hydrogeological modelling.

3.6 Acid Sulfate Soils

Description

The PER indicated the possibility of Potential Acid Sulfate Soils (PASS) or Actual Acid Sulfate Soils (AASS) within the study area. At the time of release of the PER, preliminary investigations into this issue had been undertaken, however, results from Wright Lake itself were not available in time for the release of the PER.

Submissions

The Armadale Gosnells Landcare Group and the City of Gosnells expressed concerns that the exposure of the acid sulphate soils (ASS) during the construction of the water body and its proposed use for the construction of Tonkin Highway may cause severe contamination of Southern River and surrounding bushland with toxic elements.

The City of Gosnells commented further saying that the May 2002 testing did not include the results of testing in Wright Lake which is most likely to be the area where acid sulfate soils may be found.

A submission from the public identified that the potential threat from acid sulphate soil is like reading details of a toxic dump. It was asserted that a comprehensive ASS Management Plan should be drawn up before any development proceeds, to assure that the problem can be managed.

Assessment

The area considered for assessment of this factor is the study area as in Figure 1.

The EPA's environmental objective for this factor is to plan and manage development that may potentially impact on acid sulfate soils to avoid adverse effects on the natural and built environment and human activities and health.

The proponents have conducted three phases of investigations into the potential for acid sulfate soils in the project area. It was not possible to include Wright Lake in the first phase as the Department of Indigenous Affairs was not able to grant access to disturb the lake bed. Approval was given and the lake was included in a further series of tests before the end of 2002.

These investigations showed results of potential acid sulfate soils near site ASS12 which lies outside the area to be excavated for the IRC. Further investigations were conducted in the vicinity of the site in February and March 2003. Most of the samples (94%) throughout the site did not reveal any acid sulfate soils or potential acid sulfate soils (PASS). PASS was identified within the soil profile at four locations associated with a previous piggery and will not be excavated. Dewatering of the adjacent waterbody, however, may indirectly affect these sites with the potential to release acidity into the groundwater if not properly managed. The preferred strategy for managing any acid sulfate soils is reburial beneath the water table.

The proponents have committed to prepare an Acid Sulfate Soil Management Plan which will address the management of this issue.

Given that the investigations did not reveal any significant acid sulfate soils within the project area and the proponent's commitment, it is considered that the EPA's objective for this issue can be met.

Summary

Having particular regard to the:

(h) The advice of the Land and Water Quality Branch of the Department of Environment; and

(i) The proponent's commitments,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor.

3.7 Noise

Description

The PER indicates there are several noise sources which have the potential to impact on noise sensitive premises. They include noise from construction, rowing and whitewater events, the Tonkin Highway and the commercial area.

Submissions

No submissions were received on this factor.

Assessment

The area considered for assessment of this factor is the study area as in Figure 1 and any noise sensitive premises in the surrounding area.

The EPA's environmental objective for this factor is to protect the amenity of residents from noise impacts resulting from activities associated with the construction and operation of the proposal by ensuring that noise levels meet statutory requirements and acceptable standards.

The Department of Environment has advised that the noise management proposed in the PER is satisfactory, however, because of the preliminary nature of much of the development, it is considered there are elements which have the potential to create a noise conflict with existing or proposed land uses. These are the international rowing course and associated facilities, whitewater rafting facility, conference centre, cable ski and water park, short stay accommodation, indoor sports and aquatic centre and the residential development.

The EPA therefore considers that further noise investigations should be undertaken in the Noise Management Plan of the residential areas to ensure the noise amenity of existing and future residents is protected.

Summary

Having particular regard to the advice of the Department of Environment, it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this

factor provided that further noise investigations are undertaken prior to subdivision of the residential area.

4 Conditions and Commitments

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment and Heritage on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal and, following discussion with the proponent, the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for, and commitment to, continuous improvement in environmental performance. The commitments, modified if necessary to ensure enforceability, then form part of the conditions to which the proposal should be subject, if it is to be implemented.

4.1 Proponent's commitments

The proponent's commitments as set in the PER and subsequently modified, as shown in Appendix 4, should be made enforceable. These include:

1. Construction Environmental Management Plan;
2. Foreshore Management and Revegetation Plan;
3. Overall Drainage Nutrient Irrigation and Water Quality Management Plan;
4. Individual Drainage Nutrient Irrigation and Water Quality Management Plans;
5. Site Contamination Assessments;
6. Water Conservation Principles;
7. Noise;
8. Lighting;
9. Acid Sulfate Soil Management Plan;
10. Mosquito and Midge Management Plan;
11. Archaeological Investigations;
12. Aboriginal Interpretive Centre;
13. Community Education;
14. Over-arching Environmental Management System; and
15. Detailed Planning and Design Strategy.

4.2 Recommended conditions

Having considered the proponent's commitments and information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by the Western Australian Planning Commission and the City of Armadale to develop a water-based recreation park incorporating an international rowing course and other facilities on land situated on Lake Road in the City of Armadale is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) that the proponent shall fulfil the commitments in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) prepare and implement a Water Supply Development Plan;

(c) prepare and implement a Water Quality Management Plan; and

(d) prepare and implement a Wetland Mitigation Strategy.

5. Conclusions

The EPA has considered the proposal by the Western Australian Planning Commission and the City of Armadale to develop a water-based recreation park incorporating an international rowing course and other facilities including a residential component on land situated on Lake Road in the City of Armadale. Other uses for the 138 hectare site are urban land uses, sporting facilities, conservation area, an Aboriginal interpretive centre, conference facilities, short stay accommodation and some retail commercial uses.

The proposal will impact on approximately 4.65 hectares of one vegetation complex with less than 10% of the original extent (11,328 ha) remaining in the Perth Metropolitan Region (1,020 hectares), approximately 3.38 hectares of Threatened Ecological Communities, the site contains Bush Forever Site 260 and there is potential for the spread of weeds and disease. The proposal will impact on fauna habitat and have both beneficial and deleterious impact on fauna. The site has been, however, substantially cleared for agricultural purposes, the remaining vegetation is in a degraded state and the proponent has committed to rehabilitate the vegetation throughout the site where it will be retained.

The EPA notes there is one area of potential acid sulfate soils, however, this can be managed through appropriate strategies during construction.

The EPA also notes that the proposal will impact fully on Wright Lake and that the major environmental issues associated with the proposal are the source of water supply for the waterbody and management of the water quality within it. The proponents have completed drilling investigations to establish the water supply for the waterbody, however, the results will need to be verified by the Water and Rivers Commission before the proposal can proceed. The proponent will also need to fully demonstrate that the water quality within the waterbody can be adequately managed and that any flushing will not have an adverse impact on the environment.

The EPA is satisfied that the proponents have undertaken to adopt all other practicable measures to minimise impacts and will implement a Wetland Mitigation Strategy to minimise impacts on wetlands and in particular Wright Lake. The proponents will also be required to develop a Water Supply Development Plan and a Water Quality Management Plan to address the water quality and quantity issues.

The EPA has therefore concluded that it is unlikely that the EPA's objectives would be comprised provided there is satisfactory implementation by the proponents of their commitments and the recommended conditions set out in Appendix 4 and summarised in Section 4.

6. Recommendations

Recommendations

The EPA submits the following recommendations to the Minister for the Environment and Heritage:

1. That the Minister notes that the proposal being assessed is for the development of a water-based recreation park and other uses, including sporting facilities and residential development, on a site in the City of Armadale;
2. That the Minister considers the report on the relevant environmental factors as set out in Section 3;

3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments.
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Organisations:

Armadale Gosnells Landcare Group
Armadale Redevelopment Authority
Canning Catchment Coordinating Group
Canoeing Western Australia
City of Gosnells
Department of Conservation and Land Management
Department of Indigenous Affairs
Development Planning Strategies
Free Reformed School Association
Heritage Council of WA
South East Regional Recreation Advisory Group
WA Aquatic Council
Water and Rivers Commission
WA Water Ski Association
Wetlands Conservation Society

Individual:

Blake D
Bussell R and Glover L
Clare WA
Cockman L
Dr Emery J
Francis M
James D
Hine N
Dr Hughes R
MacNish C
Mallon D
Patton N
Shepherd R
Van Loggerenberg G

Appendix 2

References

1. Bowman Bishaw Gorham 2003, *Champion Lakes Masterplan Development Lakes Road Armadale : Public Environmental Review*, BBG, Perth.

2. Bowman Bishaw Gorham 2003, *Champion Lakes Masterplan Development Lakes Road Armadale : Final Response to Submissions,* BBG, Perth.

3. Environmental Protection Authority 2002, *Tonkin Highway Extension : report and recommendations of the Environmental Protection Authority*, Bulletin 1043, EPA, Perth.

4. State of Western Australia 2000, *Bush Forever*, Western Australian Planning Commission, Perth.

Appendix 3

Summary of identification of relevant environmental factors

Summary of Identification of Relevant Environmental Factors

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
BIOPHYSICAL			
Terrestrial flora Vegetation	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation.	The City of Gosnells expressed concern that potential environmental impacts to the vegetation retained would result from the proposed lowering of the watertable, beyond that stated from dewatering during construction. The City also indicated that the adjacent reach of the Southern River is groundwater dependent in summer. Any drawdown will negatively impact an already stressed system and a lowering of the groundwater head will have impacts on groundwater dependent ecosystems. Scenario 10 will have a drawdown effect of 0.2-0.5m. The Department of Conservation and Land Management (DCLM) indicated that the Forrestfield and Southern River Complexes (within the study area) are not currently well reserved and therefore their retention wherever possible should be considered a high priority. Currently only 2% (219ha) of the original Forrestfield Complex and 6% of the original Southern River Complex (1,775 ha) have some form of protection. DCLM supports the proponent's commitment to retain and rehabilitate a conservation area within the Champion Lakes project area and also encourages the retention of any additional areas of remnant vegetation during the detailed design process. A submission from the public highlighted that an area of good bushland north of Wright Lake should have been discussed in the report. This was evaluated by Malcolm Trudgeon in his report to the City of Gosnells "A Survey of Remnant Vegetation in the City of Gosnells west of the Darling Scarp". Although, Tonkin Highway will separate Wright Lake from this bushland, amazing birdlife has been recorded and still exists there, along with many grey kangaroos must have an influencing presence on Wright Lake. The proponents have agreed to an additional commitment to prepare and	Vegetation is considered to be a relevant environmental factor

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		implement a Detailed Planning and Design Strategy to retain vegetation where possible.	
Terrestrial flora Weeds and Disease	Ensure that regionally significant flora and vegetation are adequately protected from the spread of weeds and diseases, including dieback.	The City of Gosnells identified that any successful weed control strategy must include a revegetation component, or be allied to a revegetation strategy, to be successful. These two strategies must be integrally linked.	Weeds and disease is considered to be a relevant environmental factor.
Terrestrial flora Bush Forever Site No. 206	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation.	The City of Gosnells highlighted that the potential environmental impacts to Bush Forever Site No. 260 must also include the proposed lowering of the watertable, beyond that stated from dewatering during construction.	Bush Forever Site No 206 is considered to be a relevant environmental factor.
Terrestrial flora significant flora	Protect Declared Rare and Priority Flora, consistent with the provisions of the *Wildlife Conservation Act 1950*. Protect other flora of conservation	No submissions were received on this factor and the site does not contain any significant flora.	Significant flora is not considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	significance.		
Terrestrial flora Threatened Ecological Communities		The City of Gosnells identified that worst case scenario provides for a maximum of 3.38ha of possible Threatened Ecological communities (TEC's) in Good to Completely Degraded condition to be cleared. Further, this scenario provides for 2.6ha of JsX+ vegetation type in Community FCT 20b adjacent to Wright Lake to be cleared. This is considered unacceptable for an endangered community, as described by English and Blythe (1997). Further investigation and clarification of the possible status of the TEC's is recommended prior to any loss of important biodiversity. The Armadale Gosnells Landcare Group recommended that the 1.3ha of JsX+ vegetation type that is to be cleared be revegetated elsewhere in the reserve. DCLM identified that the two TEC's proposed to be cleared are Floristic Community Types (FCT) 3b Eucalyptus calophylla – E. marginata woodlands on sandy clay soils (Vulnerable) and 20b Eastern Banksia attenuata and/or E. marginata woodlands (Endangered), both representative of plant communities found on the eastern side of the Swan Coastal Plain. These communities are threatened as a result of the high clearing rates applied to these areas in the past. Although the presence of these communities is only inferred due to their degraded state they still have conservation significance at both a local and regional level. DCLM also recommended that in order to provide a balance for the clearing of these areas the proponent should make a commitment to provide additional protection or improvement to other areas of FCT 3b and 20b. DCLM recommends an appropriate offset be provided such as the purchase and reservation of freehold or unreserved land containing the same FCT's or by the proponent undertaking weed control and rehabilitation on reserved land which contains these FCT's.	Threatened Ecological Communities is considered to be an environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		The proponents have advised that their environmental consultant, Dr Arthur Weston, believes that the areas of vegetation are too degraded to be regarded as TECs apart from one area of JsX+ near Wright Lake.	
Fauna	Maintain the species abundance, diversity and geographical distribution of fauna Protect Specially Protected (Threatened) Fauna and Priority Fauna species and their habitats, consistent with the provisions of the *Wildlife Conservation Act 1950.*	The City of Gosnells made the following comments: ▪ suggest consideration of a cat-exclusion area for adjacent new urban subdivisions, similar to the City of Stirling's Churchman's Estate Town Planning Scheme Amendment, proposed to be superseded by a Local Law specific to that area; ▪ it is generally considered that the Master plan Concept does not provide sufficient wildlife corridors; ▪ suggest consideration be given to the use of felled trees from the site as roosting poles/habitat within conservation areas and open water; ▪ with regards to the loss of mature trees, migratory bird habitat may be affected during works as a result of dewatering, and as a result of clearing. Timing or staging of works needs to consider this aspect; ▪ serious consideration must be given to the fact that "impacts associated with the development around Wright Lake may be difficult to manage and changes to fauna assemblages will be inevitable;" ▪ Bamford's fauna report states that Quenda (a Priority 4 species) were found in the south-eastern corner of Wright Lake, and it is suggested that they probably occur throughout the site where dense vegetation exists (Appendix G, pg. 8). The development of the Champion Lakes Project will result in the loss of a large portion of their habitat within the proposed development area. DCLM supports the proposal to translocate Quendas from the development site to another area (Section 4.7.5.4 pg53). However, any translocation proposal should be developed in close consultation with DCLM; and ▪ no mention is made of the re-introduction, post-construction, of the Quenda. Comment is required on the likely recolonisation from adjacent linked areas, or otherwise re-introduction (similar concerns were expressed in a submission from the public); and ▪ concern is expressed regarding the loss of the aquatic fauna within	Fauna is considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		the lake during dewatering and post-construction of the facility. A "complex of impacts, both beneficial and deleterious" will result from the alteration of the Wright Lake. Similar concerns were expressed in a submission from the Gosnells Armadale Landcare Group. DCLM identified that: ▪ the proposed development may lead to disturbance and loss of native fauna that currently utilise the area. This is of particular relevance to a number of bird species that utilise the Wright Lake area; and ▪ development of the Wright Lake area may lead to changes in the composition and number of waterbirds that currently utilise the site (a submission from the public raised a similar concern). Although the site is relatively species poor when compared to a Ramsar wetland such as Forrestdale Lake it still provides valuable habitat for a number of waterbirds (Section 4.7.3.3, pg. 44). It is important that appropriate thought is given to maintaining a mixture of habitat types to allow different waterbird species to continue using the area. A variety of habitat types should be maintained within the project area to allow different species of waterbirds to use the area; and ▪ in conjunction with the development it may be appropriate to undertake monitoring of the area for the first two years after project completion to give an indication as to the type and mix of waterbirds which are utilising the area. The Wetlands Conservation Society expressed concern that the large, artificial waterbody created by this proposal will not be suitable as wildlife habitat as it will be dredged and there will be frequent disturbance by boats and spectators.	
Wetlands	Maintain the integrity, functions and	The Water and Rivers Commission re-iterated its concern in relation to the proposed wetland mitigation, and the perceived retention, enhancement or increase in wetland function (primarily of Wright Lake)	Wetlands is considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	environmental values of wetlands.	as a result of this development. The criteria used for wetland mitigation are referenced to EPA (2001), however the full reference is not provided in the reference list. Based on the information presented on page 66 of the PER, the EPA recognises three (sic) types of wetland loss mitigation namely, restoration, creation, enhancement and conservation. The Commission had previously advised that the WRC Wetland Mitigation Criteria should be used when proposing mitigation strategies for the loss of wetland functions and values. These criteria were not addressed, and therefore the Commission did not consider the proposed alteration of an ephemeral wetland (Wright Lake) and damp-land to a permanent, lined constructed waterbody as appropriate or acceptable mitigation for the loss of natural systems within the development area. The Wetlands Conservation Society indicated that this proposal will completely transform the local environment and destroy over 30 hectares of natural wetland and several hectares of good quality bushland. The proponents had made no real attempt to replace these lost values and functions with anything comparable from a wildlife habitat perspective.	
POLLUTION			
Water quality	Ensure that the beneficial uses of surface water can be maintained, consistent with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*	The City of Gosnells highlighted that: ▪ proposed Living Streams must also be well designed and managed to perform any wildlife corridor or habitat function. Being adjacent to proposed urban areas, the pressure to accommodate traditional recreational functions will arise, to the potential detriment of any conservation function; ▪ Table 13 neglected to consider the concentration of salts likely to accumulate as a result of evaporation, which would probably be partially flushed to the Southern River in winter as the IRC receives drainage input. Refer DEWCAP July 2002 draft Water Note: Sustainable Stormwater Management on the Swan Coastal Plain – moving on from Lined Lakes; and ▪ it is stated that "if the water quality is not considered suitable for	Water quality is considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	(ANZECC 2000). Maintain or improve the quality of groundwater to ensure existing and potential uses are protected.	the rowing course, there may be a need to discharge the water to the Southern River". Should this be the case, the disposal of poor quality water to the Southern River is not considered appropriate. Statutory requirements, including the Environmental Protection (Swan and Canning Rivers) Protection Policy 1998, need to be met prior to this scenario occurring. The Water and Rivers Commission raised the following issues: ▪ it is presumed that the IRC will become brackish through input of its source water (salinity of the Yarragadee to be confirmed), and evaporation. This could encourage the growth of nuisance and potentially toxic blue-green and dino-flagellate phytoplankton species, particularly if any nutrient enrichment occurs through bird faeces and stormwater run-off; ▪ the salinity of the groundwater that will be used to fill and maintain the water levels in the lakes will determine the method and the frequency of disposing the water from the lakes during flushing operations. This is unlikely to be known before the exploration bore is tested, however the issue of maintenance of water quality and proposed flushing of the IRC is potentially a significant issue, and disposal will need to be to the satisfaction of the Commission; ▪ if the proponent intends on disposing of water that is salty, and / or of poor quality, options described in the PER (either aquifer injection or disposal off site) may be unacceptable. It is considered this issue should be addressed before environmental approval for the project is given. The proponent should be required to clearly outline how this issue will be dealt with in the event water quality determines that disposal options presented to date will be unacceptable, prior to approval being granted for the proposal; ▪ the PER lists a series of options for discharging brackish water when it becomes unsuitable for the rowing course. One of these options is discharging brackish water into the Southern River, possibly during winter. The conductivity of Southern River is fresh. Recent studies have found conductivity of around 200-600 mg/L. Discharging brackish water into this system, even during winter when the concentration would be diluted, would have adverse	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		impacts on the ecology of this system. Recent ecological monitoring studies have found a number of freshwater macro invertebrate and freshwater fish communities downstream of this site (Storey, 2000). Many of these species are intolerant to brackish conditions. Therefore, the flushing of any water into Southern River that exceeds current baseline water quality parameters of the river is unacceptable and should not be permitted; ▪ the Southern River currently experiences problems with erosion and down-cutting of the river channel during winter months and summer storms due to the removal of fringing vegetation and altered catchment hydrology. Additional water from the IRC into Southern River would only be acceptable if the water was of sufficient quality (see above) and could be released gradually during Spring and/or Summer, when flows are not meeting ecological water requirements. This option would require further investigation and monitoring by the proponent in consultation with WRC, who are currently developing Environmental Water Provisions for the Canning River System (including Southern River). ▪ if dewatering is expected to occur during winter and the proponent cannot meet current baseline water quality parameters of the Southern River this discharge shall not be permitted; ▪ it is critical that the proposed artificial liner is managed and well maintained over the life of the project to ensure that leakage, or failure does not occur. The PER does not outline how the artificial liner will be managed, or in the event of failure how it will be repaired or replaced if required (life-span of liner is not clear). The proponent should be required to outline clearly how the artificial liner will be managed, or in the event of failure how it will be repaired or replaced, and estimates of its life-span should be provided; ▪ in order to address this concern, it is recommended that a number of shallow monitoring bores will need to be constructed around the lakes and water from these bores monitored regularly (parameters to include salinity), to determine if any leakage is occurring and	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		from where. If it is determined that leakage is occurring, a process needs to be developed and implemented to limit the impacts of the leakage and if necessary, repair the artificial liner; ▪ the IRC should be lined with a synthetic liner to isolate the waterbody from the superficial aquifer and prevent brackish water from seeping into Southern River; ▪ the proposal needs to outline in specific terms, through preparation and implementation of a detailed water quality management plan, how poor water quality will be avoided and managed. Future owners and managers of the facility will need to be formally committed to undertaking water quality analysis and management; and ▪ it is considered that water quality can be managed, however at a level that may be problematic or prohibitive for the proponents. The proponent must further develop the water quality monitoring and response plans, including clearly defined contingencies in the event of unacceptable water quality, algal blooms or flushing requirements. The Wetlands Conservation Society identified that: ▪ the proposed artificial waterbody has the potential to cause serious salinity problems in the local area; ▪ algal blooms are likely and it is not clear that the proponents have the necessary skills to manage such a complex artificial ecosystem in the long term. There is a need for a post-construction environmental management plan which the proponents do not seem to have committed to; ▪ the pollution problems will be exacerbated if urban development and car parking is allowed within 50m of the waterbody. A minimum buffer of 50m is required around the whole of this waterbody. Spectators and competitors can enter the buffer but houses and vehicles should be excluded to reduce the risk of pollution. DCLM highlighted that:	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		▪ the construction of the Champion Lakes project has the potential to impact on the hydrology of the Southern River. Any development project of this nature may have impacts on the overall hydrology of the Southern River and therefore it is important that appropriate catchment management measures are implemented as part of the development. As outlined in the document (Section 5.1.5 pg. 77) a monitoring program should also form part of the overall Drainage Nutrient Irrigation and Water Quality Plan; and ▪ the Water and Rivers Commission should be given the opportunity to provide advice on, and be consulted during the development of a Drainage Nutrient Irrigation and Water Quality Plan in order to ensure that there will be no negative impacts on the hydrology of the Southern River. The Gosnells Armadale Landcare Group raised concerns that the Southern River has low levels of salinity while Wright Lake is expected to have high levels of salinity due to evaporation. In the event of flooding the overflow will contaminate the Southern River. The Group also suggested that rather than discharging water that does not meet the recreational criteria to the Southern River it is recommended that it be placed in an infiltration basin. The proponents have been issued with an exploration licence to drill into the Yarragadee aquifer to determine whether there are adequate water supplies of appropriate quality and quantity for use in the waterbody. A report on the findings will be forwarded to the WRC prior to submitting an application to extract water. A water extraction licence will require the approval of the WRC.	
Groundwater quantity	Maintain the quantity of groundwater to ensure existing and potential uses are protected.	The Water and Rivers Commission raised the following issues: ▪ it is intended to take water from the superficial aquifer for irrigating areas of public open space. It is well documented that the superficial aquifer at the proposed site maybe of poor quality and that the yield from the bores maybe insufficient to meet the full development requirements; ▪ prior to any other groundwater licence being granted (for irrigation	Groundwater quantity is considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		requirements), the proponent will be required to address all WRC criteria for granting a licence; ▪ the PER does not consider climate change and the impacts predicted for the southwest of Western Australia by CSIRO climate change modelling. Climate change will exacerbate an already marginally acceptable groundwater drawdown scenario presented in the PER. The effects of Scenario 10 will also be compounded by the effects of drought and climatic change (also raised by the Armadale Gosnells Landcare Group); ▪ reference is also made to draw-down criteria for groundwater dependent ecosystems (GDEs) and that 0.2m/year could be considered acceptable. It should be noted that although the Southern River is groundwater dependent it is also influenced by surface-water. The Commission considers a drawdown of 0.2m/year on groundwater dependent wetlands may be acceptable, however this figure is not applicable for surface water dependant systems. In saying this, some concern remains with the lack of certainty in the current modelling, and further work is required in relation to the proposed exploration work; ▪ the Commission is currently working to set Environmental Water Provisions (EWP's) for this river system. This includes detailed ecological studies, flow modelling and community consultation. Any predicted impacts on the flow of this river require certainty so as not to jeopardise this EWP project; ▪ the proponent should be required to undertake additional modelling and incorporate Yarragadee test bore drilling results such as stratigraphy and aquifer characteristics. The modelling should also include comprehensive sensitivity and uncertainty analysis and predict the best, worst and average scenarios for the predicted drawdown; ▪ the proponent will need to prepare a comprehensive 'operating strategy', and meet all the Commission criteria before being issued with a licence to take water from the Yarragadee aquifer. The operating strategy will need to address contingency issues associated with any unforseen impacts related to the taking of the	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		water. The proponent will also need to revisit the computer modelling work after a period of pumping, to more accurately predict long term impacts to the aquifer and the local environment; ▪ the Commission has concerns regarding the potential impacts dewatering will place on local superficial groundwater users. In addition to the proponent requiring a 'Licence to De-water' they will also be required to develop an appropriate monitoring program to monitor any impact the dewatering maybe having on neighbouring users. The program will also need to include a commitment by the proponent that they will be responsible for investigating any complaints and take appropriate steps to remediate or compensate for lost water supply. The onus will be with the proponent to demonstrate they were not the cause of such issues should they arise, and wish to dispute any complainants. The proponent should be required to prepare a detailed dewatering disposal management plan that addresses the above issues, prior to the commencement of site works; ▪ the proposed management and use of stormwater is not clearly articulated or consistent in the main document or in the Appendices. Page 98, section 5.2.5.1 - the approach proposed is to recharge stormwater to the superficial aquifer. It is stated that the quantity of recharge will be 26ML/year. In Appendix F, page 3 the second dot point 'drainage objective' is to "harvest stormwater from the development area to minimise rowing course top up water from other sources". Figure 23 in the main document also infers stormwater will contribute to lake water level management; ▪ due to our Mediterranean climate the majority of rainfall occurs in winter and evaporation occurs during summer, when rainfall is usually minimal. The use of stormwater should therefore not be seen as a primary source of top up water, as this may lead to inappropriate stormwater designs that deliver pollutants directly to the water body; and ▪ stormwater management should be based on the Commission's draft Position Statement for Urban Stormwater Management. Recharge of the aquifer should be maximised and runoff from large rainfall	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		events should overland flow to the rowing course basin. The Armadale Gosnells Landcare Group identified that: ▪ the plan provided is not clear on how much area will be irrigated. It is suggested that the parkland areas be designed to prevent the need for any irrigation. There are suitable native grasses and plants that can be used in the design; ▪ a lowering of the groundwater head will have impacts on the Southern River and groundwater users. Scenario 10 will have a draw down effect of 0.2-0.5m. In summer the water level in the Southern River is already less than 0.5m. This means that Scenario 10 may still leave the Southern River with no flow; and ▪ the effect of dewatering will lower the water table in the short term over summer compounding the effects of drought and causing further stress or death to the remnant vegetation. The City of Gosnells highlighted that: ▪ lowering of the watertable through abstraction from the aquifers to top up the IRC could be of benefit to adjoining subdivisions, as localised stormwater infiltration would be more effective; ▪ with reference to the possible collection of stormwater and grey water from future urban development to the north of the site within the City of Gosnells, it is difficult to comment. Although contours would indicate that this would be difficult to achieve due to flat grades; ▪ diverting runoff from adjoining residential areas in to the rowing course would potentially divert flows from the Southern and Canning Rivers, both of which are very reliant on stormwater input for their hydrological and ecological functioning; and ▪ diversion of stormwater into the rowing course reduces localised infiltration of stormwater, which is an essential element of Water Sensitive Urban Design and the WRC's recent Urban Water Management Strategy. ▪ The Canning Catchment Coordination Group expressed concerns that:	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		▪ there is a huge amount of water required for the proposal and given that our waterways and wetlands are under great stress already from the prolonged drought, there is great concern regarding both the short and long term impacts; ▪ there is very little detailed hydrological work undertaken in the upper Canning/Southern River area to really understand the influence of groundwater and superficial aquifers on the flow; ▪ modelling can come up with all sorts of scenarios but what if the one you chose does not proceed as the modelling shows. The development would be built and the rivers and wetlands would have to wear the consequences. Do not proceed if we can't prove beyond reasonable doubt that environmental damage will not occur; and ▪ given that the site requires 2.3gl to fill with ongoing top ups and given the water crisis here in WA at the moment, the question of using this amount of water for a development should have to go out for the wider community for their approval. The Group also indicated that it is currently involved in a project looking at the environmental water requirements for the Canning and its tributaries. This project requested water to improve and bring back fish habitat and general biodiversity. We have been informed there is probably not sufficient water to meet the requirements. Where is the balance in all this? Development Planning Strategies indicated that it is not satisfied that the project will not change the local hydrological conditions on the adjoining urban land. No studies or scientific evidence has been presented in the PER on the impact on hydrology. It is requested that all the studies necessary to demonstrate the impacts of the IRC on hydrology of the area be completed before the project progresses. These studies should, if necessary, establish: ▪ Variations to surface flows; ▪ Variations to seasonal groundwater levels; ▪ Variations to water quality/salinity; and ▪ Determine the economic and environmental consequences to	

