



Environment, Climate Change & Water

Your reference: MP10_0048
Our reference: DOC10/51040
Contact: Bob Marr (02) 9995 6825

23 DEC 2010

Mr Daniel Cavallo
A/Director Government Land & Social Projects
Department of Planning
23-33 Bridge St
SYDNEY NSW 2001

Dear Mr Cavallo

**RE: Environmental Assessment Exhibition – Barangaroo Headland Park Main Works
(MP10_0048)**

The Department of Environment Climate Change and Water ("DECCW") refers to your letter dated 8 November 2010, seeking advice on the above matter. DECCW refers also to the appended document prepared on behalf of the Barangaroo Delivery Authority (BDA) by MG Planning Pty Ltd dated 5 November 2010 and titled *Barangaroo Part 3A Project Application - Headland Park and Northern Cove Main Works Environmental Assessment* (and Appendices)

As you would be aware, DECCW was not provided a draft EA for an *Adequacy Review*. The EA will require additional work prior to DECCW being able to provide the full range of recommended consent conditions.

DECCW has reviewed the above documentation and offers the following comments:

As you may be aware construction and other operational environmental matters associated with the Barangaroo development will be regulated by conditions attached to an Environment Protection Licence (EPL) issued to the Barangaroo Delivery Authority (BDA). At present the EPL permits only works covered by Major Project Determination No 07_0077 issued by the DoP to the Sydney Harbour Foreshore Authority. DECCW understands that BDA will apply for variations to this EPL as Project Approvals are granted. The proponent needs to be aware that any works conducted at the site need to be done in a manner which ensures compliance with all project Approval and EPL conditions as varied from time to time.

DECCW's detailed comments on the EA are appended in **Attachment 1** and the key issues which DECCW has identified are:

Contamination

DECCW notes that all documents appear to be draft and the Site Auditor's reviews are only 'preliminary'. Consequently DECCW considers that significant related documentation is yet to be prepared and finalised.

The general remediation and material placement approach may be appropriate, but there appears to be significant detail lacking in the EA.

DECCW notes the draft Remedial Action Plan (RAP) has been provided in the EA and it includes tables of clean-up criteria to be used in the construction of Headland Park. DECCW understands the contaminant levels were derived from the Human Health and Environmental Risk Assessment (HHERA). DECCW is concerned that given the significance of these criteria and the potential consequences of DoP approving this project based on incomplete or erroneous data, review of the HHERA by DECCW is essential. Linked to the above, DECCW requires that all plans are reviewed and approved by the NSW EPA accredited Site Auditor and that all plans and works are prepared and conducted in accordance with NSW endorsed guidelines. At present the EA lacks sufficient detail for DECCW to comment further.

Waste Management

DECCW notes that the EA states - some waste may need to be imported as required (topsoil, fill, sandstone, rock armour) and some waste may need to be exported. DECCW requires that the proponent ensures that all waste entering the site can be received and disposed to land in a lawful manner in accordance with the *Protection of the Environment Operations Act* (POEO Act) 1997 and especially the Resource Recovery Exemption mechanism.

If any soil needs to be disposed of off site then it will need to comply with the Waste Classification Guidelines. These guidelines may indicate the material will need to be *immobilised* prior to disposal. If so, the proponent will need to apply for a *site specific immobilisation approval* as the general approval for gasworks waste may not apply to this material. It is likely that soil from this site may contain contaminants other than those listed in the general approval.

Noise and Vibration

DECCW notes that significant exceedances of the construction noise criteria are predicted as a result of rock hammering. DECCW recommends that restrictions on hours for rock hammering may be appropriate in conditions for any Project Approval to provide respite for those potentially impacted.

DECCW notes also that significant exceedances of both the continuous and intermittent vibration criteria are predicted. Consequently DECCW recommends Vibration Dose monitoring is undertaken at residences in High Street.

Air

The assessment predicts large exceedances of DECCW's air quality impact assessment criteria.

DECCW strongly recommends that:

- the assessment should be revised to address all technical issues detailed in **Attachment 1**; and
- the assessment should be revised to demonstrate that proper management of the project related activities and works will not cause additional exceedances at nearby sensitive receptors.

Water

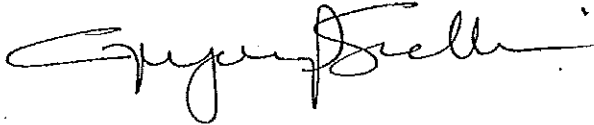
As flagged above, DECCW is yet to see the HHERA. Consequently a number of uncertainties remain in relation to proposed water management measures. Extensive water reuse is proposed both during construction and once the park is established, due to the drive for water sustainability. In other circumstances DECCW encourages appropriately treated water re-use. However, until such time as the HHERA is completed and understood, DECCW is unable to confidently provide advice on water re-use suitability in the context of contaminated site remediation.

