MAJOR PROJECT ASSESSMENT
Kurnell Desalination Plant and Associated Infrastructure

Director-General's
Environmental Assessment Report
Section 75I of the
Environmental Planning and Assessment Act 1979

September 2006

Published September 2006
NSW Department of Planning
www.planning.nsw.gov.au

EXECUTIVE SUMMARY

Sydney Water Corporation (the Proponent) has lodged an application seeking the Minister for Planning's approval of the Kurnell Desalination Project, including:

- construction and operation of a desalination plant on the Kurnell Peninsula;
- intake/inlet and outlet pipelines to draw seawater into the plant and return seawater concentrate to the ocean (including tunnelling under Botany Bay National Park);
- pipelines and/ or tunnels from the plant across Botany Bay to the Sydney Water Corporation water supply system for the distribution of drinking water;
- pipelines from the plant to Miranda water supply system for the distribution of drinking water;
- connection of the plant to the electricity grid; and
- temporary laydown areas for construction use.

On 17 August 2006, the Proponent submitted its Preferred Project Report for the proposal, including responses to issues raised in public submissions and making a number of amendments to the proposal. Key amendments made by the Proponent include: a commitment to implementation of the desalination proposal only in the event of extreme drought; effectively powering the desalination plant with 100% renewable energy; deleting the proposed water supply pipeline to Miranda/ Caringbah from the scope of the proposal; and a commitment to beneficially reuse or disposal of lime sludge to land rather than discharge to the ocean.

The Minister has authorised the lodgement of a concept plan for the proposal, and has declared the entire proposal to be a critical infrastructure project.

Public sentiment on the proposal has been very strong, with a focus not only on the impacts of the desalination plant and associated infrastructure, but also reflecting a community outrage over the process leading up to the decision to proceed with consideration of a desalination plant in the first instance. During the public exhibition of the subject application, some 612 submissions were received – of these an overwhelming 91% opposed the development based on issues including assessment of alternatives, justification, ecological impacts, water quality impacts, greenhouse gas generation, and traffic, noise and heritage concerns. There was also some support for the proposal, about 3% of all submissions, which reflected a concern over the future security of Sydney's water supply. A further 6% of submissions held the view that a desalination plant may be necessary to secure future water supplies, but retained concerns over the environmental implications of the plant, particularly on greenhouse gases, water quality and ecology.

More than half of all issues raised in public submissions (54.4%) relate to the process leading up to the environmental assessment of the proposal. There is clear and strong public sentiment that the Government has not adequately consulted with the public over the need and justification for a desalination plant, whether such a plant is preferable in light of alternative water supply and demand management measures, and the site selection process for the plant. Strong public opposition is also evident with respect to declaration of the proposal as a critical infrastructure project, with this planning mechanism seen as a means to simply deny the public any opportunity for meaningful comment on the development. While many of these concerns relate to issues outside the scope of the environmental assessment process and beyond the Department's legal control, the Department has nonetheless endeavoured to maximise opportunities for real community input into the assessment process. Not only has the minimum thirty-day public exhibition requirement for critical infrastructure projects (and all other projects under Part 3A of the *Environmental Planning and Assessment Act 1979*) been met, but the exhibition period was extended to a total of 71 days. This is well beyond the requirements of the legislation and the in excess of the public comment period afforded to other major development proposals. The Department complemented this extended exhibition period with increased notifications, exhibition locations and diversified submission mechanisms (particularly a dedicated email address for submissions, through which some 71% of submissions were received).

In recognition of the community's concern that the declaration of critical infrastructure would render public submissions meaningless, the Minister took unprecedented steps to ensure that every issue in every submission was taken into full account and adequately addressed by both the Proponent and the Department. The Minister appointed an Independent Panel to ensure that this was the case, with the Panel given the responsibility to

generally oversee and audit the Proponent's and the Department's treatment and consideration of issues raised in public submissions. The Panel has undertaken this work since early 2006, and on 8 September 2006, issued its final report stating that it was satisfied that all issues in public submissions had been adequately addressed through the assessment process.

The Department has undertaken a comprehensive assessment of the technical merits of the proposed desalination plant and associated infrastructure, with invaluable technical input from the Department of Environment and Conservation and the Department of Primary Industries. Based on the Department's assessment, as detailed in this report, the Department recommends that the Minister:

- grant full project approval to the desalination plant component of the proposal at this time;
- grant full project approval to the intake/ discharge infrastructure component of the proposal at this time; and
- grant only concept approval to the desalination water distribution infrastructure component, because the Proponent has demonstrated that this component is acceptable, in concept, but insufficient detailed information has been provided to grant full project approval at this time. A further application, assessment and determination process under Part 3A, including public exhibition and comment, would therefore be required in future.

Through its assessment, the Department has determined that the key assessment issues for the proposal relate to justification/ need, greenhouse gas impacts, water quality impacts and ecological impacts (both terrestrial and aquatic). Other issues considered in this assessment report relate to heritage impacts, land use planning implications, spoil management issues, noise impacts, traffic generation and impacts, socio-economic implications of the proposal and visual amenity.

Justification of the proposed desalination plant relies heavily on the proposal being only one of a suite of water supply and management measures outlined in the 2006 Metropolitan Water Plan. The Department considers that the desalination proposal is justified as a contingency measure, in the event of extreme drought conditions. It is important that arguments surrounding justification and consideration of alternatives are viewed in the context of the desalination plant being a "last line of defence". If no other water management measures were proposed in the Metropolitan Water Plan, or if those alternative measures are not actively pursued, justification for the desalination plant would be eroded and the broad vision of water diversity and security mooted in the Plan would similarly be diluted.

The desalination proposal put forward by the Proponent is a worst-case option that endeavours to accommodate the most extreme conditions in future. While the Department considers this precautionary approach to be prudent, it is important that a desalination option reflects future requirements and endures only so long as the option proposed by the Proponent remains relevant. In this context, the Department supports the Proponent's approach of implementing the desalination plant in compartments or stages, and recommends that any capacity in excess of 125 megalitres of desalinated water per day be subject to careful consideration of circumstances at the time of implementation of the proposal. Further, it is unlikely that the particular desalination solution proposed will continue to be appropriate and relevant *ad infinitum*, as technology, policy and water management approaches will undoubtedly change over time. The Department recommends that if the desalination plant is not implemented before 31 December 2015, that the approvals be made to lapse and cease to exist.

The desalination plant is a highly intensive operation, and as a consequence, will have an indirect significant impact on greenhouse gas impacts. The Proponent and the Government have committed to fully off-setting the greenhouse gas implications of the desalination plant, by effectively powering the plant with renewable energy. The Department considers this commitment to be well beyond what would be reasonable for such a development proposal, and fully supports such a significant off-set commitment. Implementation of the commitment will not, however, be without its challenges. The Proponent will need to carefully consider, plan for and manage a comprehensive greenhouse gas off-set strategy to ensure a net-neutral greenhouse gas outcome in a transparent, accountable and robust manner. The Department has recommended a detailed Greenhouse Gas Reduction Plan in order to tackle this important task.

While the Proponent has generally demonstrated that design options exist to ensure acceptable water quality outcomes, the Department remains concerned over the potential impacts of the Proponent's proposal to

discharge backwash solids from pre-treatment processes to the environment. The Department does not consider that the Proponent has managed to demonstrate that this approach could achieve acceptable water quality, ecological or amenity outcomes and therefore recommends prohibition of discharge of backwash solids until such time as the Proponent has put this issue beyond doubt. Until the Proponent has submitted an internationally peer-reviewed, robust and scientifically justified demonstration of the acceptability of the discharge of these materials, the Department would not be in a position to support discharge. The Department of Environment and Conservation has stated a similar view.

Provided backwash solids are not discharged with seawater concentrated, or demonstrated as acceptable in future, the Department's principal concerns with respect to water quality are resolved. Seawater concentrate does, however, have the potential to adversely impact on water quality and aquatic ecology. It is therefore important to calibrate, validate and take into account these issues in the detailed design of the intake and discharge infrastructure. Optimisation of the near field mixing zone will be required iteratively with the detailed design process to ensure minimisation of impacts on water quality and aquatic ecology.

There will inevitably be changes to reef assemblages as a result of discharge of seawater concentrate from the desalination plant. Within the context of the entire rocky reef, and provided optimisation of the mixing zone is rigorously pursued by the Proponent, the Department is satisfied that impacts on aquatic ecology can be minimised and managed within acceptable limits. Further, impingement and entrainment effects at the seawater intake point can be minimised with careful attention to the design of that infrastructure. The Department, in consultation with the Department of Environment and Conservation and the Department of Primary Industries, has recommended a comprehensive suite of stringent conditions aimed at addressing each of these issues, and minimising impacts to the greatest extent possible. A key focus of the recommended conditions is a comprehensive Marine Water Quality and Ecosystem Monitoring Program, to provide a basis for design refinement, performance optimisation, identification of impacts on ecology or water quality and to provide a clear direction for proactive and reactive measures to addresses impacts of concern.

With respect to terrestrial ecology, the Department supports the Proponent's proposal to conserve and rehabilitate up to 15 hectares of the most significant vegetation on the site. Further, the Department supports comments made in many submissions in relation to the importance of the Grey-headed Flying Fox colony on the Kurnell Peninsula. The Department has recommended specific conditions to minimise potential disturbance of the colony, particular during gestation.

The conditions of approval recommended by the Department have been carefully drafted to ensure that a comprehensive environmental framework is established, with a particular focus on community information and environmental best practice. The Department has been careful to ensure that future extreme drought conditions do not equate to implementation of a desalination plant without regard to acceptable environmental outcomes. It is important that Sydney's water supply is diverse, secure and environmentally responsible.

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1. BACKGROUND

In October 2004, the NSW Government released the 2004 Metropolitan Water Plan, outlining measures the Government intended to progress in order to achieve a sustainable and secure water future (NSW Government, 2004). As part of that plan, the Government committed to planning for a desalination plant. The Plan envisaged that a 100 megalitre per day desalination plant may be required in the future.

As committed to in the 2004 Metropolitan Water Plan, the Sydney Water Corporation (the Proponent) has proceeded with planning for a desalination plant. This planning has culminated in the lodgement of an application under Part 3A of the *Environmental Planning and Assessment Act 1979* for a 500 megalitre per day desalination plant and associated infrastructure. Approval has been sought for a worst-case 500 megalitre plant, should severe drought conditions eventuate in future. The Proponent has suggested that depending on future circumstances, the actual scale of the desalination plant constructed and operated may be reduced from this worst-case scenario.

On 8 February 2006, the Premier announced that the proposed desalination plant would only be constructed if dam levels dropped to 30%. The Premier also committed to offsetting 100% of greenhouse gas impacts using renewable energy.

In May 2006, the Metropolitan Plan was reviewed, updated and released as the 2006 Metropolitan Water Plan (NSW Government, 2006). The 2006 Plan reiterates that the desalination plant is a key component in the strategy to secure Sydney's water supplies. However the desalination option is a "last resort", to be implemented in the event extreme drought conditions. The Plan reinforces that contracts for the construction of the desalination plant would only be awarded if dam levels fall to around 30%. This report details the environmental assessment of the proposed desalination plant and associated infrastructure, as an important step in the process for ensuring that a desalination option is available for timely implementation, if it is ever needed.

The Proponent has sought concept approval from the Minister for Planning for the entire proposal, including the desalination plant and all associated infrastructure. The Proponent also considers it appropriate that the Minister grant project approval for the desalination plant and intake/ outlet infrastructure at this time. Further project application and assessment processes would be applied to infrastructure necessary to transfer desalinate water to the existing water supply system under Sydney. This further project approval would be subject to the provisions of Part 3A of the Act, including further public exhibition and consultation.

1.1 Location

The desalination plant is proposed on land near the corner of Sir Joseph Banks Drive and Captain Cook Drive on the Kurnell Peninsula. Other land is also required for the construction and operation of the seawater intake and concentrates discharge structures and associated potable water distribution. Lands comprising the bed of Botany Bay for potable water distribution and State coastal waters to the east of Kurnell Peninsula for seawater intake and concentrate discharge structures would also be required for the proposal. Figure 1 shows the site of the proposed desalination plant, while Figure 2 illustrates the regional context of the plant and associated infrastructure.

While the proposed location of the desalination plant component of the proposal has been identified, routes for water delivery infrastructure across Botany Bay and under urban areas of Sydney have yet to be finalised. These components of the proposal would be subject to further future assessment once final routes have been determined.

1.2 Existing Desalination Plant Site

The existing site for the desalination plant includes two parcels of land: Lot 2 in DP 1077972 owned by Valad Property Group; and Lot 1 in DP 1088703 owned by Serenity Cove Business Park. The total area of the desalination plant site is approximately 44.5 hectares and is extensively cleared of vegetation, with the exception of a conservation area of approximately 15 hectares along the north-western boundary of the site. This area contains endangered ecological communities and is proposed to be retained, rehabilitated and managed.

Figure 1 - Proposed Desalination Plant Site

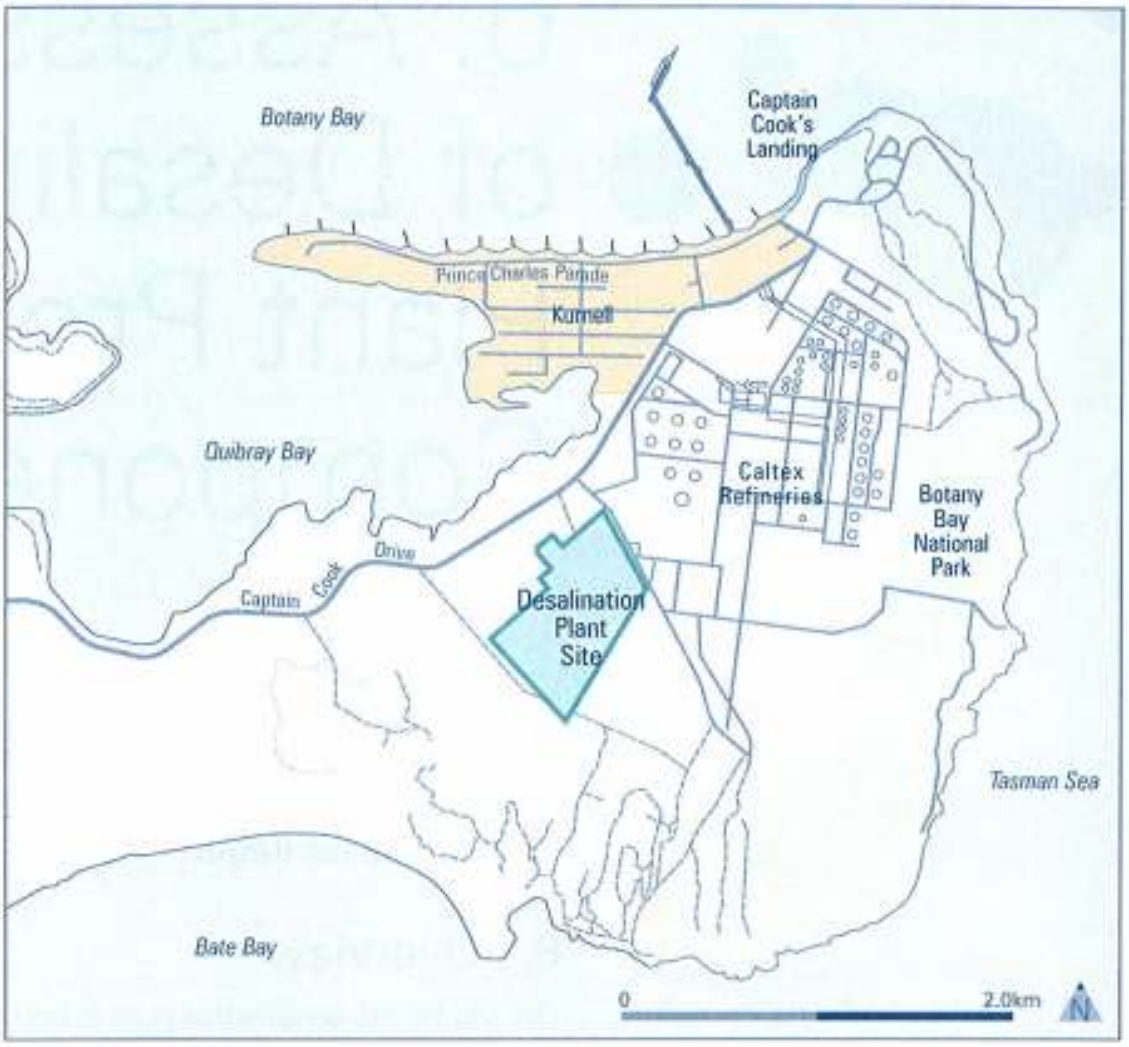
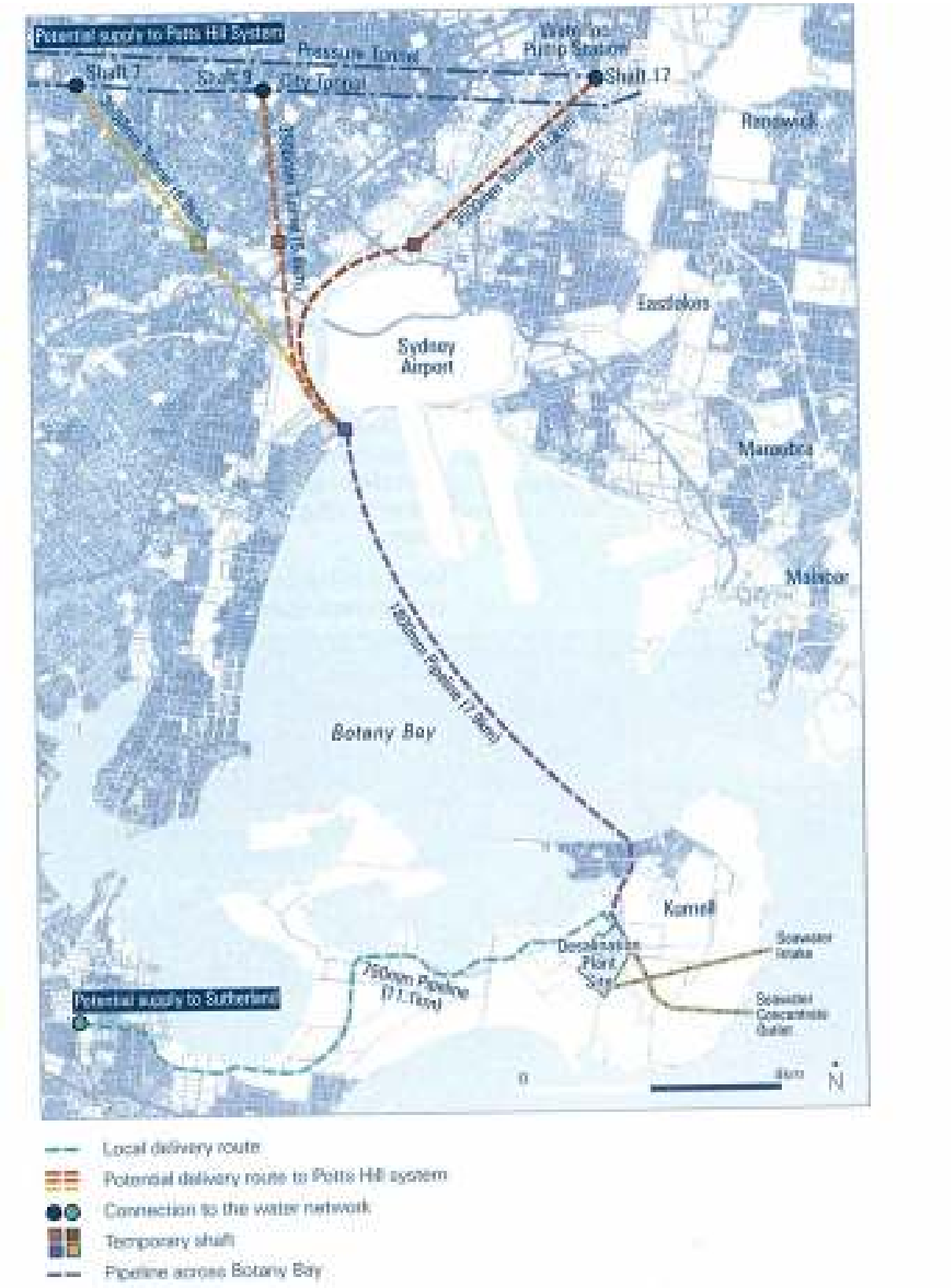


Figure 2 – Regional Context of the Desalination Plant and Associated Infrastructure



1.3 Previous Planning Approvals

The desalination plant site has previously received development consents from Sutherland Shire Council for industrial zoning and the establishment of a conservation area across portions of the site. The conservation area will remain in the project design.

