NSW EPA

ENVIRONMENT PROTECTION AUTHORITY

Our reference: DOC12/44921
Our contact: Kieran Lynch, 9995 6828

Mr Troy Loveday
Project Manager
Project Delivery Unit – Office of Director General
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

Dear Mr Loveday

Thank you for the opportunity to comment on the Water Management Plan – Stage 1 for Penrith Lakes. The relevant NSW water agencies have made specific comments on various aspects of the Plan, and these are provided as attachments to this letter.

In general, the comments fall under the broad categories of water quantity, water quality and Scheme management. The Agencies' comments provided are to assist with the finalisation of the Stage 1- Water Management Plan in the short term, and to provide guidance for the development of the lakes to ensure that the water quantity and quality requirements for recreation and ecology are provided in a way that is sustainable.

Detailed comments are contained in the attached information as follows:
Attachment 1 – NSW Office of Water
Attachment 2 - Environment Protection Agency and Office of the Environment & Heritage (Water Quality)
Attachment 3 - Office of the Environment & Heritage (Flooding)
Attachment 4 – Office of Communities – Sport and Recreation

Should you have any questions, or should any of the points require clarification beyond what is provided in the attachments, representatives from the relevant Agencies would be more than happy to assist you further.

Yours sincerely

G Howard 31/10/12

GISELLE HOWARD
Director Metropolitan
Environment Protection Authority

cc: NSW Office of Water
Office of the Environment & Heritage

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Appendix 1 - NSW Office of Water comments

Infrastructure details	
P59	Para 3 – the use of recycled water from St Marys is an artefact of the proposed revised pump location. It should not be assumed that this water will be available to extract. The majority of this water is protected by the WSP.
(A2, p33, A8-31, comment 89;)	The Water Plan has the Quarantine and Regatta Lakes connected. A comment that to decouple these will result in impacts on water levels. NOW is recommending no direct connection; the movement of water from the Quarantine Lake to the Regatta Lake is obviously required to maintain operating levels. The reason to remain connected is not clear as they state that is part of the original plan however there has been significant changes to other infrastructure such as number of weirs.
Water licensing	
A8, NOW comments (4)	Licensing – states that this will be addressed in Stage 1 of the WMP. It doesn't appear to be in there. PLDC have a licence currently with no volume (0ML/annum). This is the only licence referred to in stage 1. There are a number of licensing issues which require resolution such as groundwater licences, controlled allocation and water access licences and volumetric entitlement.
A8, comment 12	PLDC's water balance includes an average return volume to the river of 2.4 GL. It should be noted that this will not be credited to PLDC's water licence at this stage. Any extraction will be considered as lost to the river.
A8, comments 22-26	The WMP Stage 1 states that these concerns will be addressed in stage 2.
Water balance and lake operating levels – Appendix 2	
Fig 2.1	Numbers have changed since the draft was issued. However, the initial queries re groundwater contribution investigation has not been addressed. It is difficult to resolve the groundwater balance. There is an annual oversupply of 3.7 GL It appears that 16.4 GL available from the Nepean River.
Table 3-5	The operating volume of the Quarantine Lake is quite small. Will this be adequate to provide storage for river extractions? This is still not clear.
Table 4-1	Pumped flows from the Nepean River are directed straight to the Quarantine Lake, without modelling the wetlands. The wetlands must be designed prior to the water quality modelling being undertaken to get a complete picture of the water treatment.
8	Nepean River extraction. This does not take an annual extraction limit into account. The probability of the required water being available is predicated by the pumping rules (on at 500ML/d, off at 350ML/d), not by a licensed volume. NOW recommends that this volume be negotiated as soon as possible with NOW so that the river extraction volume and the reliance on this water source to ensure operating levels in the lakes are adequate and meet requirements can be confirmed. Restricting pumping when river flows are in excess of 5000ML/d due to potential water quality issues should be addressed by the water quality model.
8.2	There is no mention of an upper limit available from the Nepean River which will be a licensing requirement. The total annual volume will be decided by NOW, and extraction will be limited by this. Filling and on-going "topping up" volumes may differ, but this will need to be negotiated with NOW.
8.3	It should be noted that water returned to the River from the lakes will not provide a credit under the current Water Sharing Plan rules. The net extraction rate referred to is not appropriate. PLDC will not be allowed to extract more than their licensed volume permits, in the hope that at a later date they will be able to return some portion of this to the river.