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		the adjoining urban areas. The proponents have been issued with an exploration licence to drill into the Yarragadee aquifer to determine whether there are adequate water supplies of appropriate quality and quantity for use in the waterbody. A report on the findings will be forwarded to the WRC prior to submitting an application to extract water. A water extraction licence will require the approval of the WRC	
Acid sulfate soils		The Armadale Gosnells Landcare Group and the City of Gosnells expressed concerns that the exposure of the acid sulphate soils (ASS) during the construction of the water body and its proposed use for the construction of Tonkin Highway may cause severe contamination of Southern River and surrounding bushland with toxic elements. This may happen in two ways: ▪ If the acid sulphate soil is used for construction of roadside banks and drains along the Tonkin Highway, sulphuric acid will be produced which moves through the soil, acidifying soil water, groundwater and eventually surface waters (see Jesmond Sammut, 2000 An Introduction to Acid Sulphate Soils). Sulphuric acid and aluminium will have an adverse impact on the aquatic food chain, fish populations and the health of the fish. ▪ The lowering of the groundwater table overtime and during dewatering will oxidise the acid sulphate soils in the surrounding area having a potential impact on surrounding bushland. The City of Gosnells commented further saying that the May 2002 testing did not include Wright Lake, Results of December 2002 testing are awaited. This would most likely be the area where acid sulfate soils may be found. A submission from the public identified that the potential threat from acid sulphate soil is like reading details of a toxic dump. A	Acid sulfate soils are considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
		comprehensive ASS Management Plan should be drawn up before any development proceeds, to assure us that the problem can be managed. Three phases of acid sulfate soil testing have been carried out by the proponent and only 6% of the results have indicated the possible presence of acid sulfate soils. The sites are not within the intended waterbody area.	
Contamination		The Armadale Gosnells Landcare Group expressed concerns that if the contaminated soil from the piggery and duck farm is used for construction of roadside banks and drains along the Tonkin Highway, sulphuric acid will be produced which moves through the soil, acidifying soil water, groundwater and eventually surface water (see Jesmond Sammut, 2000 *An Introduction to Acid Sulphate Soils*). The proponents have carried out preliminary investigations to the satisfaction of the Land and Water Quality Branch of the Department of Environment. A report on the contamination investigations was forwarded to the Land and Water Quality Branch. Department of Environment.	Contamination is considered to be a relevant environmental factor.
SOCIAL SURROUNDINGS			
Public risk and safety	Ensure that risk is managed to meet the EPA's criteria for individual fatality risk off-site and the Department of Minerals and Petroleum Resources'	No submissions were received on this factor.	Public risk and safety is considered to be a relevant environmental factor.

Preliminary Environmental Factors	Proposal Characteristics	Government Agency and Public Comments	Identification of Relevant Environmental Factors
	requirements in respect of public safety.		
Mosquitoes and midges	Protect health, welfare and amenity of existing and future residents.	Submissions from the public identified that: ▪ the spraying of Forrestdale Lake with chemicals to reduce midge numbers is distressing and may have an affect on bird life. The Mosquito and Midge Management Plan should be available for public comment before development occurs; ▪ the City of Armadale and DCLM have shared responsibility for midge treatment at Forrestdale Lake. A repeat of this bad experience must not be allowed on the residents around Wright Lake; ▪ a buffer of trees and shrubs of at least 50m should be planned in this report between the lake and the residential areas; and ▪ there should be a guarantee that midge infestations wont impact on the lifestyle of those living nearby.	Mosquitoes and midges is considered to be a relevant environmental factor.
Aboriginal culture and heritage	Ensure that changes to the biological and physical environment resulting from the proposal do not adversely affect cultural associations with the area. Ensure that the proposal complies with the requirements of the *Aboriginal Heritage Act 1972*.	The Department of Indigenous Affairs indicated that the proponent is in compliance with the Aboriginal Heritage Act 1972. The proponents have a conditional consent issued by the Minister for Indigenous Affairs. The environmental management provisions regarding heritage are adequate to preserve cultural values and mitigate impacts on heritage values.	Aboriginal culture and heritage is considered to be a relevant environmental factor.

Appendix 4

Recommended Environmental Conditions and

Proponent's Consolidated Commitments

RECOMMENDED CONDITIONS AND PROCEDURES

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

Champion Lakes Masterplan Development Lake Road Armadale

Proposal: The development of a water-based recreation park incorporating an international rowing course and other facilities including a residential component on land situated on Lake Road in the City of Armadale, as documented in Schedule 1 of this Statement.

Proponent: Western Australian Planning Commission and the City of Armadale

Proponent Address: Locked Bag No 2, Armadale WA 6992

Assessment Number: 1400

Report of the Environmental Protection Authority: Bulletin 1100

The proposal referred to above may be implemented subject to the following conditions and procedures:

Procedural conditions

1 Implementation and Changes

1-1 The proponents shall implement the proposal as documented in Schedule 1 of this Statement subject to the conditions of this Statement.

1-2 Where the proponents seek to change any aspect of the proposal as documented in Schedule 1 of this Statement in any way that the Minister for the Environment and Heritage determines, on advice of the Environmental Protection Authority, is substantial, the proponents shall refer the matter to the Environmental Protection Authority.

1-3 Where the proponents seek to change any aspect of the proposal as documented in Schedule 1 of this Statement in any way that the Minister for the Environment and Heritage determines on advice of the Environmental Protection Authority, is not substantial, the proponents may implement those changes upon receipt of written advice.

2 Proponent Commitments

2-1 The proponents shall implement the environmental management commitments documented in Schedule 2 of this Statement.

2-2 The proponents shall implement subsequent environmental management commitments which the proponent makes as part of fulfillment of the conditions in this Statement.

3 Proponent Nomination and Contact Details

3-1 The proponents for the time being nominated by the Minister for the Environment and Heritage under Section 38(6) or (7) of the *Environmental Protection Act 1986* are responsible for the implementation of the proposal until such time as the Minister for the Environment and Heritage has exercised the Minister's power under Section 38(7) of the Act to revoke the nomination of those proponents and nominate another person as the proponent for the proposal.

3-2 If the proponents wish to relinquish the nomination, the proponents shall apply for the transfer of proponents and provide a letter with a copy of this Statement endorsed by the proposed replacement proponent that the proposal will be carried out in accordance with this Statement. Contact details and appropriate documentation on the capability of the proposed replacement proponent to carry out the proposal shall also be provided.

3-3 The nominated proponents shall notify the Department of Environmental Protection of any change of contact name and address within 60 days of such change.

4 Commencement and Time Limit of Approval

4-1 The proponents shall provide evidence to the Minister for the Environment and Heritage within five years of the date of this Statement that the proposal has been substantially commenced or the approval granted in this Statement shall lapse and be void.

Note: The Minister for the Environment and Heritage will determine any dispute as to whether the proposal has been substantially commenced.

4-2 The proponents shall make application for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this Statement to the Minister for the Environment and Heritage, prior to the expiration of the five year period referred to in Condition 4-1.

The application shall demonstrate that:

- the new environmental factors of the proposal have not changed significantly;
- new, significant, environmental issues have not arisen; and
- all relevant government authorities have been consulted.

Note: The Minister for the Environment and Heritage may consider the grant of an extension of time limit of approval not exceeding five years for the substantial commencement of the proposal.

Environmental conditions

5 Compliance Audit and Performance Review

5-1 The proponents shall prepare an audit program in consultation with, and submit compliance reports to, the Department of Environmental Protection which address:

- the implementation of the proposal as defined in Schedule 1 of this Statement;
- evidence of compliance with the conditions and commitments; and
- the performance of the environmental management plans and programs.

Note: Under Sections 48(1) and 47(2) of the *Environmental Protection Act 1986*, the Chief Executive Officer of the Department of Environmental Protection is empowered to audit the compliance of the proponents with the Statement and should directly receive the compliance documentation, including environmental management plans, related to the conditions, procedures and commitments contained in this Statement.

5-2 The proponents shall submit a performance review report every five years after the start of the operations phase, to the requirements of the Minister for the Environment and Heritage on advice of the Environmental Protection Authority, which addresses:

- the major environmental issues associated with the project; the targets for those issues; the methodologies used to achieve these; and the key indicators of environmental performance measured against those targets;

- the level of progress in the achievement of sound environmental performance, including industry benchmarking, and the use of best available technology where practicable;

- significant improvements gained in environmental management, including the use of external peer reviews;

- stakeholder and community consultation about environmental performance and the outcomes of that consultation, including a report of any on-going concerns being expressed; and

- the proposed environmental targets over the next five/six years, including improvements in technology and management processes.

6 Water Supply Development Plan

6-1 Prior to commencement of excavation, the proponents shall ensure that the waterbody can be maintained to achieve satisfactory water quantity to the satisfaction of the Environmental Protection Authority on the advice of the Water and Rivers Commission.

The proponents shall address:

1. the identification of the water resource for the waterbody.

2. the quantity of water to be supplied, and

3. potential environmental impacts from the drawing down from the water resource.

7 Water Quality Management Plan

7-1 Prior to commencement of excavation, the proponents shall ensure that the waterbody maintains satisfactory water quality such that any necessary discharge from that waterbody will not impact adversely on the environment to the satisfaction of the Environmental Protection Authority on the advice of the Water and Rivers Commission.

The proponents shall address:

1. the establishment of appropriate water quality criteria within the waterbody;

2. the establishment of an appropriate liner to ensure negligible leakage from the waterbody or shallow groundwater inflow which would significantly affect water quality.

3. a strategy for flushing the waterbody identifying clearly the receiving body and appropriate flushing management measures; and

4. community consultation process.

8 Wetland Mitigation Strategy

8-1 Within 12 months of substantial commencement of the project, the proponents shall prepare a Wetland Mitigation Strategy to minimise impacts on wetlands and to provide acceptable mitigation measures to ensure no net loss of the environmental values and functions of wetlands.

The proponents shall address the following:

- The avoidance of direct and minimisation of indirect impacts on all Conservation Category wetlands, Resource Enhancement and Multiple Use wetland vegetation wherever practicable;

- The offets for impacts to wetlands will be compensated by a number of measures to the satisfaction of the Environmental Protection Authority on the advice of the Department of Environment.

  These offsets should include:

  - rehabilitation and revegetation measures within the project area, creation of appropriate wetland habitat within the project area and possibly within land to be purchased by the Western Australian Planning Commission, conservation area and vegetation adjacent to Wright Lake;

  - rehabilitation, restoration and fencing of the narrow elongated area to the north of Wright Lake adjacent to the Tonkin Highway identified as Area A on Figure 1;

  - maintaining and enhancing the dampland in Area A as far as practicable;

  - creating additional waterbird water habitat in either Area A or land which the Western Australian Planning Commission may purchase for the Champion Drive extension;

  - the measures identified in Commitments 8 and 9; and

  - any equivalent offset to the satisfaction of the Environmental Protection Authority.

Notes

1 The proponent is required to apply for a Water Extraction Licence Approval from the Water and Rivers Commission.

2 The proponent is required to apply for a Development Approval for the extraction of sand for the waterbody from the Western Australian Planning Commission.

Schedule 1

The Proposal (Assessment No. 1400)

The proposal is to develop a water-based recreation park incorporating an international rowing course and other facilities including a residential component on land situated on Lake Road in the City of Armadale. The site is located in the City of Armadale and is approximately 138 hectares in size. It lies between the proposed Tonkin Highway and Lake Road and stretches from Wright Lake in the north-east to Southern River in the south-west as depicted on Figures 1 and 2.