1.4 Surrounding Land Use

Industrial land uses surrounding the desalination plant site include the Caltex Kurnell Refinery to the east, Boral Brickworks to the south, and a section of the site that was previously used by Abbot Laboratories located to the west.

The village of Kurnell, approximately 750 metres away, is the closest residential development to the north and northwest of the site. Residential developments in Cronulla are approximately 4.5 kilometres to the south of the site. The nearest sensitive land uses to the desalination plant site include Kurnell Primary School (approximately one kilometre) and Cronulla High School (approximately four kilometres).

2. PROPOSED DEVELOPMENT

2.1 Project Description

The Proponent has lodged a concept plan application for the construction and operation of a desalination plant on the Kurnell Peninsula for supply of up to 500 megalitres of drinking water per day. The concept plan application includes:

- construction and operation of a desalination plant on the Kurnell Peninsula;
- intake/inlet and outlet pipelines to draw seawater into the plant and return seawater concentrate to the ocean (including tunnelling under Botany Bay National Park);
- pipelines and/ or tunnels from the plant across Botany Bay to the Sydney Water Corporation water supply system for the distribution of drinking water;
- pipelines from the plant to Miranda water supply system for the distribution of drinking water;
- connection of the plant to the electricity grid; and
- temporary laydown areas for construction use.

The Proponent considers that it has provided sufficient information for the Minister to form that view that no further environmental assessment of the desalination plant and intake/ outlet infrastructure is required. It therefore argues that the Minister should, in addition to granting concept approval for the overall development, should also grant project approval to those components. Infrastructure for the supply of desalination water across Botany Bay and connection into the water supply system under Sydney would be the subject of a future project application and assessment process.

Construction of the proposed desalination plant will take approximately 26 months.

2.2 Preferred Project Report

Copies of the 762 submissions (refer to section 4 of this report) received in response to the exhibition of the application were referred to the Proponent at the conclusion of the exhibition period, and the Proponent was directed to prepare a Preferred Project Report. The Report was required to address all issues raised in submissions, and to detail how the proposal had been amended in light of these issues. The Report was also required, where appropriate, to update commitments made by the Proponent in its Statement of Commitments.

The Proponent submitted a final copy of its Preferred Project Report to the Department on 17 August 2006, a copy of which is provided as Appendix D to this report. In addition to addressing issues raised in submissions, the Preferred Project Report amends the proposal as follows:

- the proposal would only be implemented should an extreme drought emerge and water storages reach around 30%;
- if a desalination plant is required with capacity in excess of 125 megalitres per day, a pipeline(s) or tunnel may be implemented to transfer desalinated water across Botany Bay;
- the water supply pipeline from the desalination plant to Miranda/ Caringbah is removed from the scope of the application;
- lime treatment sludge will no longer be discharged together with concentrated seawater, but will instead be beneficially reused or disposed of to landfill; and
- the desalination plant will effectively be powered using 100% renewable energy, making the plant greenhouse-neutral.

The Proponent has also updated its Statement of Commitments in response to issues raised in submissions and to reflect amendments made to the proposal. The updated Statement of Commitments is included in the Preferred Project Report.

2.3 Need, Justification and Alternatives

Justification for Desalination

The issue of whether a desalination plant is needed, the justification for proceeding with a desalination plant now or in the future and the balance between the benefits (and "disbenefits") of a desalination plant compared with

alternative measures to address the water supply balance have been issues of substantial debate since inception of the current proposal. This debate has proceeded in the media, among public policy makers, the public generally, and most recently through the environmental planning process for the proposed desalination pant. It is clear from submissions received in response to the subject application that the issue of justification of the proposal, particularly in light of alternative water supply measures, is of significant public concern (27.5% of all comments made in submissions relate to this one issue). In addition to this, there is broad public sentiment that insufficient community consultation was undertaken prior to development of a desalination proposal (9.8% of all issues raised in submissions) and that the environmental assessment process applied to the proposal has been a means to short-circuit public debate on the merits of the desalination plant (11.7% of all issues raised). In total, these concerns represent almost half (49.0%) of all concerns presented in public submissions on the desalination plant proposal.

Whereas the Department considers that most direct environmental impacts associated with the proposed desalination plant could be mitigated and managed to achieve acceptable environmental outcomes, the strength of sentiment in public submissions suggests that implementation of any desalination option, whether now or in the future, would continue to meet with strong public opposition, irrespective of how the proposal may be modified or amended. In short, any approval of a desalination plant will not be accepted by a significant proportion of the community and stakeholders. The origin of many submissions made on this application suggests that opposition is not just confined to residents on the Kurnell Peninsula, or even the Sydney metropolitan area, but extends more broadly across the State.

The Department considers that an assessment of the justification for the proposed desalination plant must begin at first principles and be undertaken in the context of the essential nature of water and a robust approach to risk management. It is true to say that water supply is of such fundamental importance that it cannot be done without. Unlike most other resources or commodities whose depletion or scarcity can be accommodated, albeit with potentially significant adaptation, the absence of water or insufficient supply would not only have a considerable adverse impact on the economy but would also affect human health. In the most extreme cases, a loss of sufficient potable water supply would undermine basic human needs and survival.

In the context of risk, therefore, insufficient water supply has the potential to generate significant adverse consequences. The probability of these consequences being realised is difficult, if not impossible, to accurately quantify principally as a result of uncertainties in the prediction of future weather patterns, the timing and success of demand management measures, and the timing and success of the implementation of possible alternative water supply measures. What can be said, however, is that the probability of significant adverse consequences is elevated at this time, as evidence by trends in rainfall and consumption over the past five years (the Sydney Catchment recorded dam levels in late 2001 at 80%, a figure that has fallen to approximately 40% in mid 2006). The combination of significant adverse consequences, and elevated probability of realisation, has resulted in the current situation of a significant risk of water supply shortages for the Sydney region.

Given the broad implications of this risk across the entire Sydney population, the risk is appropriately characterised as a societal risk (as compared with an individual risk affecting a smaller, defined subset of the population). An elevated societal risk, with potential for significant adverse consequences is most appropriately managed through a suite of mitigation measures. To rely solely on a single approach does not reliably alleviate the risk, but would instead simply shift the focus of the risk. By taking a multi-focus approach, the risk to Sydney from water shortages would be spread across many potential mitigation measures, with the success or failure of a single measure would automatically equate to the success or failure of the mitigation strategy overall. In short, the old adage of not placing all of ones eggs in one basket is the most prudent approach to dealing with the risk of water supply shortages in the Sydney region.

This is the approach that has been applied through the *2006 Metropolitan Water Plan* (NSW Government, 2006), which details a broad suite of measures aimed at addressing the water demand-supply balance and mitigating against the risk of water supply shortfalls. The Plan outlines actions with respect to:

- demand management, including leak reduction, improved residential water efficiencies (BASIX), improved non-residential water efficiencies and informing choice through improved water efficiency labelling;
- recycling water to replace potable water currently consumed within industry, agricultural and residences, as well as replacing dam releases (Western Sydney Recycled Water Initiative); and

- new water supply sources, if needed, including deep access of dams, groundwater extraction and desalination.

The question is therefore not whether the proposed desalination plant itself is justified. It is whether the desalination plant, in the context of the full suite of water management measures outlined in the Metropolitan Water Plan, is justified. Without this context, any single component of the Plan is without the full complement of considerations necessary to inform an objective view on the issue of justification. No single component of the Plan is sufficient to fully address the risk of water supply shortages in the Sydney region, and should not be considered in isolation of all other measures to address the supply-demand balance. In this full and appropriate context, the Department considers that the desalination plant, as part of the comprehensive Metropolitan Water Plan is justified as:

- a measure of last resort in the event of an imminent water supply deficit, below what is required to sustain the Sydney region;
- a measure to be applied in addition to prior demand management, recycling and alternative water supply options;
- a relief measure in the event that timeframes for other water management measures extend beyond the necessary timeframes for correcting water supply-demand imbalances; and
- an appropriate contingency measure should the effectiveness of other water management options not succeed in fully addressing the risk of water supply shortages.

The Department cautions that a large part of the justification of the proposed desalination plant, as only one component of the Metropolitan Water Plan, rest on a vigorous pursuit of the other components of the Plan. Justification of the desalination plant is generated where demand management, recycling and alternative water supply approaches have been aggressively sought, but have not fully mitigated risks of water supply shortages. Both the community and Government must continue to view the Plan as an integrated whole, with a clear hierarchy of priorities to be applied, rather than resting on a single measure as providing the entire solution to longer-term water supply sustainability.

Scale, Scope and Timing of the Desalination Plant

As noted above, the justification for the proposed desalination plant derives from it being a component of the broader suite of water management measures detailed in the Metropolitan Water Plan. The strength of the justification for the desalination plant in this context also relates to the proposed scale of the plant, and the proposed timing for implementation.

The Proponent has sought approval from the Minister for a desalination plant and associated infrastructure with capacity of up to 500 megalitres per day of desalinated water. In seeking approval for a plant of this scale, the Proponent has reinforced that this is a "worst-case" capacity to be implemented in the event of a worst-case, extreme drought. If a desalination plant is required in future, there is potential that the full 500 megalitre capacity would not be required, or not required immediately, and a smaller plant could be constructed.

The Department concurs with the Proponent that 500 megalitres represents an extreme case and that in fact, a smaller plant may be more appropriate to address the particular water supply needs at the time of implementation. To provide flexibility in the decision-making process at the time of implementing a desalination option in future, if needed, the Department has based its assessment on the impacts associated with the full scale proposal. If a smaller plant is implemented, the environmental impacts of the proposal will in many aspects be less than for the full-scale plant. In no circumstances does the Department consider that a smaller plant would have greater impacts, and as such, assessment of a 500 megalitre plant not only accommodates a worst-case demand for desalination but also worst-case impacts of a desalination option.

As noted above, there is significant uncertainty in the actual risk posed to the Sydney region in future from a water supply shortfall. The uncertainty in this case is the result of the inherent uncertainties in predicting future meteorological conditions, the intensity of future drought effects and the timing of any adverse implications of these factors on the water supply-demand balance. In a similar manner, it is uncertain whether a full 500 megalitre desalination plant will be required in future, or whether the circumstances of the day lend themselves to a smaller capacity facility. The Department suggests that it is appropriate to consider the actual capacity of the desalination proposal at a time closer to actual implementation, if the desalination option is required in future.

This would provide the opportunity for the factors relevant to the day to be applied to determine the appropriate desalination capacity (up to a maximum 500 megalitre capacity), rather than attempting to predict demand now, over potentially significant timeframes and with inherent uncertainty over these predictions. In this regard, the Department recommends that the Minister require, through conditions of approval that:

- any desalination plant that may be implemented in future not exceed a capacity of 500 megalitres per day; and
- an initial desalination plant capacity of 125 megalitres per day, as proposed by the Proponent, be permitted to be implemented, with any increase above this level to be subject to an analysis of the actual circumstances prior to implementation, having regard to factors such as trends in water consumption, dam storage levels, water restrictions applied to water consumption, the availability and timing of alternative water sources, and meteorological trends.

In this manner, the Department suggests that an appropriate decision-making framework is provided within the conditions of approval to ensure that the scale of the desalination plant is tailored to the particular circumstances and that excessive capacity is not installed. The Department considers this approach important as it would restrict environmental impacts to as low as reasonably possible for the actual desalination plant required. Although the Department has assessed and considers impacts associated with the full-scale proposal to be within acceptable limits, it is fundamental that residual impacts be minimised wherever reasonably possible. This approach would also ensure that an over-sized desalination option is implemented to the potential detriment of other water management options, as outlined in the Metropolitan Water Plan (ie a oversized plant may divert attention from or the need for other water management options, including demand management, recycling and alternative water supply sources).

The timing of implementation of a desalination option, if required in future, is also a critical consideration. The Premier has announced that the proposed desalination plant would only be implemented if dam levels fall to 30%. A similar commitment is made in the Metropolitan Water Plan and by the Proponent as part of its Preferred Project Report and Statement of Commitments (that construction contracts would only be awarded if dam levels fall to about 30%). In relation to the timing of implementation of the desalination plant, the Minister has two principal options – either to note the commitment to only proceed with the proposal when dam levels fall to about 30% and to leave the commitment as a stand-alone requirement outside any planning approval, or to suspend operation of the desalination plant approval (similar to a deferred commencement approach under Part 4 of the *Environmental Planning and Assessment Act 1979*) until such time as dam levels actually fall to 30% (if they ever do). The Department cautions the Minister against applying the later approach, primarily due to the need to provide flexibility in the design and implementation processes, and again as a result of inherent uncertainties with predicting future need. As noted above, the desalination plant is a "last line of defence" and the exact timing of implementation is dependent on the success or otherwise of other demand management options, recycling schemes and other water supply sources such as groundwater extraction. In the two extreme cases, total failure of all of these options may require earlier implementation of a desalination plant, while better than expected outcomes from these alternatives may permit dam levels to fall below 30% before a desalination plant is required. Further, progress made by the Proponent in relation to design of the desalination plant, construction contract negotiation and lead times for implementation of the project may require some flexibility in timing, such that a rigid 30% trigger (rather than, for example, 29% or 31%) would be unnecessarily stringent. The Department therefore recommends that the Proponent's commitment to implementing the desalination plant when dam levels fall to about 30% be left as a stand-alone commitment, rather than being explicitly reflected in the desalination plant approval.

The Department does, however, recommend that the Minister stipulate a lapse period for the desalination plant approval. It is likely that the water supply situation in Sydney will change sometime in future and that desalination technology (and other water supply technologies) will also develop over time. In this context, the Department suggests that it would not be appropriate for the Minister to grant an open-ended approval for the desalination plant that would continue ad infinitum until such time as it is acted upon. There will be a natural point in future when the need for the desalination plant approval will require review, to establish whether the approval is still required as proposed, or whether technological advances have progressed to a point where the desalination plant in the form presented in the subject major project application has been superseded. The Department suggests that an appropriate timeframe in this regard is 31 December 2015 (approximately ten years from when the application was first made). If the Proponent does not act on the desalination plant approval before that time, the

Department recommends that the Minister, through conditions of approval, stipulate that the approval will lapse. This would not preclude the Proponent from seeking to amend the specified timeframe, subject to appropriate justification and assessment, if the technological situation does not change and some additional latitude is required with respect to implementation timing.

3. STATUTORY CONTEXT

3.1 Major Project

On 25 October 2005, the Minister for Planning formed the opinion pursuant to clause 6 of *State Environmental Planning Policy (Major Projects) 2005* that the proposal is for the purpose of development described in Schedule 1 to that Policy (clause 25(2) – development for the purpose of a desalination plant for drinking water supply with capital investment in excess of $10 million). The proposal is thus declared to be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies.

3.2 Concept Plan Authorisation

On 16 November 2005, the Minister for Planning authorised the submission of a concept plan for the proposal.

3.3 Critical Infrastructure Project

On 16 November 2005, the Minister for Planning formed the opinion pursuant to clause 6A of the *State Environmental Planning Policy (Major Projects) 2005* that the proposal is for the purpose of development described in Schedule 5 to that Policy (clause 1 – Kurnell desalination project). The proposal is thus declared to be a critical infrastructure project within the meaning of section 75C of the Act.

3.4 Exhibition and Notification

The Environmental Assessment for the proposal was placed on public exhibition from 24 November 2005 to 3 February 2006, which is more than twice the statutory minimum period (71 days, compared with the statutory requirement of 30 days). Exhibition locations were as follows:

- the Department of Planning's head office;
- Sutherland, Rockdale, Kogarah, Botany Bay, Marrickville, Sydney, Canterbury and Ashfield Councils;
- the Nature Conservation Council; and
- Sydney Water's head office.

The Environmental Assessment was also provided for download from the Department's internet site, making it quicker and easier for the public to access the document at any time of the day or night. Further, to make the submission process quicker and easier for busy people, the Department established a specific email address to accept submissions from the public (desalination@dipnr.nsw.gov.au).

Notification of the exhibition period was made through advertisements in 11 different local and metropolitan newspapers, and on two separate occasions in each (22 advertisements):

- *Sydney Morning Herald*;
- *Daily Telegraph*;
- *Cooks River Valley Times*;
- *The Glebe*;
- *Inner Western Suburbs Courier*;
- *Sydney Weekly*;
- *Inner West Weekly*;
- *City Weekly*;
- *Southern Courier*;
- *St George Leader*; and
- *Wentworth Courier*.

When the Minister appointed an Independent Panel into the proposal (refer to section 3.5 of this report), a further advertisement was run in each of these newspapers.

In addition to local and metropolitan media, the owners and occupiers of almost 1,200 properties on the Kurnell Peninsula were directly notified of the exhibition period in writing by the Department, and invited to make a submission on the project.

The issue of adequate community consultation was raised in a large number of submissions made in response to the formal exhibition of the application and Environmental Assessment (9.8% of all issues raised). The Department highlights that submissions reflect a public concern that insufficient consultation was undertaken prior to deciding to proceed with a desalination option, and in the process to identify a site for the project. These aspects of the proposal both pre-date and are outside the scope for the statutory planning process and have therefore not been addressed further in this report. The Department does, however, appreciate community concern over an actual or perceived lack of consultation and has endeavoured, to the extent reasonably possible within the statutory planning framework, to maximise opportunities for public input into the environmental planning process.

3.5 Role and Activities of the Independent Panel

On 29 November 2005, the Minister directed that an Independent Panel be established into the proposed desalination plant. The Minister appointed Emeritus Professor Rolf Prince AO (chair), Mr Tony Wright and Dr Gary Cox to constitute the panel. The Minister also specified that the terms of reference for the Panel would be:

- to ensure that all issues raised by the community and stakeholders in submissions to the publicly exhibited Environmental Assessment Report prepared by Sydney Water are adequately addressed and responded to by Sydney Water.
- to monitor other forms of community input (other than direct written submissions), issue compilation and assessment, so as to ensure all relevant matters are adequately addressed by the Department in its advice to the Minister.
- to ensure that issues raised in community and stakeholder submissions and Sydney Water responses thereto are adequately addressed and included in the Department of Planning assessment of the proposal and in the Department's advice to the Minister.

The Independent Panel was provided with draft copies of the Proponent's Preferred Project Report and the Director-General's Assessment Report (this document) to review and consider in light of the above terms of reference. The Panel has provided comments to the Proponent and Department on those draft documents, which both parties have taken into account in finalising the Preferred Project Report and Director-General's Assessment Report, respectively. The Panel's final position on the documents is detailed in its report, which is included as Appendix E.

3.6 Environmental Planning Instruments

The are no State Environmental Planning Policies that apply to the proposal and that substantially govern the carrying out of the development. It is highlighted that *State Environmental Planning Policy (Major Projects) 2005* nd *State Environmental Planning Policy (Metropolitan Water Supply) 2004*, although applicable, do not include provisions specific to the assessment of the proposal, nor do they contain development standards or matters for consideration when determining an application.

3.7 Nature of Application and Approvals

The Proponent has lodged an application for concept approval for the Kurnell desalination plant and associated infrastructure, accompanied by an Environmental Assessment framed to support assessment of the 'concept' of the development. The Director-General's environmental assessment requirements were framed in the context of an application for concept approval, and the Environmental Assessment deemed adequate against those requirements for the purpose of assessing and forming a view as to the environmental acceptability of the development in concept. The Department has proceeded to consider the application on behalf of the Minister based on it constituting a concept plan.

In determining the concept plan application, the Minister has the power to specify subsequent assessment and approval steps for the detailed project application stages under the concept plan. Further, the Minister has the ability to specify that no further assessment is required if he considers the level of detail in the concept plan is sufficient to also support project approval at this time. This is an important distinction to make, as the Proponent's Preferred Project Report suggests that the application has now been altered to seek project approvals for the desalination plant and intake/ discharge infrastructure in addition to the overarching concept plan approval. This is not the case. The Department considers that the nature of the application remains

unchanged since it was first made – the Proponent still seeks concept approval, and the application itself does not seek project approval for any particular development component. What the Proponent is suggesting, however, is that it believes that the level of detail it has provided with respect to the desalination plant and intake/ discharge infrastructure is sufficient for the Minister to form the view that no further assessment steps are required. The clarification here is that the Minister is not considering a project application, but is presented with a concept plan application for which the Proponent has argued that sufficient information has been provided to also grant project approval.