It appears that the many of the NOW's concerns are to be addressed in Stage 2 of the WMP.

Drought Management Study

There is no sign of a drought management study, apart from preliminary comments on lake levels and the likely time different lakes will be below the specified operating levels. NOW hopes that this will be included in Stage 2 of the WMP.

9	Section 9 states that on average 16.4GL/y will be available from the Nepean River. What volume will be available during drought years when the topping up of the lakes is more likely and catchment inflows will be reduced? NOW would expect to see a more detailed water balance for dry, average and wet years included in Stage 2 of the WMP, so that the likely impact of a drought on water levels in the lakes can be better understood. There is constant reference to water availability from the river being adequate on "average". A drought management study will have to take drought years into consideration.

Appendix 2 - NSW Environment Protection Authority and Office of Environment and Heritage (Water Quality comments)

EPA issues related to water quality are primarily to be address in Stage 2 of the WMP. The EPA/OEH identified the key elements that must be addressed and delivered in Stage 2 in a letter to PLDC from relevant agency (correspondence dated 29 May 2012).

There are implications for water quality related to Stage 1, including infrastructure and design elements that have implications for water quality processes, water levels and the flexibility to move water around the site under different circumstances. With the water quality assessment moved to stage 2 it means that these water quality aspects have not been fully considered in the infrastructure and design at this stage. These infrastructure and lake design linkages should be further assessed as part of the water quality assessment in Stage 2.

Other elements of the Stage 1 WMP related to water quality are:

- a draft WQ Strategy (an information only document); and
- a MUSIC modelling statement relating to the Southern Wetland prepared by J. Wyndham and Prince.

EPA/OEH has the following comments on these elements:

Water Quality Strategy

EPA/OEHs previous response to the Water Quality Strategy included that:

- The document provided an account and assessment of what has happened in the past but did not assist with planning how the lakes are to managed in practice in the future or provide any significant information on the likely performance in the future based on a technical engineering assessment of the water quality processes that are likely to operate in the lakes and pre-treatment systems.
- It was noted that the Strategy provided an assessment of existing data and aimed to provide support to the Water Management Plan, however, did not address most of the matters raised in correspondence from the Office of Penrith Lakes on what the Water Management Plan should address.
- It was expected that the final Water Management Plan will address the range of operational activities needed to manage water quality in the Lakes over the range of conditions expected to be encountered.

The water quality assessment (p92) states that: "Due to lower nutrient levels the incidence of algal levels would be expected to be minimal in the receiving waters." This can not be substantiated without considering the full range of nutrient inputs from the catchment, for example that may occur during very high flow events and flood conditions; or without an assessment of the potential for algal bloom in the lakes based on further research or modelling of in-lake processes and nutrient levels in sediments. The water quality assessment presented in the strategy does not account for these loads, the nutrient loads that may have accumulated in the system (including the treatment system), changes to source water and changes to the lakes and water treatment system. The summary data presented in the Water Strategy do not provide a complete picture of the water quality risks and it the water quality modelling will need to account for all of the relevant factors.

Southern Wetland

Section 6.1 of the Water quality Strategy (Appendix 4) provides a brief assessment of the Southern Wetland and is based on a modelling assessment at Appendix 6. EPA/OEH has concerns regarding the applicability of the MUSIC model (which is for small designed and constructed wetlands for urban stormwater management) to the Southern Wetland (which is large and not designed or constructed to any nominated specification but formed from resource mining fines). There are also key engineering parameters for managing the wetlands over time have not been identified or assessed, e.g. P-sorption capacity of the wetland substrate.