DECCW recommends that all water management information is consolidated into one Soil and Water Management Plan rather than be included in, for example, an Environmental and Construction Management Plan or other documents. Each stage of the works should be reflected in the most

recent Soil and Water Management Plan but site/sub-catchment specific Erosion and Sediment Controls Plans are acceptable.

If you have any queries regarding these matters please contact Bob Marr on 9995 6825.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Greg Sullivan', with a long horizontal flourish extending to the right.

GREG SULLIVAN
Deputy Director General
Environment Protection and Regulation

**ATTACHMENT 1: DECCW submission on the
Environmental Assessment (EA) for Barangaroo
MP10_0048 HEADLAND PARK – MAIN WORKS**

The DECCW has reviewed the above EA and provides detailed comment on the following aspects of the proposal:

- Site contamination and risk;
- Waste;
- Noise impact assessment and vibration;
- Air quality impact assessment; and
- Water management and receiving water quality.

Site contamination and risk

As flagged in DECCW's previous submission for "Early Works", the remediation works of the overarching project are subject to review by a NSW EPA accredited Contaminated Sites Auditor. DECCW would expect that all requirements identified by the Site Auditor be complied with. Further DECCW understands a number of required assessments and plans are yet to be fully completed, for example the Human Health and Ecological Risk Assessment, the Remediation Works Plan and Groundwater Monitoring Plan. These documents provide specifics and details of the remediation works and therefore DECCW recommends these documents must be available for review by the DECCW either prior to project approval or possibly before their implementation, as a condition of approval.

The proponent should be made aware that any commitments made in the environmental assessment process may be formalised as approval conditions. Consequently, pollution control measures should not be proposed if they are impractical, unrealistic or beyond the financial viability of the development. It is important that all conclusions are supported by adequate data.

Remedial Action Plan

The Remedial Action Plan (RAP) includes the proposed clean-up criteria as well as other controls such as water quality for irrigation which have been derived in the HHERA. However, as the HHERA is still yet to be provided, DECCW is unable to confirm whether these values are correct, whether they have been listed correctly, calculated correctly or whether the scenarios on which they are based are the most appropriate for the site. Consequently DECCW is not yet in a position to comment on the adequacy of the RAP until the HHERA is available for review. Notwithstanding the above comments, DECCW acknowledges that the Site Auditor has the primary decision-making role in this matter and for this part of the site.

DECCW notes that some of the values appear relatively high so it is important to confirm how these values can be justified (Table 6.3 and 6.4). DECCW notes also that there are a range of zones that have different criteria but it is not clear in this document what different scenarios have been applied to get the different criteria. The values proposed for materials to be used in Northern Cove seem particularly large.

The RAP document provides many options for dealing with soils of different levels of contamination but it is not clear which options will actually be used at the site.

This document describes the type of water treatment plant that might be used for contaminated water at the site. Given that this level of detail is not provided in the water management appendix, or any other document in the EA, DECCW questions the rigour of the information presented in this document. The monitoring program design needs to take into account the time needed for the water treatment plant to settle after start-up (commissioning). It may not be appropriate to stop intensive monitoring after 3 days as the plant may not have come to optimal operational conditions.

Table 6.6 lists the proposed criteria for the irrigation of water at the site post construction. These values seem high and DECCW would appreciate confirmation on whether or not these values are based on human health considerations or ecological ones. This clarification is particularly critical as, for example, it would be of considerable concern if water containing 0.19mg/L of benzene or 1mg/L of xylene or 2.4mg/L of naphthalene is used in a spray irrigation scenario.

In section 6.5.2 DECCW notes the statement regarding ongoing monitoring and management. DECCW recommends an appropriate long term management plan is in place and the park managers ensure its full and ongoing implementation.

Waste and Immobilisation Approvals

The EA flags that some waste may need to be imported as required (topsoil, fill, sandstone, rock armour) and some waste may need to be exported. At all times, the proponent must ensure that all waste entering the site can be received and disposed to land in a lawful manner in accordance with the *Protection of the Environment Operations Act* (POEO Act) 1997 and especially the Resource Recovery Exemption mechanism.

At all times, the proponent must ensure that any waste leaving the site for disposal is transported to a facility that can lawfully receive that waste.

The proponent must regularly and consistently record all waste being imported to the site (quantities, address of source site, classification, transporter details) and retain records demonstrating, where applicable, that the material meets the relevant Resource Recovery Exemption.

The proponent must regularly and consistently record all waste being exported from the site (quantities, address of disposal site, classification, transporter details) and retain original records demonstrating both this information and the lawful disposal of the waste.

Any trackable wastes must be transported and tracked in accordance with the POEO Waste Regulation 2005.