The Department has considered the concept plan application as a group of three potential project components:

- the infrastructure necessary to bring seawater from the Tasman Sea off the coast of the Kurnell Peninsula to the desalination plant and return concentrated seawater following the desalination process;
- the desalination plant itself, including all ancillary works on the desalination plant site;
- the desalination water supply infrastructure, including the pipeline, whether installed under or on the bed of Botany Bay, to transfer desalinated water from the desalination plant to the north side of Botany Bay and pipeline(s) to subsequently link the cross-Bay pipeline with the existing potable water system.

It is highlighted that the proposal to install a distribution pipeline from the desalination plant to the potable water system at Miranda/ Caringbah has been removed from the scope of the concept plan application through the Proponent's Preferred Project Report. This potential project component has therefore not been assessed further by the Department, and it is recommended that if the Minister grants concept plan approval, that this exclusion be explicitly conditioned to make it clear that it no longer forms part of the concept.

Of the three remaining project components within the concept plan, it is necessary to establish whether subsequent project approval steps are required (ie are the Proponent's claims that sufficient information has been provided to support project approval of at least some of the components at this time founded) and the nature of any subsequent project application, assessment and determination steps. The Department's consideration of this issue is presented in detail as part of its consideration of environmental impacts in section 5 of this report, along with determination of the scope of subsequent applications.

In summary, however, the Department concurs with the Proponent that sufficient information has been provided at this time to support a Ministerial view that no further assessment of the desalination plant and intake/ discharge infrastructure projects is necessary. The Department recommends that the Minister form this view and, concurrent with the grant of concept approval, also grant project approval for these components. In making this recommendation, the Department has focused on the key environmental impacts associated with the components and the ability for the environmental impacts to be conditioned with certainty and clarity. It is true that at this time, the Proponent has not finalised detailed design of the desalination plant or the intake/ discharge infrastructure. However, in the case of the desalination plant project, the Department considers that key environmental impacts relate to the generation of greenhouse gases, ecological impacts on site, visual amenity and the implications of construction with respect to issues such as dust, noise and traffic. These impacts are largely independent of the final detailed design of the desalination process. Irrespective of the final detailed technology decisions the Proponent may make, it is possible at this time to establish the maximum footprint of the plant (and hence, direct impacts on the site's ecology), the scale and bulk of the plant, the appearance of the building in which the plant is to be housed and an appropriate upper bound for the noise characteristics of the plant. These factors will not change overtime and, where relevant, will in fact set performance criteria within which the Proponent ultimately designs the plant. Similarly, construction impacts, particularly dust, noise and traffic, are a function of the physical scale of the plant and the extent of soil disturbance on the site. Desalination technologies, while they may differ between technology suppliers, are generally characterised with similar footprints and physical scales (for comparable outputs). The issue of greenhouse gas generation, while variable to a certain degree between technologies, is not a tangible element associated with the plant (with no direct impacts on the site or surrounding land) and can be mitigated through the Proponent's proposed off-set scheme. Any minor variability in greenhouse gas intensity resulting from detailed design would translate into an economic consideration for the Proponent, rather than presenting an additional or unexpected impact beyond management through conditions of approval. The Department is satisfied that the desalination plant project, and its impacts, have been sufficiently defined and assessed to enable clear and certain conditions to be imposed to mitigate, monitor and manage impacts without deferral of any issue.

Similarly, key issues associated with the intake/ discharge infrastructure relate to the generation of spoil, ambient water quality, aquatic ecological impacts and construction impacts (dust, noise, traffic), which are insensitive to the final detailed design of the infrastructure. Construction impacts and the volume of spoil generated through tunnelling would be the same regardless of final design or the exact alignment of tunnels. With respect to water quality, the Proponent has presented an assessment of impacts based on a 'worst-case' concentration of dissolved solids in discharged concentrated seawater. These impacts have been assessed and considered acceptable. The Department considers that the discharge infrastructure could be readily conditioned to require detailed design consistent with the assumed performance standards applied by the Proponent through its water quality modelling. In this manner, additional or unexpected impacts would not result from the detailed design process as environmental standards have already been established with certainty. There would, however, need to be confirmatory modelling undertaken by the Proponent once detailed design was complete, to demonstrate consistency with the assumptions and predictions presented in the Environmental Assessment. The Department's position in this regard is prefaced on its recommendation that the Proponent not be permitted to discharge backwash or cleaning chemicals along with concentrated seawater – an approach that the Department does not support and which raises significant uncertainty with regard to water quality impacts, waste management considerations and visual/ recreational amenity implications based on the level of information furnished by the Proponent to date.

In contrast, the Department does not consider that the pipeline across Botany Bay, or the pipes connecting this system to the existing potable water distribution network have been sufficiently characterised and assessed to permit granting project approval for these components at this time. Sufficient assessment has, however, been undertaken to determine that in concept – in principle – options for this project component are available that could be implemented within acceptable environmental limits. However, this project component has not been characterised with respect to the final route or design of the subject pipelines to enable project approval, with clear and certain conditions, to be granted. In the case of the pipeline across Botany Bay, not only is the ultimate route yet to be established, but the method of construction (either tunnelling or laying the pipeline on the bed of Botany Bay) has yet to be decided. Further, a decision with respect to the ultimate capacity of the pipeline (whether to carry 500 or 125 megalitres per day) would be dependent on the specific drought-related need and economic considerations at the time of design. There may need to be similar considerations applied by the Proponent in order to determine the final design and capacity of connecting pipelines with the potable water system.

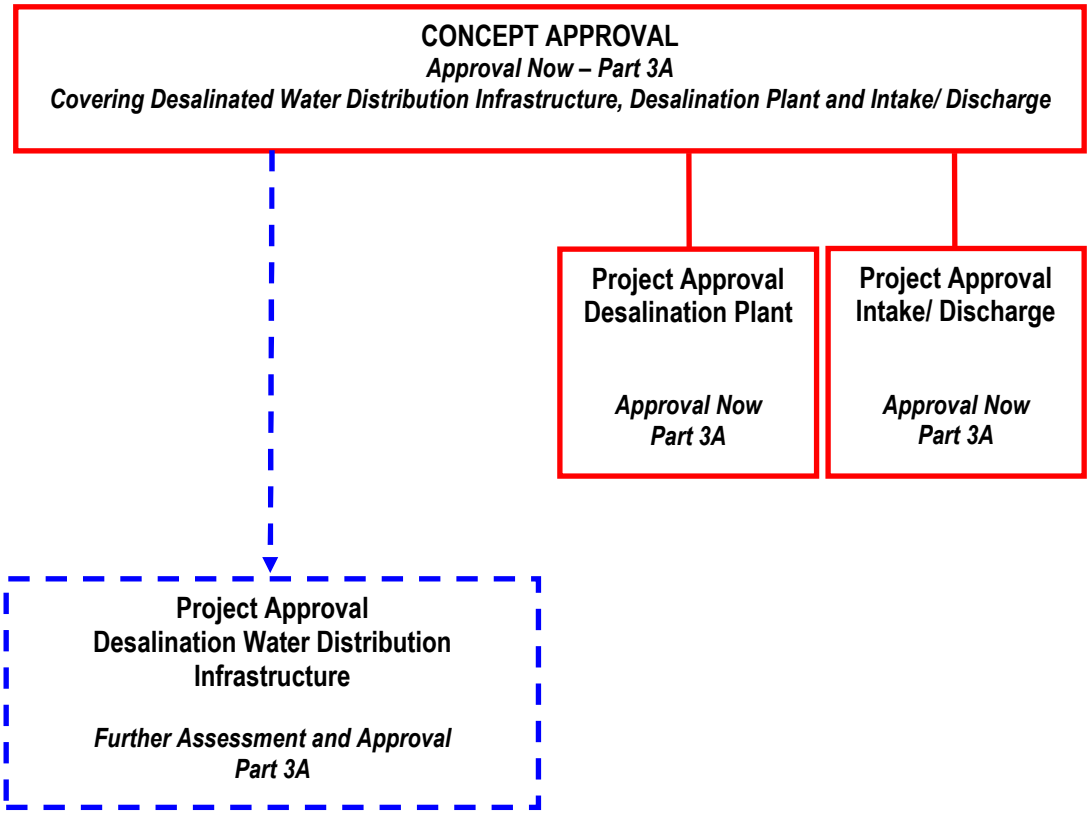
The pertinent consideration in this circumstance relates to the appropriate planning process to be applied to the project approval stages of both the cross-Bay pipeline and the connecting pipeline infrastructure. With respect to the former, the Department highlights that key impacts for the cross-Bay pipeline relate to impacts on aquatic ecology (particularly seagrasses), water quality (particularly turbidity), wave action and coastal process, and the possible flow-on implications for receptors such as commercial fishing operations. The breadth of these issues lends itself to further public consideration and comment, and as such, the project approval stage should be carried out under Part 4 or Part 3A of the *Environmental Planning and Assessment Act 1979*. Of these options, the Department highlights the fact that the pipeline would cross at least two local government areas, and therefore the practicalities of coordinating assessments through two local government bodies leads to a preference for assessment under Part 3A, for which the Minister would be the sole approval body. The Department also considers that the pipeline is of State environmental planning significance, and assessment and approval therefore most appropriately rests with the Minister. The Department therefore recommends that the cross-Bay pipeline be subject to further project approval under Part 3A, and further recommends that the Minister stipulate assessment requirements focussing on the abovementioned key issues for this component of the concept plan.

Although the impacts associated with the construction of pipelines to connect to the existing potable water system are largely construction-related (dust, noise, vibration, traffic, spoil management and erosion/sedimentation), the Department considers that this component of the proposal has the potential to impact on a significant number of residents, with broader regional planning implications. In this light, the Department suggests that it would also appropriate for the connecting pipelines to be subject to assessment under Part 3A the *Environmental Planning and Assessment Act 1979*. This would ensure a further public exhibition, participation and assessment process for this project component. The Department recommends that the Minister's approval for the concept plan

stipulate that the scope of an application for this project focus on the above mentioned key issues (dust, noise, vibration, traffic, spoil management and erosion/sedimentation).

The Department's considers it appropriate that the cross-Bay pipeline and connecting pipelines are treated as a single project. The recommended approval scheme for the concept plan and projects under the concept plan is illustrated in Figure 3.

Figure 3 - Recommended Concept and Project Approval Scheme



3.8 Environmental Planning Assessment Process

A significant proportion (11.7%) of issues raised in public submissions during the exhibition of the Environmental Assessment for the proposal relate to the adequacy of the environmental assessment process for the proposed desalination plant and associated infrastructure. Concerns raised in submissions generally relate to views that:

- the Environmental Assessment, including the Statement of Commitments, is lacking in scope and/ or detail (either as a result of an omission by the Proponent, or an omission in the Director-General's requirements);
- the Part 3A and critical infrastructure processes have been applied to fast-track the proposal at the expense of an adequate level of rigour in the assessment of the proposal;
- the critical infrastructure process has been applied to deny the community the right to comment on the proposal or to deny any right of appeal to the Land and Environment Court;
- the deferral of studies, plans or investigations to a future time, after approval of the concept plan; and
- a comprehensive Environmental Impact Assessment should have been required for a proposal of this scale.

While the Department considers that these matters do not directly relate to the factors the Minister should take into account when determining the subject application, it considers it important that these genuine concerns over the environmental assessment process are addressed.

At least some of the concerns raised in submissions relate to an opposition to, or a misunderstanding of, the Part 3A statutory framework endorsed by Parliament and coming into force from 1 August 2006. This situation was exacerbated by the fact that not only was the Part 3A process applied to the proposed desalination plant, but the new approaches of concept plans and critical infrastructure were added to the mix of applicable provisions in this case. The Department suggests that some of the opposition or misunderstanding may have been generated by the novelty of the new processes, but also accepts that the situation may have been alleviated in part by clearer and more active communication of the new Part 3A provisions from the Department. On this latter point, the Department readily accepts criticisms in some submissions that highlight a need to be more active in clearly articulating these new statutory processes to the interested community.

It is likely that debate will continue beyond this assessment in relation to the Part 3A statutory processes, particularly with respect to concept plans and critical infrastructure projects, and that views will continue to differ on the merits of the major project legislation. Part 3A has, however, been passed into legislation by Parliament and the Department is bound to apply the law as it stands, regardless of this debate and differing views. In the case of the subject development proposal, the Department has applied the provisions of Part 3A of the *Environmental Planning and Assessment Act 1979* fully and strictly as required.

It is important to note that Director-General's requirements for the proposal were issued as required under Part 3A, with a specific focus on those key issues considered by the Director-General likely to substantially influence the outcomes of the environmental assessment process. All other matters were considered generally by the Proponent in the Environmental Assessment and are considered capable of being managed through the Proponent's commitments and through conditions of approval. This is not to say that these non-key issues are not important or that they need not be addressed – simply that they can, in the context of this proposal, be addressed with reasonable certainty and with acceptable outcomes through commitments and conditions. In fact, many of these issues, while not being identified by the Director-General as key issues for the proposal, were raised as matters of concern in public submissions and have been assessed in this report. This is a slightly different approach to that applied to Environmental Impact Statements under Parts 4 and 5 of the *Environmental Planning and Assessment Act 1979* where detailed assessment of all issues is completed before making an informed decision on the significance of each issue to the ultimate determination of the application. The Department considers that the net outcome is the same in each case, except that in the case of Part 3A, consideration of the significance of issues up-front assists in focusing resources on those impacts that will eventually carry the most weight in the assessment process. The Department is satisfied that the Environmental Assessment completed by the Proponent for the concept plan application adequately addresses the requirements issued by the Director-General for the proposal.

One of the key drivers for the implementation of Part 3A has been the desire to streamline the environmental planning and assessment process for major projects of State or regional environmental planning significance. Major changes in the assessment process from Parts 4 and 5 relate to the focus of the assessment, identification of points of inadequacy or lack of information early in the process and simplification of administrative provisions. That part of the Part 3A process involving exhibition and public consultation has not altered – applications under Part 3A must be exhibited for public comment for at least 30 days. The public consultation process has been enhanced under Part 3A to include provisions to ensure adequacy of documentation prior to public exhibition and to require the Proponent to address issues raised in submissions. In this context, the public component of the Part 3A has not been diluted to "fast track" the assessment. Further, where components of the desalination plant proposal have not been finalised or assessed in sufficient detail at this time, the Department has recommended that the Minister require future project approval stages. In all cases, the net outcome will be that each component of the proposal will be assessed to the extent necessary to establish whether it could be undertaken within acceptable environmental limits. Consideration of the proposal as a concept plan or as critical infrastructure does not abrogate the need to adequately assess the development.

As a final point, the Department appreciates concerns raised in public submissions that declaration of the proposal as a critical infrastructure is perceived as a means to deny appeal rights to the Land and Environment Court. It is important to note that in the absence of Part 3A, the desalination plant would not have constituted designated development and would therefore not have attracted third-party merit appeal rights (in the absence of the critical infrastructure project). The Department has been particularly cognisant of the fact that the declaration of critical infrastructure applying to the proposal means that an interested party cannot commence a "procedural"

appeal to enforce the provisions of the Act without the Minister's agreement. The Department has therefore been particularly careful to ensure that all requirements of the Act have been complied with during the assessment process and has placed a strong focus on the public consultation process to ensure that opportunities for comment on the merits of the proposal are maximised.

4. CONSULTATION AND ISSUES RAISED

The concept plan application for the Kurnell desalination plant and associated infrastructure was publicly exhibited with the Environmental Assessment for the concept plan for an extended period from Thursday 24 November 2005 to Friday 3 February 2006. This period exceeded the statutory 30-day minimum public exhibition period by 136%.

Of the total 762 submissions received in response to the public exhibition of the Environmental Assessment for the concept plan, 91% objected to the proposal, 3% supported the proposal and 6% did not clearly state a position. Of all submissions received by the Department, a clear preference for electronic communication is evident, with some 70.5% of all submissions being received by email. In comparison, only 28.6% of submissions were received by facsimile and 0.8% by traditional mail.

Submissions were received from four State government agencies:

- Department of Environment and Conservation – **raises no objection to the proposal, in principle**, but remains concerned about the environmental impacts associated with discharge of pre-treatment backwash biosolids. The DEC considers that the Proponent has not presented sufficient information to support discharge of backwash solids at this time. Raises concern and recommends conditions with respect to ensuring greenhouse gas off-set outcomes, minimising water quality impacts, minimising biodiversity loss, managing indigenous heritage, managing and enhancing where possible terrestrial ecology, protecting Ramsar wetlands, managing noise impacts, minimising waste generation and maximising beneficial reuse, minimisation of dust generation and safe handling and storage of chemicals;
- Department of Primary Industries – **raises no objection to the proposal, in principle**, but suggests that more detailed consideration is required during detailed design of the proposal to ensure impacts on aquatic ecology are minimised and that water quality is protected. The DPI places a strong focus on refinement of design and optimisation of performance, particularly with respect to intake/ discharge infrastructure. Concerns also raised with respect to management of surface water and groundwater to prevent adverse impacts on ecology and Ramsar wetlands. DPI also considers that design of the cross-Bay pipeline must be carefully considered, including methods for construction, to prevent adverse impacts on seagrass, aquatic ecology and water quality. Stringent measures should be imposed to ensure appropriate disposal of spoil and management of acid sulfate soils, as well as comprehensive monitoring of aquatic ecology and water quality;
- Department of Health – **raises concerns**, based on the potential for the proposal to exacerbate climate change, potential noise impacts on schools, hospitals and sensitive land uses from construction, operation and traffic sources, the potential fro contaminated spoil to be generated and the management of that spoil, the need to maintain emergency access to the Kurnell Peninsula and the potential for odour generation from marine debris;
- Hawkesbury Nepean Catchment Management Authority – **raises concerns** over the indirect impacts of the proposal through greater water extraction and discharge from power stations in the Hawkesbury-Nepean Catchment. The Authority also raises concern over what it perceives as the limited scope of the terms of reference for the assessment of the proposal.