The MUSIC modelling report does not provide justification that the methodology used is representative of the wetland on site or refer to existing water quality data that could be used to support the case for the wetland performance.

The MUSIC model assumes a wetland is constructed according to design standards such as those set out in constructed wetland manuals or other appropriate guidelines. It is not clear if the wetland is designed and constructed according to specifications for a wetland that is relevant for modelling in MUSIC. This means that the wetland may not function in the same manner as the wetland node in MUSIC. The majority of data that supported the algorithms in MUSIC came from wetlands ranging in size from approximately 1000 m^2 to over 100,000 m^2. It could be argued that the USTM (Universal Stormwater Treatment Model) is valid for larger systems, because it was found to be representative of the function of Blackburn Lake in Victoria, which is around 300,000 m^2. It is recommended that the modelling is calibrated and validated to make sure that it functions for 540,000m^2 noting that the flow complexity in this size wetland might be too high to reasonably predict performance.

To establish long term removal efficiencies, the key indicators for treatment performance need to be established and assessed. The flow/water level conditions, under which the wetland may receive catchment runoff, should also be considered in nutrient loads that the wetland may receive, pass through loads of nutrients and other pollutants, or scour out of the sediment and nutrient within the wetland.

The range of fundamental engineering parameters for wetlands and pre-treatment systems include:

- Inflow concentrations and loads
- Peak flow before bypass – catchment areas and storm durations (mostly only receives flow from river pumping)
- Any flow velocities under any conditions that may cause scouring and resuspension (mostly only receives flow from river pumping)
- pollutant loads and concentrations of any bypass flows (mostly only receives flow from river pumping)
- hydraulic loading rate
- water balance
- nutrient loads and concentrations
- nutrient removal rates
- pathogen density
- pathogen removal rates
- phosphorus sorption capacity of sediments (current and remaining capacity)
- BOD loading rate
- hydraulic detention time
- Surface area and depth
- substrate type

Triggers for maintenance or other management actions should also be detailed, e.g. sediment levels in pre-treatment basins; p-sorption capacity of the wetland sediments before rehabilitation is needed.

Appendix 3- NSW Office of Environment and Heritage (flooding issues)

The following flood comments are provide with reference to the Penrith Lakes Scheme Flood Infrastructure Concept Design Project (Cardno) report dated 15 August 2012 and Penrith Lakes Scheme Peer Review Hydraulic Modelling (WMAwater) report dated September 2012.

For a number of years OEH's Sydney Unit has been providing technical flood advice on the Penrith Lakes Scheme to ensure that it does not cause adverse flooding impacts on the Nepean River and adjacent residential development. This advice has been presented in partnership with Penrith Council to protect people and property from the impacts of flooding and also to protect the Government, both NSW and local, from the scheme compromising current flood planning levels for existing and future development.

The Penrith Lakes Scheme Flood Infrastructure Concept Design Project (Cardno) report involves significant additional modelling from the previous Water Management Plan dated May 2012 to refine weir and lake levels to minimise flood impacts. Rerunning of the models and checking of the results is outside of the scope of the review by OEH. OEH's review is limited to checking the methodology and assumptions made.

For Waterside Green the report identifies 100 year and 200 year ARI modelled flood levels which are lower than flood levels adopted by Council during the design and construction of Waterside Green.

For the Cranebrook Village area it has been known for some time that the scheme would result in a lowering of the 100 year ARI flood level but cause an increase in the corresponding 200yr ARI flood level. Whist this is not ideal, OEH accepts that the modelling shows that this cannot be avoided and that the report's preliminary analysis of the flood damages suggests that the savings from lowering the 100 year ARI flood outweigh increases in the damages in the 200 year ARI flood.

