



**Primary Submission to the Commission of Inquiry**

**Proposal by Thiess Services Pty Ltd to Install and Operate an  
Indirect Heated Thermal Desorption Unit and Associated  
Infrastructure for the Remediation of Contaminated Soil at 40  
Walker Street, Rhodes, Canada Bay Local Government Area,  
and Sediments of Homebush Bay**

**Department of Infrastructure, Planning and Natural Resources**

**May 2003**

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## 1. INTRODUCTION

### 1.1 Background

On 9 December 2002, the Department received a development application from Thiess Services Pty Ltd (the Applicant) for the construction and operation of a direct heated thermal desorption unit and associated infrastructure, to remediate land at 40 Walker Street, Rhodes, Canada Bay local government area and parts of the bed of Homebush Bay.

The former Minister for Planning has directed that a Commission of Inquiry be held into all environmental aspects of the proposed development, in accordance with section 119 of the *Environmental Planning and Assessment Act 1979*. This report represents the Department's preliminary assessment of the proposed development and constitutes the Department's primary submission to the Commission of Inquiry.

Note: the Ministers administering the *Environmental Planning and Assessment Act 1979* are currently the Minister for Infrastructure and Planning and the Minister Assisting the Minister for Planning (Planning Administration). At the time of lodging the subject development application this role was known as the Minister for Planning. All references to "Minister" in this report should be interpreted as the relevant Minister in the applicable chronological context.

### 1.2 Environmental Impact Assessment

The Development Application (DA) and associated Environmental Impact Statement (EIS) relating to the proposed remediation were exhibited from 27 March 2003 to 9 May 2003. During this time, and subsequently, the Department received a total of 17 separate submissions. Submissions were received from the following parties:

- 1 from a Government agencies (Sydney Olympic Park Authority (SOPA));
- 4 from public interest groups (Nature Conservation Council, Rhodes Residents' Group, King Street Area Residents Group and Boat Owners' Association of NSW Inc); and
- 12 submissions from 9 individual members of the public.

The majority of submissions did not explicitly express opposition to the proposed development (59%). Of those submissions that expressed a clear position, 29% opposed the remediation proposal and 12% supported it. In general, submissions recognised the importance of remediation of the subject site, but raised a number of concerns in relation to the proposed method of remediation and associated environmental impacts. These concerns are outlined in more detail in section 4 of this report, and considered as part of the Department's environmental impact assessment presented in section 5. Submissions generally highlighted the complex nature of the proposed remediation and the importance of ensuring that any environmental impacts were constrained within appropriate limits.

### 1.3 Commission of Inquiry

From the Department's preliminary assessment and consideration of public submissions, and acknowledgement of the highly complex and technical nature of the proposed development and associated impacts, it was considered that proposed development warranted further independent assessment at a Commission of Inquiry. The key issues raised by the Department and within submissions include robustness of the proposed remediation technology, air quality impacts, human health impacts and soil and groundwater impacts. There was also comment made in a number of public submissions that highlighted the need to consider cumulative environmental impacts of the proposal with the remediation project currently being assessed for the adjacent site (former Allied Feeds site).

To provide an open, transparent and independent forum at which the genuine concerns of local residents could be examined in detail, the former Minister for Planning directed that a Commission of Inquiry be held into all environmental aspects of the proposed development. Following the Inquiry, the Commissioner will make an independent recommendation on the proposed development to the Minister for Infrastructure and Planning. The Department will also provide its final assessment to the Minister, which will include the findings of the Inquiry. The Minister will then proceed to determine the development application after considering the findings and recommendations of the Commissioner, together with all other submissions and advice.