Submissions were received 11 local Councils:

- Ashfield Municipal Council – **raises concerns** over the concept plan approach, stating that it makes assessment of the proposal very difficult. Council also supports further community consultation in relation to routes for desalinated water supply infrastructure;
- The Council of the City of Botany Bay – **objects to the proposal**, based on alternatives to desalination and attitudes to water consumption, excessive energy consumption and greenhouse gas generation, the perceived inadequacy of the Environmental Assessment, noise and traffic impacts particularly around Coward Street, the management of contaminated spoil and groundwater around Coward Street, the lack of assessment of impacts on terrestrial ecology, impacts on seagrasses and the inability to readily transplant/ replant seagrass, the perceived failure of the Environmental Assessment to adequately address terrestrial and aquatic ecology impacts as well as impacts on Ramsar wetlands, and the impacts of saline water discharges on the environment;

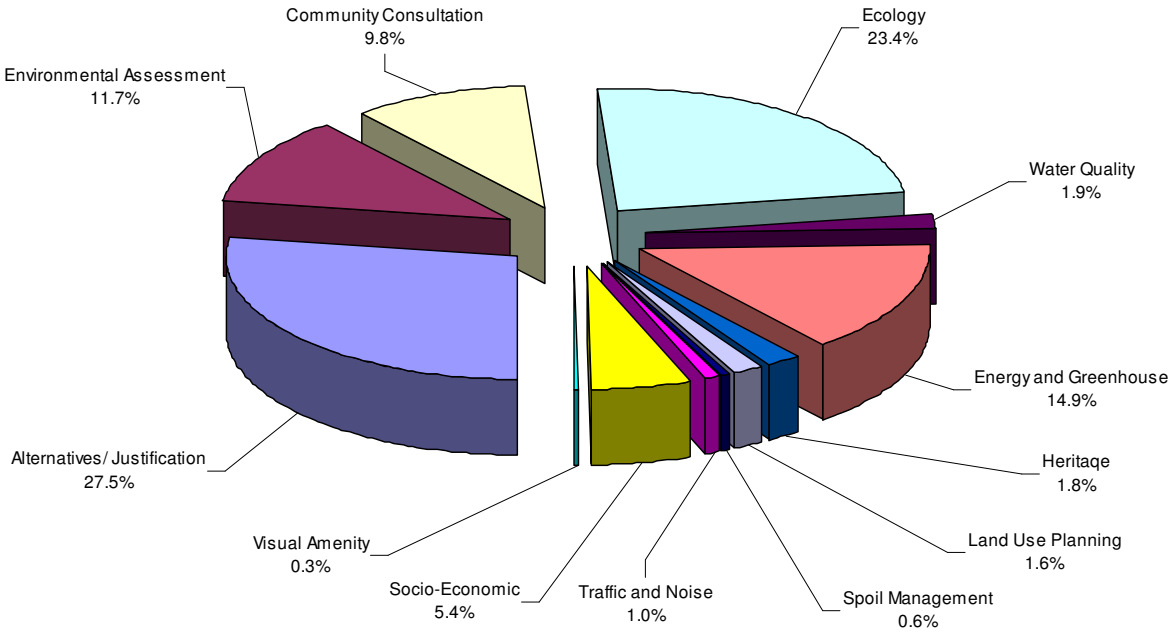
- Leichhardt Municipal Council – **objects to the proposal**, based on the energy intensity of the proposal and consequent greenhouse gas emissions, the lack of a detailed feasibility study and consideration of alternatives, underestimation of impacts on terrestrial ecology including Endangered Ecological Communities, wildlife corridors and the Towra Point Reserve, the impacts of the intake/ discharge infrastructure on aquatic ecology particularly given its location on a rocky reef, the lack of a comprehensive assessment of impacts on both aquatic and terrestrial ecology during construction and operation, and the need to further consider alternative water supply options;
- Manly Council – **objects to the proposal**, based on a perceived non-compliance of the Environmental Assessment with the Director-General's requirements and legislative provisions, the lack of a detailed analysis of alternatives to the proposal, the energy intensity of the proposal and consequent greenhouse gas emissions, the absence of an adequate stormwater and groundwater impact assessment, an inadequate assessment of impacts on terrestrial ecology, understatement of impacts on the Towra Point Reserve, the impacts of the intake/ discharge infrastructure on aquatic ecology particularly given its location on a rocky reef, lack of information on the potential impacts of seawater concentrate discharge on water quality and aquatic ecology, and lack of meaningful community consultation;
- Marrickville Council – **objects to the proposal**, based on a perceived non-compliance of the Environmental Assessment with the Director-General's requirements and legislative provisions, the fact that desalination conveys the wrong message with respect to water use and conservation, lack of detailed consideration of alternatives, the economic and environmental cost of the proposal to the community, the impacts of the proposal on Botany Bay National Park and Towra Point Reserve, impacts on the proposal on listed Ramsar wetlands, the effects of concentrated seawater discharge on water quality and aquatic ecology particularly around the rocky reef, the impacts of construction works within Botany Bay on water quality and aquatic ecology, the energy intensity of the proposal and consequent greenhouse gas emissions, impacts of pipeline construction through the Marrickville local government area through dust, noise and traffic, the impacts of the proposal on heritage streetscapes, the potential for generation of contaminated spoil, implications for acid sulfate soils, flooding, erosion and planning around Cooks River, a perceived lack of detail in the Environmental Assessment and insufficient information to adequately assess the proposal, the potential to generate impacts through acid sulfate soils and contaminated spoil, and the impacts of the proposal on Aboriginal and European heritage values in the Marrickville local government area;
- Mosman Municipal Council – **objects to the proposal**, based on the lack of consideration of alternatives and the cost of the proposal to the community, insufficient effort applied to the assessment of impacts during construction and operation, the significant energy consumption and greenhouse gas implications of the proposal, the lack of consultation with the community and local government before deciding to proceed with desalination, and a perceived inconsistency with the 2004 Metropolitan Water Plan;
- Randwick City Council – **objects to the proposal**, based on the lack of consideration of alternatives and the use of the critical infrastructure declaration to close the debate, the Government should lead by example with a strong emphasis on recycling, reuse and minimisation of consumption, the significant energy consumption of the proposal and resultant greenhouse gas impacts, and the need to change attitudes to the consumption of water;
- The Council of the City of Shoalhaven – **supports the proposal** as a component of the Government's plans and policies to secure a water supply for Sydney into the future;
- Sutherland Shire Council – **objects to the proposal**, based on a perceived lack of detail in the Environmental Assessment and an inability to adequately assess the proposal, lack of justification of the proposal or scale of the proposal in light of alternatives, the significant socio-economic implications of the proposal particularly with respect to the flow-on costs to the community, insufficient consideration of alternative sites for the desalination plant, the lack of detail and certainty over the impacts of seawater concentrate discharge on water quality and aquatic ecology, the potential for significant impacts on seagrass beds in Botany Bay, potential noise and traffic impacts and the deferment of these important issues to future assessment, the significant energy consumption of the proposal and resultant greenhouse gas impacts, restriction of terrestrial ecology assessment to the desalination site only, the potential for hydrological changes caused by the proposal to adversely impact on groundwater and ecology particularly the Towra Point Reserve, impacts on the Grey-headed Flying Fox including light spill, the lack of knowledge, assessment and certainty surrounding the water quality/ dispersion modelling, the effects of concentrated seawater discharge on water quality and aquatic ecology particularly around the rocky reef, impacts from groundwater intercepted during construction works, impacts of the proposal on migrating

whales through noise and water quality changes, insufficient details of the desalinated water delivery infrastructure to permit an adequate level of assessment, insufficient consideration of noise and traffic impacts of the proposal, and a lack of community consultation prior to deciding on desalination and the proposed development site;

- Waverly Council – **objects to the proposal**, based on energy consumption and greenhouse gas emissions, impacts on aquatic ecology, the cost of desalination to the community, and the lack of an open public debate on the need for desalination and alternative water supply measures;
- Wollondilly Shire Council – **objects to the proposal**, based on lack of justification of the need for the proposal compared with alternatives and the proposed scale of the desalination plant, insufficient detail of the proposal to enable an adequate level of assessment to be undertaken, lack of clarity and certainty over the Proponent's Statement of Commitments, the site selection process was inadequate, the energy intensity of the proposal and resultant greenhouse gas emissions, a detailed noise and traffic impact assessment has not been undertaken, there has been not constructive or objective community and stakeholder involvement in development of the proposal, the cost of the proposal will be inequitably shared among consumers and communities, there are other areas of the State that are in greater need of water than Sydney, and Sydney's water supply should be opened up to competition.

A breakdown of all issues raised in submissions is presented in Figure 4. The frequency of each issue raised in submissions has been calculated based on its occurrence relative to the total number of issues raised, rather than the fraction of total submissions that raise a particular issue.

Figure 4 - Breakdown of Issues Raised in Submissions



Issues raised in submissions can be generally divided into three distinct groups: those directly related to the direct impacts of the proposal or its immediate surrounding environment; the indirect impacts of the proposal; and the processes applied to the decision-making process, both before and during the formal assessment period.

The first group of submission issues, being those direct impacts of the proposal on the surrounding environment (ecology, water quality, heritage, land use planning, spoil management, traffic and noise, and visual amenity) cover 30.6% of all issues raised in submissions. Of these issues, impacts on ecology (comprising impacts on aquatic ecology (13.3%), terrestrial ecology (9.4%) and Ramsar wetlands (0.7%)) constitute the most frequently

raised issue of concern, at 23.4% of all issues raised in submissions. All other direct impacts are raised relatively infrequently in submissions, representing less than 2% of all issues in the case of each impact.

In the context of grouping issues raised in submissions, impacts on water quality includes both impacts on "environmental" water as a result of the project (1.6%) as well as the quality of desalinated water supplied to consumers (0.3%). Heritage impacts include effects on both Aboriginal heritage (0.7%) and European heritage (1.1%). Concerns raised in submissions relating to land use planning (1.6%) generally relate to the history of planning on the Kurnell Peninsula, a perception that the Peninsula has been a "dumping ground" for undesirable or hazardous developments, and the suitability of the site for the proposed desalination plant. Traffic and noise issues (1.0%) have been grouped together because noise issues raised in submissions were principally in relation to traffic noise, rather than specific construction or operational noise concerns.

Indirect impacts generated by the proposal relate solely to energy consumption and the consequent emission of greenhouse gases from the production of that energy. Energy and greenhouse concerns represent 14.9% of all issues raised in submissions, and have been distinguished from other impacts by the Department as a stand-alone impact of broader public concern (compared with direct impacts affecting a definite subset of local or regional receptors).

The bulk of issues raised in submissions (54.4%) can be generally described as relating to the processes applied to the desalination plant proposal. These issues relate to a perception that insufficient community consultation was undertaken by the Proponent and Government when deciding that a desalination plant would be required and where the plant should be located (9.8%). Similarly, 27.5% of all issues raised in submissions related to the justification for the desalination plant and alternatives to its implementation. While many of these submissions addressed issues of environmental impacts, the matters raised were focused more on the reduced impacts of alternative water supply measures, rather than a specific impact associated with the desalination plant as framed in the subject application for approval. In the case of environmental assessment, 11.7% of issues related to the declaration of the proposal as a "critical infrastructure project" and concern that authorisation of a concept plan and Part 3A of the Act more generally served to dilute the rigour of the impact assessment process. Socio economic impacts (5.4%) relate, in general terms, to the cost of the desalination plant and the fact that this cost will be passed on to consumers through increased water rates.

Table 1 below indicates where each broad grouping of issues raised in submissions has been considered and addressed in more detail as part of this report.

Table 1 - Assessment of Submission Issue Categories

Issue Category	Section of this Report
Alternatives/ Justification	section 2.3
Environmental Assessment	section 3.8
Community Consultation	section 3.4
Impacts on Ecology	sections 5.3 and 5.4
Water Quality Impacts	section 5.2
Energy Consumption and Greenhouse Gas Generation	section 5.1
Impacts on Heritage	section 5.5
Land Use Planning Implications	section 5.6
Spoil Management and Disposal	section 5.7
Traffic and Noise Impacts	section 5.8
Socio-Economic Implications	section 5.9
Visual Amenity Impacts	section 5.10

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

Key issues raised in the submissions in response to the public exhibition of the project and/or identified during the Department's assessment included:

- energy consumption and the generation of greenhouse gases;
- water quality impacts;
- impacts on aquatic ecology;
- impacts on terrestrial ecology;
- heritage impacts;
- land use planning implications;
- spoil management and disposal;
- traffic and noise impacts;
- socio-economic impacts; and
- visual amenity impacts.

All other issues are considered to be minor and have been addressed as part of the Proponent's Statement of Commitments.

5.1 Energy Consumption and Greenhouse Gas Generation

Issues

The Proponent has estimated that electricity consumption for the project will be in the order of 906 gigawatt-hours per annum for a 500 megalitre per day desalination plant, and approximately 225 gigawatt-hours per annum for a 125-megalitre per day plant. These figures are based on an assumed continuous operation for the entire year (365 days with no shut-down). Applying an emission factor for grid electricity of 1.054 tonnes of carbon dioxide per megawatt-hour, the Proponent suggests that a 500 megalitre plant would generate the equivalent of 950,000 tonnes of carbon dioxide per annum. A 125 megalitre plant would generate 240,000 tonnes of carbon dioxide per annum.

The Environmental Assessment presents the Proponent's intention to off-set 50% of the greenhouse gas impacts of the proposal (as a result of electricity consumption) and presents a number of options for achieving this goal. The Proponent established 50% as an appropriate off-set goal because this would reduce greenhouse gas impacts generally to the same level as estimated for a water recycling scheme of comparable size.

Since preparation of the Environmental Assessment, the Government has announced that the entire greenhouse gas load of the proposal would be off-set. That is, renewable energy sources would be used to produce a neutral greenhouse gas outcome. The Proponent's Preferred Project Report reflects this commitment and suggests that 100% off-set could be achieved through packages such as "Green Power". The Proponent also quotes in its Environmental Assessment that sales of Green Power in 2003/2004 of 482,000 MWh were predicted by the Australian Business Council for Sustainable Energy to increase to 550,000 MWh by 2006. The Proponent also suggests that given there is currently 1,500,000 MWh of installed national capacity, there would be sufficient renewable energy available to off-set the full 906,000 MWh (ie 906 gigawatt-hours) needed for the 500 megalitre per day plant (and certainly sufficient renewable energy if a smaller plant is implemented).

The Proponent's amended Statement of Commitments, as presented in its Preferred Project Report, makes the following commitments with respect to energy consumption and greenhouse gas generation:

- energy recovery systems and energy efficient equipment will be incorporated into the design of the desalination plant and used to optimise energy efficiencies during operation; and
- a Greenhouse Reduction Plan will be developed and implemented to ensure that the plant is effectively powered by 100% renewable energy.

Submissions

Concern over the energy consumption of the desalination plant, and the consequent generation of greenhouse gases represents 14.9% of all issues raised in submissions. Key issues raised in submissions are as follows:

- the total energy consumption of the desalination plant is too high, and significantly higher than alternative water supply options;
- because of its high energy consumption, the desalination plant will be responsible for large amounts of greenhouse gases and resultant global warming;
- global warming caused by the emission of greenhouse gases from the plant will actually exacerbate water shortages and drought conditions;
- the Environmental Assessment presents estimates of energy consumption and greenhouse gas impacts based on average performance and average greenhouse gas emissions across the electricity market;
- an excessive amount of coal will be burnt to power the plant;
- discharge of water from reservoirs or hydroelectricity should be used to power the plant;
- solar energy should be used to power the plant;
- only renewable energy sources should be used to power the plant;
- there is currently not enough green energy available in Australia to power the plant;
- the desalination plant will only support the establishment of nuclear energy in Australia;
- there is insufficient information in the Environmental Assessment to provide certainty about the proposed greenhouse gas offset strategy;
- any greenhouse gas offset strategy must be credible, secure and cost-effective;
- the existing electricity generation and transmission systems in Sydney and the State cannot handle the additional load produced by the desalination plant; and
- 100% of greenhouse gas emissions should be offset, rather than only 50%.

Consideration

The Department considers that the assessment of energy consumption and resultant greenhouse gas emissions presented in the Environmental Assessment is appropriate for the purpose of assessing the impacts of the proposed desalination plant. In this regard, the Department considers it appropriate that the Proponent has applied an emission factor across the electricity grid, rather than speculating on the exact source of electrons that may eventually flow to the plant.

The Department also notes the outcomes of the Proponent's discussions with EnergyAustralia that transmission infrastructure to the site has sufficient capacity to accommodate the load likely to be generated by the proposed desalination plant. With respect to power generation capacity, the Department reinforces the Proponent's statements that there is considerable flexibility in the times of day required for operation of the desalination plant. It is possible to schedule operation to avoid peak load periods and to respond to the changing electricity supply-demand balance across the network. The issue of managing growing base load requirements across the network is the subject of on-going monitoring and reporting by the National Electricity Market Management Company (NEMMCO), with market opportunities to address predicted additional generating requirements over time. The Department is satisfied that this mechanism, with additional market investment by the private sector, or where appropriate, by Government through State-owned corporations, is appropriate to respond to generation needs.

To appropriately consider the potential greenhouse gas impacts of the proposal, it is first important to contextualise the potential impact within recent Australian and international performance. In 2004, it was estimated that total greenhouse gas emissions in Australia, as carbon dioxide equivalents, was 387.2 million tonnes, up by 2.3% from 1990 levels (Australian Greenhouse Office, 2006a). The major contributor to this increase came from the stationary energy sector, which alone grew in emissions by 43.0% to 279.9 million tonnes CO_2-e. Recorded total greenhouse gas emissions in New South Wales have generally remained stable during the period 1990 to 2004, although national accounts strictly suggest a reduction from 160.6 million tonnes in 1990 to 158.7 million tonnes in 2004 (Australian Greenhouse Office, 2006b). Reduced emissions in other sectors have offset a recorded increase in emissions from the New South Wales stationary energy sector from 60.4 million tonnes of CO_2-e in 1990 to 75.9 million tonnes in 2004 (approximately 26% increase). Globally, it is estimated that total recorded emissions from the consumption and flaring of fossil fuels was in the order of 27,043 million tonnes of CO_2-e in 2004, increasing by 26.2% over 1990 figures (Energy Information Administration, 2006).

In the context of 2004 greenhouse gas emissions, the full-scale desalination plant (500 megalitres per day), operating continuously over the entire year and without any mitigation or offsets would:

- increase total New South Wales emissions by approximately 0.6%, and within the stationary energy sector by 1.3%;
- increase total Australian emissions by approximately 0.2%, and within the stationary energy sector by 0.3%; and
- increase global fossil fuel emissions (consumption and flaring) in the order of 0.004%.

It is important to note that the above figures are particularly conservative for three reasons. The first is that calculations are based on reported/ recorded greenhouse gas emissions at State, national and international levels. Although these emission inventories are good estimates, they are at best estimates and may in some cases not account for all emission sources. They may well then represent an underestimate of inventories of emissions within a particular region at a particular time, and as a result, the estimates of percentage increases that would be attributable to the proposed desalination plant would be overestimated.

Secondly, the calculations assume continuous operation of the desalination plant over an entire year. This is not the intended mode of operation for the development, and it is highly unlikely that the plant would be required for anything other than intermittent operation to supplement water supplies from time to time. Further, the final scale of the plant, whether 500 megalitres, or 125 megalitres, or somewhere in between. As such, it may be that a 125 megalitre plant is implemented in future, with the result that increases in emissions are in the order of a quarter of those estimated above.

Finally, the calculations do not take into account any energy conservation measures that may be applied to the plant, nor any greenhouse offset development to reduce net greenhouse gas impacts.

The Department agrees with comments made in submissions that, relative to other developments, the energy intensity of the proposed desalination plant is elevated. Without mitigation, the proposal will be indirectly responsible for a comparatively high greenhouse gas emission load. In a global context, the Department also concurs with statements made in submissions that greenhouse gas emissions contribute to global warming, future sea level rises and the alteration of weather patterns that may reduce rainfall in Sydney's drinking water catchments over time. These observations are, however, made on a global scale and the Department does not agree that the desalination plant in and of itself will cause these effects. The plant will certainly contribute to total global greenhouse gas emissions and impacts, but the Department considers that the desalination plant itself will not generate an impact in isolation that would cause sea level rises or a reduction in rainfall. To suggest that the plant would be the sole trigger for these outcomes is inaccurate and the Department suggests misses the scale and context of greenhouse gas impacts. It is however, important that greenhouse gas emissions from the proposed desalination plant be minimised as much as reasonable and feasible, and as a result, minimise the plant's contribution to the much broader greenhouse issue.

The Proponent has endeavoured to minimise the net greenhouse gas contributions from the desalination plant through a greenhouse gas off-set strategy and through a commitment to installing energy efficient equipment and energy recovery devices to the desalination plant. The Department considers the Proponent's approach to be appropriate in this regard – with mitigation applied through the design of the plant in the first instance, and residual impacts addressed through greenhouse gas off-sets. The Department recommends that the Minister reflect the Proponent's commitment to energy efficiency as a condition of approval.

With respect to greenhouse gas off-sets, the Department considers that the Proponent's 50% off-set strategy, as outlined in the original application was both reasonable and justified. Part of the justification at that time related to the economic implications of off-setting emissions further, with the Proponent suggesting that it would not be economically reasonable or feasible to off-set above 50%. Since that time, the Government has committed to off-setting 100% of emissions, through the use of renewable energy sources. This approach will not prevent emission of greenhouse gases, but it will ensure that the net outcome of the proposal, if it proceeds, would be greenhouse gas neutral. The Department accepts and supports this approach, as adopted by the Proponent in its Preferred Project Report, and notes without further analysis that the proposed 100% off-set strategy is greater than the Department would normally and reasonably expect from development.

The Proponent has committed to the development and implementation of a Greenhouse Gas Reduction Plan, which would outline how the 100% off-set would be achieved. The Department recommends that the Minister reflect this commitment as a condition of approval. While the Department appreciates that many interested members of the public would prefer to see the details of the Plan now, including exact sources of renewable energy contributing to the off-set package, the Department considers it unreasonable to require this level of detail at this time. On this point, the Department highlights that the desalination plant would only be implemented in future as a contingency in the event of extreme drought (an event which in itself is difficult to predict) and any attempt to detail the off-set strategy now runs into the difficulty of trying to predict future conditions and regulatory requirements. Noting the recommended lapse period for the desalination plant approval (31 December 2015), it would be necessary to take into account all possible eventualities over the course of the next 10 years in order to develop a robust and fully detailed Greenhouse Gas Reduction Plan at this time. The Department considers it more reasonable, and prudent, to require the Plan to be developed prior to the operation of the desalination plant, with the benefit of analysis of real information on options at that time. For a similar reason, the Department does not consider it appropriate to specify the source of renewable energy (for example solar power or hydroelectricity) at this time, as suggested in submissions. Solar power and hydroelectricity may eventually contribute to the Proponent's off-set strategy in part, although the contribution from these energy sources, as well as others, is most appropriately dealt with at the time of implementation.