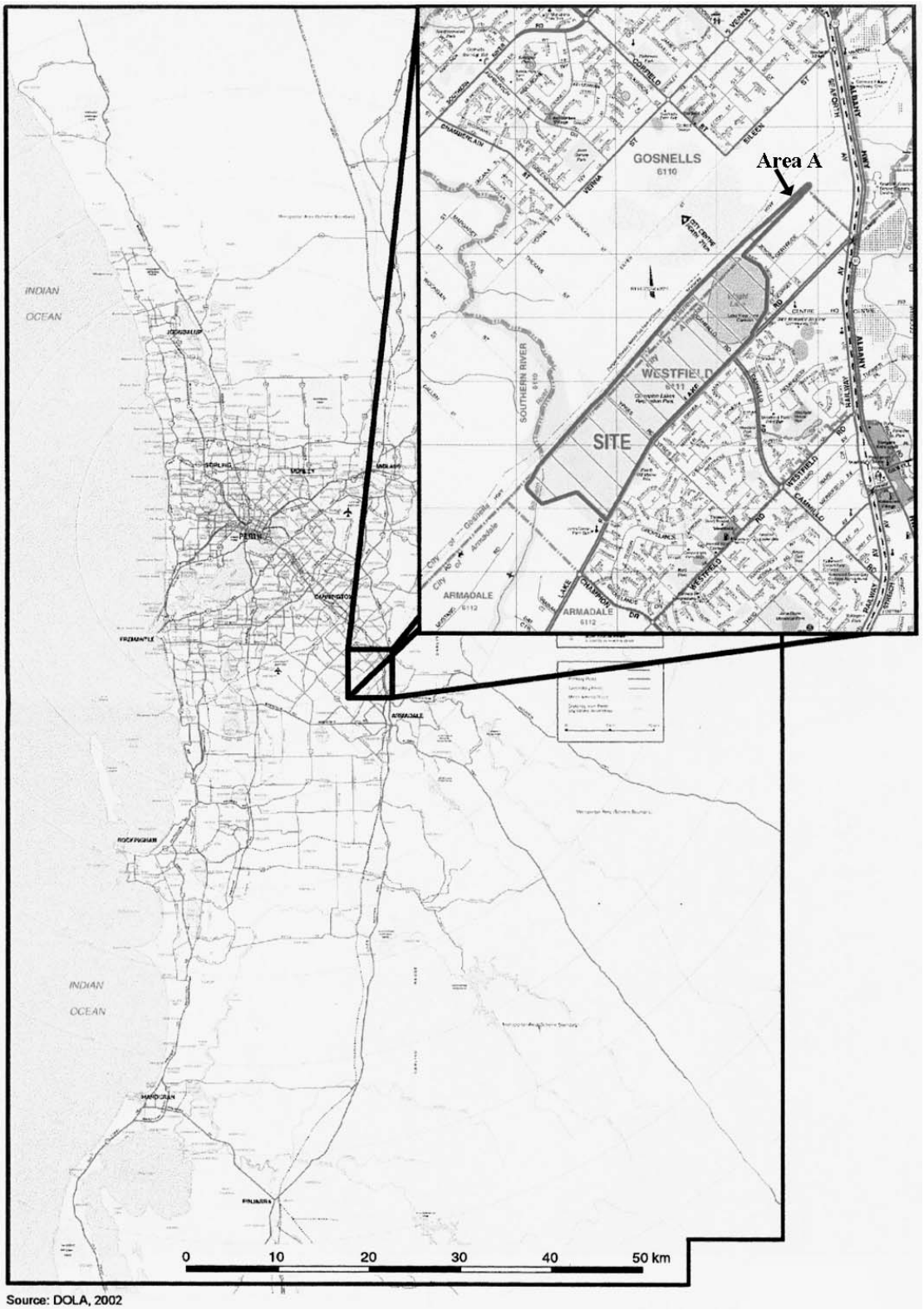

Figure 1: Locality of the Champion Lakes proposal within the south-east Metropolitan Region.

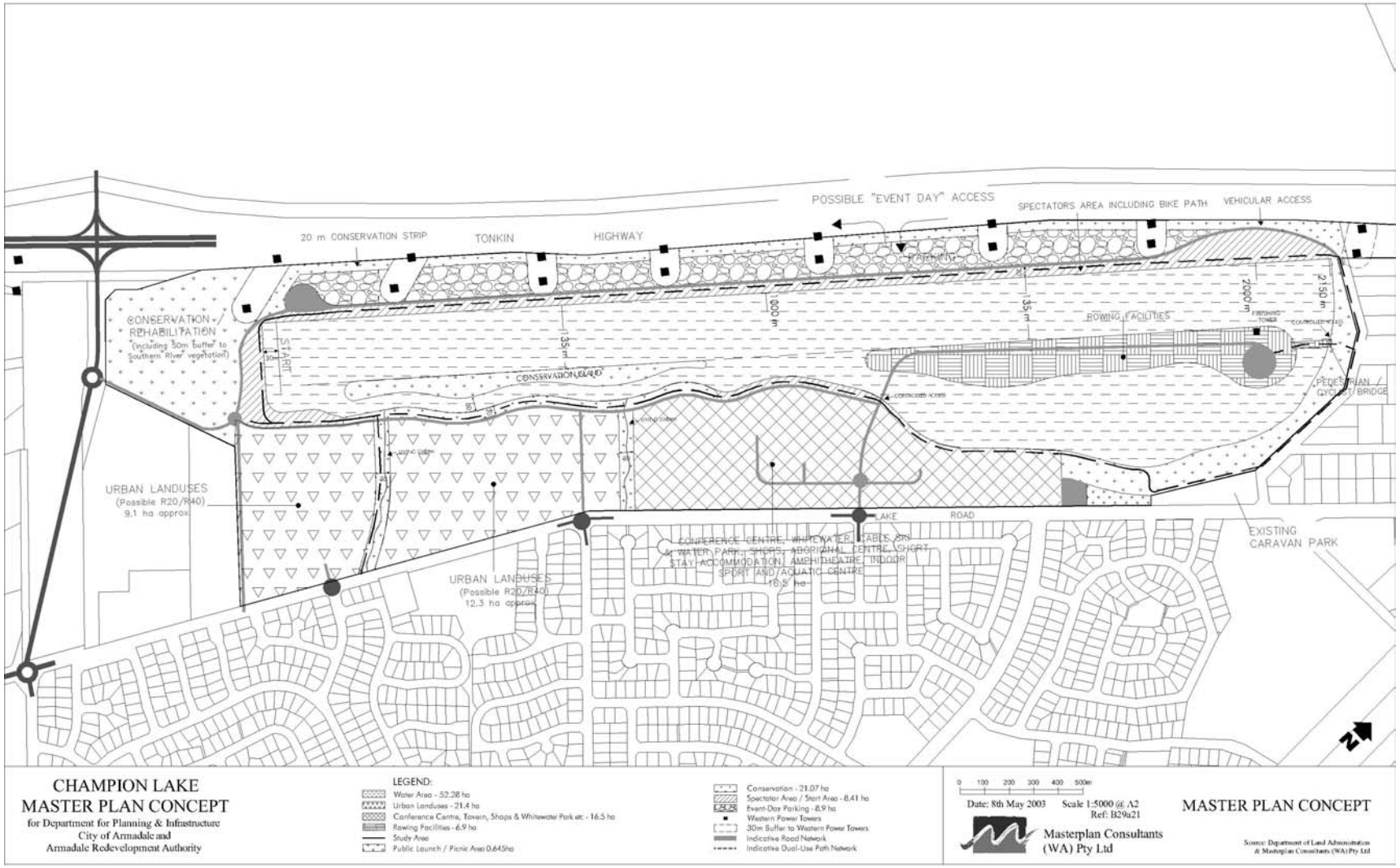

Figure 2: Champion Lakes Master Plan concept development showing areas proposed for various uses.

The proposal Master Plan includes the excavation of an area of approximately 53 hectares to a depth of 3.5 – 4.5 metres to form the basis of the rowing course and associated water bodies.

The remainder of the site is proposed to be used for residential purposes, other water based and recreational facilities, conference and Aboriginal centres, shops, parking areas and conservation purposes. Detailed planning has not yet commenced for the remainder of the site outside the waterbody.

Table 1 – Key characteristics of approved proposal

Element	Description
Proposal Description	A water based recreational park incorporating an international rowing course, an island dedicated to rowing facilities, whitewater rafting facility, conference centre, shops, Aboriginal centre, cable ski and water park, short stay accommodation, indoor sport and aquatic centre, amphitheatre, conservation areas, parking areas, urban land uses, launch area and a residential development.
Total area of proposal	approximately 138 hectares
Dimensions of rowing course	Approximately 2150 metres long x 135 metres wide, 3.5 – 4.5 metres deep
Dimension of artificial watercourse/rowing return lane	Notionally 535 metres long x 30 metres wide (subject to further detailed design)
Dimensions of warm up lake	Notionally 800 metres long x 200 metres wide (subject to further detailed design)
Total Water Area	Rowing course ~29 hectares (fixed) Warm up lake and return lane – Notionally approximately 24 hectares (subject to further detailed design – maximum area will not exceed 24 hectares)
Area set aside for conservation	21 hectares
Area for conference centre, shops, whitewater rafting course, cable ski and water park, short stay accommodation, indoor sport and aquatic centre, amphitheatre and Aboriginal centre	Notionally 16 hectares (subject to further detailed design)
Spectator area/ Start area	Notionally 8 hectares (subject to further detailed design)
Public Launch and Picnic Area	Notionally 0.6 hectares (subject to further detailed design)
Rowing Facility Island Area	Notionally 7 hectares (subject to further detailed design)
Event Day Parking Area	Notionally 9 hectares (subject to further detailed design)
Urban land uses	Notionally 21 hectares (subject to further detailed design)
Construction Duration	approximately 18 months (rowing course only)

Since the release of the PER, the Fédération Internationale des Sociétés d'Aviron, or Federation of Rowing Associations \(FISA) advised that the minimum width for an international rowing course had been changed from 130 metres to 135 metres. The Master Plan has been modified according to this requirement.

As the proponents have not undertaken any detailed planning of the layout of the facilities within the Master Plan, Table 1 has been modified to reflect this by indicating most areas notionally.

Schedule 2

Environmental Management Commitments

June 2003

Champion Lakes Masterplan Development Lake Road Armadale

(Assessment No. 1400)

Western Australian Planning Commission and City of Armadale

Proponent's Environmental Management Commitments

CHAMPION LAKES MASTERPLAN DEVELOPMENT LAKE ROAD ARMADALE (Assessment No. 1400)

Note: The term "commitment" as used in this schedule includes the entire row of the table and its six separate parts as follows:

- a commitment number;
- a commitment topic;
- the objective of the commitment;
- the "action" to be undertaken by the proponent;
- the timing requirements of the commitment; and
- the body/agency to provide technical advice to the Department of Environmental Protection.

	Topic	Objective	Action	Timing	Advice
1.	Construction Environmental Management Plan	To protect the remnant wetland vegetation identified for protection within *Bush Forever* and proposed to be conserved within the development from potential impacts associated with construction. To minimise (direct and indirect) impacts associated with the construction of the course and surrounds on fauna, surface and groundwater quality and quantity and local residents.	Contractors and the proponent will prepare a Construction Environmental Management Plan which addresses: • Weed and Disease Management; • Comprehensive Dust Management Program; • Control of stock and human access into the conservation areas by erection of fencing and construction of access ways; • Fire management including retention or placing of strategic firebreaks around the perimeter of the conservation areas; • Protection of other remnant vegetation not located within the required earthworks boundary; • Quenda Relocation Program; • Dewatering Program to determine and manage the potential impacts of dewatering on the ecology within the conservation areas, surrounding wetlands, Southern River, Canning River and groundwater and surface water quality; • Mosquito and Midge Management for dewatering ponds; • Timing of construction around Wright Lake to avoid periods of peak water levels, from July-August through to October-November which coincides with potential for peak bird breeding and nesting times; • Construction Noise Management Plan.	Preparation prior to commencement of site works as applicable to each phase of construction	CALM City of Armadale WRC for Dewatering Program Consultation with Armadale Gosnells Landcare Group
2.	Construction Environmental Management Plan	As for Commitment 1	The proponent and contractors will implement the Construction Environmental Management Plan.	During design and construction	CALM City of Armadale
3.	Foreshore Management and	To protect the conservation values identified for protection within the development adjacent	The proponent will prepare a detailed Foreshore Management and Revegetation Plan which addresses: • Comprehensive Weed Eradication Program;	Preparation prior to	Bush Forever Office for Bush

	Topic	Objective	Action	Timing	Advice
	Revegetation Plan	to Wright Lake and Southern River. To mitigate proposed clearing within the development and enhance linkages and habitat value.	• Revegetating and restoring conservation areas with appropriate indigenous flora of the Southern River and Forrestfield Complex from seed collected within the site and surrounding areas wherever available; • Increase the area (to the extent depicted as 'conservation' in Figure 2) and condition of native vegetation contained within Bush Forever Site No. 260; • River bank stabilisation; • Creation of habitat and wildlife corridors; • Controlling vehicle and pedestrian access; • Provision of public facilities; • Water conservation and harvesting principles (Commitment 12); • Soil and plant source material hygiene; • Fire management including provision of fire hydrants; • Provision of educational and interpretative materials within the area; • Long-term monitoring criteria to determine the success of the revegetation and weed eradication program; • Progress and Compliance reporting; • Timing and implementation schedule.	construction of any permanent buildings within the site.	Forever Site 260 CALM Agriculture WA WRC Consultation with Armadale Gosnells Landcare Group
4.	Foreshore Management and Revegetation Plan	As for Commitment 3.	The proponent will implement the Foreshore Management and Revegetation Plan.	Implementation to be as per determined in Schedule within Foreshore Management and Revegetation Plan.	Bush Forever Office for Bush Forever Site No 260 CALM Agriculture WA WRC

	Topic	Objective	Action	Timing	Advice
5.	Overall Drainage Nutrient Irrigation and Water Quality Management Plan	To maintain acceptable water quality within the proposed waterbody and the Southern River. Determine if and when water from the IRC can be released to the Southern River.	A Drainage, Nutrient, Irrigation and Water Quality Management Plan (DNIWQMP) will be prepared for the Champion Lakes development as a whole site which will include: • water conservation and harvesting principles (Commitment 13); • nutrient control; • a monitoring schedule; • determination of flushing requirements, associated impacts and management options including development of acceptable criteria for water release; • ensure any releases are consistent with the objectives of the WRC's Canning River System Environmental Water Provisions Project; • contingency in the event that unacceptable nutrient levels are detected in the waterbody and groundwater; and • contingency in the event that hydrogeological investigations reveal that the superficial aquifer is inadequate to provide all of the water required to irrigate the water area of public open space.	The overall DNIWQMP is to be prepared prior to subdivision or the development of buildings on any component of the development.	WRC Swan River Trust Consultation with Armadale Gosnells Landcare Group
6.	Overall Drainage Nutrient Irrigation and Water Quality Management Plan	As for Commitment 7.	The proponent will implement or require the implementation of the Drainage Nutrient Irrigation and Water Quality Management Plans.	Implementation for various components as determined within the individual Drainage Nutrient Irrigation and Water Quality Management	WRC

	Topic	Objective	Action	Timing	Advice
				Plans	
7.	Individual Drainage Nutrient Irrigation and Water Quality Management Plans	As for Commitment 7.	Once detailed planning has been undertaken within each individual component of the development, a more detailed DNIWQMP is required to be prepared to demonstrate how water quality will meet required targets set in the overall DNIWQMP.	Individual DNIWQMP's will be required to be prepared prior to subdivision or development of that individual component of the development.	WRC
8.	Wetland Mitigation Strategy	To minimise impacts on wetlands and to offset any wetland impacts to ensure no net loss of function or value. To provide for additional appropriate wildlife habitat where possible within the proposed waterbody in the detailed planning and design as outlined in Table 1.	Prepare a Wetland Mitigation Strategy as outlined in the PER which: • Avoids direct and minimises indirect impacts on all Conservation Category wetlands. • Avoids impacts on Resource Enhancement and Multiple Use wetland vegetation wherever practicable. • Where Resource Enhancement and Multiple Use wetlands will be impacted, the proponent's objective will be no net loss of Resource Enhancement and Multiple Use wetland values and functions. • Impacts to Resource Enhancement and Multiple Use wetlands will be compensated by: - fencing and limiting access by humans and stock into the Conservation Category wetland vegetation at Southern River; establishing a dryland buffer zone to Southern	During construction	WRC Consultation with Armadale Gosnells Landcare Group

	Topic	Objective	Action	Timing	Advice
			River from the development; - revegetating and restoring the riverine and wetland vegetation as well as the buffer with the Southern River Vegetation Complex; - undertaking a weed eradication program at Southern River and the conservation area adjacent to Wright Lake; - rehabilitating and restoring the relevant part of the conservation area and vegetation adjacent to Wright Lake; - creating and actively maintaining a large permanent waterbody and living stream to enhance and expand the previous wetland functions and values. - provide for additional appropriate wildlife habitat where possible within the Wright Lake area of the proposed waterbody, by the construction of shallow water areas and introduction of appropriate fringing vegetation, including where possible appropriately vegetated transition zones for wildlife habitat.		
9.	Wetland Mitigation Strategy	As for Commitment 5.	The proponent will implement the Wetland Mitigation Strategy. In order to establish changes in the biodiversity present on the site it is proposed to undertake aquatic fauna and waterbird monitoring over a period of two years from completion of the rowing course. Should the monitoring establish that there is a significant decrease in the biodiversity and abundance of fauna occurring in the waterbody compared to Wright Lake, this will trigger the proponent to provide further offset requirements within the Wetland	Progressively and within 4 years of particular wetlands being lost/impacted or as soon as practically possible.	WRC

	Topic	Objective	Action	Timing	Advice
			Mitigation Strategy for replacement of habitat values lost.		
10.	Individual Drainage Nutrient Irrigation and Water Quality Management Plans	As for Commitment 7.	The proponent will require the implementation of the Drainage Nutrient Irrigation and Water Quality Management Plans.	Implementation for various components as determined within the individual Drainage Nutrient Irrigation and Water Quality Management Plans	WRC
11.	Site Contamination Assessments	To determine nature and extent of any soil or groundwater contamination present within the site which may pose risk to human health or the environment.	A Preliminary Site Investigation (PSI) has been completed. Potential contamination will be assessed at areas identified in the PSI using the staged approach recommended in the *Contaminated Sites Management Series* (DEP, 2001). The next assessment phase will be an initial sampling and analysis program to assess the presence, nature and magnitude of contamination at the identified areas of potential contamination.	Prior to site works in areas identified in the PSI as potentially contaminated	Land and Water Quality, DEP
12.	Site Contamination Assessments	As for Commitment 11.	The proponent will conduct site contamination assessments for areas identified in the PSI.	Prior to site works in areas identified in the PSI as potentially contaminated	Land and Water Quality, DEP

	Topic	Objective	Action	Timing	Advice
13.	Water Conservation Principles	Water is an important public resource and availability within the Perth Metropolitan Area is limited.	Water conservation measures are recognised by the proponent as important design elements and will be applied within the development. These include (but are not necessarily limited to) the following: • The waterbody will be lined with suitable clay or synthetic materials to a specified permeability rating, as available superficial groundwater is insufficient to maintain an average water level of 3.5m. • Promote the use of plant species which have low water and fertiliser requirements. • Utilise local native varieties in landscaping. • Consider the collection and transfer of road stormwater drainage to the IRC. • Consider re-injection of stormwater into the superficial aquifer. • Promote landscape treatments sympathetic to climatic conditions and prevailing site conditions – soil types, topography, environment, wetlands etc. • Utilise "cluster or clump" plantings to provide useable shade areas and better use of reticulated water in preference to single item or symmetrical planting regimes. • Irrigate grass and garden areas at appropriate time so as to reduce evaporative loss and minimise transpiration losses. • Ensure that irrigation regime is responsive to prevailing weather conditions.	To be considered within preparation of the Foreshore Management and Revegetation Plan and the DNIWQMPs (Commitments 3 and 6).	WRC
14.	Noise	To maintain amenity of nearby sensitive land uses and to comply with the requirements of the *Environmental Protection (Noise) Regulations 1997*.	Measures to minimise noise levels will include: • using a larger number of small speakers carefully positioned along the rowing course; • Memorials will be required for new residential titles to provide a warning that the area is subject to noise generated at the rowing course; Noise emissions from white water generating pumps will be	During the design of the PA system and water pumps, and prior to the subdivision of	DEP