DECCW strongly suggests that the proponent implements due diligence measures and conducts regular audits of its records to ensure that waste is being managed and disposed of in a lawful manner. This information may be asked for by the EPA at any time. The proponent must be aware that it cannot 'contract out' its environmental responsibilities to any third party, including transporters.

If any soil needs to be disposed of off-site then it will need to comply with the Waste Classification Guidelines. These guidelines may indicate the material will need to be immobilised prior to disposal. If this is the case, the proponent must apply to DECCW for a site specific immobilisation approval.

Noise and Vibration Impact Assessment

DECCW notes that there is a large amount of data shown to be affected by weather in the unattended noise monitoring graphs in Appendix 3 of the Noise Impact Assessment (NIA), meaning there is only about 4 days worth of unaffected data.

DECCW understands that the proposed general construction hours sought are 7.00am to 6.00pm Monday to Friday and 8.00am to 3.00pm Saturdays. The construction hours sought marginally exceed the standard construction hours recommended in the Interim Construction Noise Guideline (ICNG) with respect to Saturday hours. DECCW does however note that the proposed hours are slightly more stringent than the standard construction hours applied by the Sydney City Council. Additionally, the NIA identifies circumstances where out of standard hours works are necessary, for example, dewatering. DECCW recommends that the general construction hours sought are reasonable, given that they are slightly more stringent than would be routinely applied by SCC to construction works in the CBD. That said, given that the hours sought marginally exceed the standard hours in the ICNG, and that the potential for significant noise impacts are identified, it is recommended that the Noise and Vibration Management Plan (NVMP) include provisions to reduce construction hours on Saturday, in line with ICNG (8am to 1pm), in the event that significant, and unresolved, community concern is raised regarding these extended Saturday hours.

The Noise & Vibration Assessment (NVA) indicates that 24hr operation will be needed for dewatering plant, and gives the following commitment: "The dewatering pump would be sited, or treated to meet the established noise limits 24 hour operating plant at all residential receivers locations at all times".

Appendix 2: Preliminary Noise & Vibration Management Plan: The plan needs to be updated as detailed design progresses. Measures such as training, site induction, tool box talks etc need to be included in the NVMP. Additionally, the NVMP should include provision for access to independent acoustic expertise, that are available on request from proponent representatives, and that attend the site on regular intervals to confirm that all feasible and reasonable noise mitigation measures and site practices are in place. These site visits may be scheduled to coincide with attended noise monitoring. DECCW is also supportive of the proposed establishment of a community liaison forum.

Significant exceedances of the construction criteria are predicted as a result of rock hammering. DECCW recommends that restrictions on hours of rock hammering may be appropriate in conditions in any Project Approval to provide respite.

Significant exceedances of both the continuous and intermittent vibration criteria are predicted. DECCW recommends Vibration Dose monitoring is undertaken at residences in High Street.

The EA does not include an assessment of operational noise. DECCW expects all mechanical plant and equipment associated with Headland Park (e.g. air conditioning plant, generators, chillers, pump stations, treatment plants etc) to not emit noise more than 5dBA above background, in accordance with the NSW Government's Industrial Noise Policy

DECCW flags the following Project Approval conditions for Noise:

1. The proponent must prepare and implement a detailed Construction Noise and Vibration Management Plan (CNVMP), to be approved by the Director General of the Department of Planning before commencement of works, that includes but is not necessarily limited to;
 - (a) identification of the specific activities that will be carried out and associated noise sources at the premises,
 - (b) identification of all potentially affected sensitive receiver locations,
 - (c) quantification of the rating background noise level (RBL) for sensitive receivers, as part of the CNVMP, or as undertaken in the EA,