The issue of availability of green power, or renewable energy, to contribute to the Proponent's off-set strategy is potentially a more problematic issue. The Proponent has demonstrated in its Preferred Project Report that capacity currently exists to purchase "Green Power", for example, to off-set the likely emissions from a full 500 megalitre per day plant, operating continuously. In reality, the desalination plant is not expected to operate continuously, and in this light, there is clearly sufficient green power capacity to off-set the greenhouse gas impacts from the proposal, if implemented today. Whether there will be sufficient capacity, and whether the Proponent is able to secure this capacity in future are questions that cannot be readily answered without the ability to foresee future circumstances. The Department considers that this is an additional matter that will need to be carefully considered and detailed in the Proponent's Greenhouse Gas Reduction Plan. The Plan will need to be developed to provide sufficient flexibility to accommodate circumstances in which the greenhouse gas emissions attributable to a particular day of operation cannot be neatly off-set on that day. Through provision of some temporal flexibility, the Department considers it reasonably possible to accommodate a net outcome of greenhouse gas neutrality, although greenhouse gas emissions and off-sets may not align exactly within a discrete timeframe. The Department highlights, for example, that off-sets may be applied in a year of no operation in the expectation that those off-sets will negate a future year's emissions, or perhaps retrospectively, where greenhouse gas emissions from a particular period are off-set to neutrality following the actual period of emission. The recommended condition of approval requiring the Greenhouse Gas Reduction Plan requires consideration to be given to this flexibility, in addition to other key aspects, including monitoring, auditing, transparency and attainment of net greenhouse neutrality in a secure, credible and cost effective manner.

The Department does not accept that the desalination plant proposal will generate a need for nuclear power, or would influence any decision by the Australian Government to change its policy position on a nuclear power industry in this country. It is noted that Australian Government policy on nuclear energy is based on its own merit assessment of the benefits and drawbacks of nuclear power. Any change in this policy would be based on a similar merit assessment and would, the Department suggests, be much broader in consideration than simply in response to this desalination proposal.

5.2 Water Quality Impacts

Issues

The desalination plant proposal (and associated infrastructure) has the potential to impact on water quality through:

- erosion and sedimentation during the construction of dry land components of the proposal;
- stormwater and surface water run-off from dry land components of the proposal during operation;
- construction of the cross-Bay pipeline and intake/ discharge infrastructure;
- the quality of desalinated water provided to consumers; and
- discharge of concentrated seawater and process chemicals from the desalination plant (and equally, intake water quality may be affected by ambient conditions).

In order to manage potential erosion and sedimentation impacts during construction of dry land components of the proposal, the Proponent has committed to the development and implementation of a Construction Stormwater Management Plan. The Proponent intends to include appropriately sized surface and groundwater management controls in that Plan, designed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004). A particular focus of the Plan will be prevention of sediment-laden run-off from construction activities impacting on Quibray Bay.

The Proponent has also committed to development and implementation of a similar plan, a Stormwater and Groundwater Management Plan, for the operation of the proposed desalination plant.

With respect to the construction of intake/ discharge infrastructure and the pipeline across Botany Bay, the Proponent has committed to undertaking the construction works to meet ANZECC water quality criteria.

In response to concerns raised in submissions in relation to the quality of water produced by the desalination plant, the Proponent highlights that desalination technology is employed internationally, including in Europe, the United States, Singapore and the Middle East to produce potable water within acceptable quality standards. In an Australian context, the Proponent highlights that it would be bound to meet domestic drinking water standards, as stipulated by NSW Health and the Australian Drinking Water Guidelines published by the National Health and Medical Research Council. Through application of these standards, and through the Proponent's existing strict monitoring and reporting processes, the Proponent is confident that acceptable potable water quality outcomes will be met and maintained.

A key issue identified by the Proponent in the Environmental Assessment is the impact of the proposal on water quality through discharge of seawater concentrate. In addition to the discharge of seawater concentrate, the Proponent initially intended to discharge lime sludges and filter backwash solids (ferric chloride flocs) from the desalination plant pre-treatment process (combined with the seawater concentrate). As part of its Preferred Project Report, the Proponent committed to beneficial reuse or disposal to land for lime sludge materials, but has maintained its position that backwash solids should be discharged to the ocean. The Proponent estimates that if required to remove backwash solids from the discharge stream, the capital cost of the 500 megalitre per day plant would increase in the order of $30 – 40 million, with annual landfilling costs in the order of $2 – 3 million. The Proponent suggests that this additional expense is not economically reasonable, particularly given that it considers impacts from backwash solids discharges can be managed within acceptable environmental limits. Notwithstanding, the Proponent has committed to reviewing and confirming that this is the case once the desalination plant is operational, and if it identifies an unacceptable impact, the Proponent will proceed with measures to remove the backwash solids from the discharge stream.

Cleaning chemicals used within the plant would be oxidised and neutralised before discharge, and as such, would not contribute to water quality impacts over and above those related to the seawater concentrate and sludge discharge.

The Environmental Assessment presents the results of modelling undertaken by the Proponent based on a conceptual design for the desalination plant and discharge diffuser. The results of this modelling for the full-scale 500 megalitre per day plant, comparing the quality of unaffected seawater (intake), seawater concentrate and at the edge of the mixing zone (background plus seawater concentrate discharge) are reproduced in Table 2 below. The Proponent estimates the near field mixing zone to extend approximately 50 – 75 metres in a generally north-south from the point of discharge, and approximately 30 – 35 metres wide.

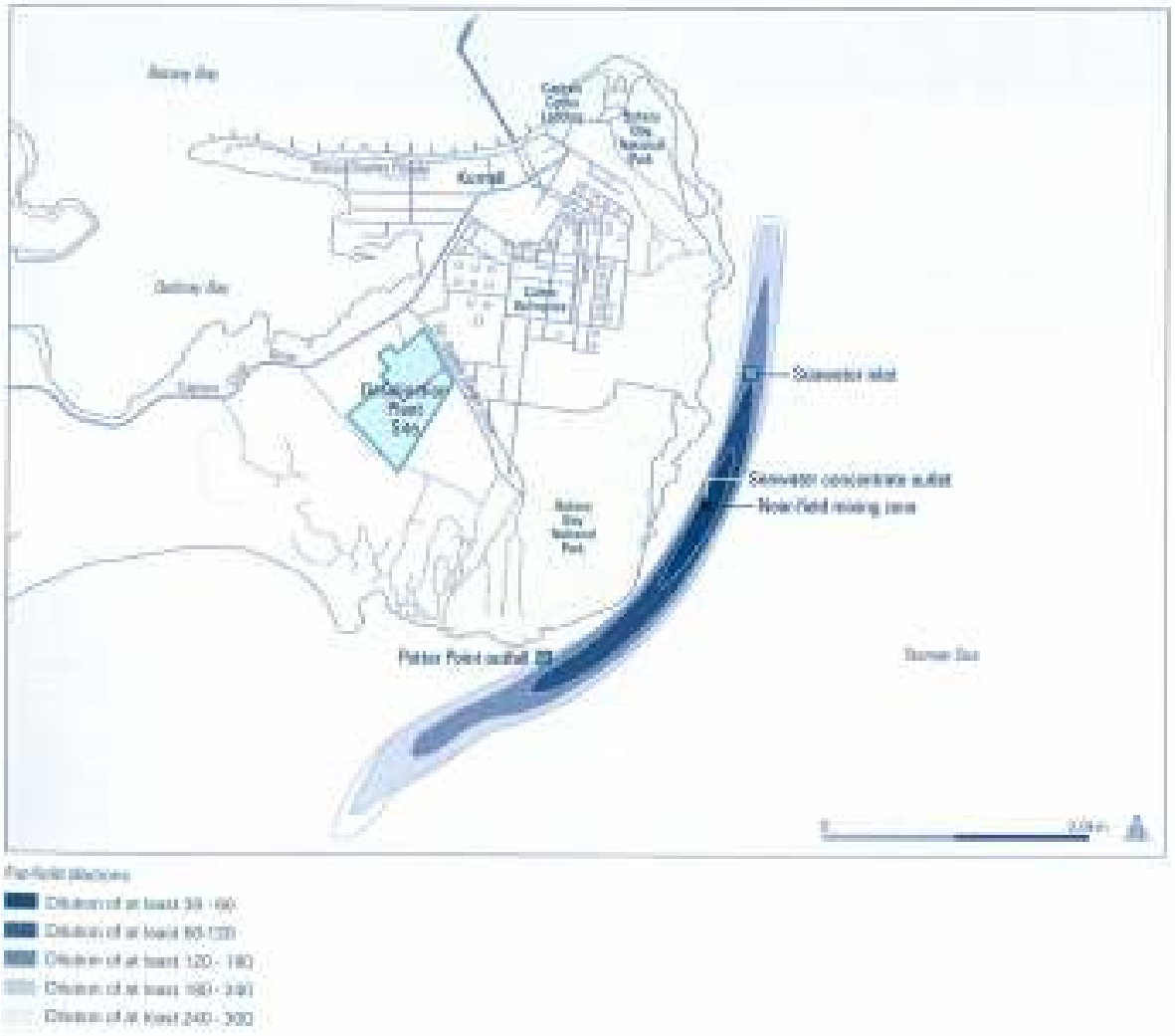
From the results of modelling presented in Table 2 below, the Proponent highlights that physico-chemical parameters generally return to near background levels at the edge of the near field mixing zone. The most significant elevation in concentration at that point is with respect to salinity (indicated as total dissolved solids and chloride in the table).

Table 2 - Predicted Water Quality Outcomes (500 Megalitres per Day)

Parameter	Seawater Intake	Seawater Concentrate	Edge of Mixing Zone
Temperature (°C)	14 – 24	17 – 27	14.1 – 24.1
pH	~8	~6 – 8	7.9 – 8.0
Total dissolved solids (mgL^{-1})	35,000 – 40,000	56,400 – 65,700	35,700 – 40,850
Total suspended solids (mgL^{-1})	<2 – 10	6 – 20	2.1 – 10.3
Total iron (included in total suspended solids) (mgL^{-1})	<1	<4	1 – 1.1
Chloride (mgL^{-1})	19,500 – 22,000	31,700 – 33,800	19,894 – 22,381
Free chlorine (mgL^{-1})	-	0	0
Sulfate (mgL^{-1})	2,500 – 3,200	4,070 – 5,210	2,551 – 3,265
Total nitrogen (μgL^{-1})	110 – 340	553 – 924	124 – 359
Total phosphorus (μgL^{-1})	7 - 24	11.3 – 38.6	7.1 – 24.5

The Proponent has also modelled far field dilutions to demonstrate further dilution outside the near field mixing zone and to assess the potential for "short-circuiting" between the discharge and intake points. The results of far field modelling are reproduced in Figure 5.

Figure 5 - Far Field Dispersion Modelling Results



In relation to operation of the proposed desalination plant, the Proponent's amended Statement of Commitments, included in its Preferred Project Report, details the following key commitments:

- the desalination plant and discharge infrastructure will be designed to achieve water criteria developed in accordance with ANZECC guidelines at the edge of the near field mixing zone and to protect the DEC's water quality objectives;
- the desalination plant and discharge infrastructure will be designed with the aim of achieving a 30-times dilution at the edge of the near-field mixing zone;
- the desalination plant and discharge infrastructure will be designed to minimise acute toxicity effects within the near field mixing zone;
- location of intake and discharge infrastructure will be refined during the design process to minimise impacts on water quality and ecology;
- treatment chemicals known to bioaccumulate will not be used in the desalination plant;
- a monitoring program will be developed and implemented to refine and confirm modelling predictions with respect to water quality and ecological impacts;
- measures will be implemented to manage pre-treatment and filter backwash discharges to minimise impacts on water quality, ecology and visual amenity;
- lime sludge will not be discharged and will be preferentially beneficially reused, or failing reuse, directed to landfill;
- assessment of intake system cleaning chemicals will be undertaken to minimise acute toxicity effects; and
- seawater intake and discharge locations will be refined during the design process to ensure adequate intake water quality and avoid impacts from discharges from sewage treatment plant discharges.

Submissions

Concern over the water quality impacts resulting from and impacting on (ie seawater intake) the proposal represent 1.9% of all issues raised in submissions. Within this, 1.6% relates to impacts on ambient water quality, while the remaining 0.3% relates to the quality of desalinated water. It should be noted that where issues raised in submissions relate to the impacts on ecology as a result of water quality changes attributable to the proposal, these matters have been considered in detail in section 5.3 of this report. Key issues raised in submissions are as follows:

- concentrated seawater discharged from the plant will be high in metallic salts that will be much more harmful than sodium chloride;
- there are uncertainties and assumptions related to toxicities and the dispersal of seawater concentrate;
- water quality and toxicity testing around the proposed discharge point is supported given uncertainties surrounding toxicities and dispersion of seawater concentrate;
- concern over pipe-laying activities around the Cooks River foreshore, particularly in relation to erosion, contamination, acid sulfate soils and flooding;
- the water is already polluted with too much sewage and oil;
- the development will alter the temperature and composition of water around Kurnell and Cronulla beaches;
- seawater concentrate will negatively impact on beaches and quality of living;
- concern over the water quality impacts associated with dredging a trench across Botany Bay, particularly in relation to turbidity, nutrients and the potential to disturb contaminated sediments;
- support for further investigations into tunnelling under Botany Bay, testing for contamination, use of turbidity screens and implementation of a water quality monitoring program by an independent water quality expert;
- Botany Bay is toxic from historical industrial operations and contaminated groundwater, which will impact on the quality of seawater intake;
- there is insufficient background data on coastal processes including current direction and strength to accurately model dispersal of discharge;
- there is a poor understanding of the exact nature of the chemicals used in the desalination process and the effect of these chemicals once discharged;
- there is a lack of knowledge of background water quality of the receiving waters, lack of quality control and calibration of the dispersion models, resulting in no certainty in the assessment of water quality impacts;
- there has been no assessment of concentrations within the mixing zone;

- there has been no assessment of the impact of brine plume, temperature differences in discharge waters or presence of other chemicals in the disposal effluent;
- the impact and behaviour of saline plumes are not well understood and there are no standard management procedures for dealing with these potential impacts;
- the management of discharge brine should aim to prevent the discharge of treatment chemicals such as lime sludge to the ocean;
- any works that alter the sedimentation regime of the Cooks River, such as runoff from trench diggings will jeopardise the high precision measurements of the River Science Ecological Monitoring Program; and
- iron, in significant concentrations, is a pollutant of concern.

Consideration

The Department considers that the two key issues associated with water quality impacts generated by the proposal relate to the issue of discharge of backwash solids, and management of the near field mixing zone.

The Department does not support the discharge of backwash solids from the technology envisaged in the Environmental Assessment and in the manner proposed by the Proponent. The Department considers that the Proponent has neither conclusively demonstrated that discharge of these backwash solids along with the seawater concentrate would meet acceptable environmental outcomes and equally nor has it adequately demonstrated that the economic implications of removing and disposing of the solids is prohibitive. The Department of Environment and Conservation holds a similar view that the Proponent has not adequately demonstrated that discharge of backwash solids is acceptable in terms of water quality outcomes. The Department of Primary Industries has expressed concern over the effects of the backwash solids on marine biota.

There are four key aspects related to the discharge of backwash solids that the Department considers support its position that backwash solids should not be permitted to be discharged along with seawater concentrate:

- significant uncertainty remains in relation to the ecotoxicological effects of the backwash solids on marine biota;
- significant uncertainty remains in relation to the physical effects of backwash solids, particularly the potential for gill occlusion and smothering of benthic organisms through the settling of solids on the seabed and reef structure;
- significant uncertainty remains in relation to the potential for re-entrainment of backwash solids, with the potential for suspended materials to generate an amenity impact through discoloured plumes and deposition of backwash solids on foreshore areas or more sensitive marine ecosystems; and
- it is questionable whether discharge of backwash solids is an appropriate and acceptable waste management approach in the absence of a robust analysis of whether the alternative (removal and disposal to landfill) is reasonable and feasible.

With the remaining uncertainties over the impacts of the backwash solids discharge, the Department considers it inappropriate to permit discharge of the solids, having regard to the Precautionary Principle. The Proponent's proposal to discharge the solids, monitor and take future ameliorative action if an unacceptable impact is identified is not considered an appropriate course of action and is inconsistent with good environmental practice and the Precautionary Principle. As such, the Department recommends that the Minister require, through conditions of the intake/ discharge infrastructure approval that backwash solids be prohibited from being discharged.

The Department has presented this position consistently to the Proponent from November 2005, and through the environmental assessment process. In response, the Proponent has suggested that technological advances between now and future implementation of the proposal may result in a pre-treatment process that produces a backwash stream that is acceptable for direct discharge. Alternatively, the Proponent has sought flexibility to demonstrate the acceptability of backwashes at some point in future, using the technology proposed in the Environmental Assessment.

The Department suggests that the Proponent's position on the potential advancement of technologies may be optimistic given the current status of ferric chloride flocculation as a commonly and widely employed means of solids management in water quality systems. If any substantial technological advances occur in future, the

Department suggests that the advances will be more likely to support processes for removal of the solids from the treatment train, rather than making the solids acceptable for environmental discharge. Notwithstanding, the Department appreciates the Proponent's desire for design flexibility and suggests that the Minister also include conditions in the intake/ discharge infrastructure project approval that permit the Proponent to demonstrate the acceptability of discharge whether from an alternative technology or from the processes proposed. If detailed design of the desalination plant includes an alternative pre-treatment process, with different backwash qualities (for example, different solids materials with different physico-chemical characteristics), or the Proponent considers it can further justify the current proposal, then the Proponent should be provided the opportunity to demonstrate that discharge of backwash is consistent with acceptable environmental outcomes. The demonstration presented by the Proponent would need to address the key outstanding issues listed above, focusing on ecological impacts, water quality impacts and amenity issues. The Department considers it important that an international peer review of the Proponent's arguments be undertaken prior to permitting any alternative discharge to ensure a robust assessment of the merits of the approach.

The Department supports the Proponent's proposal to remove lime sludges from the discharge stream and recommends that this approach be reflected in the Minister's conditions of approval. The Department further recommends that the conditions stipulate that the lime sludge is to be preferentially applied to beneficial reuse, and only landfilled where no reuse options are available.

The second key water quality issue associated with the proposal relates to the management of the near field mixing zone. The dispersion and water quality modelling undertaken by the Proponent and presented in the Environmental Assessment is illustrative in nature and based on assumed worst-case conditions, and assumed plant and intake/ discharge infrastructure design. While the Department considers that this modelling is sufficient for the purpose of this stage of the assessment process, and to conclude that in principle, that it is possible to design the proposal to meet acceptable water quality outcomes, the Department considers that the Proponent has considerable additional work to be completed during the design and refinement stages of the development. The Proponent will need to refine water quality modelling, based on further monitoring of background seawater quality and currents, and taking into account detailed design of the development, to demonstrate that water quality outcomes derived in accordance with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ, 2000) can and will be met. This refinement process will also assist the Proponent in optimising the design of the desalination plant and intake/ discharge infrastructure.

The Department has consulted with the Department of Environment and Conservation on the scope of the necessary water quality refinement and optimisation investigations, and it has been agreed that the following should be required as part of a comprehensive Marine Water Quality and Ecosystem Monitoring Program (with respect to water quality issues):

- deployment of instrumentation necessary to gain an understanding of the ambient oceanographic conditions (eg spatial and temporal variation in currents and density structure (temperature and salinity), winds, waves) in an area encompassing the inlet and outlet structures as well as other significant regional features, for example flows from Botany Bay and Potter Point sewage treatment plant discharge;
- combination of the data obtained from the pre-commissioning component of the program with best estimates of discharge quality and quantity in a near field numerical model to calculate and optimise the dilution achieved by the diffuser. A physical model may also be used in addition to the numerical model for this purpose;
- consideration of variables in the performance optimisation of the diffuser including, but not necessarily limited to: number of ports, orientation of ports, configuration of ports, length of diffuser, discharge exit velocity and the depth and location of the diffuser;
- based on the modelling undertaken, refinement, during design, of the outlet location and design to ensure effective plume dispersion;
- based on the understanding of oceanographic conditions derived from deployment of instrumentation necessary to gain an understanding of the ambient oceanographic conditions and the modelling undertaken, refinement of the location and design of the discharge point to minimise impacts on water quality and ecology as far as practicable;
- reconciliation of the discharge performance envelope against the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) to provide a clear understanding and description of

the mixing zone. Results are to be presented using a statistical approach that defines best, typical and worst case scenarios and the relative likely occurrence of each; and

- post-commissioning, the use of tracers in the discharge stream, in combination with the instrumentation deployed to gain an understanding of the ambient oceanographic conditions for a range of oceanographic and discharge conditions, to calibrate and validate the near field numerical model so that it is capable of making ongoing and robust diagnostic and prognostic predictions of plume geometry and dilutions. The tracing experiments should also determine the fate of the plume in the far field. The range of oceanographic conditions should encompass, but not necessarily be limited to, a matrix of features including receiving water currents flowing north and south, flood and ebb tides at Botany Bay, onshore and offshore winds, and calm and elevated significant wave heights.