	Topic	Objective	Action	Timing	Advice
			controlled by placing them in acoustic enclosures or at a suitable distance from the residential area.	the residential area.	
15.	Lighting	To protect the amenity of nearby land users and comply with acceptable standards.	The design of the lighting systems in the Champion Lakes Regional Recreation Park will be undertaken in accordance with AS4282-1997 and the recommended limits.	During design of outdoor lighting	
16..	Acid Sulfate Soil Management Plan	To ensure that that no unacceptable effects will occur to human health or the environment from the disturbance of soils within the proposed development area.	Design and preparation of an Acid Sulfate Soil Management Plan.	Prior to earthworks or dewatering in areas identified as having potential for Acid Sulfate Soils	Land and Water Quality, DEP Consultation with Armadale Gosnells Landcare Group
17.	Acid Sulfate Soil Management Plan	As for Commitment 16.	The proponent will implement the Acid Sulfate Soil Management Plan.	During construction.	Land and Water Quality, DEP
18.	Mosquito and Midge Management Plan	To prevent nuisance proportions of mosquitos and midges.	Mosquito and midge control, management and monitoring programs will be provided in a Mosquito and Midge Management Plan. This will include a recommendation that the City of Armadale request the Western Australian Planning Commission impose memorials on the titles of future residential development in the area to advise of the possibility of a mosquito nuisance associated with the waterbody.	Prior to completion of the construction of the Rowing Course	WRC Health Department WA

	Topic	Objective	Action	Timing	Advice
19.	Mosquito and Midge Management Plan	As for Commitment 18.	The proponent will implement the Mosquito and Midge Management Plan.	All phases as determined in the schedule within the Mosquito and Midge Management Plan.	WRC Health Department WA
20.	Archaeological investigations	To fulfil the requirements stipulated on the Section 18 clearances of the *Aboriginal Heritage Act 1972*	The proponent will undertake further investigations which may include, but are not limited to: • Surface recording, mapping and collection of archaeological material; and • Archaeological excavation and/or sub-surface evaluation. A Section 16 permit will be applied for by a qualified archaeologist and relevant Aboriginal people will monitor earth disturbing work during the excavation of Wright Lake and the general development area.	Prior to site works	Department of Indigenous Affairs
21.	Aboriginal Interpretive Centre	To provide information and education opportunities on local Aboriginal heritage and culture.	To plan and develop an Aboriginal Interpretive Centre as part of the Champion Lakes Regional Recreation Park. The centre will be used for, among other things, the display of salvaged material. Substantial input into the decisions for the centre will be made by Aboriginal people, particularly those in the Armadale Shire Community. In addition, a strategy will be developed which will encourage the employment of aborigines within the centre and throughout the Champion Lakes development.	During the planning and implementation of the Champion Lakes Development	Department of Indigenous Affairs

	Topic	Objective	Action	Timing	Advice
22.	Community Education	To provide information on the sensitive nature of the Champion Lakes environment	Information will be provided to all purchasers within a 'Sense of Place' document the Champion Lakes development advising of: • Water conservation and harvesting measures including recommended landscaping; • Water quality issues and need for nutrient management; • Dog and cat control.	During marketing and selling of land and design of signage within Foreshore Management and Revegetation Plan.	DEP City of Armadale Consultation with Armadale Gosnells Landcare Group
23.	Over-arching Environmental Management System	To ensure that all on-going commitments are readily referenced and audited.	The proponent commits to preparing an over-arching Environmental Management System, to integrate all of the long term management and monitoring requirements specified into one plan. This management plan will be prepared by the proponents and will be reviewed every five years, or earlier if needed, based on analysis of data collected or changes in management techniques/technology.	Following the preparation of all of the management plans committed to above.	DEP
24.	Over-arching Environmental Management System	As for Commitment 23.	The proponent will implement the over-arching Environmental Management System.	During the lifetime of the project.	DEP

	Topic	Objective	Action	Timing	Advice
25.	Detailed Planning and Design Strategy	To retain remnant vegetation and Threatened Ecological Communities (TEC) to the extent possible in the detailed planning and design as outlined in Table 1.	In preparing the Detailed Planning and Design Strategy identified in Table 1, the proponent will: ▪ endeavour to identify and retain the maximum area of remnant vegetation; ▪ endeavour to protect any positively identified TEC and the JsX+ vegetation to the east of Wright Lake to the extent possible; ▪ and ▪ consult with relevant conservation and appropriate community groups.	Prior to excavation of the return lane and warm-up lake.	DEP CALM

Appendix 5

Summary of Submissions and

Proponent's Response to Submissions

CHAMPION LAKES MASTERPLAN DEVELOPMENT
PUBLIC ENVIRONMENTAL REVIEW

RESPONSES TO SUBMISSIONS

(EPA ASSESSMENT NO. 1400)

Prepared for:
Western Australian Planning Commission and City of Armadale
c/- 469 Wellington Street
PERTH WA 6000

Prepared by:
Bowman Bishaw Gorham
290 Churchill Avenue
SUBIACO WA 6008
Telephone: (08) 9382 4744
Facsimile: (08) 9382 1177

Report No: M03051
April 2003

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1.0 INTRODUCTION

The City of Armadale and the Western Australian Planning Commission (WAPC), in conjunction with the Armadale Redevelopment Authority (ARA), propose to create a local and regional sporting facility that will provide a variety of sporting uses for the Armadale region. The facility will be located within the proposed 'Champion Lakes' Regional Park. A number of water based activities are included in the proposal, including a rowing course constructed to international standards, together with associated urban land uses and conservation, rehabilitation and management concepts.

The Champion Lakes Master Plan proposal was referred by proponents the City of Armadale and the (then) Ministry for Planning (now the Department of Planning and Infrastructure) to the Environmental Protection Authority (EPA) in September 2001, and the EPA subsequently set a level of assessment at Public Environmental Review (PER). Guidelines for the assessment were provided by the EPA, and a PER was prepared by the proponents to satisfy and address these guidelines.

The PER was available for a public review and comment period of 6 weeks from 10th February 2003 to the 24th March, 2003.

This report provides a summary of the submissions received by the EAP, and the proponent's detailed response to each of the issues raised.

2.0 SUBMISSIONS

A total of 29 submissions were received by the Environmental Protection Authority during and after the advertising period for the PER. A break down of the submitters is provided below:

- 14 from members of the public;
- 2 from adjoining land owners;
- 3 from conservation organisations;
- 4 from sporting organisations;
- 1 from Local Government; and
- 5 from State Government departments.

3.0 GENERAL SUBMISSIONS

The following section provides a summary of the general submissions i.e. not directly related to any one particular PER topic or issue. The wording extracted directly from submissions is in italics. The numbers in parentheses following each summary corresponds to the identification number assigned to each individual submission, the identity of which is unknown to the proponent in most cases.

3.1 General Comments Supporting the Proposal

3.1.1 Sixteen submissions (55%) were submitted in support of the proposed Champion Lakes Masterplan development and facilities citing benefits including:

- *Transfer of savings to the government from the Tonkin Highway construction amounting to around $20 million (dependent on access to Champion Lakes site by June 2003);*
- *Provision of year round international standard rowing and canoeing facilities;*
- *The existing facilities on the Swan and Canning Rivers are heavily used and are subject to severe time constraints;*
- *Social and economic benefits for the Armadale area and WA generally;*
- *Allowing WA paddlers and rowers to train and learn without having to travel to eastern states;*
- *Improvement in standards and numbers of West Australian paddlers as currently rivers unreliable and mostly inaccessible for all but a few weeks a year;*
- *Allows beginners to be introduced to moving water in relative safety;*
- *Active and passive recreation;*
- *Function as a tourist attraction;*
- *Housing diversity;*
- *Employment; and*
- *Enhanced sense of community pride.*

(Submissions 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 21, 23, 29)

With over half the submissions supporting the project, strong support for the proposal is duly noted.

3.1.2 *The direct and indirect positive externalities* (benefits) *will be of great benefit to the Armadale community which suffers from an acute lack of employment and infrastructure investment with consequential social problems. (21)*

The proponent concurs with this comment.

3.1.3 Section *3.3 of the PER has underestimated the social and economic benefits of the proposal, particularly from the proposed whitewater park. Benefits of the whitewater park include:*

- *Provide access to water based sporting and recreational facilities that previously required a drive of many hundred kilometres to reach;*
- *Slalom component will become recognised as best in the world;*
- *Venue of first preference for the conduct of international and national events in canoe slalom and canoe freestyle in the Southern hemisphere;*
- *Range of whitewater facilities including whitewater rafting, tubing, boogie boarding, as well as good facilities for family passive recreation;*
- *Accessed by several hundred thousand visitors each year including high school groups, family groups, tourists and corporate development programs;*
- *Cater for a range of patrons ranging from 5 years and up, with spray park for younger patrons;*
- *Establishment of Australian Moving Water Safety Centre with the goal being to reduce injury and deaths in moving water. It is likely that the Royal Life Saving Society of Australia, Fire and Emergency Services, Water Police and defence forces will use the facility for training;*
- *Auditorium will provide opportunities for open air performances;*
- *Whitewater Park will require up to 10 full time and 90 part time staff;*
- *At least 12 countries have indicated that they would bring their national elite paddling teams to Perth during our summer to train.*
  (5, 6, 7, 8, 9, 10, 11, 12, 15)

The purpose of the PER was to identify environmental impacts and address management of the proposal. The section describing economic and social benefits was included for context and background. However the proponents agree that implementation of the project will undoubtedly result in significant benefits for the locality, region and Western Australia.

3.1.4 *The South East Region Recreation Advisory Group (SERRAG) undertook the development of the South East Regional Sport and Recreational Facilities Plan, which made a number of recommendations regarding the development and/or upgrading of the major sport and recreational facilities in the region. Two of the recommendations contained within the South East Region Sport and Recreation Facilities Strategy Plan relate specifically to the Champion Lakes proposal:*

- *Wright Lake is identified as a prime location for the development of a major recreational facility in the south east region, with provision to be made for a diverse range of aquatic activities, sporting programmes and community and commercial recreational opportunities.*

- *The Cities of Armadale and Gosnells, the Ministry for Planning and the Ministry of Sport and Recreation be encouraged to form partnerships and explore opportunities for the joint venture development of Wright Lake. (23)*

The recommendations of the South East Region Sport and Recreation Facilities Strategy Plan are being actively implemented by both the City of Armadale and Department for Planning and Infrastructure through this proposal.

3.1.5 *It is highly likely that the development of the Champion Lakes Recreation Park will be included in the revised plan as a priority facility development project for the region. (23)*

The proponents support this proposition.

3.2 Level of Consultation Undertaken

3.2.1 *The Armadale Gosnells Landcare Group would be pleased to be further consulted with the preparation of the Construction Environmental Management Plan, Foreshore Management and Revegetation Plan, Wetland Mitigation Strategy, Drainage Nutrient Irrigation Water Quality Management Plan, Acid Sulphate Soil Management Plan and Community Education. (27)*

The proponents will consult with the Armadale Gosnells Landcare Group during the preparation of these plans as appropriate.

3.2.2 *The Free Reformed School Association appreciates the consultative approach that this project has taken, in particular the efforts of Gavin Cann from the City of Armadale in explaining the proposal to the School Principal. (4)*

Duly noted.

3.2.3 *The proponents did not contact the Wetland Conservation Society or the Conservation Council during the preparation of their PER. (3)*

The proponents would be pleased to meet with the Wetland Conservation Society and the Conservation Council to discuss the issues raised in the submission, and opportunities for future involvement and consultation during the further development of the project.

3.3 General Comments on Potential Environmental Impacts

3.3.1 *The proposal has potential impacts on native vegetation, fauna and hydrological values within and surrounding the project area. The Department of Conservation and Land Management (DCLM) believes that provided appropriate environmental management measures are implemented during development then the project could proceed with minimal impact to the environment. Subject to addressing the issues raised in the submission, DCLM has no objections to the Champion Lakes proposal. (26)*

The proponent notes and welcomes DCLM's conditional support for the project. The proponent has addressed the issues raised in the DCLM submission in points 3.5.9, 4.1.3, 4.2.3, 4.2.4, 4.5.6, 4.5.11, 4.5.12, 4.5.13, 5.1.20 and 5.1.21.

3.3.2 *This development requires more thought before it can be considered sustainable or environmentally sensitive. (3)*

This statement is not supported by technical reference to any particular aspect or factor of the PER. However as a general response, sustainability principles are being applied in a multitude of areas including design, conservation, revegetation, habitat and drought refuge creation, stormwater harvesting, reducing open space and landscaping irrigation demand, water sensitive urban design, and commitment to long term monitoring.

3.3.3 *In these times of environmental awareness and the need to accommodate people's leisure and sport, in some type of balance, it is requested that existing wildlife and flora values are preserved or improved in this changing environment and not sacrificed in the long term. (24)*

The technical data and analysis presented in the PER indicates that Wright Lake, and in general the site as a whole, does not have outstanding vegetation, flora or fauna values.

However, the proponent has committed to mitigate for the unavoidable loss of vegetation and degraded wetlands by retaining approximately 7.4ha of remnant vegetation within the development, and setting aside approximately 21ha for the purposes of conservation. Further, it is proposed to retain a significant portion of vegetation on the eastern shore of Wright Lake in conservation oriented open space.

In addition the proponent has committed to preserving and rehabilitating degraded areas of vegetation and wetlands within the Southern River Conservation area (Bush Forever Site No. 260), adjacent to the Site No. 260 in the form of a buffer, and preparation of a management strategy to maintain and encourage species diversity and ecological processes.

3.3.4 *The main environmental issues associated with water-skiing are:*

- *Noise pollution from boat movement and emission of harmful gases, gaseous products and particulates from marine engines;*
- *Emissions of hydrocarbons into the water body, ground water, lake sediments and atmosphere;*
- *Increased water turbidity due to the engine, boat and even the skier;*
- *Disturbance of birds and wildlife due to boating activity.*

There are also benefits of boating and skiing on enclosed waterways and many of these issues have been addressed in the more modern boats. Water-skiing can directly benefit the ecosystem by:

- *Increasing the oxygen content in the water; and*
- *Removing of carbon dioxide and other pollutants from the water body. (16)*

The proponent notes the detailed submission received from the WA Water Ski Association. However, at this time water skiing does not form part of the proposed uses for Champion Lakes. The Champion Lakes concept focuses on non-motorised craft events for rowing and canoeing.

3.4 Ownership Issues

3.4.1 *The bulk of the land allocated for meaningful conservation purposes occurs on land that is not under the ownership of the proponents. Over 3ha of land that is allocated for conservation purposes is actually owned by the Free Reformed School Association who seeks some assurances that the timely and equitable arrangements will be in place for the transfer and acquisition of this land, or alternatively a land swap as previously discussed with Department of Planning and Infrastructure. It is apparent that the Masterplan has made provision for this suggested land exchange. Confirmation on the proposed land exchange is sought via this submission. (4)*

The WAPC has advised the Free Reformed School Association that the proposed land exchange as previously discussed is no longer proceeding, on advice from the Armadale Redevelopment Authority that the WAPC's land is integral to the proposed Champion Lakes Development. However, the WAPC has confirmed an offer to purchase the subject land from the School Association for the purpose of consolidating land reserved under the Metropolitan Region Scheme for conservation and road construction facilities.

3.5 Project Design and Concepts

3.5.1 *Much more of the site should be set aside for conservation. At least 10 hectares of wetland and 10 hectares of bushland in one or two large blocks should be dedicated to wildlife habitat to replace the functions lost by the proposed destruction of Wright Lake. The design of the project should be re-assessed with a view to:*

- *Increasing the amount of wildlife habitat to at least 20 hectares. This should be fenced off but available for passive recreation.*
- *Including one or two small, created wetlands in the habitat areas to provide a water supply for wildlife, including bush and water birds.*
- *Providing minimum setbacks of 50m for potentially polluting activities (such as car parking and housing) from all water bodies. (3)*

Approximately 21ha of land within the development will be set aside for the purposes of conservation and vegetation corridors (the dark green areas on Figure 2 of the PER). Fencing and management of access into the core conservation areas will be proposed in the Foreshore Management and Revegetation Plan to be prepared by the proponent.

The construction of a rowing course, which is effectively a large permanent wetland, will provide 52ha of open water and associated habitat and important drought refuge for wildlife. In the detailed design of the project, particularly in the informal water bodies outside of the main rowing course, the wetland habitats will be designed to provide areas of open water of varying depths. These areas will essentially be smaller diversified wetlands within the overall wetland habitat.

Consequently over 73ha of open water and conservation areas will be created, including an island.

In addition, the proponent has committed to the preparation and implementation of a Wetland Mitigation Strategy, which will include:

- fencing and limiting access by humans and stock into the Conservation Category wetland vegetation at Southern River;
- establishing a dryland buffer zone to Southern River from the development;
- revegetating and restoring the relevant part of the riverine and wetland vegetation as well as the buffer with the Southern River Vegetation Complex;
- undertaking a weed eradication program at Southern River and the conservation area adjacent to Wright Lake;
- rehabilitating and restoring the relevant part of the vegetation adjacent to Wright Lake within conservation areas;
- creating and actively maintaining a large permanent waterbody and living stream to enhance and expand the previous wetland functions and values.

The construction of a small wetland within the cleared area of the conservation area near Southern River is also being considered as part of the Wetland Mitigation Strategy. However this concept is subject to further design and planning.

A setback in excess of the DEP's generic 50m buffer, 70m up to 170m, has been applied to the Southern River Conservation Category wetland boundary (please see PER Figure 8, yellow dashed line). The buffer to Bush Forever Site No. 260 boundary is 40m to 170m.

There is no basis to adopt a 50m buffer from the rowing course to car parking and houses, provided nutrient and stormwater is appropriately managed as proposed.

3.5.2 *The Master plan Concept illustrates mostly linear Conservation Areas, which will be very management intensive and will require significant financial and management input on an almost perpetual basis to assist in their functioning. (17)*

The proponent recognises and accepts that significant management inputs will be required in these areas. This requirement will be sufficiently resourced to ensure that all identified conservation areas are appropriately and effectively managed.

3.5.3 *A very thin linear strip is proposed between the Tonkin Highway and parking areas which is considered unsuitable for conservation purposes, and should be more correctly termed landscaping. One of the functions of such an area should be fauna habitat. This proposed Conservation Area could not perform that function for terrestrial fauna, as road kills would decimate any fauna therein. (17, 3)*

It is agreed that the proximity to Tonkin Highway will reduce the effectiveness of the proposed conservation area for fauna, especially larger ground dwelling animals. Avian fauna are more likely to successfully utilise this area. The proponent concedes that this area may be better described as a "vegetation corridor", rather than a conservation area. Nonetheless it is viewed as an opportunity to plant endemic native vegetation, rather than traditional landscaping species.

3.5.4 *Consideration is requested of the sport of Competition Water Skiing in deliberations and planning for the future of Champion Lakes. It needs and deserves access to an enclosed water area such as Champion Lakes and will be a bonus to the region and have an environmental benefit for the waterway. (16)*

Please refer to response 3.3.4.

3.5.5 *The proposal to establish a rowing course that offers little potential to create revenue, in the path of this districts notoriously ferocious gully winds, appears to be a seriously flawed concept, especially after analysing wind induced disasters in the Eastern States in what appears to be less wind prone areas. (28)*

This submission provides no evidence that the proposal has little potential to create revenue, and the relationship of this aspect to wind characteristics is unclear. In any event, the purpose of the PER is to address environmental issues, not provide a detailed economic analysis of the proposal. Notwithstanding, the rowing course is the subject of a separate feasibility study which considers the viability of the facility in the context of the

entire project, not simply as a stand alone entity. The financial viability of the facilities is relevant to the government's commitment to the project.

Section 3 of the PER details the considerable analyses over a substantial period of time that has been applied to the selection of a site for an international standard rowing facility and associated uses. The Wright Lake site has been selected as the preferred site based on a multitude of criteria.

In terms of wind, both FISA (Fédération Internationale des Sociétés d'Aviron, or Federation of Rowing Associations) and Rowing Australia require the proponent to undertake several years of wind studies of the area before classifying the venue suitable for international and national events. Gully winds will be diffused by the design and location of buildings and vegetation along the course. Some wind is considered acceptable, as long all rowing lanes are equally affected. While there is no evidence to indicate that prevailing winds will unreasonably impact upon an international standard course at the subject site, it is likely that wind tunnel model testing will be undertaken at the detailed design stage of the project.

3.5.6 *The third proposition outlined in the PER for no rowing course is supported as it allows a better usage of the land available. (28)*

It is unclear what "better usage" refers to. However, it is important to understand that the site provides two unique, and most probably one-off (due to the integration of the lake construction with the program for the Tonkin Highway extension which represents a $20 million saving to government), opportunities to implement an international standard rowing course in the Perth Metropolitan Area and Western Australia:

- the substantial area of land, in the required shape, is available under one ownership and is appropriately zoned as Parks and Recreation under the Metropolitan Region Scheme; and

- excavation of the course can be completed by Main Roads contractors, with the direct transfer of excavated material to support the adjacent extension of Tonkin Highway.