#### **1.4 Scope of this Report and Assessment**

This report represents the Department's primary submission to the Commission of Inquiry. It outlines the Department's assessment of the environmental impacts associated with the proposed development. As is noted in the relevant parts of section 5 of this report, there are a significant number of issues for which the Department has sought additional information from the Applicant. This additional information is required before the Department can complete an adequate level of assessment of the relevant environmental impacts. As such, the assessment presented in this report is preliminary, pending the satisfactory resolution of outstanding information issues. The Department notes that the Environment Protection Authority (EPA) has similarly sought additional information from the Applicant to enable its assessment to be completed. The Commission of Inquiry process provides an opportunity for the Applicant to provide the necessary additional information, and affords the community to be involved in the environmental impact assessment process in an open and transparent manner.

From review of the public submissions received during the public exhibition of the subject development application and accompanying Environmental Impact Statement, the Department notes that some issues raised in submissions relate to matters outside the scope of assessment of the proposed remediation. Submissions in particular raised concern in relation to matters associated with the redevelopment, or "overdevelopment", of the Rhodes Peninsula.

Key issues raised relate to the possible future redevelopment of the land to be remediated, particularly in relation to residential densities, traffic generation and socio-economic impacts. The Department highlights that any redevelopment of the site does not form part of the subject development application. If the Applicant, or another party, wishes to develop the land after remediation, a separate development application would need to be lodged with the Department (the Minister would be the consent authority under *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* (SREP 29)). The development application would then be assessed and determined on its merits. Potential redevelopment of the site is only relevant to the subject development application in the context of potential future land uses. SREP 29 permits potential future development of the land as residential, open space and mixed uses (subject to assessment under the *Environmental Planning and Assessment Act 1979*). In assessing the proposed remediation, one must be mindful of these potential future land use categories to ensure an adequate level of remediation for the respective land uses (as required by *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55)).

## 2. DEVELOPMENT PROPOSAL

### 2.1 Background

The Applicant seeks consent for the remediation of land described as 40 Walker Street, Rhodes, in the Canada Bay local government area, and parts of the bed of Homebush Bay. The proposal includes the remediation of the site to a standard suitable for a combination of residential, mixed and open space use land. The subject development application only includes remediation of the site, and does not incorporate any component of potential redevelopment of the land.

### 2.2 Proposed Development Site

The proposed development site covers approximately 17 hectares and comprises the former Union Carbide (Lednez) site and a section of the north-eastern foreshore of Homebush Bay, which extends from the northern tip of Rhodes Peninsula to the northern portion of the neighbouring Orica site. Figure 1 indicates the location of the site.

The proposed development site has been used for industrial purposes since the early 1900s, with various chemical manufacturing industries operating from the site since the 1930s. Between the 1930s and 1970s, the site was subject to extensive reclamation of Homebush Bay, significantly modifying the natural shoreline of Rhodes Peninsula. Although the use of 'spent lime' sludge was permitted for these works, unauthorised contaminated materials were utilised, including boiler ash, rubble, chlorinated benzenes and chlorinated phenols. Combined with past chemical manufacturing practices on site and the uncontrolled discharge of contaminated stormwater from the site, the site and the sediments along the foreshore of Homebush Bay are highly contaminated by a range of chemicals, including dioxins, pesticides, and polycyclic aromatic hydrocarbons (PAHs).

Between 1988 and 1993, remediation works were conducted along the eastern portion of the site. However the remainder of the site, including the foreshore of Homebush Bay, has remained in a contaminated state. Currently, there are four regulatory notices applying to the site and Homebush Bay:

- Section 5 Notice under the *Unhealthy Building Land Act 1990*, dated 20 October 1995, on the land component of the development application area;
- Section 28 Notice under the *Contaminated Land Management Act 1997*, dated 14 January 2000, on the land component of the development application area;
- Section 21 Notice under the *Contaminated Land Management Act 1997*, dated 1 December 1998, on Homebush Bay; and
- Section 8 Notice (fishing closure) under the *Fisheries Management Act 1998*, prohibiting all methods of fishing in Homebush Bay.