This approach is reflected in the recommended instrument for the project approval of the intake/ discharge infrastructure.

With respect to water quality impacts during the construction of the intake/ discharge infrastructure, the Department is satisfied that this issue can be managed as proposed by the Proponent to achieve water quality outcomes consistent with ANZECC guidelines.

Management of surface water and stormwater associated with the construction and operation of the desalination plant component of the proposal can be adequately and appropriately addressed through the application of best environmental practice. This includes well-known and commonly applied surface water management techniques to minimise and manage the generation of sediment-laden waters, and prevention of erosion. The Department recommends imposition of conditions requiring the Proponent to install and operate surface water management controls in accordance with *Managing Urban Stormwater: Soils and Conservation* (Landcom, 2004) and in relation to operation, to develop a comprehensive Surface Water and Groundwater Management Plan.

In relation to the quality of desalinated water produced by the proposal, the Department notes and agrees with the Proponent's observations that reverse osmosis technology is frequently applied internationally to meet acceptable drinking water standards. In the case of the subject application, application of this technology is considered capable of producing a potable water stream of appropriate quality. Further, it is considered that existing drinking water criteria, monitoring and reporting are sufficient to ensure this outcome.

Construction of the desalinated water distribution infrastructure has the potential to impact on water quality, particularly in Botany Bay. As highlighted in submissions, it may also lead to water quality impacts at on-shore locations, including around the Cooks River. This component of the proposal will be the subject of a future project application, at which time the issue of water quality impacts will be assessed in detail. The Department is satisfied that, in principle, reasonable measures exist to manage these impacts within acceptable limits. These include, for example, standard erosion and sedimentation controls, and in the case of works within Botany Bay, mitigation measures such as silt curtains. The Department recommends that the Minister specify as part of the concept approval that the issue of water quality be included as a key component of the Proponent's future application for the desalinated water distribution infrastructure project.

5.3 Impacts on Aquatic Ecology

Issues

The Environmental Assessment specifies that intake and discharge points associated with the proposal will be located in the rocky reef off Kurnell Peninsula, rather than further off-shore, due to operational and economic considerations. The Proponent argues that to locate the intake/ discharge infrastructure further off-shore and away from the ecological values of the rocky reef would increase the potential for sand and other debris to be drawn into the infrastructure, particularly the intake.

The Proponent recognises the potential for marine biota to become impinged on or entrained in the intake. The potential for this to occur is particularly relevant for juvenile fish, larvae and plankton. To mitigate against impingement and entrainment, the Proponent intends to design the intake infrastructure to achieve an intake velocity of approximately 0.1 ms^{-1}, which is considered sufficiently low to allow most marine biota to escape the intake waters. This velocity is predicted to fall to about 0.026 ms^{-1} at a distance of two metres from the intake

point. For the full-scale 500 megalitre per day desalination plant, the Proponent has estimated that this design approach will result in the impingement or entrainment of about 2% of the total population of fish larvae in the immediate area.

The Proponent also recognises that changes in seawater quality around the discharge point will affect aquatic ecology. It recognises that there is limited information on the effects of desalination plant discharges on aquatic organisms, and so has adopted a design philosophy of maximising dispersion and dilution effects around the discharge point. While larger, mobile biota such as fish would be able to avoid the area of affectation, invertebrates and some fish species inhabiting reefs and bottom sediments within the predicted near field mixing zone would be impacted. The Proponent suggests that overall, the discharge of seawater concentrate is likely to alter the marine assemblages in the near field mixing zone. The Proponent highlights, however, that based on its modelling, the near field mixing zone will be in the order of 0.5 hectares, which represents only 0.05% of the total area of the rocky reef habitat off the Kurnell Peninsula.

The Environmental Assessment presents the results of tests of significance under section 5A of the *Environmental Planning and Assessment Act 1979* for the following species:

- Loggerhead turtle (*Caretta caretta*);
- Blue whale (*Balaenoptera musculus*);
- Grey nurse shark (*Carcharias taurus*);
- Great white shark (*Carcharodon carcharias*);
- Green turtle (*Chelonia mydas*);
- Leathery turtle (*Demochelys coriacea*);
- Southern right whale (*Eubalena australis*);
- Australian fur seal (*Arctocephalus pusillus doriferus*);
- New Zealand fur seal (*Arctocephalus forsteri*); and
- Black cod (*Epinephelus daernelii*).

The assessment of the above species presented in the Environmental Assessment concludes that the proposal will not have a significant impact.

Although whale species are known to migrate along the coast, off-shore from Kurnell Peninsula, the Proponent suggests that construction noise and disturbance is more likely to affect these species than direct water quality effects around the discharge point. The Proponent intends to incorporate specific management measures in its construction noise management plan for the intake/ discharge infrastructure to minimise the potential for disturbance to whales.

The Proponent has also considered the impacts of the proposal on recreational and commercial fishing, particularly the flow-on effects to species important to fishers and the fishing industry. The Proponent suggests that the impact is likely to be minimal given the mobility of significant species and the very small fraction of the rocky reef impacted by the seawater concentrate discharge.

Key commitments made by the Proponent with respect to the aquatic ecological impacts of the intake/ discharge infrastructure (other than those already outlined in relation to water quality) include:

- design of intake infrastructure to reduce intake velocities to around 0.1 ms^{-1};
- refining the design of intake infrastructure to minimise the potential for impingement or entrainment of marine biota;
- assessment of cleaning chemicals for the intake system to minimise the potential for acute toxic effects;
- monitoring the distribution and mortality of planktonic larvae; and
- inclusion in the construction noise management plan of measures to minimise disturbance on marine mammals, particularly whales.

With respect to the desalinated water distribution infrastructure, the key aquatic ecological impact will result from the need to install the cross-Bay pipeline through seagrass beds off Silver Beach. As the final route for the cross-Bay pipeline will not be established until the time of a future project application, the Environmental Assessment presents the impacts associated with two possible route alignments. The Environmental Assessment

demonstrates that it would not be possible to avoid seagrass beds entirely, so a design philosophy of minimising the extent of disturbance has been adopted. The Proponent predicts that depending on final route selection, approximately 0.2 – 0.5 hectares of seagrasses would be directly affected. Possible pipeline routes have been considered in concept with the intention of avoiding dense seagrass beds, with a preference for patchy or degraded areas. The Proponent initially proposed to recover and replant seagrasses. However, in light of issues raised in submissions, and advice from the Department of Primary Industries that replanting is generally unsuccessful, it has updated its commitments to reflect the development of an off-set package, to preserve, protect and rehabilitate other degraded seagrass areas to off-set the impacts of the proposal.

Submissions

Concern over the impacts of the project on aquatic ecology represents 13.3% of all issues raised in submissions (noting that impacts on Ramsar wetlands are considered as part of terrestrial ecology impacts in section 5.4). Key issues raised in submissions are as follows:

- the outpour of hot brine from the desalination plant will adversely impact on aquatic flora and fauna in the ocean and along the entire shore;
- the final route for the pipeline across Botany Bay has not been established, and it is therefore impossible to predict the impacts of the project on seagrasses;
- it is not clear how or where seagrass beds will be replaced/ off-set and by whom;
- replanting of seagrass has been suggested, but it is well-known that replanting is not an effective or successful measure;
- more investigation into the adverse impacts of discharges, including cleaning chemicals in the discharges, need to be undertaken;
- dredging parts of Botany Bay will suspend contaminated sediments, including sediments contaminated with dioxins and mercury, which will adversely impact on aquatic ecology;
- hypersaline discharges onto the rocky reef off the Kurnell Peninsula will have a significant impact on aquatic ecology;
- research into the design of the seawater intake needs to be undertaken to ensure that it does not adversely impact on threatened species such as the weedy sea dragon;
- marine micro organisms will either be sucked into the intake or caught on the intake screens;
- the proposal will have a significant impact on Commonwealth marine reserves;
- the issue of treatment chemicals has been inappropriately deferred for later consideration instead of considering their impacts on marine ecology upfront;
- the proposal will destroy the bed of Botany Bay;
- increased temperatures and marine salinity will adversely impact on the Boat Harbour Aquatic Reserve;
- the proposal will not have a significant impact on aquatic ecology because of good design;
- the proposal will adversely impact on migrating whales through water quality changes and construction noise impacts;
- the discharge of ferric chloride will clog the gills of aquatic species and smother benthic organisms; and
- the intake and discharge points should be located further off shore to minimise impacts on sensitive ecology.

Consideration

There is potential for the proposal to impact on aquatic ecology in the following ways:

- construction of the intake/ discharge infrastructure and cross-Bay pipeline;
- impingement of entrainment of marine biota on or in the seawater intake; and
- water quality impacts associated with the seawater concentrate discharge.

As noted in the assessment of water quality impacts, the Department recommends that the Proponent be required to meet ANZECC water quality criteria during construction of the intake/ discharge infrastructure and the cross-Bay pipeline. For the intake/ discharge infrastructure, this has been reflected in the recommended conditions of approval. The Department would recommend a similar condition for the cross-Bay pipeline as part of the future assessment of that project application.

The Department supports the Proponent's approach of applying management measures to ensure minimal noise disturbance to whales and other marine mammals during construction of the intake/ discharge infrastructure. The Department considers that the most likely and effective means of achieving this outcome will include careful scheduling of works and the monitoring intensity of works to minimise concurrent peaks in construction activities with active occupation of surrounding waters by marine mammals. The construction noise management plan included in the recommended conditions of approval for the intake discharge infrastructure reflects this requirement.

It is accepted that if the project proceeds, complete avoidance of seagrass beds in Botany Bay will be unavoidable. In this context, the Department supports the Proponent's approach of minimising impacts on seagrasses through route selection of the cross-Bay pipeline in the first instance, followed by an off-set package to compensate for impacts on seagrasses. While the Proponent has committed to developing an off-set strategy in future, the Department considers this issue to be of key importance, particularly consideration of the scope and nature of off-sets, and therefore recommends that at least a framework off-set package be provide as part of the future project application for the desalinated water distribution infrastructure. This requirement is reflected in the recommended concept approval.

The Department considers that impingement or entrainment of marine organisms on or in the seawater intake is a significant issue both in terms of impacts on ecology and impacts on the proper and efficient operation of the desalination plant. These impacts can be mitigated through the proper design of the seawater intake, including intake screens, to minimise the potential for impingement and entrainment. The Department recommends that these design philosophies be included in the project approval for the intake/ discharge infrastructure, with designs developed and refined in consultation with the Department of Primary Industries.

The approach taken with respect to water quality around the seawater concentrate discharge, and reflected in the recommended conditions of approval, is the attainment of ANZECC water quality outcomes outside the near field mixing zone, and optimisation of the mixing zone to minimise impacts within this area. In this manner, direct impacts on aquatic ecology will be confined to the near field mixing zone itself. It is important to note that ANZECC guidelines highlight that water quality criteria need not be met within the mixing zone and as a consequence there is no assurance that aquatic ecology will be protected within the mixing zone.

In the context of the predicted scale of the mixing zone, the Department highlights that impacts on aquatic ecology would be restricted to an area in the order of 0.5 hectares, or 0.05% of the rocky reef habitat. Impacts within the mixing zone itself would be a function of distance from the point of discharge, noting gradients in physico-chemical parameters from the point of discharge to the edge of the near field mixing zone. It would be inaccurate to suggest that the entire near field mixing zone would be destroyed as a consequence of seawater concentrate discharges. The near field mixing zone will, however, tend to favour more salt tolerant species, with the result of changes in marine assemblages as a gradient across the mixing zone. While there will certainly be impacts on aquatic ecology within the mixing zone, the Department is satisfied that in the context of all rocky reef habitat off the Kurnell Peninsula, the net outcome will not be significant. This scale and extent of the impact is capable of minimisation and management through a rigorous design process for the discharge infrastructure, to optimise the near field mixing zone and dispersion/ dilution of seawater concentrate. It is considered important that this approach be applied during the design process and that impacts on ecological health be carefully monitored during implementation of the proposal to ensure minimisation of deleterious effects. To this end, the Department recommends that the Marine Water Quality and Ecosystem Monitoring Program (refer to consideration of water quality impacts) include consideration of aquatic ecology. The Department has consulted with the Department of Primary Industries, and it has been agreed that the following should be required as part of a comprehensive Marine Water Quality and Ecosystem Monitoring Program (with respect to aquatic ecology issues):

- baseline monitoring of ecological health during at least two seasons (summer and winter) and at least twice in each season, with monitoring locations to include the Boat Harbour Aquatic Reserve, representative locations around the intake and discharge points, and representative locations predicted to be in and outside the near field mixing zone;
- a sampling, data collection and assessment regime to monitor ecological impacts resulting from the project, with specific reference to reef assemblages, larvae, juvenile fish and invertebrates;

- identification and establishment of an ecological monitoring network with specific provision for monitoring in and around the rocky reef, and taking into account spatial variability in species types and distribution; and
- water quality monitoring, particularly in relation to salinity and temperature.

The above requirements have been reflected in the conditions of approval for the intake/ discharge infrastructure project.

5.4 Impacts on Terrestrial Ecology

Issues

Under an existing development consent issued by Sutherland Shire Council for an industrial subdivision, the desalination plant site has already been cleared and levelled with the exception of a vegetated conservation area (approximately 15 hectares in area) along one boundary of the land. The conservation area is proposed to be retained as part of the desalination plant proposal.

Construction of the desalination plant will require removal of a small area of degraded vegetation in the south-western corner of the site, comprising approximately 0.1 hectares of Swamp Sclerophyll Forest on Coastal Floodplains (SSFCF), 0.3 hectares of Sydney Freshwater Wetlands (SFW) and 0.4 hectares of Swamp Oak Floodplain Forest (SOFF). The Proponent considers this loss of vegetation to be acceptable given its degraded nature and the fact that 15 hectares of more significant vegetation would be retained within the existing conservation area on the site. As the vegetation to be removed constitutes a series of Endangered Ecological Communities, the Proponent undertook tests of significance under section 5A of the *Environmental Planning and Assessment Act 1979* to determine whether the loss would be significant. The Proponent's assessment concludes that impacts on threatened flora and Endangered Ecological Communities would not be significant.

Review of historical recordings of threatened species indicates that the Green and Golden Bell Frog (*Litoria aurea*), the Nankeen Kestrel (*Falco cenchroides*) and Grey-headed Flying Fox (*Pteropus poliocephalus*) have been identified in associated with the desalination plant site in the past. The Proponent also notes that parts of the site represent potential habitat for the Wallum Froglet (*Crinia tinnula*), the Glossy Black Cockatoo (*Calyptorhynchus lathami*), the Striated Fieldwren (*Calamanthus fuliginosus*), the Eastern Bristlebird (*Dasyornis brachyperus*), the Swift Parrot (*Lathamus discolour*) and the Regent Honeyeater (*Xanthomyza phrygia*). Based on previous surveys of the site (in 2000, 2002, 2003, 2004 and 2005), the nature of vegetation on the site and the distribution of recorded sightings, the Proponent concluded that the proposed desalination plant would not have a significant impact on the aforementioned avian species. Impacts on the Grey-headed Flying Fox, Wallum Froglet and the Green and Golden Bell Frog were considered possible and as such, tests of significance were conducted on these species. The Proponent's assessment concludes that the proposal would not have a significant impact on these threatened species.

The construction of water supply infrastructure was also identified by the Proponent as potentially impacting on the Greater Sand Plover (*Charadrius leschenautlii*). The test of significance was also applied to this species and concluded that the proposal would not generate a significant effect.

The Proponent also notes in the Environmental Assessment that the Green and Golden Bell Frog and the Grey-headed Flying Fox are species listed under the Commonwealth *Environment Protection and Biodiversity Act 1999*. The Commonwealth Minister for the Environment and Heritage has formed the opinion that the proposal is not a Controlled Action under that legislation because *inter alia* the proposal is not likely to have a significant effect on listed threatened species.

The amended Statement of Commitments presented in the Preferred Project Report lists the following commitments with respect to terrestrial ecology:

- the desalination plant would be designed to protect threatened species and endangered ecological communities within the conservation area, including retention of the conservation, assessment of any opportunities to improve habitat connectivity where possible, minimisation of clearing for fencing and provision of sufficient area for stormwater and groundwater controls;
- development of management practices to minimise impacts on ecology during construction;

- development and implementation of a stormwater management plan during construction to minimise the potential for surface water and stormwater to impact on ecology, both on and off the site;
- development and implementation of a management plan for the conservation area, including maintenance and rehabilitation of vegetation, regeneration, measures to minimise impacts on threatened species and monitoring of the area; and
- development and implementation of a stormwater and groundwater management plan during operation to minimise potential impacts on ecology both on and off the site.

Submissions

Concern over the impacts of the project on terrestrial ecology represents 9.4% of all issues raised in submissions. Because submissions relating to impacts on wetlands, and in particular Ramsar wetlands, focus in the most part on avian species, issues raised in relation to wetlands have been considered in this section of the report. Impacts on wetlands represent 0.7% of all issues raised in submissions. Key issues identified in submissions are as follows:

- the desalination plant will be located within 250 metres of Towra Point wetland (a Ramsar wetland) and has the potential to adversely impact on wetland species;
- the assessment of ecological impacts is inadequate because it only focuses on the desalination plant site, and does not consider surrounding land, particularly those areas affected by drilling and tunnelling;
- many of the direct and indirect ecological impacts of the proposal have not been identified;
- the Environmental Assessment fails to map the threatened species and endangered ecological communities to be cleared as a result of the proposal and does not contain information obtained from site visits or surveys for this proposal;
- all flora removed from the site should be replaced in a 2:1 ratio, preferably in a manner that enhances habitat corridors, conservation areas and/ or remnant vegetation;
- there is potential to link the conservation area with the Botany Bay National Park to enhance habitat protection and increase the long-term viability of threatened species on the site;
- a twenty-metre wide strip of revegetated land is required along the south-western boundary of the desalination plant site to establish connectivity between the conservation area and Botany Bay National Park;
- action needs to be taken to address weeds that have infested the site and encircled trees housing bat colonies;
- building the desalination plant will involve the clearing of native vegetation inhabited by threatened species;
- the project will adversely affect threatened species and endangered ecological communities;
- the desalination plant has the potential to significantly affect a roosting site for Grey-headed Flying Fox, despite proposed mitigation measures;
- light and noise impacts will have a significant effect on Grey-headed Flying Foxes;
- the proposal will have a significant impact on the Green and Golden Bell Frog, the Wallum Froglet and orchids;
- the project will adversely impact on migratory bird species, including those listed under JAMBA and CAMBA;
- the project is in close proximity of Botany Bay National Park and the Towra Point Aquatic Reserve, and will impact on these sensitive areas;
- the desalination plant will indirectly and adversely impact on breeding and roosting tendencies in the area;
- the final route for the delivery infrastructure has not been chosen, and it is therefore not possible to assess impacts on threatened species with any certainty;
- recent vegetation clearing on the desalination plant site has been undertaken without appropriate approvals and has resulted in the destruction of flying fox roosting sites;
- construction of pipelines through the Botany Bay National Park and the Towra Point Reserve will have devastating impacts on threatened species;
- the proposal will cause the removal of and damage to trees;
- the proposal will damage or destroy existing biodiversity along the Cooks River foreshores; and
- overland movement of stormwater from the site into Towra Point Reserve should not be permitted.

Consideration

The Department considers that the Proponent has undertaken an appropriate level of assessment of impacts on terrestrial species and generally concurs with the conclusions drawn in the Environmental Assessment.

The Department is strongly supportive of the Proponent's intention to retain the existing 15-hectare conservation area on the site, and recommends that this commitment be reflected in the conditions of approval for the desalination plant. In the context of the ecological values of the site, this conservation area is considered the most significant, with the remainder of the site representing little ecological value, having been largely cleared and levelled. The degraded and fragmented nature of the approximately 0.8 hectares of vegetation to be removed from the south-western corner of the site supports the view that its removal will not generate a significant impact on terrestrial ecology.