- (d) the construction noise, ground-borne noise and vibration objectives derived from an application of the DECCW Interim Construction Noise Guideline (ICNG), as reflected in conditions of approval,
 - (e) prediction and assessment of potential noise, ground-borne noise (as relevant) and vibration levels from the proposed construction methods expected at sensitive receiver premises against the objectives identified in the ICNG and conditions of approval,
 - (f) where the objectives are predicted to be exceeded, an analysis of feasible and reasonable noise mitigation measures that can be implemented to reduce construction noise and vibration impacts,
 - (g) description of management methods and procedures, and specific noise mitigation treatments / measures that will be implemented to control noise and vibration during construction,
 - (h) where the objectives cannot be met, additional measures including, but not necessarily limited to, the following should be considered and implemented where practicable; reduced hours of construction, the provision of respite from noisy / vibration intensive activities, acoustic barriers / enclosures, alternative excavation methods or other negotiated outcomes with the affected community,
 - (i) where night time noise management levels cannot be satisfied, a report shall be submitted to the Director General outlining the mitigation measures applied, the noise levels achieved and justification that the outcome is consistent with best practice,
 - (j) measures to identify non-conformances with the requirements of the CNVMP, and procedures to implement corrective and preventative action,
 - (k) suitable contractual arrangements to ensure that all site personnel, including sub-contractors, are required to adhere to the noise management provisions in the CNVMP,
 - (l) procedures for notifying residents of construction activities that are likely to effect their noise and vibration amenity,
 - (m) measures to monitor noise performance and respond to complaints,
 - (n) measures to reduce noise related impacts associated with offsite vehicle movements on nearby access and egress routes from the site,
 - (o) procedures to allow for regular professional acoustic input to construction activities and planning; and,
 - (p) effective site induction, and ongoing training and awareness measures for personnel (e.g. tool box talks, meetings etc).
2. All construction work at the premises must be conducted between 7am and 6pm Monday to Friday and between 8am and 3pm Saturdays and at no time on Sundays and public holidays, unless inaudible at any residential premises. Works outside these hours are not permitted except as explicitly specified below or in other conditions and include:
- (a) the delivery of materials which is required outside these hours as requested by Police or other authorities for safety reasons;
 - (b) emergency work to avoid the loss of lives; damage to property and/or to prevent environmental harm;
 - (c) other works expressly approved by the Director General of the Department of Planning;
 - (d) Out of standard hours works identified in a CNVMP approved by the Director General of the Department of Planning.

3. Construction noise management levels (NML) derived in accordance with the DECCW Interim Construction Noise Guidelines apply to this project, and are required to be identified in an approved CNVMP. Any activities that have the potential for noise emissions that exceed the NMLs must be identified and managed in accordance with the CNVMP. The proponent must implement all Reasonable and Feasible noise mitigation and management measures with the aim of achieving the NMLs.
4. Vibration caused by Construction and received at any sensitive receiver outside the project must be assessed against the guidelines contained in the DECCW publication "Environmental Noise Management - Assessing Vibration: a technical guideline" and in accordance with the CNVMP.

In addition to the conditions above, it is normal practice for DoP to impose "Construction Noise Management" conditions, for example conditions 31-34 in the project approval for the City West Cable Tunnel (http://www.planning.nsw.gov.au/asp/pdf/05_0178_dgreport.pdf). These conditions are also recommended for imposition in any project approval for the Barangaroo site.
5. All mechanical plant and equipment associated with post-construction facilities at Headland Park (e.g. air conditioning plant, generators, chillers, pump stations, treatment plants etc) are to not emit noise more than 5dBA above background, in accordance with the NSW government's Industrial Noise Policy

Air Quality Impact Assessment

Odour Assessment

The assessment predicted odour concentrations up to 67 OU at nearby sensitive receptors compared with the assessment criteria of 2 OU. This assessment result is 33 times larger than the relevant impact assessment criteria. The odour levels predicted would result in significant amenity impacts.

Peak to mean factors

- Section 6.3 of the assessment advises that a peak to mean (P/M) factor was applied to "*E and F stability classes where maximum levels occur*".
- The *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) requires that a P/M factor is applied to all emissions regardless of the stability class. The P/M factor enables estimates of nose response time (~ 1 second) concentrations from 1-hour averaged dispersion model predictions.
- The model configuration file titled *Combined Sources – Odour Emissions, Main Works – Odour Emissions – with controls* includes odour emission rates that have not been adjusted with a P/M factor. It is possible that the results were scaled in a post process manner. The assessment does not discuss any post processing of odour model predictions.
- The model configuration file titled *Combined Sources – Odour Emissions, Main Works – Odour Emissions – with controls* includes odour emissions during the hours of proposed operation (i.e. daylight hours) only.
- The assessment does not specifically provide an analysis of the modelled meteorological data file showing the occurrence of atmospheric stability class by hour of day. However, Appendix B of the assessment provides a summary the method used to determine stability class for the meteorological file. Based on Table 2 of Appendix B, stability classes E and F do not occur during daylight hours.
- If the model configuration only assessed emissions during daylight hours and P/M factors were only applied to stability classes E and F, it is likely that no P/M factors were applied to the assessment scenario.

Odour exceedances

- The relevant odour criteria adopted in the assessment is 2 OU.

- The assessment predicts off site odour impacts up to 67 OU.
- Based on the discussion on P/M factors above, if no P/M factor was applied the assessment could have under predicted peak impacts by a factor of ~2. I.e. nose response time predictions could be in the order of ~ 127 to 154 OU depending on the P/M factor applied.
- Odour results are presented for the maximum predicted value (100th percentile).
- The assessment says "*Frequency of exceedance plots are unable to be prepared for odour.....*". This statement is incorrect. DECCW advises that section 2.10.6 of the Ausplume user manual discusses the preparation of frequency plots.
- The Approved Methods permits odour modelling results to be presented at the 99th percentile (88th highest model prediction).
- There is not enough information provided in the assessment to determine whether DECCW's odour impact assessment criteria (2 OU) is exceeded at the 99th percentile prediction with P/M factors applied.