### 2.3 Description of Proposed Development

The Applicant is proposing to conduct the remediation in four stages, with Stage 1 involving the remediation of Homebush Bay and foreshore, and the remaining stages comprising of the remediation of contaminated material originating from within the Lednez site.

The proposed development is expected to be completed over an approximate 5 year period. Stage 1 activities would be in progress throughout the entire period, while Stage 2 – 4 works would be conducted in concurrence with Stage 1, each taking approximately 1-2 years.

Stage 1 would consist of the site preparation works for the overall development, and the remediation of Homebush Bay and foreshore. This would include:

- establishment of site facilities, including staff amenities, security fencing, electricity and water infrastructure, site entry and internal roadways;

- relocation of existing services traversing the development site;
- excavation of material from the Lednez site for constructing the coffer dams and haul road;
- construction of up to eight temporary coffer dams along the foreshore to enable a 'dry' excavation of marine sediments and areas adjacent to the existing seawall;
- removal of the existing seawall and eventual reinstatement of the seawall along the foreshore of the Lednez site;
- removal and stockpiling of marine sediments for classification and eventual treatment (in conjunction with land remediation work stages);
- construction of water retention basins and water treatment plant within south-western portion of the site for dewatering purposes; and
- implementation of erosion and sedimentation control measures.

Stages 2-4 would involve the excavation, treatment and re-use of contaminated soil within the Lednez site. The proposed staging of the works have been designed to facilitate the progressive north to south remediation of the site and permit the staged release of land for future development works. Each stage would essentially comprise of a similar remediation cycle that includes:

- installation and maintenance of environmental controls;
- excavation, stockpiling and classification of contaminated material. Material would be classified into three categories based on geotechnical characteristics;
- pre-treatment of Category 1 material to prepare the contaminated soil for treatment at the thermal heat plant;
- treatment of Category 1 material using an indirect thermal desorption technology;
- re-classification of treated soil;
- validation of excavations and reinstatement of excavated regions with suitable material; and
- release of regions validated by an accredited EPA auditor for future development works.

In addition to these activities, the Applicant is proposing to undertake the following works as part of Stage 2 of the proposal:

- construction and operation of a pre-treatment building for Category 1 material within south-western portion of the site. Operations conducted within this building include screening, dewatering, drying, blending, storing and loading the feed hopper of the thermal treatment plant;
- establishment and operation of the indirect thermal desorption plant within south-western portion of the site. A portion of this plant would be located within the pre-treatment building;
- installation of temporary vertical steel sheet pile walls along portions of the Lednez site boundaries to prohibit cross-site contamination; and
- demolition of existing structures on-site.

Once the proposed remediation works are completed at the site, the pre-treatment building, water treatment plant and thermal treatment plant would be decommissioned and validated by an accredited EPA auditor.

### ***Proposed Remediation Process***

The Applicant is proposing to utilise indirect thermal desorption technology (ITD) to remediate the site.

Following categorisation and pre-treatment, contaminated soil is loaded into the desorption chamber. The furnace within the chamber heats the steel walls of the rotary kiln containing the soil, indirectly heating the soils to temperatures averaging 450°C to promote the desorption of the contaminants in a vaporised state. The gas stream from this process would then pass

through a series of components and filters to extract contaminants from the vaporised waste stream and convert into a liquid state. Any remaining process gases from the plant would exit the filters and pass through the vapour phase activated carbon filters to remove any remaining contaminants. Gases existing these filters are sent to the thermal desorption plant furnace for combustion.

The resultant liquid waste, also known as condensate, would be conveyed to a liquid treatment system for further treatment using base catalysed decomposition (BCD) technology. Currently, the Applicant would not undertake this treatment on-site, but would containerise the waste on-site and transport it to a purpose-built facility in Queensland.

Following treatment, soil would be cooled and moistened for stockpiling in a designated area adjacent to the treatment plant. The soil would then undergo verification testing to determine if soils require further treatment or if it is suitable for reinstatement on-site.