Depending on the final design and layout of the desalination plant, particular with respect to its capacity, there may be potential for the Proponent to revegetate a strip of land along the boundary of the site to improve sub-regional connectivity. The Department supports establishment of this habitat corridor, subject to there being sufficient residual land available after a decision on plant capacity is made. The Department recommends that the conditions of approval reflect the Proponent's commitment to investigate revegetation of this area, to form a continuation of the existing conservation area, if possible.

The existing conservation area includes significant habitat for key threatened species, including the Green and Golden Bell Frog and the Wallum Froglet. It is therefore important that the conservation area be appropriately managed to protect these ecological values and to protect from threats such as invasion by weeds or inadvertent encroachment during construction. The Department therefore recommends that the Proponent be required to prepare and implement a comprehensive Conservation Area Management Plan to minimise and manage impacts on the conservation area during construction and operation. This approach is reflected in the recommended instrument of approval. To improve the value of the conservation area, the Department also recommends that the Proponent be required to revegetate and rehabilitate, where necessary, degraded parts of the conservation area, with a particular focus on Swamp Sclerophyll Forest on Coastal Floodplains (SSFCF), Kurnell Dune Forest (KDF), Sydney Freshwater Wetlands (SFW) and Swamp Oak Floodplain Forest (SOFF) communities.

Some submissions also raised concern over impacts of the proposal on orchids. The threatened orchid, *Pterostylis sp. Botany Bay* has been recorded on the Peninsula, a considerable distance from the proposed desalination plant and removed from construction areas associated with the proposal. The Department is satisfied that any impact on this species is highly unlikely. Any potential for previously-undiscovered examples of this species to be located on the proposed desalination plant site would occur within the existing conservation area on the site (which will be retained).

Impacts on Grey-headed Flying Foxes was raised as a significant issue of concern in public submissions, and is a concern similarly held by the Department. The Kurnell Peninsula is inhabited by a colony of Grey-headed Flying Foxes, which would not be directly impacted by the proposal through vegetation clearance, may be indirectly impacted through noise and lighting effects. These impacts are particularly relevant during the latter stages of the Flying Foxes' gestation period, during which any disturbance has been recorded as a threat leading to spontaneous abortion (National Parks and Wildlife Service, 2001). The Proponent has committed to inclusion of specific noise minimisation and lighting direction mitigation approaches to minimise the potential for disturbance of roosting and gestating Flying Foxes. The Department is concerned, however, that although the mitigation measures proposed by the Proponent are reasonable, qualified ecological oversight needs to be provided during construction of the desalination plant to ensure effective mitigation and to respond to specific impact situations. In this regard, the Department recommends that the Minister require a qualified ecologist, experienced with Grey-headed Flying Foxes to be present on the site during construction works that may occur towards the end of the Flying Foxes' gestation period. Gestation is a six-month period, concluding in October/ November (National Parks and Wildlife Service, 2001), and the Department therefore recommends that site attendance by such an ecologist be required for any construction works from 1 September to 1 December in each year (ie the latter phase of the gestation period).

Other potential off-set impacts on terrestrial ecology from the proposal relate to the Towra Point Reserve, a listed wetland of international significance under the Ramsar Convention. The Ramsar Information Sheet prepared

under the provisions of the Ramsar Convention notes the significance of the Reserve as one of the few remaining estuarine wetlands in Sydney, and a significant feeding ground for migratory avian species. In particular, 31 of the 66 avian species listed under the Japan-Australia Migratory Birds Agreement (JAMBA) have been identified within the Reserve. The Information Sheet also relevantly identifies a key threat to the wetlands from oil pollution, works within Botany Bay changing wave action and the consequent implications for seagrass meadows. The Department highlights that as part of the subject proposal, both the proposed desalination plant (site run-off) and the cross-Bay pipeline (water quality within Botany Bay) have the potential to impact on this highly significant area. The Proponent does not, as suggested in some submissions, intend to dredge or install pipelines through the Towra Point Reserve. Similarly, the intake/ discharge infrastructure will be tunnelled under the surface of the Botany Bay National Park, and will therefore not include clearing of an easement through the Park, as suggested in some submissions.

In relation to the desalination plant component of the proposal, the Department considers that potential impacts on the Reserve may result if surface water and stormwater run-off are not adequately controlled. Sediment-laden run-off, particularly during construction, may enter the Reserve generating a significant water quality impact with flow on effects to the wetlands ecology. The Department considers that this issue can be adequately addressed through the installation and management of surface water/ stormwater mitigation, management and monitoring measures as proposed by the Proponent, and consistent with best environmental practice. These measures would include first flush systems, construction of artificial wetlands or sedimentation basins and gross pollutant traps on the desalination plant site. The Department recommends that the conditions of approval for the desalination plant require Surface Water Management Plans during construction and operation, to detail how these measures will be implemented and maintained to ensure potential impacts are avoided. Additionally, the Department recommends that all liquid chemical stores on the desalination plant site be bunded in accordance with Australian Standards and relevant best practice guidelines to prevent contamination of surface waters.

Construction of the cross-Bay pipeline has the potential to impact on the Reserve through generation of suspended sediments and alteration of wave characteristics during the construction phase. While this component of the proposal will be the subject of a future project application, the Department considers that water quality and wave action implications during the construction phase could, in principle, be managed within acceptable limits. Assessment of other proposals, including the expansion of Port Botany and dredging of the south arm of the Hunter River have demonstrated that there are options available for managing these potential impacts. These issues will be a fundamental aspect of the future assessment of the cross-Bay pipeline project, and the Department recommends that the Minister require through the approval of the concept plan that these issues be comprehensively canvassed and assessed as part of any application that may be lodged for the cross-Bay pipeline project component.

During construction and operation of the desalination plant, it will be important to effectively manage noise and minimise light spill that could impact on migratory birds occupying the wetland areas. To address these issues, the Department recommends imposition of requirements for noise management plans during construction and operation, and to require that lighting be installed in accordance with Australian Standards to minimise light spill impacts.

5.5 Heritage Impacts

Issues

The Environmental Assessment indicates that four sites of indigenous heritage significance have previously been identified on the desalination plant site:

- 52-3-1232, a disturbed surface scatter of stone artefacts (seven flakes) in the northern corner of the site;
- 52-3-0370, an open artefact scatter (two quartz flakes, two chert flakes, a chert flaked piece and a core) near the eastern corner of the site;
- 52-3-0217, a shell midden containing stone artefacts and associated stone artefact scatters along the south-western boundary of the site; and
- 52-3-0214, a shell midden containing stone artefacts and associated stone artefact scatters along the south-western boundary of the site.

Site 52-3-1232 was located during surveys of part of the site known as Lot 101 during 2002, along with evidence of buried shorelines. The survey work and subsequent assessment concluded that there is potential for subsurface sites to remain within the conservation area along the north-western boundary of the site, but the remainder of Lot 101 was otherwise devoid of identified items of indigenous heritage significance. The Proponent does not propose to develop within the conservation area or to directly affect site 52-3-1232.

The remaining three sites were identified during survey work on the part of the site known as Lot 102 in 1987 (site 52-3-0370) and in 1996 (sites 52-3-0217 and 52-0214). Previously recorded sites could not be relocated during surveys in 2004 as part of a development application to Sutherland Shire Council for industrial subdivision on the site, although two areas of low density midden shell were located. Assessment at the time could not establish whether these two new areas were evidence of subsurface items of significance, or the remains of artefacts disturbed from elsewhere on the site. Further testing was conducted in 2005 to resolve this question, and concluded that there were in fact no remaining items of heritage significance on the Lot 102 land. This information was considered by Council in its determination of the development consent for industrial subdivision of the site, including clearing and levelling much of Lot 102 (and that part of Lot 101 outside the conservation area). Site works permitted under this development consent have now been undertaken.

The Proponent undertook its own survey work on the site, in the presence of a representative of the La Perouse Local Aboriginal Land Council, which confirmed the conclusions drawn in relation to Council's assessment of the industrial subdivision proposal. No previously identified or new items of indigenous heritage significance were located and it was concluded by the Proponent that no appreciable potential for sites of indigenous heritage significance remains.

With respect to European heritage, the Proponent has not identified that the proposal will have any potential impact on heritage items other than connection of water supply infrastructure to the heritage listed City/ Pressure Tunnels. The Proponent considers that these impacts are likely to be low and would be subject to further heritage survey work and consultation as part of the future project application and assessment process for that component of the proposal.

The Proponent's amended Statement of Commitments, as presented in its Preferred Project Report, makes the following commitments with respect to heritage impacts:

- the desalination plant will be designed to retain the conservation area, in which there remains potential for significant indigenous heritage items;
- if indigenous heritage items are uncovered during construction of the desalination plant or the water delivery infrastructure, works will cease and the DEC and La Perouse Local Aboriginal Land Council will be notified. Further investigation would be undertaken to inform the management process for the uncovered item prior to recommencement of works;
- if non-indigenous heritage items are uncovered during construction, works will cease and the NSW Heritage Office will be notified. Further investigation would be undertaken to inform the management process for the uncovered item prior to recommencement of works;
- the desalination plant will be designed to minimise potential visual amenity impacts on the Kurnell Peninsula National Heritage values and the natural conservation values of Botany Bay National Park;
- infrastructure routes and temporary construction sites will be located and managed to minimise impacts on indigenous and non-indigenous heritage;
- connection to the Pressure or City Tunnels will be designed to be consistent with the heritage values of the tunnels, and the NSW Heritage Office will be consulted in relation to mitigation measures to be applied during construction.

Submissions

Concern over the impacts on heritage items represents 1.8% of all issues raised in submissions, including impacts on indigenous heritage (0.7%) and European heritage (1.1%). Key issues raised in submissions are as follows:

- the assessment of indigenous heritage is inadequate;
- the Kurnell Peninsula is Australia's birthplace and should be a showcase of natural and heritage values, rather than being allowed to be degraded with the desalination plant, sand mining and heavy industry;

- the pipelines below the Botany Bay National Park will destroy heritage values;
- the Proponent has failed to consult Aboriginal elders;
- the value and significance of Captain Cook's landing place will be diminished;
- the development will destroy National Heritage values;
- the Proponent should carefully manage indigenous heritage items if they are uncovered during construction;
- there will be significant impacts on the heritage values of Marrickville local government area as a result of tunnelling for water supply infrastructure;
- the Aboriginal community should be the only people who have a say in the site;
- the indigenous heritage assessment is based on outdated and irrelevant information, and fails to take account of the recently identified indigenous heritage significance of the Besmaw site;
- the desalination plant is offensive to indigenous Australians; and
- surveys of the site were only undertaken after it was bulldozed and filled.

Consideration

The Department is satisfied that the Proponent has undertaken an adequate level of assessment of the impacts of the proposed desalination plant on heritage values. The Department agrees with the Proponent that the proposal would not have a significant impact on heritage.

With respect to indigenous heritage, the Department considers it appropriate that the Proponent has assessed the proposal based on the current state of the site and having regard to a series of surveys conducted over the past five years. This information is considered to be current and appropriate for use in the assessment process. The heritage significance of the Besmaw site has been considered and the Department is satisfied that it would not be affected by this proposal.

The Proponent's consultation with the Aboriginal representatives is also considered to be acceptable, and as a site free from Native Title claims, it is unclear why the Aboriginal community should be the only people who have a say in the site. Further, given that the proposal will not have a significant impact on indigenous heritage, and its other impacts have been assessed to be within acceptable limits, the Department cannot see how the proposal would be offensive to indigenous Australians, other than on ideological grounds.

It is well recognised that the Kurnell Peninsula includes areas of significant non-indigenous heritage, particularly related to Captain Cook's landing. The proposal will not, however, have a significant impact on the non-indigenous heritage of the Peninsula. The Department does not consider that the proposal will adversely impact on National Heritage values. There is no credible mechanism for the subterranean pipeline under the Botany Bay National Park to significantly impact on heritage values associated with the surface.

The Department agrees that the potential heritage impacts of the water supply infrastructure will need to be carefully considered by the Proponent during the selection of the preferred pipeline routes. This will include avoidance of any areas of heritage significance in and around Botany Bay, as well as onshore in local government areas such as Marrickville. The Department is satisfied that these considerations can be adequately and appropriated taken into account as part of the Proponent's further application and assessment process for the water supply infrastructure project.

5.6 Land Use Planning Implications

Issues

The Preferred Project Report for the proposal outlines the Proponent's position with respect to land use planning issues. In particular, the Proponent refutes claims in submissions that the proposal is appropriately characterised as a heavy industry and should not be imposed on the Kurnell Peninsula with its existing industrial developments. The Proponent argues that the impacts associated with the proposed desalination plant can all be managed within acceptable environmental limits, and as such, there are no potential land use concerns or conflicts associated with location of the plant on the site. Further, the Proponent notes the proposal is not a hazardous industry and is not affected by land use planning risks from existing industrial development.

Submissions

Concern over the land use planning implications of the proposal represents 1.6% of all issues raised in submissions. Key issues raised in submissions are as follows:

- a chemical storage management plan should be developed and implemented to ensure safe storage of chemicals on the site;
- the co-location of a major water source and oil refining on the one Peninsula makes it a prime target for terrorists;
- location near the Kurnell Refinery poses a risk that oil could contaminate water;
- the proposal will have a significant impact on the limited amount of housing in a small geographical area;
- the proposal is inconsistent with the need to protect our coastal lands;
- water treatment and oil refining are incompatible land uses;
- the Kurnell Peninsula will be degraded with further industrial development when industrial land should be rezoned for conservation uses;
- Kurnell Peninsula should be established as a haven for tourism, shops, restaurants and tours;
- Kurnell Peninsula is already overburdened with industrial development, sand mining and landfill;
- in relation to water delivery infrastructure, all works should be located away from sensitive land uses such as schools;
- the site selection process fails to recognise the zoning of the Besmaw site as 7(b) Special Development under SREP 17;
- the Botany Bay area is already overburdened with an airport, a port and heavy industry;
- in the event of a major incident on the Peninsula, there is no plan to evacuate the workers at the plant;
- the industrial zoning of the site and the Peninsula occurred before the significant ecological values of the land were known;
- the Proponent has completely ignored the aims of SREP 17;
- the site was unlawfully cleared, an act that cannot be condoned; and
- development of Discovery Point and potential conflicts with the proposal should be carefully considered when assessing the location of water supply infrastructure.

Consideration

The Department concurs with the Proponent's statements that many of the land use planning concerns raised in submissions are the result of a mischaracterisation of the proposal a heavy industry. The proposed desalination plant is not an industrial development and does not exert similar impacts to an industry.

It is important to note that as a critical infrastructure project, the permissibility or otherwise of the desalination plant, as stipulated in underlying environmental planning instruments is not relevant. Further, the aims and provisions of Sydney Regional Environmental Plan No. 17 do not apply to the proposal. Notwithstanding, the Department considers that in a land use planning context, the proposed development site is appropriate for location of a development of this nature.

Concerns raised in submissions in relation to the zoning of other parcels of land on the Kurnell Peninsula (including the Besmaw site) and the desire of some parties to focus land uses on the Peninsula for tourism and commerce are not considered relevant to the current assessment. The Proponent has demonstrated that the impacts associated with the desalination plant are acceptable and do not generate a land use conflict with existing or potential future development on the Peninsula. The mix of land uses on the Peninsula is subject to separate consideration under Part 3 of the *Environmental Planning and Assessment Act 1979*.

The Department is satisfied that the use of water quality chemicals on the site can be managed consistent with Australian Standards and best environmental practice (including bunding of storage areas) is a manner that does not exert a significant land use safety planning risk. In the event of an emergency at the desalination plant or in another development on the Peninsula, the Department considers that appropriate regulatory mechanisms and response arrangements, through the emergency management services, already exist to address emergency response and evacuation where necessary. The location of both the desalination plant and an oil refinery on the same Peninsula is not considered likely to enhance the potential for a terrorist attack. If a terrorist threat exists, that threat would be independent of location and, rather than managing the risk through land use planning, the

Department suggests that the risk is more appropriately addressed through awareness, security and intelligence, all of which are outside the scope of the environmental assessment process for this proposal.

Although the desalination plant would be located on the same Peninsula as an existing oil refinery, there appears to be no credible mechanism for the contamination of water in the desalination plant with oil from the refinery. Other than direct and deliberate mixing of the oil and water, which would be counter to the interests of the parties involved, the Department has identified no risk of contamination.

The catchment for employees to work at the desalination plant is likely to be much broader than the Kurnell Peninsula, with potential for staff to commute to the plant from across the Sydney basin. As such, the Department does not consider that the proposed desalination plant would generate an appreciable demand for existing or new housing on the Peninsula.

The Department agrees with submissions that developments, such as the Discovery Point development, should be taken into account when determining the final route for water supply infrastructure. This issue, and more broadly, the potential for land use conflicts associated with the water supply infrastructure, would be an important consideration in the assessment of the future project application for the water supply infrastructure component of the proposal.

5.7 Spoil Management and Disposal

Issues

The Environmental Assessment indicates that spoil will be generated from tunnelling/ trenching activities associated with the construction of intake/ discharge infrastructure, the water supply pipeline connections under Sydney, the cross-Bay pipeline and the pipeline connection from the desalination plant to Botany Bay. The Proponent indicates that a conservative spoil generation scenario (excluding the pipeline connection to Caringbah/ Miranda, which was omitted from the proposal through the Preferred Project Report) would result in approximately 611,900 tonnes of material for management. This is equivalent to between 12,284 and 19,040 truckloads (of 31m^3 and 20 m^3 capacity, respectively) over the life of the bulk excavation works.

The Proponent indicates that the quality of spoil will be assessed upon excavation, particularly with respect to contamination and the presence of acid sulfate soils, and disposal or reuse options developed based on this characterisation. Where spoil is of appropriate quality, the Proponent's preference is for reuse of the spoil for construction purposes on other development sites. Failing that, spoil would be directed to landfill. Contaminated materials would be directed to an appropriately-licensed waste management facility.

The Proponent proposes a Spoil Management Plan to set the framework for characterising spoil and identifying appropriate locations for reuse or disposal.

Submissions

Concern over the management of spoil represents 0.6% of all issues raised in submissions. Key issues raised in submissions are as follows:

- beneficial re-use of spoil is supported, subject to classification as VENM, inert waste or acid sulfate soils;
- materials excavated from Botany Bay must not be permitted to contaminate the water column, particularly if the soils are acid sulfate in nature;
- all excavated materials should be tested for contamination before deciding on whether to beneficially reuse or dispose of these materials;
- the proposal will generate huge volumes of contaminated spoil;
- there is insufficient detail to know how spoil will be handled, managed and reused/ disposed;
- it is negligent not to identify disposal locations for spoil up-front;
- the management of spoil is not a particularly difficult issue to deal with;
- the Environmental Assessment has significantly underestimated the volumes of spoil likely to be generated by the proposal;
- a waste management plan should be developed for the proposal, with a strong focus on beneficial reuse and how acid sulfate soils will be appropriately managed; and

- representatives of the indigenous community request that spoil be spread one-metre deep over previously mined areas of the Peninsula.

Consideration

The Department is generally satisfied that the Proponent's assessment of potential spoil generation is reasonable and concurs with the Proponent's approach to characterising spoil before preferential reuse or disposal. Although the generation of spoil presented in the Environmental Assessment is based on conservative assumptions, the Department considers that estimates provide an appropriate indication of the magnitude of the spoil management task.

In principle, options exist for the management and disposal of all spoil generated by the proposal. Ideally, sufficient opportunities for beneficial reuse of spoil will be available at the time it is generated to minimise the quantity needing to be disposed of to landfill. Failing opportunities to reuse all or some of the spoil, the Department is satisfied that the spoil could be landfilled and that large quantities of spoil would not be generated without any possible final destination. In this context, the key issue relates to the management of spoil and the maximisation of reuse, rather than the need to identify viable options for ultimate reuse or disposal.

While the Department appreciates concerns raised in submissions that a definitive list of disposal or reuse sites has not been detailed in the Environmental Assessment, the Department considers that production of such a definitive list at this time would be of little benefit. Sites for reuse of spoil will most likely be associated with major construction works, which will come and go from time to time as various developments occur across Sydney. Production of a definitive list of reuse sites will become redundant relatively quickly as development proceeds, with some projects completed and other potential sites becoming available as developments commence. As such, the Department considers that identification of potential reuse sites (and alternatively, disposal sites) should be undertaken at the time bulk excavation works associated with proposed desalination plant and associated infrastructure are scheduled to commence. As noted previously in this report, this may well occur in ten years time, if at all, and consideration of reuse and disposal must be relevant at that time.