Odour Controls

It will be important to appropriately manage stockpiles to ensure that they can be covered, for example using tarpaulins. DECCW experience at other sites has shown that hydro-mulch and other such techniques are often not sufficient for controlling odour from soils containing these types of chemicals. DECCW recommends that tarpaulins should be added to the list of controls and be used in preference to odour suppressant etc.

Particulate Matter Assessment

The assessment predicts PM₁₀ concentrations will approximately double as a result of project activities. Based on the modelling results, the increase in ambient particle concentrations will cause large exceedances of DECCW's PM₁₀ impact assessment criteria.

DECCW also notes that proponent has used a soil density of 1.3 in it's calculations regarding PM10 – normally soil density is 1.6 or 1.8 – and it needs to be confirmed that 1.3 is appropriate. In appendix A, a density of 1.66 is used where the parameters for modelling are listed in calculating the chemical evaporation from the soil.

PM₁₀ Maximum 24-hour Average

- The assessment predicts a project increment of >40 µg/m³ when the proposed particulate controls are applied.
- DECCW's impact assessment criteria is 50 µg/m³. The criteria must be applied on a cumulative basis, i.e. impacts from the proposal in addition to background particle concentrations.
- No result showing the sum of the existing background with the project increment is provided in the assessment.
- The assessment states that "*frequency of criteria exceedances estimates are considered unnecessary for the particulate criteria exceedances as anticipated levels are consistent with existing background levels where air quality controls are applied*".
- DECCW advises that the frequency and magnitude of cumulative impacts must be reported. Where necessary, additional controls must be proposed to reduce off-site impacts.

PM₁₀ Annual Average

- The assessment reports exceedances of DECCW annual average PM₁₀ criteria when cumulative impacts from the Headland Park, Barangaroo South and the existing background are considered (57 µg/m³ compared to DECCW's criteria of 30 µg/m³).
- The project increment for annual average PM₁₀ is probably conservative due to the model configuration using a 90 day averaging period.

- The annual average background concentration ($21 \mu\text{g}/\text{m}^3$) adopted is slightly conservative compared with the actual annual average PM_{10} concentration measure at Rozelle ($18 \mu\text{g}/\text{m}^3$) in the modelled year (2007).
- The contribution from Barangaroo South was estimated based on results presented in *Draft Air Quality Impact Assessment Barangaroo Site Excavation and Preparation Works* (AECOM, 11 June 2010). It should be noted that AECOM, 11 June 2010 was revised to *Air Quality Impact Assessment Barangaroo Site Excavation and Preparation Works* (AECOM, 20 September 2010). The revised AECOM assessment reports lower particulate impacts at nearby receptors.
- The assessment should be revised to provide a more refined prediction of cumulative annual PM_{10} impacts. The revised assessment should carefully consider factors listed above and, if necessary, propose additional mitigation measures.

Deposited Dust

- The model configuration titled *Combined Sources – Wind Speed Variable Files – Deposition* only includes particles with a particle size distribution up to 10 microns. This is not representative of total suspended particulate emissions from earth works, where particles greater than 30 microns will be emitted. On this basis, the settling velocity and deposition velocity computed in the model may not be accurate.
- Section 5.9 of the assessment advises that *“To remain conservative, it has assumed that wet depletion of particulates occurs”*. The model configuration file titled *Combined Sources – Wind Speed Variable Files – Deposition* does not state that plume depletion due to wet removal mechanisms was included. Additionally, the assumption of wet depletion is not demonstrated to be a conservative assumption based on the emission scenario assessed.

Benzene

- The assessment predicts a maximum 1-hour averaged benzene concentration of $0.035 \text{ mg}/\text{m}^3$ at the Sydney Ports Cruise Passenger Terminal.
- DECCW's impact assessment criteria for benzene is $0.029 \text{ mg}/\text{m}^3$.
- The assessment states that:

“Levels of chemical emissions have been generally found to be well below DECCW published or endorsed criteria, apart from the maximum level of airborne benzene which was found to slightly exceed the DECCW endorsed criteria at the interim port facility adjoining the site. However review of modelling data indicated that these exceedances would generally only occur during very early morning periods when this facility was likely to be unoccupied”.