Figure 1 - Location of the Proposed Remediation Site



### **3. STATUTORY PLANNING FRAMEWORK**

#### **3.1 Permissibility**

Two separate environmental planning instruments require development consent for the proposed remediation:

- *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* (SREP 29); and
- *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55).

*Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* (SREP 29) applies to the proposed remediation site. SREP 29 replaces all local environmental plans, deemed environmental planning instruments and the *Concord Planning Scheme Ordinance* to the extent that those documents apply to land to which SREP 29 applies. As such, zoning and permissibility matters for the subject site are provided by SREP 29.

The SREP provides that the site includes residential, open space and mixed use zones. Remediation of land is permissible with development consent in each of these zones, and as such the proposed development is permissible with consent.

SREP 29 does not affect the application of *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55), which also applies to the proposed development. SEPP 55 provides that a person may carry out remediation work in accordance with the SEPP despite any provision to the contrary in an environmental planning instrument. In accordance with SEPP 55, the proposed remediation constitutes a “category 1 remediation work”, and may only be carried out with development consent.

#### **3.2 Minister's Role**

As with permissibility, both SREP 29 and SEPP 55 make the Minister the consent authority for the proposed development.

SREP 29 makes the Minister the consent authority for all development applications on land to which the SREP applies. SREP 29 applies to the proposed remediation site, and as such, the Minister is the consent authority.

SEPP 55 makes the Minister the consent authority, and makes the proposal State significant development, because the proposed remediation is to be carried out on a “remediation site”. The SEPP defines a remediation site as land for which a notice under section 35 of the *Environmentally Hazardous Chemicals Act 1985* is in force, *inter alia*. The proposed remediation carries such a notice, and is therefore a remediation site. SEPP 55 therefore makes the Minister the consent authority, and the proposal State significant development.

#### **3.3 Legislative Context**

In accordance with the provisions of the *Environmental Planning and Assessment Act 1979* (the Act), the proposed development is classified as State significant, designated and integrated development.

As required for this type of designated development, an Environmental Impact Statement (EIS) was prepared and lodged by the Applicant with the subject development application.

#### **Notification and Exhibition**

In accordance with Division 4, Part 6 and Schedule 2 of the Regulation, the development application and accompanying EIS (including EIS Supplementary Report) were publicly exhibited for at least 30 days. Exhibition of these documents took place between Thursday 27 March 2003 and Friday 9 May 2003 (43 days) at the following locations:

- Department of Planning Head Office, Sydney;

- Department of Planning, Parramatta Office;
- City of Canada Bay Council, Drummoyne;
- Concord West Library, Concord West; and
- Nature Conservation Council, Sydney.

The Department notes that the same documents exhibited during the public exhibition period were also exhibited by the Office of the Commissioners of Inquiry for Environment and Planning as part of the COI process. That exhibition commenced on 28 April 2003.

Exhibition of the development application and Environmental Impact Statement (undertaken by the Department, as opposed to the COI exhibition period) was notified in the following newspapers on 26 March and 16 April 2003:

- *Daily Telegraph*;
- *Sydney Morning Herald*;
- *Gladesville Weekly Times*;
- *Glebe and Inner Western Weekly*; and
- *Auburn Review Pictorial*.

All adjacent landowners/ occupiers and all landowners/ occupiers in the vicinity of the proposed remediation site that may be adversely impacted by the proposal were notified of the exhibition of the development application and Environmental Impact Statement. The Department wrote to these parties directly, as well as providing a letterbox drop across the notification area. In excess of 6,500 landowners/ occupiers were notified in this manner. The notification area included areas of Rhodes, Concord West, Liberty Grove, Homebush Bay, Meadowbank, West Ryde and Melrose Park. Written notifications provided details of the proposal, exhibition locations and dates, and information on how interested parties could make a submission. All notifications were undertaken in accordance with the requirements of the *Environmental Planning and Assessment Act 1979*.