It is important that, in addition to simply identifying reuse and disposal options, the Proponent proactively manage the scheduling of excavation works to benefit from opportunities that may arise during and around the time of the excavations. The Department suggests, therefore, that it is prudent for the Proponent to prepare and implement a strategic management document to proactively plan for spoil management as opportunities arise. This proactive management would include strategic identification of current and imminent spoil reuse opportunities at the commencement of excavation works, as well as reuse sites that may be available towards the end of the excavation works. This strategic approach is even more important where project components (such as the cross-Bay pipeline and the intake/ discharge infrastructure) are commenced at different times. In a strategic context, it is also important for the Proponent to ensure that any reuse opportunities have relevant planning and environmental approvals, and that reuse of spoil from the desalination plant proposal is consistent with the requirements of those approvals. The Department therefore recommends that as a condition of the concept plan approval, the Proponent be required to develop and implement a Spoil Management and Disposal Strategy to provide a framework for these considerations. Specific Spoil Management Plans can then be developed as a condition of each project approval, consistent with the overarching Strategy, to deal with the spoil from each project.

A key consideration when determining the ultimate destination of excavated spoil will be the quality of the materials. The Department therefore recommends that the Spoil Management Strategy also include provisions for testing of spoil quality against the DEC's waste guidelines and testing for acid sulfate soils. In addition, it is recommended that the Spoil Management Strategy include a specific assessment framework for determining the appropriate destination of contaminated or acid sulfate soil materials based on characterisation of the materials (ie suitability for disposal as inert, solid or industrial waste).

The proposal by representatives of indigenous communities to spread spoil over previously-mined areas of the Kurnell Peninsula has not been assessed by the Department as part of the subject application. However, subject to planning and environmental approvals, options such as that proposed by indigenous representatives may be appropriate for future reuse of spoil from the desalination plant proposal.

5.8 Traffic and Noise Impacts

Issues

Traffic Impacts

The proposed desalination plant will employ 20 people during operation.

The most significant traffic impacts associated with the proposal will, however, be generated during construction of the desalination plant and disposal of spoil generated from tunnelling associated with the intake/ discharge infrastructure and the desalinated water supply infrastructure. The Proponent has estimated that daily truck movements associated with bulk excavation works and spoil management will be in the range of 130 to 200 (depending on whether 31m^3 or 20m^3 vehicles are used) if one tunnel-boring machine is employed, and in the range of 260 to 400 if two machines are operating concurrently. This equates to 13 to 40 truck movements during peak hours.

The Proponent has assumed that spoil generated from the proposal will be brought to the Kurnell Peninsula for disposal. This represents a worst-case traffic scenario, with the potential that traffic on the Peninsula will in fact be lower if spoil reuse and disposal sites are located elsewhere in the Sydney basin. Based on these assumptions, the Proponent has calculated the expected increase in traffic along key routes to and on the Peninsula, as reproduced in Table 3 below. Along Captain Cook Drive, the main access to the Kurnell Peninsula, the Proponent predicts that daily movements of heavy vehicles will increase by no more than 6% during spoil disposal operations, in a worst-case scenario.

Table 3 - Predicted Increases in Traffic Movements (Kurnell Peninsula)

Location	Increase in AM Peak	Increase in PM Peak
Intersection of Taren Point Road, The Boulevarde and Captain Cook Drive		
Captain Cook Drive	1.8%	1.9%
Taren Point Road (North)	1.5%	1.4%
The Boulevarde	0%	0%
Taren Point Road (South)	0%	0%
Intersection of Gannons Road and Captain Cook Drive		
Gannons Road (North)	0%	0%
Captain Cook Drive (East)	5.1%	2.8%
Gannons Road (South)	0%	0%
Captain Cook Drive (West)	2.1%	1.9%
Intersection of Elouera Road and Captain Cook Drive		
Captain Cook Drive (East)	8%	6.7%
Elouera Road	0%	0%
Captain Cook Drive (West)	5.4%	4.5%
Intersection of Sir Joseph Banks Drive and Captain Cook Drive		
Captain Cook Drive (East)	17.7%	12.9%
Sir Joseph Banks Drive	58.0%	21.5%
Captain Cook Drive (West)	6.6%	5.1%

In response to issues raised in submissions, the Proponent presents an intersection performance assessment in its Preferred Project Report, as summarised in Table 4. The assessment considers the current performance of key intersections along the Kurnell Peninsula, and the impact of spoil traffic (future case).

Table 4 - Predicted Intersection Performance

Location	Average Delay (s)		Level of Service		Degree of Saturation	
	Current	Future	Current	Future	Current	Future
Intersection of Taren Point Road, The Boulevarde and Captain Cook Drive						
AM Peak	82.2	82.2	F	F	1.05	1.05
PM Peak	54.8	57.9	D	E	0.92	0.91

Intersection of Gannons Road and Captain Cook Drive						
AM Peak	114.8	125.9	F	F	1.34	1.38
PM Peak	19.1	21.9	B	B	1.00	1.00
Intersection of Elouera Road and Captain Cook Drive						
AM Peak	7.9	8.2	A	A	0.49	0.52
PM Peak	9.4	9.6	A	A	0.38	0.39
Intersection of Sir Joseph Banks Drive and Captain Cook Drive						
AM Peak	9.2	9.7	A	A	0.21	0.21
PM Peak	9.4	10.1	A	A	0.19	0.21

The Proponent has committed to the preparation and implementation of a management plan for spoil traffic, to manage traffic movements in a manner that minimises impacts on the surrounding road network for the duration of excavation works.

Noise Impacts

The Proponent's Preferred Project Report details the results of background noise monitoring undertaken in August 2005, and derivation of noise limits based on those monitored levels, in accordance with the Industrial Noise Policy. Based on this assessment, the Proponent suggests that if the desalination plant were to be built now, applicable noise limits would be as follows:

- at Horning Street, Kurnell – 46 dB(A) during day, 48 dB(A) during the evening and 45 dB(A) at night;
- at Torres Street, Kurnell – 47 dB(A) during the day, 44 dB(A) during the evening and 41 dB(A) at night; and
- at the Cronulla High School, 45 dB(A) during the day.

The Proponent suggests, however, that it is more appropriate to develop noise criteria once a decision is made to proceed with the desalination plant, to accurately reflect conditions at that time. It has committed to undertaking this assessment at the relevant time and to designing the desalination plant to meet criteria stipulated in the Industrial Noise Policy.

The Proponent does not consider it necessary to consider operational traffic noise impacts in detail, given the low volumes of traffic generated by operation of the desalination plant. With respect to construction noise and traffic noise from spoil management activities, the Proponent suggests that these impacts should be the subject of noise management plans.

Submissions

Concern over the traffic and noise impacts represents 1.0% of all issues raised in submissions. Key issues raised in submissions are as follows:

- vehicles associated with the desalination plant will generate a significant noise impact and a noise wall should be constructed;
- the proposal will generate significant additional traffic on Captain Cook Drive, and a detailed, independent traffic study should be undertaken;
- the proposal will increase the number of coal trucks on roads;
- the proposal will generate heavy vehicle movements 24 hours per day;
- an adequate traffic study is needed to determine the impact on Coward Street, including consideration of the State and regional road network and potential damage to the road pavement;
- it is necessary to maintain access for emergency vehicles, private vehicles and public transport along Captain Cook Drive, as well as protecting local bicycle and pedestrian routes along Kurnell Peninsula;
- the method of construction of pipelines across Botany Bay will significantly affect the type of traffic generated and the level of traffic noise;
- overloading the single road into and out of the Kurnell Peninsula will make the area very dangerous;
- noise generated by the proposal will adversely affect teaching activities and student free-time;
- the spoil management plan will need to consider noise impacts on sensitive receivers and road safety implications;
- there will be noise impacts on surrounding communities during construction and operation, and sensitive receptors should be identified in order to prevent adverse impacts on human health; and

- noise impact assessment has been deferred to later stages when the proposal should be the subject of a comprehensive noise modelling exercise now.

Consideration

Traffic Impacts

The Department considers that the Proponent's consideration of traffic impacts associated with the proposal is reasonable, but cautions against blind application of the results of the assessment for the following reasons:

- the Proponent has assumed a worst-case spoil generation volume and rate. Depending on the final decisions made in relation to the capacity of the desalination plant, and the methods of infrastructure construction (particularly whether to tunnel or lay pipelines for the cross-Bay infrastructure), it is possible that the total volume of spoil produced and its rate of production will be below the worst-case scenario;
- the Proponent has assumed that spoil will be brought to the Kurnell Peninsula for disposal. In reality, alternative spoil reuse and disposal locations are likely to be used in addition to or in place of Peninsula sites, thereby spreading traffic associated with spoil management and reducing the concentrated traffic implications for access routes along the Peninsula; and
- the Proponent has considered current traffic volumes and intersection performance. As the proposal may not be implemented for the next ten years, if at all, there is potential for traffic conditions to change, including road and intersection upgrades.

What the Proponent's assessment does indicate is that assuming a worst-case scenario, the traffic impacts of the proposal are within manageable limits. In particular, the most significant impacts occur within peak periods and at a limited number of intersections. This suggests that management measures could be put in place to reduce impacts, primarily through scheduling of works to avoid peak periods and perhaps seeking spoil reuse or disposal options outside the Kurnell Peninsula.

The Department also highlights that the context of traffic generation must also be taken into account. Rather than an on-going operational traffic scenario, the traffic generated by the proposal will be limited in duration and would not extend beyond the period of excavation works. This context lends weight to the argument that traffic impacts should be managed for the duration of excavation works, rather than considering, for example, road infrastructure upgrades to alleviate a short-term impact. This approach is commonly applied to development proposals, particularly where construction traffic, rather than operational traffic, generates the most significant numbers of vehicles. The Department therefore recommends that the Spoil Management and Disposal Strategy included in the concept plan approval reflect the need to manage traffic movements, having regard to issues such as scheduling of works to avoid peak periods where possible, route selection, road safety requirements and minimisation of conflicts with other road users, particularly sensitive road users (schools, hospitals etc) and public transport.

In relation to the potential for the proposal to increase the number of coal trucks on the State's roads, the Department highlights that the traffic implications of each coal-fired power station have already been considered as part of the environmental assessment process for those developments. This issue is therefore not considered further as part of this report.

One submission raised particular concern over impacts on Coward Street. This part of the proposal falls within the scope of the future project application for the desalinated water supply infrastructure and will be assessed in detail as part of that application, where relevant.

Noise Impacts

The Department agrees with the Proponent's proposed approach to noise during construction and operation, and noise generated by traffic.

In relation to construction and spoil traffic noise, the Department considers that given these activities are limited in duration, it is appropriate to apply a management approach, rather than to specify noise limits. It is important that noise impacts during construction and from spoil traffic are minimised and managed to the greatest extent practicable to protect acoustic amenity during the course of these activities. To this end, the Department recommends that the Spoil Management and Disposal Strategy include a specific framework for consideration and management of traffic noise. In relation to construction noise, the Department recommends that the Minister

require the Proponent to prepare and implement for both the desalination and intake/ discharge infrastructure projects. The Plans should focus on identification of activities that may generate a noise or vibration impact, and to implement measures to mitigate, manage and monitor these effects, particularly through scheduling of works.

In relation to operational traffic noise, the Department agrees with the Proponent that the operational traffic generation is sufficiently low not to have a significant impact on acoustic amenity.

As the principal traffic noise impact associated with the proposal relates to spoil management, which is expected to occur over a definite period rather than continuously over the life of the proposal, the Department does not consider it appropriate to require on-going mitigation such as noise walls along roads.

With respect to operational noise, the Department concurs that noise limits for the desalination plant should be developed and imposed at the time a decision is made to proceed with the proposal. In this way, noise limits would reflect the background acoustic environment and relevant receptors, both of which may alter significantly over the next ten years. The recommended conditions for the desalination plant include a requirement for the Proponent to undertake monitoring of background noise and to develop noise limits in accordance with the Industrial Noise Policy at the relevant time in future. In addition, the Department recommends a comprehensive noise audit once the plant is operational to ensure that these noise limits are being met. Given that the desalination plant is to be enclosed within a building, the Department is satisfied that mitigation (through equipment design and acoustic treatment of the building) is readily available to meet noise limits that would be imposed on the plant.

5.9 Socio-Economic Impacts

Issues

The Proponent's Preferred Project Report reiterates that the cost of the full scale (500 megalitre per day) desalination plant and associated infrastructure would be in the order of $2.5 billion, while a 125 megalitre per day option would cost $1.3 billion. How the cost of the desalination plant will be recovered is to be established by the Independent Pricing and Regulatory Tribunal (IPART), which will establish whether a fixed or variable charge should be applied. In the case of a variable charge, consumers with lower water consumption will be charged proportionally less. The Proponent estimates that, if variable charges are applied, an average household might expect an increase in its annual water bill of about $60 if a 125 megalitre plant is implemented, and $150 for a 500 megalitre plant.

With respect to the effects of the proposal on property values, the Proponent suggests that concerns over land value depreciation relate to an inaccurate perception of the desalination plant as a heavy industry. The Proponent also quotes from an opinion it obtained from an independent valuer that the proposed desalination plant would not detrimentally affect property prices and may in fact improve amenity over and above that likely from the currently-approved land use (industry). The Proponent suggests that impacts during construction of the desalination plant would be limited in duration and would not affect property values in the longer term.

Submissions

Concern over socio-economic impacts represents 5.4% of all issues raised in submissions. Key issues raised in submissions are as follows:

- the proposal is extremely expensive and a waste of money that the State does not have;
- the proposal is a complete waste of tax payers' money;
- the cost of the desalination plant will draw funding away from hospitals and schools;
- the cost of the proposal could be offset by recovering salt for sale;
- the inevitable rise in water rates will place a significant financial burden on consumers;
- the cost of the desalination plant will not be equitably spread;
- Council rates will rise in order to maintain roads that become rundown as a result of the proposal;
- the desalination plant will devalue property of the Kurnell Peninsula and across Sydney;
- the cost of constructing and operating the desalination plant has been grossly underestimated;
- operating the desalination plant only in times of need will result in value for money;

- the desalination plant will jeopardise tourist dollars from the whale watching industry, as well as affecting the ability of schools and community groups to fund raise;
- if Sydney doesn't have a secure water supply, people will move out of Sydney, leading to a depression in land values; and
- the proposal has not been subject to a rigorous cost-benefit analysis.

Consideration

The proposed desalination plant is a contingency measure in the event of an extreme drought. If water supply shortages eventuate and the desalination plant does not proceed, the Department considers that there is significant socio-economic risk to the Sydney region with full or partial loss of necessary water supplies to industry and residential consumers in the most extreme case. In this context, the Department considers that expenditure on the desalination plant would be justified, particularly in light of the socio-economic hardships that would eventuate if this contingency measure is not applied.

It is inevitable that the costs of the desalination plant will be passed on to taxpayers, whether through expenditure of usual tax revenue and/ or through an increase in water rates. Both of these issues lie outside the scope of this environmental assessment. In the case of tax revenue, it is the responsibility of the Government of the day to determine what tax revenue framework should be applied and how that revenue will be spent to the benefit of the NSW public. In doing so, the Government will undertake its own assessment of the merits of funding various infrastructure and service projects, including projects such as the proposed desalination plant.

For those components of the cost of the desalination plant that will be sought to be recovered through increased water rates, an appropriate fee regime will be independently established by IPART. The Department does not consider it appropriate for the land use planning system to comment or attempt to influence this process.

The Department does not accept that the proposed desalination plant would in itself lead to a large-scale desertion of the tourist industry or devaluation of property in the Sydney region. These effects would only potentially result from unacceptable environmental impacts generated by the proposal, or a public perception that unacceptable environmental impacts exist. On the former, the Department highlights that the proposal has been assessed and considered to be within acceptable environmental limits. Provided the construction and operation o the desalination plant is carefully managed, with the suite of mitigation measures proposed by the Proponent strictly applied and on-going impacts comprehensively monitored, the Department is satisfied that the environmental outcomes will be acceptable. It is not possible, however, for the Department or the planning system to correct any misconceptions that parties may have in relation to the impacts of the proposal. This issue is best addressed through the Proponent's on-going consultation with the community, transparent provision of information and response to community concerns. The Department notes that the Proponent has committed to proceeding in this fashion. To reflect this commitment, the Department recommends that the concept plan approval include conditions requiring complaints handling and management mechanisms, and to require the Proponent to provide an internet site on which information about the desalination plant, its operation and the management of environmental issues can be published and regularly maintained.

The Department notes the suggestion in submissions that salt be recovered from the desalination plant for sale in an endeavour to off-set the cost of the facility. Given that the salt is dissolved in the seawater concentrate stream, considerable additional capital expenditure (and energy consumption) would be required to recover the salt content. The Department does not consider this approach to be feasible in this circumstance.

5.10 Visual Amenity Impacts

Issues

The Environmental Assessment includes an artist's impression of the proposed desalination plant in both 125-megalitre and 500-megalitre capacity configurations, as reproduced in Figure 6 and Figure 7 below. The Proponent's Statement of Commitments, as presented in the Preferred Project Report, includes the following commitments with respect to visual amenity:

- disturbed areas will be progressively rehabilitated as far as practicable to pre-work conditions to mitigate visual impact; and

- the desalination plant will be designed to be consistent with the visual landscape from local and regional vantage points (including the air) including the use of colour, landscaping and retaining the conservation area to allow screening.

Figure 6 - Artist's Impression of 125-Megalitre Plant

Figure 7 - Artist's Impression of 500-Megalitre Plant

Submissions

Concern over the visual amenity impacts of the desalination plant represent 0.8% of all issues raised in submissions. Key issues raised in submissions are as follows:

- the Kurnell Peninsula is known world-wide and is the aerial gateway to Sydney;
- Kurnell is beautiful with National Parks, rugged headlands, whales, fishing and the best views in Sydney;
- the development will be a blot on the beautiful landscape;
- the development will add another eyesore to Botany Bay; and
- the foreshore is used for recreation all year round and the Shire should be kept beautiful and useful for a healthy lifestyle.

Consideration

The Department does not consider visual amenity impacts to be a key issue associated with the proposed desalination plant, and a matter that can be readily and appropriately dealt with through the detailed design stage. However, the Department also considers it important that the Proponent's commitment to minimising the visual impacts of the proposal on the surrounding environment and visual receptors be attained in reality, given the prominent position of the site on the Kurnell Peninsula. To this end, the Department recommends that the Proponent be required to demonstrate, through an external finishing board, how it has applied appropriate treatments to the façades of the desalination plant building to minimise visual intrusion and to address issues such as reflectivity and compatible colour.

Provided the Proponent demonstrates good design outcomes through the external finishing board, the Department is satisfied that the proposal will not adversely impact on the visual character of the area.

6. CONCLUSIONS AND RECOMMENDATIONS

The Department has undertaken a detailed assessment of the Kurnell Desalination Project, having regard to the Proponent's Environmental Assessment and Preferred Project Report, the issues raised in more than 600 submissions and the invaluable technical support provided by the Department of Environment and Conservation and the Department of Primary Industries.

Based on its assessment, the Department is satisfied that if the desalination proposal is ever required in future, that it could be undertaken within acceptable environmental limits. This is not to say that no further works lies ahead for the Proponent. The Department's recommended conditions place a strong focus on best environmental practice and a detailed design process focused on minimising impacts to the greatest extent possible. To the Proponent's benefit, it has readily accepted the need for a rigorous design process to ensure that these outcomes are achieved and has committed to on-going consultation and dialogue with affected and interested communities.

The Department considers that the Proponent has undertaken an adequate and appropriate level of environmental assessment of the desalination plant and intake/ discharge infrastructure, and therefore recommends full project approval for those components of the proposal. In contrast, the desalination water distribution infrastructure is considered acceptable in concept, but further environmental impact assessment based on more detailed design is necessary in future. Key issues for this assessment will including water quality, aquatic ecology and construction impacts associated with installing pipelines within urban areas. The Department recommends that the Minister require further assessment of this component of the proposal in future, including full community consultation once the Proponent has detailed the project and its environmental impacts at a project-specific level.

7. REFERENCES

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APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL (CONCEPT PLAN)

APPENDIX B – RECOMMENDED CONDITIONS OF APPROVAL (DESALINATION PLANT)

APPENDIX C – RECOMMENDED CONDITIONS OF APPROVAL (INTAKE/ DISCHARGE)

APPENDIX D – PREFERRED PROJECT REPORT

APPENDIX E – INDEPENDENT PANEL'S REPORT

APPENDIX F – ENVIRONMENTAL ASSESSMENT