- The cruise passenger terminal can operate 24-hours per day 7 days per week. On this basis, DECCW does not consider appropriate for the assessment to assume that the port facility will be unoccupied in the early hours of the morning.
- Benzene results are presented for the maximum predicted value (100th percentile).
- The assessment says *“Frequency of exceedance plots are unable to be prepared for odour or benzene emission”*. This statement is incorrect. DECCW advises that section 2.10.6 of the Ausplume user manual discusses the preparation of frequency plots.
- The Approved Methods permits benzene modelling results to be presented at the 99.9th percentile (9th highest model prediction).
- There is not enough information provided in the assessment to determine whether DECCW's benzene impact assessment criteria ($0.029 \text{ mg}/\text{m}^3$) is exceeded at the 99.9th percentile prediction.

Chromium criteria

- The assessment adopted DECCW's chromium III impact assessment criteria.
- DECCW's chromium III criteria is $0.009 \text{ mg}/\text{m}^3$.

- DECCW's chromium VI criteria is 0.00009 mg/m³ and hence more stringent than the chromium III criteria.
- There is no discussion of chromium speciation in the assessment.
- If all chromium assessed was assumed to be chromium VI, the relevant impact assessment criteria would not be exceeded at the identified sensitive receptor locations.

Links to Health Assessment

As flagged above, because the HHERA is yet to be completed the air quality assessment for chemicals and odours in the air appears to be based on assumptions. These assumptions are based upon largely unknown levels of contamination of the material that might be received at the site from the Southern area or might be excavated in the Northern area of the site. Until DECCW has a better understanding of what will and won't be accepted for use at Headland Park, it is difficult to know how essential the proposed controls really are.

As a consequence of the order in which this assessment process is proceeding, it is possible that the materials that will be accepted will be much less contaminated than assessed in this modelling exercise. This would mean the level of control of odours and chemicals could be much less. However, it will be necessary to include all the controls listed in the conclusions in the consent and/or licence to ensure that any necessary controls can indeed be provided if needed.

Water

Overall Water Management Design

DECCW notes that Human Health & Environmental Risk Assessment (HHERA) for this site is yet to be made available. Consequently a number of uncertainties remain in relation to proposed water management measures. Extensive water re-use is proposed both during construction and once the park is established due to the drive for water sustainability. In other circumstances DECCW encourages appropriately treated water re-use. However, until such time as the HHERA is completed and understood, DECCW is unable to confidently provide advice on water re-use in the context of contaminated site remediation.

DECCW will need to review the exposure scenarios assumed and the resultant criteria. Until this is completed DECCW cannot comment on the adequacy of the risk control measures. DECCW notes that the proponent is yet to engage a contractor to carry out the proposed works. A consequence of this is that uncertainty remains on whether or not a water treatment plant will be installed, what type of treatment it will involve and what treatment criteria will be achieved for proposed uses (discharge or re-use). These details are important for stormwater and groundwater management during the construction because disposal to sewer is not likely to be an option available to the site.

In summary DECCW's comments on water management are limited because of the lack of details in relation to water treatment technology (if any is proposed) and the likely water quality produced as well as its implications for the HHERA and Remedial Action Plan.

Reuse of potentially contaminated water is a serious issue that must be avoided so full assessment of water management is of utmost importance.

Construction Phase

Silt curtains – will be needed at least around each of the areas where excavations for the shoreline design are taking place and around the water discharge structure. Each of these silt curtains needs to be in place before works begin in the area and need to remain in place perhaps for the life of the project. Many of the activities on the site could impact water quality so source controls as well as sedimentation basins and curtains will need to be installed operated and maintained. Due to the scale of these works it is possible that even best practice controls could

prove to be ineffective in the event of prolonged intense wet weather events. As such the integrity of controls and silt curtains needs to be checked regularly, preferably daily.

Ambient monitoring in the harbour – DECCW will require turbidity monitoring outside of the silt curtains discussed above.

Monitoring – DECCW's recommended water quality monitoring program on-site and in the harbour is dependent on obtaining full details water treatment. DECCW's recommended monitoring requirements such as sampling locations and frequency are likely to change as the project progresses. DECCW is flagging that the monitoring proposals listed in the documents are unlikely to be sufficient in the early stages of works but may be acceptable once performance of the various systems has been proved.

DECCW will require further information on whether flocculants will be used (including what types) in the sediment basins as well as the information discussed above on the treatment plant.

Controls on demolition of the Caisson walls – DECCW considers that particular attention will be needed to protect water quality during wall demolition.

Discharge limits – the proponent will need to ensure compliance with the table of limits (Attachment 2) unless otherwise agreed to by DECCW. In addition, if flocculants are to be used in the sediment basin then a limit for the relevant flocculant may need to be added to the list.

DECCW notes the following minor errors in the text

Appendix 13 refers to baseline monitoring in the harbour finding a conductivity of 53uS/cm – this must be incorrect as almost no waterways in NSW would have such a low conductivity.

Section 3.11 says that water quality will be assessed with reference to the recreational water quality guidelines but as mentioned in the early works comments this is not acceptable and earlier in the document reference is made to the ANZECC guidelines for marine waters which is the correct source of guidelines for this assessment.