There are specific issues in the Concept design report that require confirmation by Council:

- Section 11.2.5. The Cardno model shows an increase in water levels over the pre-quarry scenario in the 200yr ARI of 0.1 – 0.2m immediately upstream of Waterside Green which extends across Andrews Road and into the adjacent Penrith Industrial Area. The report states that this increase is due to the construction of Waterside Green and not from the Lakes Scheme.
- Section 11.2.6. The report recommends a flood cell around Nepean Park & Hadley Parks to isolate the property from Main Lake B. Whilst this may reduce flood risks below the 100yr ARI flood level once the levee is overtopped there are other issues that need to be considered including drainage and pumping of flood waters.

Similarly, WMAwater have not re-run models as part of the Penrith Lakes Scheme Peer Review Hydraulic Modelling report but rather checks the methodology used and assumptions made. In Section 3.3.3. the report raises concerns regarding the 2D modelling of:

- The railway embankment and Victoria Bridge that cross the Nepean River floodplain,
- Andrews Road, Castlereagh Road, McCarthys Lane and Farrells Lane, and
- Some of the watercourses in this area such as the eastern watercourse under the railway embankment.

Within the text of the report it states that these locations may benefit from being implemented as 1D structures in the model, however this recommendation is not repeated in the Report's Conclusions And Recommendations. PLDC's flood consultant should be requested to address this 2D modelling of structures issue in order to provide confidence in its model results.

OEH is aware that Penrith City Council has raised concerns regarding modelled flood level differences between its Regional Nepean River flood model and the Penrith Lakes Development Corporation's flood model. It is acknowledged that Council's Regional flood model and the Corporation's flood model have different objectives. However once Council updates its Regional flood model to include the currently proposed lake landform (from the current Water Management Plan), the flood levels results of the two models can be equally compared and any impact on Council's established flood planning levels can be checked.

Separately OEH has only recently become advised of a letter dated 14 August 2012 from the Penrith Lakes Development Corporation to Penrith City Council which compares flood levels for its latest 2012 model against Council's established flood planning areas at 8 sites. It is of some concern that these results were not presented in the Stage 1 Water Management Plan and do not seem to support the Plan's conclusion that council's established planning levels have not been compromised.

The clarification by PLDC of its letter dated 14 August 2012 and the subsequent updating of the Council's Regional model using the current landform and modelled structures are essential next steps before approval of the Stage 1 Water Management Plan by DP&I. The revised modelling will act a separate peer review on PLDC's flood model and address Council's concerns regarding the Scheme's adverse impacts on its adopted flood planning levels.

OEH will continue to support Penrith Council to undertake this exercise by providing technical advice and financial assistance.

Report prepared by Gus Pelosi
25 October 2012

Sue Ribbons
Manager, Sydney Unit, Urban and Coastal Water Programs
(Flood, Coast and Estuary Group)

Appendix 4 - Office of Communities – Sport and Recreation

Comments on PLDC's Water Management Plan – Stage 3

The following comments on the Water Plan relate to the sustainability of the Penrith Lakes for aquatic events, sporting and recreational use.

1.0 Macrophytes

Submerged aquatic plants (macrophytes) are important components of freshwater ecosystems, providing a vital food source and habitat for aquatic organisms and fish. Macrophytes also have the ability to positively influence physical and chemical properties of water quality. Conversely, their abundant growth and the annual release and defoliation of some species, regularly causes utilisation problems at the Sydney International Regatta Centre (SIRC).

Dominant macrophytes in the SIRC Lakes include *Vallisneria*, *Hydrilla* and *Potamogeton*. These species have the ability to disrupt recreational use because of their strong growth characteristics and invasive nature. As part of the management of the SIRC lakes, Venue Management now requires the services of two harvesting machines, each working 100 days per year. This method proves to be particularly costly, time consuming and only effective for short periods of time.

If the average depth of the Main Lakes is similar to SIRC i.e. 5 metres, macrophytes will readily spread throughout the lakes and inhibit the proposed recreational activities (swimming, boating, sailing, rowing, canoeing, etc.).

Information from PLDC is required regarding:

- the proposed depth of the Main Lakes; and
- the depth to which macrophytes can establish.

If the depth of the main recreational zones in the Lakes does not exceed the depth to which the macrophytes can colonise, the lakes may not be viable for the recreational activities envisaged and government will inherit a considerable liability.