The planning for Champion Lakes as a water-based regional recreation park has been undertaken over a period of years, and the proponents have always viewed the rowing course as an essential element of the project. Importantly, development of the rowing

course will deliver a world-class facility to an area that is currently under-represented in terms of regional sporting and recreation amenity. The rowing course is also seen as an important opportunity to underpin the project by exposing Champion Lakes and the Armadale region to quality international sporting events. For these reasons, the proponents consider that the development of a championship standard rowing course is the preferred option for the site.

3.5.7 *A concept which could harness this wind aspect, a revenue producing wind farm, erected above the lake is less fanciful. This concept might better allow for continuing better usage of the area as a seasonally waterfowl reproducing site as it has been for the past 100,000 years well before human habitation. The income from the wind farm would allow Armadale to become a university city, culturally and aesthetically attractive and less dependent on commercialism for development. (28)*

A detailed history and justification for the proposal is outlined in Section 3 of the PER. Strategic planning documents such as the *Planning Structure for the Southeast Corridor, Metroplan* and *the Southeast Corridor Structure Plan South of Armadale* earmarked approximately 136 hectares of rural land including Wright Lake, on Lake Road Kelmscott for the development of a Regional Recreation Park in the late 1970's and 1980's. Since that time, planning for the site has focused on providing the residents of Armadale and the south-east metropolitan corridor with a recreation facility of regional significance, and the land has been progressively acquired by Government for this purpose. The current proposal is consistent with those strategic objectives.

The proposed uses would conflict with the intended recreational qualities of the site. There is no evidence to support the viability of windfarms at this location.

3.5.8 *An alternative development plan was submitted for the site which contains several colleges of learning and associated housing for the use of overseas students as the main components. The vision is to create a cultural educational centre, rather than another fun park – housing estate development. Housing of overseas students, colleges and possible wind farms are revenue earners to assist development works of the Armadale Development Corporation. The proposed housing and colleges may be interspersed and integrated amongst reintroduced original bird, animal and fauna life now extinct. This proposal will restrict sand removal to Wright Lake and other proposed lakes. The centre may become a place*

of democratic internationalism blueprinting the way forward for multiculturalism and reconciliation. (28)

Please refer to response 3.5.7 in response to this statement.

The proposed Champion Lakes project is not a fun park. The proposed international rowing course facility will be one of only four FISA accredited rowing courses in Australia, and the whitewater park will be one of only two in Australia catering for international sporting events and water safety training.

Although these facilities will be used and enjoyed by the Western Australian public generally, these facilities are also designed and constructed for the purpose of holding Australian and International rowing and canoeing championships. The residential component of the development is an important element of the project's viability. However, it also provides the opportunity to increase the variety of housing currently available in Armadale, and to integrate existing residential areas east of Lake Road with the Champion Lakes development.

It is noteworthy that the Master plan also proposes an Aboriginal centre and a conference centre.

3.5.9 *Thought should be given within the detailed site design stage to increase areas of remnant vegetation that are retained within the project area. (26)*

Approximately 88% of the project area has been cleared of native vegetation for rural activities. Consultant botanist Dr Weston (2002) considers that the study area's remnant vegetation is mainly in degraded and weedy condition, with relatively low diversity of plant species, and consequently does not have particular regional significance. However, the proponents have maximised the retention of native vegetation where possible and will further explore this aspect in the detailed design stage of the project.

3.6 Management

3.6.1 *What is proposed after construction? There is no mention of an EMP for ongoing maintenance of the site, especially the conservation areas. Who will be responsible for this? The EPA must insist on an EMP for the post-construction phase (operational phase) and this must be reviewed and updated every five years*

as part of the operating licence. This is a very complex project and the potential for serious pollution is evident. A long-term EMP is essential to prevent this. (3)

As described in the PER, the proponent has committed to preparing and implementing a detailed Foreshore Management and Revegetation Plan prior to construction of any buildings within the site which includes:

- Comprehensive Weed Control Program;
- Revegetating and restoring conservation areas with appropriate indigenous flora of the Southern River and Forrestfield Complex;
- Creation of habitat and wildlife corridors;
- Control of vehicle, stock and pedestrian access;
- Permanent fencing and public facilities;
- Water conservation and harvesting principles (Commitment 6);
- Soil and plant source material hygiene;
- Fire management including provision of fire hydrants;
- Provision of educational and interpretative materials within the area;
- Long-term monitoring criteria to determine the success of the revegetation and weed eradication program;
- Progress and Compliance reporting; and
- Timing and implementation schedule.

There will be a number of management requirements identified in the plan that will be on-going (weed and fire management for example), and the proponent has committed to undertaking long-term monitoring of the success of the plan.

There are also a number of other management plans that the proponents have been committed to during and following construction (please refer to Section 7 of PER) which includes a Drainage Nutrient Irrigation and Water Quality Management Plan. Of these plans, it is envisaged that all but the Construction Management Plan will have ongoing long-term management components. The long-term performance of these plans will be audited on an annual basis by the EPA Service Unit as part of the standard conditions for the approval of the development.

However the proponent agrees that, for ease of auditing of the long term commitments, it may be beneficial to integrate all of the long term components of the prepared management plans into one over-aching Environmental Management System. As such the proponent commits to preparing and implementing an over-aching Environmental

Management System, following the preparation of all of the managements committed to previously, to integrate all of the long term management and monitoring requirements specified into one plan. This management system will be prepared by the proponents and will be reviewed every five years, or earlier if needed, based on analysis of data collected or changes in management techniques/technology, and the outcomes of the annual EPA audit.

3.6.2 *The Armadale Redevelopment Authority in its statutory capacity will ensure full compliance with EPA conditions and attempt to ensure best practice urban water management in all project developments. (21)*

The proponents acknowledge and appreciate the partnership being forged with the Armadale Redevelopment Authority to facilitate the successful implementation of this project.

3.6.3 *There are many environmental management strategies proposed for the various potential impacts. These will need to be carefully monitored to ensure they are being undertaken in the correct manner and the ongoing results managed correctly. (22)*

Agreed. The requirements outlined within these plans will be monitored by staff employed within the facility, contractors and health agencies, and will be audited on an annual basis by the EPA Service Unit as part of the standard conditions on the approval of the development. The ongoing over-aching Environmental Management System committed to in response 3.6.1 will be reviewed every five years or earlier if needed, based on analysis of data collected and changes in technology.

3.6.4 *It is recommended that a management group consisting of the DEP, DPI, Armadale Redevelopment Authority, City of Armadale, Sporting body and a member of a key local catchment group be formed to meet quarterly for the first three years, and then 6 monthly thereafter. All of the results of the proposed management strategies will be presented to this body to ensure any potential environmental impact is identified at the early stage and rectified. (22)*

The establishment of a management body or committee with the above members, to review the environmental performance of the project, is supported by the proponents.

3.6.5 *At this stage the proponent is the City of Armadale while the site has been identified in the future coming under the planning considerations of the Armadale Redevelopment Authority. Who will be legally responsible to pay for the ongoing environmental management strategies and also any future environmental repairs? (22)*

The City of Armadale and the WAPC, as joint landowners, are joint project proponents. It is likely that responsibility for delivery and ongoing management of the project will be transferred to a single public authority, together with the responsibility for compliance with all environmental approvals. That authority will be appropriately resourced, in terms of both personnel and funds, to meet the environmental management obligations associated with the project.

3.6.6 *The commitment of the proponent to undertake the management of the conservation area is creditable and will help to fulfil the recommendations of the Upper Canning Southern Wungong Catchment Management Plan. It is noted however that must be a long term budgetary commitment to successfully implement any conservation measures. (27)*

Refer to response 3.6.5. It should also be noted that the Armadale Redevelopment Authority is establishing a planning scheme (planned to be implemented by end of 2003). The scheme will provide for the determination and recoupment of necessary costs through the provision of scheme's cost's.

3.7 Traffic and Other Issues Adjoining School

3.7.1 *Provide assurance that the impact from the 3 new proposed roads surrounding the school site will not unduly affect school children in terms of noise levels, safety and pollution.* (4)

One of the three roads shown south of the school property on Figure 2 within the PER is Champion Drive. This is a proposed 'Regional' road which is not part of the proposed Champion Lakes Development Master Plan. It was shown on the figure to provide context to the location of the Champion Lakes facilities to existing and proposed infrastructure.

The other roads shown within the Champion Lakes Mater Plan site boundaries are only indicative at this stage. The road layout will be considered and determined in the next stage of detailed design and will be the subject of a development application which will necessarily address the issues raised.

It is anticipated that the road off of Champion Drive past the school and into the site will be a local road only, and is not expected to transport high volumes of traffic. Traffic volumes to the Champion Lakes site are likely to be higher on the weekends and before and after school hours.

In terms of noise, the project will be required to comply with the relevant criteria relating to neighbourhood noise.

3.7.2 *Assurance that the new roads surrounding the existing school site and the proximity of the proposed Champion Lakes Regional Recreation Park will not pose an increased security threat upon the School premises (eg. Vandalism).* (4)

The Master Plan indicates that there will be urban land uses (most likely residential) and a conservation area closest to the school grounds, where none exist at present. This factor has the potential to reduce vandalism at the school through passive and active surveillance from the proposed residential area.

3.7.3 *Some solutions to the above mentioned issues may include:*

- *Potential land exchange with existing school owned property and immediately adjoining government owned land;*
- *Bunding and landscaping of roads;*
- *Fencing; and*
- *Ensuring less noise and activity at the school interface with the complex. (4)*

Please refer to response 3.4.1 in regards to the land exchange issues, and 3.7.1 regarding road issues.

Bunding, landscaping and fencing are detailed design issues that will be considered in later design stages for inclusion in any development application. The final determination on these issues will be made following consultation with the School Association and any other affected parties.

3.8 General Submission Relating to the PER

3.8.1 *The PER report is hastily prepared incomplete and inconclusive, created to satisfy what appears to be a premature start to creating an international rowing course. For instance the report does not:*

- *Provide details of capital establishment costs, running costs, and annual revenue expectancy;*
- *Does not advise sufficiently that soils analysis is as yet conclusive and finalised;*
- *That it does not sufficiently investigate all aspects of establishing a course in the driest and windiest state. It should have been acknowledged that the local area is the windiest area of the windiest state – being continually affected, during much of the year by winds tunnelling through nearby range gullies;*
- *It should have revealed disastrous situations at other Australian Rowing Courses such as once when rowers oars became entangled in an unexpected weed growth;*
- *Does not sufficiently reveal the likely delays arising from Aboriginal sensitivities, or problems arising from the use of subject lands for purposes other than for which they are acquired (open spaces). (28)*

The PER report and associated investigations were prepared over a course of a year from appointment of consultants on the 6 February 2002 and subsequent release of the PER on the 10 February 2003.

The proponent is not required to divulge the business aspects of the proposal within the PER process, nor is the EPA permitted to assess the proposal on economic grounds under the *Environmental Protection Act, 1986*.

A contamination Preliminary Site Investigation (PSI) was completed as part of the PER. Soil contamination sampling investigations were not required to be completed within the PER process, however the proponents have proceeded with the testing during the time from release of the PER. The results of the contamination testing undertaken to date have been provided in response number 5.5.1. Similarly further investigations have occurred on Acid Sulphate Soils which is provided in response 5.4. As expected, no fatal flaws have been identified.

Significant work has been undertaken on the water requirements for the proposal in its current location (please refer to Sections 5.1.and 5.2 of the PER). Wind characteristics in

the area are acknowledged, however there is no evidence to support the supposition that prevailing wind strength is sufficient to impact upon the functionality of an international rowing course. In any event, the proponents will be required to achieve the standards set by FISA and Rowing Australia. However it is not an environmental impact, and is not considered by the EPA in its assessment of the proposal.

In relation to weed growth, which relates to an incident at the Penrith International Regatta Facility, there is a requirement for aquatic flora to be a minimum depth beneath the bottom of the rowing boats for competitions. If aquatic flora grow too long or float at the surface, rowers coming into contact with the plants with their oars can protest their place in a competition. At Penrith, the course is connected to a river system and it is our understanding that initially no monitoring of flora entering the course was undertaken, and unwanted species were able to establish rapidly in the course, which now require on-going management. The Champion Lakes IRC is in the fortunate position of having a "closed system", and learning from past experiences both nationally and overseas, and plans to monitor and manage this aspect from inception.

In regards to delays due to aboriginal sensitivities, comments from the Department of Indigenous Affairs in its submission on the PER are relevant, which state:

"The proponent is in compliance with the Aboriginal Heritage Act 1972. The proponent has a conditional consent issued by the Minister for Indigenous Affairs. The environmental management provisions regarding heritage are adequate to preserve cultural values and mitigate impacts on heritage values."

The land has been acquired for the purpose of establishing a regional recreation facility. The current proposal is consistent with that purpose. The land owned by the Western Australian Planning Commission was acquired pursuant to the *Metropolitan Region Town Planning Scheme Act 1959* and reserved under the Metropolitan Region Scheme. The Champion Lakes project will however be developed under the provisions of the *Armadale Redevelopment Act 2001* and the Armadale Redevelopment Scheme. The provisions of the MRTPS Act and the Metropolitan Region Scheme will therefore not apply to the project.

4.0 SUBMISSIONS RELATING TO BIOPHYSICAL FACTORS

4.1 Terrestrial Flora – Vegetation

4.1.1 *Potential environmental impacts to the vegetation retained must also include the proposed lowering of the watertable, beyond that stated from dewatering during construction. (17)*

The potential impacts on groundwater dependent ecosystems were considered in the PER under the factor of water quantity (Section 5.2), however discussion on the issue has been expanded in the response to 4.1.2.

4.1.2 *The adjacent reach of the Southern River is groundwater dependent in summer. Any drawdown will negatively impact an already stressed system. A lowering of the groundwater head will have impacts on groundwater dependent ecosystems. Scenario 10 will have a drawdown effect of 0.2-0.5m. (17)*

The proposed water resource is the Yarragadee aquifer. It is envisaged there will be negligible impact on the Southern River for the following reasons. The predicted drawdown presented in the PER is based on very conservative model parameters, agreed with the Water and Rivers Commission, which assumes there are no confining layers between the superficial aquifer and the Yarragadee aquifer 600m beneath the surface.

However, in reality it is highly likely that confining layers will exist between the superficial, Leederville and Yarragadee aquifers as found elsewhere on the Swan Coastal Plain. If present, these will significantly limit the potential drawdown on the superficial aquifer.

The modelled drawdown was predicted to occur over a period of 25 years, which at the worst case scenario calculates to be a drawdown of approximately 2cm a year. This small and gradual drawdown could logically be expected to be within the tolerances of healthy vegetation. For example, the Water and Rivers Commission recently advised that that groundwater levels on the Gnangara Mound were now on average of 20-30cm lower than at the same time last year (West Australian, Saturday 29 March, 2003).

Notwithstanding the above, the proponents will install a test bore on the Champion Lakes site in April 2003 to determine the properties of the aquifers beneath the site. This test bore will establish the presence of any confining layers and test pumping will be carried out to re-calibrate the drawdown modelling. This will provide an accurate prediction of potential impacts and drawdown, which is expected to confirm that the potential drawdown will be much less than predicted in the initial worst-case scenario modelling.

It is noted that the proponents' on-site experience indicates that the Southern River is now summer-dry adjacent to the site. Subject to satisfactory water quality, and approval from the Water and Rivers Commission, there may be an opportunity for environmental release of water from the IRC.

4.1.3 *The project area contains remnant vegetation representative of the Forrestfield and Southern River Complexes. Both of these vegetation complexes are not currently well reserved and therefore their retention wherever possible should be considered a high priority. Currently only 2% (219ha) of the original Forrestfield Complex and 6% of the original Southern River Complex (1,775 ha) have some form of protection. DCLM supports the proponent's commitment to retain and rehabilitate a conservation area within the Champion Lakes project area and also encourages the retention of any additional areas of remnant vegetation during the detailed design process. (26)*

The proponent notes the DCLM support and will endeavour to protect more remnant vegetation in the detailed planning and design of the development, including replanting species from these Complexes in revegetation and rehabilitation areas. Please also refer to response 3.5.9.

4.1.4 *An area of good bushland north of Wright Lake should have been discussed in the report. This was evaluated by Malcolm Trudgeon in his report to the City of Gosnells "A Survey of Remnant Vegetation in the City of Gosnells west of the Darling Scarp". Although, Tonkin Highway will separate Wright Lake from this bushland, amazing birdlife has been recorded and still exists there, along with many grey kangaroos must have an influencing presence on Wright Lake. (24)*

This vegetation is outside of the Champion Lakes Master Plan area accordingly it is not impacted by the proposal, however it is noted and described in the PER on page 24 (Section 4.1.4) as being in better condition and richer in species than the vegetation contained within the Master Plan area. It is also noted on page 53 (Section 4.7.5.2) in

relation to the proposal to improve the fauna linkage from Southern River to the remnant woodland.

Maintaining linkages from this bushland to the IRC and conservation areas, and improving its linkages to Southern River, will continue to be considered in the design and layout of the Champion Lakes development. It is unknown whether this vegetation will be retained within the future urban development of the adjoining land, however the proponents have assumed that it will be for the purposes of the Master plan. It is also recognised that once constructed the Tonkin Highway will provide a significant barrier for wildlife movement between the two areas.

4.2 Terrestrial Flora – Threatened Ecological Communities

4.2.1 *Worst case scenario provides for a maximum of 3.38ha of possible Threatened Ecological communities (TEC's) in Good to Completely Degraded condition to be cleared. Further, this scenario provides for 2.6ha of JsX+ vegetation type in Community FCT 20b adjacent to Wright Lake to be cleared. This is considered unacceptable for an endangered community, as described by English and Blythe (1997). Further investigation and clarification of the possible status of the TEC's is recommended prior to any loss of important biodiversity. (17)*

The term "possible" is considered the essential and logical key to this issue.

Vegetation assessment, condition assessment, and rare flora searches of the study area were conducted through intensive field surveys in March, April, July and September 2002 by Dr Arthur Weston (Weston, 2002). Dr Weston has advised that it is not possible to undertake more detailed studies or surveys which will further clarify or determine the "possible" existence of TECs or FCT's located within the site. In correspondence to BBG dated 2 April, 2003 Dr Weston has advised:

> "Possible" TECs on the site are all floristic community types, and, as I state on Page 8 of my report, "it would not be possible to assign most, if any, of the vegetation of the study area to any floristic community type with confidence, even on the basis of detailed floristic analysis, because there is so little native understorey and ground layer vegetation left in it".

Consequently, the proponent considers that the presence of TEC's or FCTs's within the Master plan area has not been, and cannot be, determined with any scientifically accepted accuracy.

Further, no Declared Rare or Priority flora was recorded within the site.

Given these facts, the proponent does not consider that the proposal could be deemed to result in any significant or important loss of biodiversity on the Swan Coastal Plain. Indeed, given the significant habitat creation and management proposed, biodiversity at the site is more likely to increase.

4.2.2 *It is recommended that the 1.3ha of JsX+ vegetation type that is cleared be revegetated elsewhere in the reserve. (27)*

This submission has highlighted an error in the PER report. The PER report on page 29 (Section 4.2.4) states that:

The worst case scenario for FCT 20b, which has the largest potential area, is that 2.6ha of JsX+ adjacent to Wright Lake will be cleared. However it is proposed to retain 1.3ha of the JsX+ vegetation within conservation areas, and more of this vegetation will be considered for retention during the detailed planning and landscape design of the boat launch and picnic area.

Reference to 'JsX+' in the above paragraph should be replaced with 'FCT 20b'. A maximum of 2.6ha of FCT 20b will be cleared within the whole site. A maximum of 0.17ha of the JsX+ will be cleared adjacent to Wright Lake.

Similarly there is 1.3ha of FCT 20b being retained over the whole site, not just within JsX+. A minimum of 0.22ha of JsX+ is proposed for retention adjacent to Wright Lake, with the remaining 0.17ha of JsX+ being considered for retention in the detailed design stage.

In relation to the submitter's recommendation, the proponent has committed to preparing a detailed Foreshore Management and Revegetation Plan which will include revegetating and restoring conservation areas with appropriate indigenous flora of the Southern River and Forrestfield Complex. The proponent considers that it would be beneficial to replace some of the JsX+ vegetation along the eastern margin of Wright Lake where weedy tree species currently dominate. The proponent will determine and report on the practicalities

of undertaking this revegetation as part of the Foreshore Management and Revegetation Plan.