Post Construction Phase

Stormwater management using bioswales – DECCW notes that bioswales present a potential drowning risk due to people falling into these water storages (particularly at night). Any proposals to utilise bioswales for stormwater management must adequately assess and address these risks.

Seawater cooling system – any antifouling agent needs to be one registered or permitted by the APVMA and must be used at all times in accordance with the instructions on the label as required by the Pesticides Act. DECCW does not 'approve' such products.

Trade waste discharge – The proponent needs to demonstrate whether or not sewer discharge of liquid waste streams is an option. DECCW is yet to be formally advised if the sewer has capacity to accept discharges of wastes that are not of a sufficient quality for discharge to the environment. DECCW recommends the proponent enters into discussions with Sydney Water to ensure appropriate provisions are available for the new works.

Irrigation water criteria – as discussed above – until DECCW reviews the HHERA it is not possible for DECCW to provide advice on the acceptability of using the collected water on site for irrigation and other purposes.

Blackwater – in figure 3 on page 10 of Appendix 13 and in the related text it is proposed to add recycled blackwater from Barangaroo South as top up for the water used to manage the park.

This would not be acceptable unless there is a full sewage treatment system including disinfection as part of the Barangaroo South development. DECCW requires clarification on any proposal to treat/reuse blackwater.

DECCW flags the following Project Approval conditions for Water:

Prior to the commencement of works, the proponent must develop and provide to the DECCW for comment, a comprehensive Stormwater and Water Management Plan.

All groundwater or surface water arising from the works must be collected, managed and/or treated in a manner that ensures that it can be legally discharged to waters.

All water discharged from the site must comply with the table of limits (see Attachment 2) unless otherwise agreed to by DECCW. In addition to the limits (Attachment 2), a turbidity limit or trigger will be applied to ambient monitoring locations outside silt curtains. In the initial stages of the project an interim limit or trigger of 50 mg/L will be applied. Once sufficient ambient data is available from both ambient monitoring locations and reference locations a final limit or trigger will be developed which will include consideration of background turbidity. Trigger criteria for commencing management action should be specified in the Stormwater and Water Management Plan.

Any discharge structure constructed to allow water to be discharged to Darling Harbour must allow for at least an initial 5 fold dilution. Dilution calculations must be provided to allow dilution to be factored into any licence conditions. Dilution is not acceptable for bioaccumulative chemicals. The discharge point must be installed inside an appropriately installed silt curtain arrangement.

Silt curtains must be in place prior to any excavation of the northern cove, including the stage where the cement caissons remain in place.

Any proposed water treatment plant to facilitate discharges to Darling Harbour must be designed to remove all relevant contaminants (including petroleum hydrocarbons, PAHs, BTEX, sediments and metals) to a level in the water management plan or as otherwise agreed to by DECCW.

Untreated water must be held onsite until results from monitoring are available for review unless otherwise agreed to by DECCW.

The stormwater soil erosion and sediment control measures must be designed in accordance with the document titled *"Managing Urban Stormwater – Soils and Construction, Volume 1"* and incorporated into the Soil and Water Management Plan. For sediment disturbance activities, such as soil stockpiling fill near the Harbour, a high level of sediment control and runoff capture protection will be required, including sizing of sediment basin to be increased from an average recurrence interval of 85 to 90% to reduce the risk of sediment runoff into Sydney Harbour during construction activities. DECCW may require the installation and maintenance of silt curtains in areas of shorelines and stormwater runoff outlets to control turbidity where rainfall events exceed the design capacity of the system (this requirement should be discussed in the Soil and Water Management Plan but DECCW may review case by case).

The Soil and Water Management Plan must include a detailed proposal for monitoring water quality.

The monitoring program must at least include an onsite program for waters held onsite prior to discharge to Darling Harbour either via the stormwater system or via a water treatment plant. It must include also an ambient monitoring program.

Water to be discharged to Darling Harbour must be monitored on a daily basis for the first two weeks of operations. The monitoring frequency of subsequent discharges must be not less than weekly and unless otherwise agreed by DECCW and/or permitted by licence conditions.

The on-site monitoring program must cover all types of water on the site that needs to be discharged including turbid stormwater from areas of low or no contamination; stormwater that has come into contact with contaminated areas; and contaminated groundwater from excavations or earth works.

Initial intensive monitoring must be conducted to coincide with actual worse case conditions (eg. significant rainfall events) during full scale excavation, fill and stockpiling activities, in order to provide information to DECCW on which to base licence conditions on for ongoing activities (eg. in order to relax the frequency of monitoring if water quality controls are effective).