There is a risk of exotic aquatic flora (and fauna) infiltrating the Penrith Lakes via the transfer of water from the Nepean River. The Wetlands System and Quarantine Lake must be relied upon to filter any exotics before transferring water to the recreation lakes. How will this be achieved?

2.0 Water Quality

Under the current design, the Regatta Lake continues to serve as a treatment or "polishing" lake for the water bodies to the north. A plan to receive poor quality water directly from the Detention Lakes at the eastern end and the Quarantine Lake at the western end is not consistent with the primary contact water quality objectives for the Regatta (and Whitewater Stadium) Lake.

Water transfer from the Detention Lakes periodically results in elevated microbial and bacterial levels in the Regatta Lake that cause primary contact events to be cancelled. Inflows of nitrogen and phosphorus contribute to the strong growth rates of macrophytes and continuing enrichment of the Regatta Lake.

Better water quality could be achieved in the Regatta Lake by having the ability to transfer stormwater from the Detention Lakes to the Quarantine Lake (via the wetland system on the southern side of Old Castlereagh Road) during red alert conditions.

Further improvements could be achieved by transferring water from the Quarantine Lake directly to the Main Lake A. This action was recommended by the Water Committee and discussions with PLDC's former Water Manager - Rebecca Wright also concluded this to be the best way to preserve primary contact recreational water quality in the Regatta Lake.

As discussed in previous stakeholder meetings, water modelling research should be conducted as basis for making informed decisions about water management.

3.0 Water Quantity

Fluctuations in the water level of the Regatta Lake occur when storage capacities are exceeded in the Detention Lakes. Apart from having to receive untreated stormwater, the transfer affects the operation of regatta infrastructure (e.g. start system, pontoons, etc) and can result in the cancellation of events.

Enabling the water to transfer from the Detention Lakes to the Wetland System would serve to protect the Regatta Lake from fluctuations in water quality and quantity.

Water levels in the Quarantine Lake will need to be monitored carefully to ensure that there is not a need to transfer water before suitable levels of water quality are achieved. Connecting the Quarantine Lake to Main Lake A will insure against unwanted water transfer to the Regatta Lake.

To improve the circulation and water flow between the Main Lakes (A & B) and the Regatta Lake, it will be necessary to be able to pump water both ways between the lakes. This will also be required to maintain water levels in Main Lake A and the Regatta Lake.