Please also see Response 4.2.1.

4.2.3 *The two TEC's proposed to be cleared are Floristic Community Types (FCT) 3b Eucalyptus calophylla – E. marginata woodlands on sandy clay soils (Vulnerable) and 20b Eastern Banksia attenuata and/or E. marginata woodlands (Endangered), both representative of plant communities found on the eastern side of the Swan Coastal Plain. These communities are threatened as a result of the high clearing rates applied to these areas in the past. Although the presence of these communities is only inferred due to their degraded state they still have conservation significance at both a local and regional level. (26)*

Dr Arthur Weston has advised that he tentatively agrees with this statement to a limited extent, namely that the JsX+ stand between Wright Lake and Lake Road, which is "probably" a representation of FCT 20b and the condition of which is assessed as Good (4), has conservation significance at both local and regional levels. On Page 11 of Dr Weston's report in Appendix D of the PER, it is noted that this stand does have native plants in its understorey (more than in any other stand of bushland in the study area), and that this vegetation type does not appear to be represented in any of the ten Bush Forever sites shown in Figure A1 of the report. Of the total 0.39ha area of the stand JsX+, 0.22ha will be retained in a conservation area and a maximum of 0.17ha will be cleared. However it is expected that this figure will be reduced during the detailed planning and landscape design of the boat launch, carpark and picnic area.

Because the condition of the other possible representations of FCT 20b (EtcMpJsX, EmcBamX+, Ec+?, JsXWs+, JsX) is assessed as Degraded (5) or/to Completely Degraded (6), and they have few to no native plants in their understoreys, Dr Weston's opinion is that determination of FCT is impossible, and their conservation significance is limited, if any.

Dr Weston considers that the vegetation tentatively identified as FCT 3b (Wg and EcmX?) and in condition assessed as mainly Completely Degraded (6) or worse (with three small stands west of the junction of Cammillo Road and Lake Road assessed as Degraded to Completely Degraded [5-6]) has no conservation significance, at either local or regional levels.

Bush Forever (Volume 2, Page 494) states that vegetation in Degraded condition has "Scope for regeneration but not a state approaching good condition without intensive management". It does not comment regarding the possibility of regenerating Completely Degraded vegetation.

Please also see Response 4.2.1.

4.2.4 *To provide a balance for the clearing of these areas the proponent should make a commitment to provide additional protection or improvement to other areas of FCT 3b and 20b. DCLM recommends an appropriate offset be provided such as the purchase and reservation of freehold or unreserved land containing the same FCT's or by the proponent undertaking weed control and rehabilitation on reserved land which contains these FCT's. (26)*

The proponents have considered DCLM's and the EPA Service Unit's suggestion of preparing and implementing a Vegetation Mitigation Strategy for the loss of the vegetation within the site. The proponent's recognise and acknowledge the rationale behind providing offsets for clearing of TECs, if they exist at the site (please see Response 4.2.1).

WAPC is currently negotiating with the Free Reformed School Association to purchase land containing the Southern River and associated vegetation in the south of the Champion Lakes site. Part of this area (~2.69ha) was identified for protection within Bush Forever Site No. 260 (refer Section 4.3 of PER), however the proponents are purchasing a greater area of land (3.08ha) for the purposes of consolidating, restoring and revegetating the riparian vegetation and a dryland buffer into a ~8.69ha conservation area. The existing vegetation does not contain any TEC's, but it forms part of the Southern River Complex which is below the 10% retention threshold level set by the EPA (refer to PER Section 4.1.3.1).

Given the advice provided by Dr Arthur Weston in response 4.2.1, that it is not possible to assign most, if any, of the vegetation of the study area to any Floristic Community Type with any scientific confidence, it is not possible to ascertain with any confidence the existence of TECs within the site.

Of the vegetation within the site, the proponent is of the view that the JsX+ is the most significant and worthy of protection. A maximum of 0.17ha of this JsX+ stand will be cleared, and 0.22ha will be conserved and rehabilitated. The proponent will be protecting

and rehabilitating a further 1.1ha of "possible" TECs within the Champion Lakes site, which will involve weed management and revegetation.

Consequently the proponents do not consider it reasonable to be requested to purchase or manage vegetation outside of the site as part of a Vegetation Mitigation Strategy, other than that being obtained to achieve the objectives of Bush Forever which is arguably a vegetation mitigation strategy in itself, when the presence of any TEC's or FCT's within the site cannot be scientifically confirmed, despite intensive investigation.

Notwithstanding the above it is noteworthy that the WAPC, one of the proponents, has proposed to secured a total of 17,797ha extra land for conservation, more than doubling the protection of the Forrestfield Complex (adding an extra 354ha) and adding an additional 1,372ha of land containing the Southern River Complex through the Bush Forever initiative.

4.3 Terrestrial Flora – Bush Forever Site No 260

4.3.1 *Potential environmental impacts to Bush Forever Site No. 260 must also include the proposed lowering of the watertable, beyond that stated from dewatering during construction. (17)*

The long term drawdown from the groundwater abstraction is expected to be minimal and within the normal tolerances of the vegetation. Further modelling on the potential drawdown will be conducted following test pumping in the Yarragadee aquifer. Please refer to response 4.1.2 for more detail.

4.4 Terrestrial Flora - Weeds

4.4.1 *Any successful weed control strategy must include a revegetation component, or be allied to a revegetation strategy, to be successful. These two strategies must be integrally linked. (17)*

Agreed. The proponent has committed to preparing a detailed Foreshore Management and Revegetation Plan which includes both a weed control program and revegetation provisions (PER Section 4.3.5).

4.5 Fauna

4.5.1 *Suggest consideration of a cat-exclusion area for adjacent new urban subdivisions, similar to the City of Stirling's Churchman's Estate Town Planning Scheme Amendment, proposed to be superseded by a Local Law specific to that area. (17)*

The City of Armadale and Armadale Redevelopment Authority have considered this suggestion and although they agree with the principle, they are concerned about the difficulties in policing such provisions. The potential impacts associated with pets in this area and the responsibilities that come with cat ownership will be provided in the 'Sense of Place' education document to all prospective residents. In addition the conservation island will provide a safe refuge for wildlife within the project area.

4.5.2 *It is generally considered that the Master plan Concept does not provide sufficient wildlife corridors. (17)*

Figure 3 of the PER demonstrates that the site is mostly cleared (88%) and currently does not provide any vegetated linkage between the two most significant features on the site; Southern River and Wright Lake.

The proposed Master Plan concept provides a 20m wide vegetation corridor from Southern River to the northern end of the IRC, as well as providing a long conservation island and vegetated strip between this area as a 'stepping stone' for birdlife.

The perimeter of the rowing course will also be vegetated with fringing and emergent vegetation running the length of the course. It is considered that the Master Plan provides better opportunities for fauna movement within the site than currently exist.

4.5.3 *Suggest consideration be given to the use of felled trees from the site as roosting poles/habitat within conservation areas and open water. (17, 27)*

The proponent agrees and has arranged for the small amount of cleared vegetated material to be stockpiled on the site for use in rehabilitation, roosting poles and habitat creation.

4.5.4 *With regards to the loss of mature trees, migratory bird habitat may be affected during works as a result of dewatering, and as a result of clearing. Timing or staging of works needs to consider this aspect. (17)*

The rowing course and associated water bodies will be constructed in stages of approximately 100m long, and will take approximately 18 months for earthworks to be completed. Timing of construction around Wright Lake will avoid periods of peak water levels, from July-August through to October-November which coincides with potential for peak bird breeding and nesting times.

Clearing within the site will be staged. The construction of the rowing course will occur first, and consequently those areas south of Cammillo Road in the path of the rowing course will be cleared as Stage 1. Clearing in the area in the vicinity of Wright Lake north of Cammillo Road will occur approximately 5 months later, in the summer months, closer to the start of construction in that area.

Clearing over the remainder of the site will occur at later stages once detailed planning has been completed.

4.5.5 *Serious consideration must be given to the fact that "impacts associated with the development around Wright Lake may be difficult to manage and changes to fauna assemblages will be inevitable."(17)*

The quoted information was provided by Dr Mike Bamford, consultant ecologist to the project, and is recognised by the proponents. Making Wright Lake deeper and permanent will alter some vegetation and the aquatic invertebrate fauna, which will probably benefit some waterbirds but may disadvantage other species, and the relative abundance of species will probably change (Bamford, 2002).

In order to establish changes in the biodiversity present on the site it is proposed to undertake aquatic fauna and waterbird monitoring over a period of at least two years from completion of the rowing course. Should the monitoring establish that there is a significant decrease in the biodiversity and abundance of fauna occurring in the water body compared to Wright Lake prior to development, this will trigger the proponent to provide further offset requirements within the Wetland Mitigation Strategy for augmentation of habitat values.

4.5.6 *Bamford's fauna report states that Quenda (a Priority 4 species) were found in the south-eastern corner of Wright Lake, and it is suggested that they probably occur throughout the site where dense vegetation exists (Appendix G, pg. 8). The development of the Champion Lakes Project will result in the loss of a large portion of their habitat within the proposed development area. DCLM supports the proposal to translocate Quendas from the development site to another area (Section 4.7.5.4 pg53). However, any translocation proposal should be developed in close consultation with DCLM. (26)*

As previously noted the site is largely cleared (88%) of native vegetation, and remaining vegetation is generally in poor condition. Where populations are identified, a translocation program will be developed and organised in close consultation with DCLM.

4.5.7 *No mention is made of the re-introduction, post-construction, of the Quenda. Comment is required on the likely recolonisation from adjacent linked areas, or otherwise re-introduction. (17)*

Quenda have a relatively high reproductive rate and are known as effective colonisers with the ability to quickly re-establish in areas of vegetation once a population has been removed, taking as little as two to three months to reach the previous population levels (Dr Peter Mawson CALM 2001 pers. comm.). It is expected that the Quenda will recolonise around Wright Lake post construction from the vegetation to the north-west of the development, depending upon territorial requirements.

Quenda are territorial animals, although they commonly share territories within a larger home range. Survival of each individual depends upon the possession and defence of an adequate territory, which can be up to 7ha (Braithwaite, 1983). Studies at Harry Waring Nature Reserve south of Perth found population densities in dense shrubby vegetation, which was fenced to exclude predators, of one Quenda per 1.6ha (Nagy *et al*, 1991). As such the vegetation around Wright Lake post-construction is expected to only be large enough to sustain up to two Quenda.

4.5.8 *Mammals of the area do include the Quenda as stated in the report. A dense understorey vegetated area should be established so their presence can continue, and not driven out of the area during construction due to lack of shelter and habitat requirements. (24)*

As described in response 4.5.7 it is expected that Quenda will actively recolonise Wright Lake post-construction, subject to territorial requirements.

4.5.9 *There are concerns about the loss of aquatic fauna within the lake during dewatering and the associated loss of habitat for migratory birds. (27)*

Timing of construction around Wright Lake will avoid periods of peak water levels, from July-August through to October-November. It is the contractors preference to undertake the construction work when the lake is dry.

4.5.10 *Wright Lake has always been shallow and dry and to lose its shallow water is a loss for wading birds. Admittedly a permanent deep lake will benefit other species. (24)*

Anecdotal evidence provided from early residents of the area suggests that Wright Lake was in fact permanently inundated prior to 1965 (refer to Section 4.8.3.2 of PER).

Some seasonal shallows will be provided in the detailed design of the water body to allow the continued use of the area by wading birds, most likely on the eastern shore of Wright Lake. As detailed in response 4.5.5 monitoring will be undertaken to establish the variance in bird species and abundance pre and post construction.

4.5.11 *The proposed development may lead to disturbance and loss of native fauna that currently utilise the area. This is of particular relevance to a number of bird species that utilise the Wright Lake area. (26)*

Please refer to responses 4.5.5 and 4.5.10.

4.5.12 *Development of the Wright Lake area may lead to changes in the composition and number of waterbirds that currently utilise the site. Although the site is relatively species poor when compared to a Ramsar wetland such as Forrestdale Lake it still provides valuable habitat for a number of waterbirds (Section 4.7.3.3, pg. 44). It is important that appropriate thought is given to maintaining a mixture of habitat types to allow different waterbird species to continue using the area. A variety of habitat types should be maintained within the project area to allow different species of waterbirds to use the area. (26)*

The proponent agrees that a variety of habitat types should be maintained within the project area. This issue will be considered in the detailed design of the water body.

It is also relevant to note that the IRC and surrounding habitats will provide a large, dependable and hence valuable drought refuge for the region.

Please also refer to responses 4.5.5 and 4.5.10.

4.5.13 *In conjunction with the development it may be appropriate to undertake monitoring of the area for the first two years after project completion to give an indication as to the type and mix of waterbirds which are utilising the area. (26)*

Agreed. It is proposed to undertake aquatic fauna and waterbird monitoring over a period of at least two years from the completion of the rowing course. Please also refer to response 4.5.5.

4.5.14 *The large, artificial waterbody created by this proposal will not be suitable as wildlife habitat as it will be dredged and there will be frequent disturbance by boats and spectators. (3)*

The proponent strongly disagrees with this statement. Whilst people will be the principal users of this facility at some times, the course will provide on-going and significant habitat and refuge for wildlife. For example, the Penrith Lakes Development Corporation has recorded over 75 species of water birds visiting or nesting in the Penrith International Regatta Centre and lake system, and several indigenous species of fish successfully breeding.

4.5.15 *Concern is expressed regarding the loss of the aquatic fauna and flora within the lake during dewatering and post-construction of the facility. A "complex of impacts, both beneficial and deleterious" will result from the alteration of the Wright Lake. (17)*

Please refer to response 4.5.5.

4.6 Wetlands

4.6.1 *This proposal will completely transform the local environment and destroy over 30 hectares of natural wetland and several hectares of good quality bushland. The proponent has made no real attempt to replace these lost values and functions with anything comparable from a wildlife habitat perspective. (3)*

The proponent strongly disagrees with this statement. Of the total 96.01ha wetland area mapped by the WRC within the site, approximately 14.51ha (~15%) contains remnant wetland vegetation, all of which is in Degraded or Completely Degraded condition. Including the wetland bed of Wright Lake, the total remaining wetlands of any significant ecological value is approximately 33.8ha (~35%). The remaining 65% of the mapped wetland areas are totally cleared or parkland cleared, and is used for residential or agricultural purposes.

There is one Conservation Category wetland within the site which will be protected with a buffer in a conservation area. The remaining wetlands are Resource Enhancement or Multiple Use wetlands.

The proponent will implement a Wetland Mitigation Strategy which:

- Avoids direct and minimises indirect impacts on all Conservation Category wetlands where practical.
- Avoids impacts on Resource Enhancement and Multiple Use wetland vegetation wherever practical.
- Where Resource Enhancement and Multiple Use wetlands will be impacted, the proponent's objective will be no net loss of Resource Enhancement and Multiple Use wetland values and functions.
- Impacts to Resource Enhancement and Multiple Use wetlands will be compensated by:
  - fencing and limiting access by humans and stock into the Conservation Category wetland vegetation at Southern River;
  - establishing a dryland buffer zone to Southern River from the development;
  - revegetating and restoring the relevant part of the riverine and wetland vegetation as well as the buffer with the Southern River Vegetation Complex;
  - undertaking a weed eradication program at Southern River and the conservation area adjacent to Wright Lake;
  - rehabilitating and restoring the relevant part of the vegetation adjacent to Wright Lake within conservation areas;

- creating and actively maintaining a large permanent waterbody and living stream to enhance and expand the previous wetland functions and values.

Approximately 73 ha of open water and conservation habitat will be created within the proposal.

In order to establish changes in the wildlife present on the site it is proposed to undertake aquatic fauna and waterbird monitoring over a period of at least two years from completion of the rowing course. Should the monitoring establish that there is a significant decrease in the biodiversity and abundance of fauna occurring in the water body compared to Wright Lake prior to development, this will trigger the proponent to provide further offset requirements within the Wetland Mitigation Strategy for augmentation of habitat values.

4.6.2 *The Water and Rivers Commission re-iterates its concern in relation to the proposed wetland mitigation, and the perceived retention, enhancement or increase in wetland function (primarily of Wright Lake) as a result of this development. The criteria used for wetland mitigation are referenced to EPA (2001), however the full reference is not provided in the reference list. Based on the information presented on page 66 of the PER, the EPA recognises three (sic) types of wetland loss mitigation namely, restoration, creation, enhancement and conservation. The Commission has previously advised that the WRC Wetland Mitigation Criteria should be used when proposing mitigation strategies for the loss of wetland functions and values. These criteria have not been addressed, and therefore the Commission does not consider the proposed alteration of an ephemeral wetland (Wright Lake) and damp-land to a permanent, lined constructed waterbody as appropriate or acceptable mitigation for the loss of natural systems within the development area.* (25)

The full reference for the document is:

Environmental Protection Authority (2001). *A Policy Framework for the Establishment of Wetland Banking Instruments in Western Australia: Draft for Public Comment.* Published by the Environmental Protection Authority, June 2001.

The previous advice provided to the proponent in correspondence by the WRC dated 10 September 2002 was:

The aim of a mitigation strategy will be to replace the attributes and functions lost as best as possible. The most appropriate way to do this is to match the impacted wetland with one of the same or better condition (same type, same suite, has similar vegetation species and occurs in the local area). However it is understood that achieving all of these is difficult. It is also highly desirable to mitigate with a wetland which otherwise would have experienced adverse impacts. It is not appropriate to replace with a wetland which already has an appropriate level of protection or which is functioning well in its current setting, and where that situation is unlikely to change.

In relation to this proposal, the WRC advises that the EPA should require the proponent to prepare and implement a 'mitigation strategy' for the Resource Enhancement Wetlands incorporating Wright Lake and its immediate surrounds.

Resource Enhancement Wetlands: The WRC's aim is for innovative approaches, for example it may be acceptable to purchase vegetation that creates a corridor or larger buffers between other protected conservation category wetlands. It may also be acceptable to purchase a smaller area of threatened Conservation Category wetland or rehabilitated Resource Enhancement wetland.

Acquisition wetlands are required to be placed in an appropriate management body such as CALM or the local government. One option may be to covenant a wetland and allow community groups to undertake ongoing management. There may also be other innovative approaches that could be appropriate.

The PER should address appropriate wetland sites for mitigation that encompass the following criteria;

- *Of the same **management category/ in the same condition** or better. As discussed above this means a resource enhancement wetland may need to be rehabilitated to mitigate for a conservation category wetland.*
- ***Threatened:** There must be a proposed threat from current or proposed landuse. For example urban and industrial development or rural landuses which are currently threatening and degrading the wetland. The threatening impacts should be eliminated or controlled. For example if a wetland is proposed to be cleared and filled as part of a development it should be purchased with an appropriate buffer. Some resolution on the management of drainage and other impacts should be negotiated with the developer. In the situation of a rural wetland the threat may be grazing and trampling*

by cattle. The wetland should be purchased or covenanted, an adequate buffer applied and the whole area fenced. The buffer and wetland should be rehabilitated.

- *It is preferable that the wetland is not already identified to be protected by some other mechanism eg is part of the EPP or Bushplan where there is already a presumption against development.*
- ***Of the same area.*** *It will not be appropriate to replace a conservation category wetland of a substantial size with something much smaller. A number of wetlands may be used in this type of situation. However, it could be appropriate that a smaller wetland of much better condition and with higher values with a good buffer replaces a larger wetland.*
- ***Of the same type.*** *For example a sumpland should be replaced with a sumpland.*
- ***Contain the same vegetation types.*** *For example if a wetland contains a closed forest Melaleuca rhaphiophylla community type a wetland with the same community type should be found.*
- ***Be part of the same consanguineous suite.***
- ***Occur in the local area***
- ***Other issues.*** *It may be appropriate to replace a number of small wetlands with one larger area of wetlands which is easier to manage. However it must be considered in the context of the above issues.*

In response to these comments the proponents advised the WRC that they intended to proceed with the proposed wetland mitigation strategy provided in the PER which focuses on providing wetland mitigation within the Champion Lakes Master Plan site, and is not considering acquisition or reservation of any wetlands off site.

In later WRC correspondence to the proponent's consultants dated 8 January 2003 the WRC advised:

'*…that the proposed mitigation measures outlined are acceptable subject to the further development of the Wetland Mitigation Strategy'.*

Given the current degraded status of Wright Lake, proposed protection and rehabilitation of the Southern River, and that the proposal will create and manage over 73ha of wetland and associated habitat and conservation areas, the proponent does not consider the WRC's suggestion that off-site wetlands be purchased and managed as scientifically valid or reasonable.