The ambient water monitoring program must include up and downstream/tide sampling locations around potential sources of sediment discharge to the Harbour (including near discharge point silt curtains, near excavation of the northern cove and near naturalistic shoreline shaping) as well as a reference locations. (The reference location for other Barangaroo sites could be used).

Different monitoring locations may be required for Early and Main Work, for different stages of works and for different components of the works (these locations may be specified in the Environment Protection Licence).

The quality of the fill to be used on the Headland will need to be uncontaminated such that groundwater moving through the fill and to the Harbour, must meet ANZECC 2000 guidelines for aquatic ecosystems and other relevant environmental values at any points of discharge to the Harbour. The Human Health and Ecological Risk Assessment will need to account for this risk factor. The impacts on water quality and reuse water in the longer term post construction period must also be addressed.

No water that is contaminated may be reused on site without being treated to meet relevant criteria determined by the Human Health and Ecological Risk Assessment that addresses this risk.

The Soil and Water Management Plan must consider cumulative impacts on water quality during the life of the headland construction; the cumulative impacts on water quality due to all related works at the Barangaroo site.

For the proposed seawater cooling system, details of the configuration of inlet and outlet pipes and proposed quality of water discharge (in particular heat and antifouling chemicals) should be provided to DECCW for review and comment as part of the proposed detailed concept design stage.

Headland Park Main Works
Attachment 2 – Water Quality Limits

	Units	Criteria
Total suspended solids (TSS)	mg/L	50 (100-percentile concentration limit that already incorporates dilution) Applies to discharges from sediment basins for areas that in areas of low or no contamination; and to water treatment plant discharges. Additional turbidity/TSS limits will be needed for discharges from any water treatment plant for stormwater that has come into contact with contaminated areas or contaminated groundwaters (eg. percentile limits and turbidity triggers that control the performance of the water treatment process).
Turbidity	NTU	0.5 – 10 (ambient guideline for outside silt curtain) A trigger value above background may be calculated for use as either a licence limit and/or licence trigger to action specific licence conditions for both wet/windy and dry weather). NTU discharge criteria from sediment basins would need to be developed based on a good site specific relationship to TSS.
Sheens or plumes	daily inspections	Action on visual sheens or plumes outside silt curtain to be specified in Soil and Water Management Plan
pH	pH	6.5 – 8.5 (100-percentile concentration limit that already incorporates dilution)
Arsenic	µg/L	2.3
Cadmium	µg/L	0.7
Copper	µg/L	1.3
Lead	µg/L	4.4
Mercury	µg/L	0.1
Zinc	µg/L	15
Chromium (trivalent)	µg/L	27
Chromium (VI) compounds	µg/L	4.4
Nickel	µg/L	7
Cyanide	µg/L	4
Ammonia	µg/L	910
BTEX		
Benzene	µg/L	500
Ethyl benzene	µg/L	80
Toluene	µg/L	180
m-Xylene	µg/L	75
p-Xylene	µg/L	200
o-Xylene	µg/L	350
Phenol	µg/L	400
Total Petroleum Hydrocarbons C10-C14 Fraction	µg/L	50 [#]
Total Petroleum Hydrocarbons C15-C28 Fraction	µg/L	100 [#]
Total Petroleum Hydrocarbons C29-C36 Fraction	µg/L	50 [#]
Total Petroleum Hydrocarbons C6-C9 Fraction	µg/L	20 [#]
Oil and grease	mg/L	10 (100-percentile concentration limit that already incorporates dilution)

PAHs		
Naphthalene	µg/L	50
Anthracene	µg/L	2 (0.01)*
Phenanthrene	µg/L	2 (0.6)*
Fluoranthene	µg/L	2 (1.0)*
Benzo(a)anthracene	µg/L	2 (0.5)*
Benzo(a)pyrene	µg/L	2 (0.1)*
Benzo(b)fluoranthene	µg/L	2 (0.1)*
Benzo(k)fluoranthene	µg/L	2 (0.1)*
Acenaphthene	µg/L	2*
Acennaphthylene	µg/L	2*
Chrysene	µg/L	2*
Indeno(1,2,3-cd)pyrene	µg/L	2*
Pyrene	µg/L	2*
Flourene	µg/L	2*
Benzo[ghi]perylene	µg/L	2*
Dibenz[a,h]anthracene	µg/L	2*
Electrical conductivity		monitor
Dissolved oxygen		-
Total Polychlorinated Byphenols (PCBs)	µg/L	Early non-detects and this can be removed from any ongoing monitoring requirements

- * In the case of PAHs the limit of reporting of 2 µg/L can be used even though ANZECC criteria are lower than this detection limit as this is the normal level available at most laboratories
- # Standard limit of reporting

Note: Where default trigger values are not available then ANZECC criteria from volume 2 of the Water Quality Guidelines is used. These are environmental concern levels and the ANZECC (2000) guidelines explain their application.