Comments on Penrith Lakes Water Plan by Rowing Australia – 10/07/12

Rowing Australia's Comments	PLDC Response
The proposed time line to join and then fill this new Quarantine lake to the existing Regatta Lakes, conflicts with the key events in the lead up to the SIRR. That is, filling the Quarantine Lake from the existing Regatta Lakes will disrupt the water level to such an extent that the Youth Olympic Festival Regatta (Jan 19/20) will be jeopardized. The YOF is a major test event for the SIRR.	PLDC is implementing the approved Scheme Structure Plan as described in the Regional Environmental Plan and Deed of Agreement. After consultation with the State government in early 2012 the Department of Planning advised that PLDC was contractually obliged to deliver landforms consistent with the Scheme Structure Plan. Given this PLDC met with SIRC to understand the calendar of events around 2012 to 2014 and has attempted to mitigate the potential impacts, i.e. filling of lakes and quarry process impacting on SIRC and the program of events. The Quarantine lake and Regatta flowpath works program will be amended to, as far as possible, avoid conflict with SIRC's major events. PLDC will liaise with SIRC in amending its program of works.
In dredging the soil to join the Lakes in this peak regatta season, the primary contact value of the water quality will be lost	This work will be carefully considered to minimize impacts. Primary Contact requirements have been upheld during all works to date and this is expected to be continued. No Dredging works have been considered as part of the connection of the Lakes. Any environmental disturbances caused by quarrying actions will be treated in alignment with EPA and PLDC's own environmental management processes and a cost-effective construction methodology which may include protective bunding and sediment control practices will be adopted to minimize impacts..
Constructing the new lake will require removing a significant number of trees. Given the prevailing wind towards the regatta course comes directly from this area, the existing 'faimess' of the course will be affected. Recognised as one of the world's best man made courses has taken many years to achieve – following comprehensive wind analysis prior to planting of the existing tress surrounding the venue. This appears to not have been considered.	The connection of the Quarantine Lake to the Warm-up lake is expected to have little impact on the wind dynamics of the competition course. This was identified as a key issue during the planning of the Regatta Lake pre-Olympics, and was the key reason for moving the outlet for the Quarantine Lake to the Warm-up Lake rather than the previous plans of joining directly to the Regatta Lake. PLDC has previously placed significant emphasis on wind break plantings and the planning process will ensure as few as possible of these plantings will be affected.
Management of existing levels of aquatic plants in the Regatta Lakes is a significant issue for SIRC. This has just recently been recognized by Minister Annesley, when he allocated extra funding to SIRC to manage the issue. Adding now another lake almost the size of the warm	The Quarantine Lake is believed by the relevant plant specialists to have little impact on the macrophyte growth of the SIRC, with the likely outcome of increased nutrient removal in the Quarantine Lake via dense macrophyte beds reducing the amount of nutrients available to the existing SIRC lakes. This could potentially decrease the amount of macrophyte growth occurring in the existing SIRC. Current water modelling suggests significantly lower nutrients will be introduced via the Southern Wetland and Quarantine Lake systems when compared to the current eastern detention basin system. It is expected that this

up lake, will potentially set weed management within the Competition Lakes system back again into a 'crisis management' situation.	additional water source will decrease reliance of the current system on the macrophyte plantings in the competition lakes.
The SIRC is a world's leading venue for three legacy sports. Rowing, Canoe Kayak Sprint and White Water Canoeing. Current management of flooding incidents and planned water flow patterns (shown by the red arrows in the attached map) will continue to feed phosphates into a water body that requires primary contact water. This will prolong the continual weed management and water quality issues SIRC currently face. Under current planning (red arrow directions), this primary contact requirement will always struggle to be achieved. It is my view that the flow of water (arrow 9) would be better directed into the big Lake A	PLDC has followed the current reticulation system as approved via the RES, Deed, relevant DA's and water plans and independent studies shows this reticulation system to work effectively for all of the lakes in the Scheme By its very nature the flow of flood waters in major events cannot be varied. A future option may be the installation of a significantly sized pump and pipeline to allow water from the eastern catchment to bypass the SIRC and divert to the Southern Wetlands. This is a matter for Government as it is beyond PLDC's scope under the Deed.
It has been stated that connecting the new Quarantine Lake will allow aquatic plants to filter the water for the larger sporting lakes. That is true. However, weed growth is not stationary. New varieties of plant life (and more phosphate run off) will potentially move from the Wetland system into the SIRC waterbody via this route.	PLDC has conducted preliminary modelling which has shown the nutrient retention from the current Southern Wetland design will be able to produce significantly less phosphate (and nitrate) levels compared to the water sourced from the eastern catchment. PLDC is currently investigating various wetland and Quarantine Lake design features which may aid in controlling the entry of plant species into SIRC. This will include the installation of mesh filters installed on pump inlets and may also include sand filters and weed booms in the wetlands and "drop-zone" in the Quarantine Lake.