However as previously stated, in order to establish changes in the wetland values present on the site, the proponent will commit to undertake aquatic fauna and waterbird monitoring over a period of at least two years from completion of the rowing course. Should the scientific monitoring establish that there is a significant decrease in the biodiversity and abundance of fauna occurring in the water body compared to Wright Lake prior to development, this will trigger the proponent to provide further offset requirements within the Wetland Mitigation Strategy for augmentation of habitat values.

5.0 SUBMISSIONS RELATING TO POLLUTION MANAGEMENT FACTORS

5.1 Water Quality

Living Streams

5.1.1 *Proposed Living Streams must also be well designed and managed to perform any wildlife corridor or habitat function. Being adjacent to proposed urban areas, the pressure to accommodate traditional recreational functions will arise, to the potential detriment of any conservation function. (17)*

Agreed. Detailed designs of the living streams will require input from scientists, engineers, landscape architects and town planners to ensure that the design meets its environmental and drainage functions, whilst also complementing and remaining in context of the surrounding development. It is also noteworthy that the urban development component of the proposal will be designed in accordance with Water Sensitive Urban Design principles.

Salinity

5.1.2 *The proposed artificial waterbody has the potential to cause serious salinity problems in the local area. (3)*

The IRC water body will be lined, and consequently interaction with the local aquifer will be minimised.

Water quality will be actively managed to prevent salinity rising to levels at which potential serious impacts would be possible. This will be largely dependent on the quality of source water from the Yarragadee aquifer, which will be investigated in April, 2003.

In the event flushing of the water body is necessary, one management strategy under consideration is to release approximately 0.19GL/year (0.52ML/day) of water from the IRC into the Southern River (PER Appendix H, Section 4.4). In practical terms this release would only occur in winter. Please see Response 5.1.10 for an analysis of this option on the base salinity of the Southern River. Any discharge of water into the Southern River would require the approval of the WRC.

In relation to other wetlands, a naturally occurring saline plume already exists beneath Wright Lake. The salinity in this plume has been measured as high as 28,000mg/L. Wright Lake naturally varies from fresh to saline throughout the year.

5.1.3 *The Southern River has low levels of salinity while Wright Lake is expected to have high levels of salinity due to evaporation. In the event of flooding the overflow will contaminate the Southern River. (27)*

Since the IRC is a controlled water body there is no potential for flooding. Notwithstanding this, a naturally occurring saline plume already exists beneath Wright Lake. The salinity in this plume has been measured as high as 28,000mg/L, which is about 80% the concentration of seawater. Wright Lake naturally varies from fresh to saline throughout the year, depending upon the season and weather pattern. Wright Lake does not naturally flood or enter the Southern River.

Importantly, the IRC will have sufficient storage capacity above the high water mark to accommodate an additional 1m depth of water prior to any discharge or over-topping. This is more than the total average annual rainfall for the locality.

5.1.4 *Table 13 neglects to consider the concentration of salts likely to accumulate as a result of evaporation, which would probably be partially flushed to the Southern River in winter as the IRC receives drainage input. Refer DEWCAP July 2002 draft Water Note: Sustainable Stormwater Management on the Swan Coastal Plain – moving on from Lined Lakes. (17)*

The issue of salt accumulation is addressed in the PER Section 5.1.5.2. The rate at which salt will evapo-concentrate is dependant on a number of factors, principal amongst them being the initial concentration of the IRC source water, the rainfall quantity, spatial and temporal distribution, and cloud cover.

It is estimated that if the initial salt concentration in the IRC was 2000mg/L, after 20 years without partial flushing, the salt concentration would increase to 9,150mg/L. By contrast, assuming partial flushing of 190ML/year the concentration **after** 20 years would only be 3,250mg/L.

To place this salinity concentration in context, water with 1,500-3,500 mg/L can be used to irrigate oats, wheat, couch, olives, spinach, asparagus, carnations, hibiscus, buffalo grass, kikuyu, bougainvillea (to name a few) in free draining soils.

Water with up to 3,000mg/L for healthy dairy cattle, 4,000mg/L for healthy beef cattle and horses, and up to 6,000mg/L for healthy sheep. Sheep can survive on water up to 13,000mg/L. Seawater is 35-36,000mg/L.

Consequently, it is important to understand that when we discuss salinity in the context of water in the IRC, we are referring to water that is still relatively low in salt, which would be suitable and usable for the purposes listed above. The purpose of controlling salt accumulation is to protect the wetland habitat created at the site, rather than complying with any rowing water quality criteria.

No discharge to the Southern River would be undertaken without approval of the WRC. There are also other options for partial flushing including disposal into either the Yarragadee or Leederville aquifers via reinjection. The preferred option will be dependant on the results of the test drilling and hydrogeological assessment that will commence in April, 2003.

5.1.5 *It is presumed that the IRC will become brackish through input of its source water (salinity of the Yarragadee to be confirmed), and evaporation. This could encourage the growth of nuisance and potentially toxic blue-green and dino-flagellate phytoplankton species, particularly if any nutrient enrichment occurs through bird faeces and stormwater run-off. (25)*

Routine monitoring will occur and if factors conspire to potentially result in nuisance algal growth, then management measures will be undertaken to reduce risk and prevent outbreaks before they occur.

The proposed Yarragadee water source is likely to be free of nutrients. Stormwater runoff from roads will be recharged to the superficial aquifer. Nutrients already present in the superficial groundwater will be prevented from entering the IRC through the use of a liner and the maintenance of a slightly positive hydraulic head (i.e. greater water “pressure”) within the IRC.

Given the volume of the IRC, it would require a significant quantity of bird faeces to change the nutrient concentrations in the water body, which is considered unlikely.

Flushing Operations

5.1.6 *It is stated that "if the water quality is not considered suitable for the rowing course, there may be a need to discharge the water to the Southern River". Should this be the case, the disposal of poor quality water to the Southern River is not considered appropriate. Statutory requirements, including the Environmental Protection (Swan and Canning Rivers) Protection Policy 1998, need to be met prior to this scenario occurring. (17)*

No discharge from the IRC will occur without WRC approval. Please also refer to responses 5.1.4 and 5.1.5.

5.1.7 *Rather than discharging water that does not meet the recreational criteria to the Southern River it is recommended that it be placed in an infiltration basin. (27)*

The hydraulic conductivity of the superficial aquifer is too low for an effective infiltration basin. The only water that is proposed for infiltration is runoff from roads and car parks.

Water in the IRC will be managed to ensure it meets recreational water quality criteria. Therefore any water from the IRC that is discharged into Southern River will comply with the recreational water quality criteria, however any discharge would require approval by the WRC.

It is proposed that water from all roofs within the development area be collected and piped directly into the IRC.

5.1.8 *The salinity of the groundwater that will be used to fill and maintain the water levels in the lakes will determine the method and the frequency of disposing the water from the lakes during flushing operations. This is unlikely to be known before the exploration bore is tested, however the issue of maintenance of water quality and proposed flushing of the IRC is potentially a significant issue, and disposal will need to be to the satisfaction of the Commission. (25)*

The proponent concurs that the scope of the management of flushing operations will be dependant on the results of the test drilling and hydrogeological investigations that will be undertaken soon.

However all discharges from the IRC will require approval from the WRC. A commitment of the PER is to undertake a Drainage, Nutrient, Irrigation and Water Quality Management Plan (DNIWQMP).

5.1.9 *If the proponent intends on disposing of water that is salty, and / or of poor quality, options described in the PER (either aquifer injection or disposal off site) may be unacceptable. It is considered this issue should be addressed before environmental approval for the project is given. The proponent should be required to clearly outline how this issue will be dealt with in the event water quality determines that disposal options presented to date will be unacceptable, prior to approval being granted for the proposal. (25)*

Please see Response 5.1.4 for discussion regarding salinity concentrations.

The issue of the disposal of IRC water is dependant on the results of the test drilling and hydrogeological investigations. When these results are known, they will be used in the DNIWQMP. The proponent is committed to undertake appropriate management requirements in order to protect existing and created environmental values. The potential effect of discharge of brackish water on the base salinity of Southern River is discussed in response 5.1.10. However any discharges from the IRC will require approval from the IRC.

5.1.10 *The PER lists a series of options for discharging brackish water when it becomes unsuitable for the rowing course. One of these options is discharging brackish water into the Southern River, possibly during winter. The conductivity of Southern River is fresh. Recent studies have found conductivity of around 200-600 mg/L. Discharging brackish water into this system, even during winter when the concentration would be diluted, would have adverse impacts on the ecology of this system.*

Recent ecological monitoring studies have found a number of freshwater macroinvertebrate and freshwater fish communities downstream of this site (Storey, 2000). Many of these species are intolerant to brackish conditions. Therefore, the flushing of any water into Southern River that exceeds current baseline water quality parameters of the river is unacceptable and should not be permitted. (25)

One possible management strategy is to release 0.19GL/year (0.52ML/day) of water from the IRC into the Southern River (PER Appendix H, Section 4.4). In practical terms this release would only occur in winter.

Data on base flows and salinity in Southern River has recently been provided by the WRC, which was not available during the preparation of the PER. This data (as presented in the WRC submission) indicates the base salinity in Southern River ranges from 200 to 600mg/L. Based on an average base flow of 17ML/day, it is calculated that the addition of 0.52ML/day of water from the IRC at a concentration of 4,000mg/L would increase the baseline salinity from 300mg/L to 700mg/L.

If the IRC discharge water was at a concentration of 2,500mg/L the increase in baseline salinity is calculated to be 270mg/L to 660mg/L. The calculated range of values are all categorised as "fresh", and would be unlikely to have a significant impact on salt sensitive flora and fauna in the Southern River.

Consequently, the potential for environmental maintenance water release to the Southern River may be possible, to augment the significant reduction in flows since the construction of the Wungong Dam in 1979, subject to WRC approval.

5.1.11 *The Southern River currently experiences problems with erosion and down-cutting of the river channel during winter months and summer storms due to the removal of fringing vegetation and altered catchment hydrology. Additional water from the IRC into Southern River would only be acceptable if the water was of sufficient quality (see above) and could be released gradually during Spring and/or Summer, when flows are not meeting ecological water requirements. This option would require further investigation and monitoring by the proponent in consultation with WRC, who are currently developing Environmental Water Provisions for the Canning River System (including Southern River). (25)*

Any discharge into the Southern River would require the approval of the WRC. In this regard the proponent will liaise with the WRC to ensure appropriate management is implemented prior to discharge. If properly designed and managed, the volume of water that could potentially be discharged into the Southern River is unlikely to result in additional erosion and down-cutting. In addition the proponent has committed to the revegetation and rehabilitation of a significant portion of the river bank (within the conservation area of the subject site), which will also reduce the erosion and down-cutting potential.

Please also see Response 5.1.10.

Dewatering

5.1.12 *If dewatering is expected to occur during winter and the proponent cannot meet current baseline water quality parameters of the Southern River this discharge shall not be permitted. (25)*

It is proposed that all groundwater abstracted during the construction of the IRC will be contained and disposed onsite. In the event that any dewatering discharge is required to the Southern River, comprehensive testing of the water would be undertaken and WRC approval sought prior to any discharge. This factor will be addressed in the Construction Management Plan.

Lining of Waterbody

5.1.13 *It is critical that the proposed artificial liner is managed and well maintained over the life of the project to ensure that leakage, or failure does not occur. The PER does not outline how the artificial liner will be managed, or in the event of failure how it will be repaired or replaced if required (life-span of liner is not clear). The proponent should be required to outline clearly how the artificial liner will be managed, or in the event of failure how it will be repaired or replaced, and estimates of its life-span should be provided. (25)*

The use of an artificial liner for the IRC was only one option considered in the PER assessment. The option preferred by the proponent is a clay liner, which will be required to meet strict geotechnical specifications and auditing during construction. Clay was chosen by the proponent as a source is available on site.

Geotechnical testing of the source clay will be undertaken to prove the material is capable of acceptable long-term performance. Should the clay being used to construct the liner not be of acceptable geotechnical quality, bentonite can be mixed with the clay to create a material that is less permeable. The clay liner will be protected and not allowed to dry out to prevent cracking, through the maintenance of an appropriate critical water level. The clay to be used as lining material must be compatible with the estimated water quality range in the IRC (i.e. the clay should not be dispersive in brackish or warm water).

Groundwater pressure beneath the liner during construction will be assessed by a geotechnical engineer, and considered in the overall IRC management plan. The retention of the dewatered groundwater onsite during construction will help prevent any upward hydraulic pressure that may cause "heaving" of the liner.

Holes or perforations in clay lining systems are not anticipated. If they do occur they may be difficult to detect, particularly when there is little hydrostatic pressure to 'force' water through the lining i.e. there is a balance of pressure between the IRC and groundwater. In areas where leakage can be identified by viewing water seeping through a void or where monitor bores indicate a leak may be nearby, bentonite can be used to fill the void. Bentonite is a powder that expands significantly when immersed in water. As the bentonite enters the void, it expands and becomes lodged within the void, effectively sealing it.

An artificial liner is guaranteed for a period of 25 years, although it is expected to last 50 years. A clay liner built to the correct geotechnical standards will have an indefinite life provided any maintenance required is promptly attended to.

5.1.14 *In order to address this concern, it is recommended that a number of shallow monitoring bores will need to be constructed around the lakes and water from these bores monitored regularly (parameters to include salinity), to determine if any leakage is occurring and from where. If it is determined that leakage is occurring, a process needs to be developed and implemented to limit the impacts of the leakage and if necessary, repair the artificial liner. (25)*

It is proposed to construct a series of shallow groundwater monitoring bores around the IRC. It is likely this would involve a minimum of 10-12 bores in two circles surrounding the water body. The outer circle of bores would be at a sufficient distance that the effects of the IRC would not be noticeable. Comparison between the heads in both sets of bores would be used to determine if significant seepage was occurring.

5.1.15 *The IRC should be lined with a synthetic liner to isolate the waterbody from the superficial aquifer and prevent brackish water from seeping into Southern River. (25)*

It is important to note that the IRC will have a very low potential to leak, as it will be mainly, if not completely, submerged below the surrounding watertable. Hence the

hydraulic gradient (head difference) across the low-permeability liner will be minimal. However both water quality and levels will be monitored in the surrounding local aquifer.

Water Quality Management

5.1.16 *The proposal needs to outline in specific terms, through preparation and implementation of a detailed water quality management plan, how poor water quality will be avoided and managed. Future owners and managers of the facility will need to be formally committed to undertaking water quality analysis and management. (25)*

The proponent concurs with the requirement to undertake and implement a detailed water quality management plan. The proponent is committed to prepare a DNIWQMP, which will contain the required monitoring programs and contingency responses.

5.1.17 *It is considered that water quality can be managed, however at a level that may be problematic or prohibitive for the proponents. The proponent must further develop the water quality monitoring and response plans, including clearly defined contingencies in the event of unacceptable water quality, algal blooms or flushing requirements. (25)*

The proponent is committed to prepare a DNIWQMP, which will contain the required monitoring programs and contingency responses.

5.1.18 *Algal blooms are likely and it is not clear that the proponents have the necessary skills to manage such a complex artificial ecosystem in the long term. There is a need for a post-construction environmental management plan which the proponents do not seem to have committed to. (3)*

There is no technical evidence provided to support the proposition that algal blooms are likely. In fact a very large water body with good source water, together with appropriate management of the surface water catchment as proposed, is likely to result in very good water quality as is the case with the Penrith Lakes Facility.

Please also refer to response to submissions 5.1.5 and 5.1.17.

5.1.19 *The pollution problems will be exacerbated if urban development and car parking is allowed within 50m of the waterbody. A minimum buffer of 50m is required*

around the whole of this waterbody. Spectators and competitors can enter the buffer but houses and vehicles should be excluded to reduce the risk of pollution. (3)

There is no technical evidence provided to support the imposition of a 50m buffer.

The water body will be primarily a rowing course and as such will require vehicle access and car parking. Roads and car parks will be designed and managed to prevent runoff directly entering the water body.

Hydrology of Southern River

5.1.20 *The construction of the Champion Lakes project has the potential to impact on the hydrology of the Southern River. Any development project of this nature may have impacts on the overall hydrology of the Southern River and therefore it is important that appropriate catchment management measures are implemented as part of the development. As outlined in the document (Section 5.1.5 pg. 77) a monitoring program should also form part of the overall Drainage Nutrient Irrigation and Water Quality Plan. (26)*

The proponent concurs that a monitoring program should form part of the DNIWQMP, as proposed. Impacts on the hydrology of Southern River have been addressed in a response to a number of the other submissions including 5.1.10, 5.1.11 and 5.1.14.

5.1.21 *The Water and Rivers Commission should be given the opportunity to provide advice on, and be consulted during the development of a Drainage Nutrient Irrigation and Water Quality Plan in order to ensure that there will be no negative impacts on the hydrology of the Southern River. (26)*

The WRC has been involved in the preparation and review of the PER, and will be consulted during the implementation and ongoing management of the project. Any discharge of water into the Southern River will require approval by the WRC.

5.2 Groundwater Quantity

Irrigation

5.2.1 *The plan provided is not clear on how much area will be irrigated. It is suggested that the parkland areas be designed to prevent the need for any irrigation. There are suitable native grasses and plants that can be used in the design. (27)*

The proponent has committed to the consideration of water conservation principles in the preparation of the DNIWQM Plan.

It is proposed that wherever possible native plants and low water use gardens will be used as discussed in Section 5.2.5.6 of the PER.

5.2.2 *It is also intended to take water from the superficial aquifer for irrigating areas of public open space. It is well documented that the superficial aquifer at the proposed site maybe of poor quality and that the yield from the bores maybe insufficient to meet the full development requirements. (25)*

The portion of the overall water requirements for irrigating POS is relatively small. The modelling was undertaken for a much greater amount of POS irrigation (150ML/year) than is currently proposed. The groundwater flow modelling indicated that sufficient water resources existed to provide for the POS irrigation requirements, using the latest available data from the WRC.

The use of water containing nutrients on areas of POS will reduce fertiliser requirements and effectively recycle this parameter.

5.2.3 *Prior to any other groundwater licence being granted (for irrigation requirements), the proponent will be required to address all WRC criteria for granting a licence. (25)*

The proponent agrees that prior to a groundwater abstraction licence being granted, all WRC criteria will be addressed. The recommended work requirements are listed in Section 5.2.5.7 of the PER.

Climate Change

5.2.4 *The PER does not consider climate change and the impacts predicted for the southwest of Western Australia by CSIRO climate change modelling. Climate change will exacerbate an already marginally acceptable groundwater drawdown scenario presented in the PER. The effects of Scenario 10 will also be compounded by the effects of drought and climatic change. (25, 27)*

It is agreed that climate change has not been directly considered in the modelling with the exception that conservatively low estimates of recharge were used in the modelling, which may help account for future lower rainfall quantities. However, the drawdown impact was modelled over a 20 year period.

The modelling is also considered very conservative as no confining layers between the superficial and Leederville aquifers or the Leederville and Yarragadee aquifers have been incorporated. This effectively allows a direct connection between the abstraction point in the Yarragadee and the piezometric surface of the superficial aquifer. It is considered that in reality confining layers will be identified in the proposed test drilling program and no superficial drawdown impacts will be observed as a result of the pumping. The results of the test drilling program and hydrogeological study will be used if required to refine the modelling.

Lowering of Watertable

5.2.5 *Lowering of the watertable through abstraction from the aquifers to top up the IRC could be of benefit to adjoining subdivisions, as localised stormwater infiltration would be more effective. (17)*

The lowering of the water table is unlikely to occur for the reasons detailed in 5.2.4. The infiltration of localised stormwater is governed by the hydraulic conductivity of the sub-surface soils, which are low in this instance. Groundwater abstraction for the IRC will not alter the properties of these soils and no change is expected to infiltration rates.

5.2.6 *A lowering of the groundwater head will have impacts on the Southern River and groundwater users. Scenario 10 will have a draw down effect of 0.2-0.5m. In summer the water level in the Southern River is already less than 0.5m. This means that Scenario 10 may still leave the Southern River with no flow. (27)*

Water may be discharged into Southern River, subject to WRC approvals, providing additional environmental flows. The actual drawdown on Southern River is not anticipated to be as large as the modelling indicated for the reasons outlined in 5.2.4. A definitive answer to the question of actual drawdown will be established once the test drilling program and hydrogeological investigation have been completed.

5.2.7 *The effect of dewatering will lower the water table in the short term over summer compounding the effects of drought and causing further stress or death to the remnant vegetation. (27)*

Please see response 5.2.4. In the event of severe drought, contingency measures may be required and the IRC maintained at a lower level (unless a national or international standard rowing event was scheduled), and therefore less pumping would be undertaken.

5.2.8 *Reference is also made to draw-down criteria for groundwater dependent ecosystems (GDEs) and that 0.2m/year could be considered acceptable. It should be noted that although the Southern River is groundwater dependent it is also influenced by surface-water. The Commission considers a drawdown of 0.2m/year on groundwater dependent wetlands may be acceptable, however this figure is not applicable for surface water dependant systems. In saying this, some concern remains with the lack of certainty in the current modelling, and further work is required in relation to the proposed exploration work. (25)*

Dr Ray Froend of Edith Cowan University, the most notable expert in this area, was consulted regarding the 0.02m/year value, which he believes should be acceptable. The current model is conservative as discussed in submission 5.2.4. It has always been understood that once the proposed test drilling program and hydrogeological investigation are completed the modelling can be revisited and a more refined prediction of any drawdown impacts assessed and agreed with the WRC.

5.2.9 *The Commission is currently working to set Environmental Water Provisions (EWP's) for this river system. This includes detailed ecological studies, flow modelling and community consultation. Any predicted impacts on the flow of this river require certainty so as not to jeopardise this EWP project. (25)*

See response to submission 5.2.8. The draft EWPs were considered (via Natasha Hyde, WRC) during the preparation of the PER.

5.2.10 *The prediction of a 0.5m drawdown on the Canning River has to be avoided. The river is suffering as it is from lack of water. (24)*

The Canning River runs along the base of the Scarp and forms the boundary of the groundwater model. The predicted drawdown is largely numeric and reflects the placement of a river along the model boundary rather than any real circumstance. The Canning River in this area cuts through Guildford clays and is likely to be hydraulically isolated from the surrounding superficial aquifer (which is also very thin). It is proposed that as part of the commitment to ongoing monitoring, at least two observation bores will be installed into the superficial aquifer, placed between the IRC and the Canning River to monitor long-term groundwater fluctuations.

Further Modelling and Investigations

5.2.11 *The proponent should be required to undertake additional modelling and incorporate Yarragadee test bore drilling results such as stratigraphy and aquifer characteristics. The modelling should also include comprehensive sensitivity and uncertainty analysis and predict the best, worst and average scenarios for the predicted drawdown. (25)*

It has always been proposed that the modelling be revisited once the results of the test drilling program and hydrogeological investigation are available (see PER Sections 5.1 and 5.2).

5.2.12 *Not satisfied that the project will not change the local hydrological conditions on the adjoining urban land. No studies or scientific evidence has been presented in the PER on the impact on hydrology. It is requested that all the studies necessary to demonstrate the impacts of the IRC on hydrology of the area be completed before the project progresses. These studies should, if necessary, establish:*

- *Variations to surface flows;*

Variation to surface flows will only occur if water is discharged into the Southern River. The WRC would have to approve any such discharge.

- *Variations to seasonal groundwater levels;*

As the IRC will be lined and not elevated above the existing groundwater levels, variation in seasonal groundwater levels are not expected. As discussed in response to submission 5.2.4, model predicted drawdown impacts are unlikely to eventuate.

- *Variations to water quality/salinity; and*

Currently the salinity in and beneath Wright Lake varies significantly. The IRC will be managed so that the salinity impacts are minimal (see submission 5.1.4 and 5.1.10).

In addition, it should be noted that the Superficial aquifer in the area will never be suitable for use as a public drinking or industrial water source due to its low yield and poor quality. The aquifer has only a moderate vulnerability to contamination (according to published Groundwater Vulnerability to Contamination maps). Also rates of groundwater flow (ie rates of contamination movement) in this aquifer are relatively slow compared to other (higher permeability) areas of Perth.

- *Determine the economic and environmental consequences to the adjoining urban areas. (18)*

It is beyond the scope of the PER and submissions to comment on economic consequences, beyond the general impression that once constructed the Champion Lakes park would be expected to improve property values.

However, it is fair to say that the environmental consequences to adjoining urban areas will be minimal and logically quite possibly enhanced.

Management

5.2.13 *The proponent will need to prepare a comprehensive 'operating strategy', and meet all the Commission criteria before being issued with a licence to take water from the Yarragadee aquifer. The operating strategy will need to address contingency issues associated with any unforseen impacts related to the taking of the water. The proponent will also need to revisit the computer modelling work after a period of pumping, to more accurately predict long term impacts to the aquifer and the local environment. (25)*

The proponent has committed to preparing an operating strategy, which will be approved by the WRC prior to the receipt of a groundwater abstraction licence. In regard to the groundwater modelling please refer to submission 5.2.11.

Dewatering

5.2.14 *The Commission has concerns regarding the potential impacts dewatering will place on local superficial groundwater users. In addition to the proponent requiring a 'Licence to De-water' they will also be required to develop an appropriate monitoring program to monitor any impact the dewatering maybe having on neighbouring users. The program will also need to include a commitment by the proponent that they will be responsible for investigating any complaints and take appropriate steps to remediate or compensate for lost water supply. The onus will be with the proponent to demonstrate they were not the cause of such issues should they arise, and wish to dispute any complainants. The proponent should be required to prepare a detailed dewatering disposal management plan that addresses the above issues, prior to the commencement of site works. (25)*

It is clearly understood and accepted by the contractor and the proponent that a separate licence to dewater will be required prior to the commencement of construction. In this regard the contractor is committed to preparing a comprehensive dewatering management plan to the satisfaction of the WRC, as part of the Construction Management Plan.

Stormwater

5.2.15 *The proposed management and use of stormwater is not clearly articulated or consistent in the main document or in the Appendices. Page 98, section 5.2.5.1 - the approach proposed is to recharge stormwater to the superficial aquifer. It is stated that the quantity of recharge will be 26ML/year.*

In Appendix F, page 3 the second dot point 'drainage objective' is to "harvest stormwater from the development area to minimise rowing course top up water from other sources". Figure 23 in the main document also infers stormwater will contribute to lake water level management. (25)

It is proposed to separate runoff from roofs and roads. Runoff from roads and carparks will be infiltrated back into the superficial aquifer, whilst rain water collected on roofs will be collected and piped directly into the IRC.

5.2.16 *Due to our Mediterranean climate the majority of rainfall occurs in winter and evaporation occurs during summer, when rainfall is usually minimal. The use of stormwater should therefore not be seen as a primary source of top up water, as this may lead to inappropriate stormwater designs that deliver pollutants directly to the water body. (25)*

Agreed. The use of stormwater is seen as a secondary source of top up water, with the primary water source being groundwater from the Yarragadee aquifer. Please see response to submission 5.1.15.

5.2.17 *Stormwater management should be based on the Commission's draft Position Statement for Urban Stormwater Management. Recharge of the aquifer should be maximised and runoff from large rainfall events should overland flow to the rowing course basin. (25)*

Agreed. Please see response to submission 5.2.15.

5.2.18 *With reference to the possible collection of stormwater and grey water from future urban development to the north of the site within the City of Gosnells, it is difficult to comment. Although contours would indicate that this would be difficult to achieve due to flat grades. (17)*

There is no current proposal to collect stormwater and grey water from future urban development to the north of the site. However, when the land is developed it would be prudent to consider the possibility of harvesting the available urban runoff as a contributing water source for the IRC.

5.2.19 *Diverting runoff from adjoining residential areas in to the rowing course would potentially divert flows from the Southern and Canning Rivers, both of which are very reliant on stormwater input for their hydrological and ecological functioning. (17)*

There is no intention or proposal to divert current stormwater flows away from the rivers and into the IRC.

5.2.20 *Diversion of stormwater into the rowing course reduces localised infiltration of stormwater, which is an essential element of Water Sensitive Urban Design and the WRC's recent Urban Water Management Strategy. (17)*

Please see response to submission 5.2.19.

Groundwater Abstraction

5.2.21 *There is a huge amount of water required for the proposal and given that our waterways and wetlands are under great stress already from the prolonged drought, there is great concern regarding both the short and long term impacts. (22)*

The Yarragadee aquifer water source proposed for the project is not potable. Please also see the response to submission 5.2.12.

The total water use to replenish evaporation loss is the equivalent of an eighteen hole golf course. The impacts have been widely discussed in a number of the other responses as well as the PER and Appendix H to the PER.

5.2.22 *There is very little detailed hydrological work undertaken in the upper Canning/Southern River area to really understand the influence of groundwater and superficial aquifers on the flow. (22)*

Agreed, one of the main phases of work additional to the PER is the test drilling program and hydrogeological investigation, which is to proceed shortly.

5.2.23 *Modelling can come up with all sorts of scenarios but what if the one you chose does not proceed as the modelling shows. The development would be built and the rivers and wetlands would have to wear the consequences. Do not proceed if we can't prove beyond reasonable doubt that environmental damage will not occur. (22)*

Following the completion of the test drilling program and hydrogeological investigation, the modelling will be revisited and predictions refined. Proposed ongoing monitoring will also be used to validate model predictions.

It is not possible to define what reasonable doubt is in relation to environmental impacts as all human activity will result in some impact. The key is to monitor and implement management responses when or if environmental triggers are breached.

It is the proponent's commitment to prepare and implement such management plans as outlined in the PER. The acceptability of the outcomes will be decided by the regulatory authorities.

5.2.24 *Given that the site requires 2.3gl to fill with ongoing top ups and given the water crisis here in WA at the moment, the question of using this amount of water for a development should have to go out for the wider community for their approval. (22)*

The water required to fill the IRC will come from the dewatering of the superficial aquifer that will be contained onsite during construction, subject to acceptable quality, and/or from the Yarragadee aquifer. Both these sources in the vicinity of the site are not potable and will not have any impact on available water resources.

Environmental Water Requirements

5.2.25 *Currently we are involved in a project looking at the environmental water requirements for the Canning and its tributaries. This project requested water to improve and bring back fish habitat and general biodiversity. We have been informed there is probably not sufficient water to meet the requirements. Where is the balance in all this? (22)*

The water required to improve the environmental water requirements (EWRs) of the Canning River needs to be fresh. It is understood that scheme water from the Canning Dam is currently used for this purpose. The amount of water proposed for use in the IRC is likely to be very small compared to the annual flows in the Canning River. The provision of potable water from Canning Dam to provide required EWRs is not comparable with the use of slightly brackish, non-potable groundwater for the IRC.

In light of the above, the proposal will not materially impact upon EWR's for the Canning River and it is beyond the scope of this PER to discuss the prospect of using groundwater sources to provide EWRs for the Canning River.

5.3 Noise

5.3.1 *The Free Reformed School Association seeks assurance that the potential noise impact from the recreation, functions and other activities within the proposed*

Champion Lakes Regional Recreation area will not unduly disrupt the classroom environment. (4)

The Master plan indicates that there will be urban land uses (most likely residential) and a conservation area closest to the school grounds which will not create levels of noise of concern to the school grounds. The City of Armadale and the Armadale Redevelopment Authority will consider the issue of noise in any development applications that are made within the Master Plan area. Noise emissions will be required to comply with the relevant Noise Regulations.

Measures to minimise noise levels from the proposed rowing course will include:

- using a larger number of small speakers carefully positioned along the rowing course;
- Memorials will be considered on new residential titles to provide a warning that the area is subject to noise generated at the rowing course;
- Noise emissions from white water generating pumps will be controlled by placing them in acoustic enclosures or at a suitable distance from the residential area.

5.4 Acid Sulphate Soils

5.4.1 *The exposure of the acid sulphate soils (ASS) during the construction of the water body and its proposed use for the construction of Tonkin Highway may cause severe contamination of Southern River and surrounding bushland with toxic elements. This may happen in two ways:*

a) If the acid sulphate soil is used for construction of roadside banks and drains along the Tonkin Highway, sulphuric acid will be produced which moves through the soil, acidifying soil water, groundwater and eventually surface waters (see Jesmond Sammut, 2000 An Introduction to Acid Sulphate Soils). Sulphuric acid and aluminium will have an adverse impact on the aquatic food chain, fish populations and the health of the fish.

b) The lowering of the groundwater table overtime and during dewatering will oxidise the acid sulphate soils in the surrounding area having a potential impact on surrounding bushland. (27, 17)

(a) Potential Acid Sulfate Soils (PASS) will not be used for embankment and roadside drainage construction on the Tonkin Highway. Investigations undertaken to date indicate that PASS do not occur within the proposed earthworks excavation "footprint".

Whilst direct effects associated with excavation of PASS should consequently not be realised, potential indirect effects associated with short-term lowering of the water table will be managed via controls implemented through an agreed Acid Sulfate Soil Management Plan (ASSMP).

The ASSMP will be approved by the Department of Environment, Catchment and Water Protection (DEWCP) prior to the commencement of development activities. Monitoring programs will also be implemented to assess ongoing surface water and groundwater quality during the dewatering and earthworks program, to ensure environmental performance objectives are met. Contingency measures will also be set out in the approved ASSMP to rectify any deviation from DEWCP approved performance standards.

(b) The dewatering strategy will be implemented in accordance with the approved ASSMP and Construction Management Plan to ensure that appropriate management and mitigation measures are implemented to minimise potential environmental effects associated with localised groundwater draw-down.

5.4.2 *May 2002 testing did not include Wright Lake, Results of December 2002 testing are awaited. This would most likely be the area where acid sulfate soils may be found. (17)*

An investigation of Wright Lake was completed in December 2002 for Potential Acid Sulfate Soils (PASS), following approval from the Minister for Aboriginal Affairs. Seven locations were investigated in accordance with DEWCP guidelines to a depth of 6 metres below lake surface level. Field results indicated that 54 of 56 samples tested (i.e. 96.4%) comprised non-acid sulfate soils. Two field tests indicated the possible presence of PASS. Confirmatory laboratory analyses, using the standardised Peroxide Oxidation Combined Acidity Sulfate (POCAS) and Chromium Reduced Sulfur (CRS) methods recommended by DEWCP, established that the two unconfirmed samples were not acid sulfate soils.

5.4.3 *The potential threat from acid sulphate soil is like reading details of a toxic dump. A comprehensive ASS Management Plan should be drawn up before any development proceeds, to assure us that the problem can be managed. (24)*

A comprehensive Acid Sulfate Soil Management Plan (ASSMP) will be developed and approved by DEWCP prior to the commencement of development. The ASSMP will provide a framework of practical and achievable monitoring and control strategies, within which dewatering and bulk excavation activities can be guided to avoid potential impacts associated with the direct and indirect disturbance of Potential Acid Sulfate Soils (PASS).

The ASSMP will include details of:

- Proposed prevention, minimisation and mitigation strategies for controlling environmental impacts caused by dewatering and excavation operations, including, but not limited to:
  - treatment and use of any excavated material (including strategic burial considerations);
  - treatment of acidity;
  - containment strategies to manage site runoff and infiltration;
  - techniques for managing water table height; and
  - if appropriate, management of any existing acidity and contamination being produced.

- Proposed monitoring programs for surface water and groundwater and remedial measures to mitigate potential impacts caused by disturbance of PASS.

- Implementation responsibilities for environmental management.

- Reporting requirements and auditing responsibilities to ensure that agreed performance objectives are met, including quality assurance considerations.

- Contingency measures to rectify any deviation from the agreed performance standards.

5.5 Contamination

5.5.1 *If the contaminated soil from the piggery and duck farm is used for construction of roadside banks and drains along the Tonkin Highway, sulphuric acid will be produced which moves through the soil, acidifying soil water, groundwater and*

eventually surface water (see Jesmond Sammut, 2000 An Introduction to Acid Sulphate Soils). (27)

See response to submission 5.4.1.

6.0 SUBMISSIONS RELATING TO SOCIAL SURROUNDINGS FACTORS

6.1 Mosquitos and Midges

6.1.1 *The spraying of Forrestdale Lake with chemicals to reduce midge numbers is distressing and may have an affect on bird life. The Mosquito and Midge Management Plan should be available for public comment before development occurs. (24)*

The spraying of chemicals of any kind to control midges and mosquitos would be considered a last resort.

The City of Armadale will consult with the community on the proposed Mosquito and Midge Management Plan prior to adoption.

6.1.2 *The City of Armadale and DCLM have shared responsibility for midge treatment at Forrestdale Lake. A repeat of this bad experience must not be allowed on the residents around Wright Lake. (24)*

It will be responsibility of the ultimate Management Authority for Champion Lakes to monitor midge levels and implement management measures. The Management Authority will be adequately resourced, in terms of both personnel and funds, to meet its obligations in this regard. As such it is expected that the management of midge within the water body will be more active and intensive than that of Forrestdale Lake.

6.1.3 *A buffer of trees and shrubs of at least 50m should be planned in this report between the lake and the residential areas. (3, 24)*

Although this is a management technique which can be successful on natural and created wetlands, in this instance the water body is being created for the purposes of an international sporting facility and as such vehicle, pedestrian and spectator viewing are required to be provided around the course. At present the proposed residential areas are located approximately 20m from the water body edge.

6.1.4 *There should be a guarantee that midge infestations wont impact on the lifestyle of those living nearby. (24)*

The proponents cannot guarantee against the presence of midges within the water body. The proponents can however commit to managing the water body to best management practice standards through a Mosquito and Midge Management Plan to minimise the possibility of significant midge infestations occurring.

6.2 Aboriginal Heritage and Culture

6.2.1 *The proponent is in compliance with the Aboriginal Heritage Act 1972. The proponent has a conditional consent issued by the Minister for Indigenous Affairs. The environmental management provisions regarding heritage are adequate to preserve cultural values and mitigate impacts on heritage values. (20)*

Noted.

6.3 European Heritage and Culture

6.3.1 *The Heritage Council of WA has conducted a search based on the information provided and it showed that, in relation to the subject site:*

- *There are no Heritage Agreements in place; and*
- *No Conservation Orders have been issued.*

It is also confirmed that, according to our records, there are no properties situated within an historic precinct in this area, none are entered in the Register of Heritage Places or include in the local Council's Municipal Inventory, and none appear to be listed with either the National Trust or the Australian Heritage Commission in your specified area. (19)

Noted.

6.3.2 *Historical information about Wright Lake and its bushland surrounds, in the times of first settlement would have been good to read for comparison to today. (24)*

Unfortunately, searches with local libraries and historical societies did not result in any significant references, publications or information regarding the area in the times of first settlement. However Bowman Bishaw Gorham was provided with written transcripts

from some of the early residents of that area. This information can be provided to the submitter if permission is granted by the authors of the transcripts.

6.3.3 *Are there any living Pioneers or descendants that could be contacted? (24)*

The authors of the written transcripts referred to in the PER can be contacted through the City of Armadale.

7.0 DEFINITION OF THE PROPOSAL

The PER provided a schematic drawing of the proposed layout of the Champion Lakes Master Plan (Figure 2) and outlined the key characteristics of the drawing in Table 1, the key characteristics table.

Since the development of the schematic drawing FISA has altered the minimum width for an international standard rowing course from 130m to 135m. As such the proponents are required to alter the proposed width of the rowing course to 135m. A revised Champion Lakes Master Plan is attached.

The proponents have not undertaken any detailed planning of the layout of the facilities and proposals contained within the Champion Lakes Master Plan. As such they are keen to maintain some degree of flexibility in the relative areas of the various development components. Consequently the proponents have reviewed Table 1 of the PER and have highlighted those parts of the proposal which are currently notional and are subject to further design. The revised key characteristics table is provided below:

TABLE 1
Key Concept Plan Characteristics

Element	**Description** (all areas approximate)
Proposal Description	A water based recreational park incorporating an international rowing course, an island dedicated to rowing facilities, whitewater rafting facility, conference centre, shops, Aboriginal centre, cable ski and water park, short stay accommodation, indoor sport and aquatic centre, amphitheatre, conservation areas, parking areas, urban land uses, launch area and a residential development
Total area of proposal	~138 ha
Dimensions of rowing course	~2150m long x 135m wide, 3.5-4.5m deep
Dimensions of artificial watercourse/rowing return lane	Notionally 535m long x 30m wide (subject to further detailed design)

Dimensions of warm up lake	Notionally 800m long x 200m wide (subject to further detailed design)
Total Water Area	Rowing course ~29ha (fixed) Warm up lake and return lane – Notionally ~24ha (subject to further detailed design - maximum area will not exceed 24ha)
Area set aside for conservation	21ha
Area for conference centre, shops, whitewater rafting course, cable ski and water park, short stay accommodation, indoor sport and aquatic centre, amphitheatre and Aboriginal centre	Notionally 16 ha (subject to further detailed design)
Spectator area / Start area	Notionally 8 ha (subject to further detailed design)
Public Launch and Picnic Area	Notionally 0.6 ha (subject to further detailed design)
Rowing Facility Island Area	Notionally 7 ha (subject to further detailed design)
Event Day Parking Area	Notionally 9 ha (subject to further detailed design)
Urban land uses	Notionally 21 ha (subject to further detailed design)
Construction Duration	~18 months (rowing course only)

As a result of the PER process, discussions with the EPA Service Unit and this response to submissions, the proponents commitments have been expanded and modified. Please find attached a copy of the updated Proponent Commitments Table (Table 2).