Comments on Penrith Lakes Water Plan by Rowing Australia – 20/09/12

Rowing Australia's Comments	PLDC Response
The proposed time line to join and then fill this new Quarantine lake to the existing Regatta Lakes, conflicts with the key events in the lead up to the SIRR. That is, filling the Quarantine Lake from the existing Regatta Lakes will disrupt the water level to such an extent that the Youth Olympic Festival Regatta (Jan 19/20) will be jeopardized. The YOF is a major test event for the SIRR.	PLDC is implementing the approved Scheme Structure Plan as described in the Regional Environmental Plan and Deed of Agreement. After consultation with the State government in early 2012 the Department of Planning advised that PLDC was contractually obliged to deliver landforms consistent with the Scheme Structure Plan. Given this PLDC met with SIRC to understand the calendar of events around 2012 to 2014 and has attempted to mitigate the potential impacts, i.e. filling of lakes and quarry process impacting on SIRC and the program of events. The Quarantine lake and Regatta flowpath works program will be amended to, as far as possible, avoid conflict with SIRC's major events. PLDC will liaise with SIRC in amending its program of works.
In dredging the soil to join the Lakes in this peak regatta season, the primary contact value of the water quality will be lost	This work will be carefully considered to minimize impacts. Primary Contact requirements have been upheld during all works to date and this is expected to be continued. No Dredging works have been considered as part of the connection of the Lakes. Any environmental disturbances caused by quarrying actions will be treated in alignment with EPA and PLDC's own environmental management processes and a cost-effective construction methodology which may include protective bunding and sediment control practices will be adopted to minimize impacts..
Constructing the new lake will require removing a significant number of trees. Given the prevailing wind towards the regatta course comes directly from this area, the existing 'fairness' of the course will be affected. Recognised as one of the world's best man made courses has taken many years to achieve - following comprehensive wind analysis prior to planting of the existing tress surrounding the venue. This appears to not have been considered.	The connection of the Quarantine Lake to the Warm-up lake is expected to have little impact on the wind dynamics of the competition course. This was identified as a key issue during the planning of the Regatta Lake pre-Olympics, and was the key reason for moving the outlet for the Quarantine Lake to the Warm-up Lake rather than the previous plans of joining directly to the Regatta Lake. PLDC has previously placed significant emphasis on wind break plantings and the planning process will ensure as few as possible of these plantings will be affected. Further to this VIPAC Engineers & Scientists Ltd. noted on two separate reports produced in 1992 and 2007 that a 100m setback from the Competition Lake is required to have minimal impact on course fairness. The current wind-block headland on the Western Back will remain after the construction of the Quarantine Lake, with greater than 300m setback distance from the competition finish lane.
Management of existing levels of aquatic plants in the Regatta Lakes is a significant issue for SIRC. This has just recently been recognized by Minister Annesley, when he allocated extra funding to SIRC to manage the issue. Adding now another lake almost the size of the warm up lake, will potentially set weed management within the Competition Lakes system back again into a 'crisis management' situation.	The Quarantine Lake is believed by the relevant plant specialists to have little impact on the macrophyte growth of the SIRC, with the likely outcome of increased nutrient removal in the Quarantine Lake via dense macrophyte beds reducing the amount of nutrients available to the existing SIRC lakes. This could potentially decrease the amount of macrophyte growth occurring in the existing SIRC. Current water modelling suggests significantly lower nutrients will be introduced via the Southern Wetland and Quarantine Lake systems when compared to the current eastern detention basin system. It is expected that this additional water source will decrease reliance of the current system on the macrophyte plantings in the competition lakes.
The SIRC is a world's leading venue for three legacy sports. Rowing, Canoe Kayak Sprint and White Water Canoeing. Current management of flooding incidents and planned water flow patterns (shown by the red arrows in the attached map) will continue to feed phosphates into a water body that requires primary contact water. This will prolong the continual weed management and water quality issues SIRC currently face. Under current planning (red arrow directions), this primary contact requirement will always struggle to be achieved. It is my view that the flow of water (arrow 9) would be better directed into the big Lake A	PLDC has followed the current reticulation system as approved via the RES, Deed, relevant DA's and water plans and independent studies shows this reticulation system to work effectively for all of the lakes in the Scheme By its very nature the flow of flood waters in major events cannot be varied. A future option may be the installation of a significantly sized pump and pipeline to allow water from the eastern catchment to bypass the SIRC and divert to the Southern Wetlands. This is a matter for Government as it is beyond PLDC's scope under the Deed.
It has been stated that connecting the new Quarantine Lake will allow	PLDC has conducted preliminary modeling which has shown the nutrient retention from the current Southern Wetland design will be able to produce significantly less

aquatic plants to filter the water for the larger sporting lakes. That is true. However, weed growth is not stationary. New varieties of plant life (and more phosphate run off) will potentially move from the Wetland system into the SIRC waterbody via this route.	phosphate (and nitrate) levels compared to the water sourced from the eastern catchment. PLDC is currently investigating various Southern Wetland and Quarantine Lake design features which may aid in controlling the entry of plant species into SIRC. This will include the installation of mesh filters installed on pump inlets and may also include sand filters and weed booms in the wetlands and "drop-zone" in the Quarantine Lake.

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From: Dani Drewry [Dani.Drewry@pldc.com.au]
Sent: Tuesday, 18 September 2012 10:06 AM
To: Wade, Karen; mark.isaacs@dpc.nsw.gov.au
Cc: Flynn, Kevin
Subject: Sydney International Rowing Regatta 2013 - Draft Minutes
Karen (Mark)

Re: Sydney International Rowing Regatta 2013 - Draft Minutes

I have reviewed the draft minutes of the agency meeting and especially our presentation to your committee. Given we were asked to attend the meeting after significant concern was raised by SIRC and Rowing Aust on the Quarry operations within the vicinity of SIRC during the event - I have added below in red what I believe PLDC presented to the committee and I think need to be considered by the Committee and the Event to ensure the risks are mitigated. As always PLDC is willing to assist Kevin Flynn and Rowing Australia with resolving and integrating operations to ensure the Event is successful.

- *See attached presentation by Penrith Lakes Development Corporation.*
- Water Plan was submitted on 17 August 2012, Explaining the impacts to SIRC operations.
- PLDC's presentation to this committee outlined the management of risks to the SIRC March 2013 event - Water Quality and Quantity & Construction of Infrastructure.
- Water Quality / Quantity
    1. Top up Water for SIRC currently comes mainly from the PCC controlled catchment, and outside the control of SIRC and PLDC.
    2. PLDC confident they will be able to achieve 95% compliance (under normal operating conditions) the water quality required to service SIRC events.
    3. In future, as part of the Scheme management, State Government will be able to operate a pump on the Nepean River which will take water from the River and add water to the Lakes.
    4. This will reduce instances of risk to events due to the quality of the River water is much better than the quality of the water coming off the catchment.
    5. Primary contact is defined by NSW health specifically for SIRC. (means the water can be swallowed and used for swimming NOT SURE THIS IS CORRECT DD).
    6. Releasing water into SIRCC from the eastern detention basins could be an issue in regard to macrophyte and algal bloom management but is part of the agreement between State Government and PLDC in regard to ongoing management of the Scheme.
    7. Weather will be pivotal and there is only a limited ability to hold water in the event of major storms.
- Construction of Infrastructure
    1. PLDC under contract with the State Government is required to construct major infrastructure during the 2013 – 2014 calendar yrs. For the Regatta Centre, there is a lot of infrastructure that is required to be provided.
    2. Flood protection works will mitigate the risks of damage to SIRC as the level of the river during flood potential will be up to the banks.
    3. Design will take account of concerns by SIRC.
    4. PLDC are working closely with SIRCC and are attempting to ensure works and quarry operations where possible are being rescheduled to ensure that there is no impact on the Regatta.
    5. PLDC will determine a construction methodology that will potential prevent sediment flow into SIRCC.
- Risks to be considered by SIRC prior to the Event include:
    1. Quarry operations and infrastructure construction
    2. Deteriorating water quality from only available source Eastern Catchment
    3. Water Licence requirements
    4. Ecosystem and Algal bloom management as event being held in the peak risk season.
- KFlynn advised that SIRCC will work with PLDC to discuss different controls for incorporation into the risk assessment.
- MDraper: Looking forward to speaking in detail with PLDC. Weed growth continues to be an issue.
- KFlynn confirmed that there are a lot of events that could be affected and has provided a calendar of events.