### **State Significant Development**

As noted above, *State Environmental Planning Policy No. 55 – Remediation of Land* (SEPP 55) makes the proposed remediation State significant development because it is a “category 1 remediation work” on a “remediation site”. The proposal is a “category 1 remediation work” because it constitutes designated development (refer below). The site is a “remediation site” because there is a notice under the *Contaminated Land Management Act 1997* currently applying to the land (Homebush Bay sediments). As a result, the proposal constitutes State significant development.

It should be highlighted that *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* makes the Minister the consent authority, but does not make the proposal State significant development. The *Environmental Planning and Assessment Act 1979* provides that the Minister is the consent authority for all State significant development, but not the converse.

### **Designated Development**

The proposed development is listed in Schedule 3 of the *Environmental Planning and Assessment Regulation 2000* and is thus designated development. As such, the development application was accompanied by an Environmental Impact Statement. In particular, the proposed development is designated as a “contaminated soil treatment works”.

### **Integrated Development**

This proposal is integrated development as defined under section 91 of the *Environmental Planning and Assessment Act 1979* because, in addition to development consent, it requires an additional licence, permit or approval listed under the aforementioned section. In particular, the following integrated approvals are required:

- an Environment Protection Licence (EPL) from the EPA under the *Protection of the Environment Operations Act 1997*;
- a permit from the Waterways Authority under Part 3A the *Rivers and Foreshores Improvement Act 1948*; and
- a permit from NSW Fisheries under section 201 of the *Fisheries Management Act 1994*.

In accordance with the *Environmental Planning and Assessment Act 1979*, the Department has forwarded copies of all submissions to the Waterways Authority and NSW Fisheries, and sought General Terms of Approval, should those agencies be satisfied that the relevant integrated approval could be issued. These General Terms of Approval will be provided to the Department by mid-June 2003, and will be submitted to the reply session of the Inquiry, either by the respective agencies, or by the Department on behalf of the agencies.

The Environment Protection Authority (EPA) has indicated that some matters remain outstanding and must be resolved before it can formulate a final position in relation to the proposed remediation (and determine whether an Environment Protection Licence could be issued). In accordance with the *Environmental Planning and Assessment Act 1979*, the Department will require provision of the EPA's General Terms of Approval within 21 days of the satisfactory resolution of these outstanding matters. It is recommended that the Commission consider the timing of provision of GTA from the EPA when determining dates for the reply session to ensure that the GTA are available for consideration by all stakeholders and interested parties before the reply session commences.

Additional information provided by the Applicant to address EPA requirements to date is reproduced as Appendix B of this report, as well as a copy of correspondence from the EPA outlining outstanding additional information requirements.

### **3.4 Commonwealth Legislation**

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires approval from the Commonwealth Minister for the Environment for actions that have a significant impact on matters of national environmental significance. The Applicant identified no matters of national environmental significance (as defined by the EPBC Act) with this development application, and hence, the EPBC Act does not apply.

### **3.5 Relevant Environmental Planning Instruments**

The assessment of the proposed development is subject to the following environmental planning instruments:

- *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development*;
- *State Environmental Planning Policy No. 55 – Remediation of Land*;
- *State Environmental Planning Policy No. 56 – Sydney Harbour Foreshore and Tributaries*;
- *Sydney Regional Environmental Plan No. 22 – Parramatta River*;
- *Sydney Regional Environmental Plan No. 24 – Homebush Bay*; and
- *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula*;

Consideration of the proposed development in the context of the objectives and provisions of these environmental planning instruments is provided below.

#### **State Environmental Planning Policy No. 33**

The Applicant has argued that the proposed remediation works do not constitute "industry" and as such the provisions of *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) do not apply. That is, the proposal is not "potentially hazardous industry" or "potentially offensive industry" because the proposal itself is not "industry".

The Department has advised the Applicant that, notwithstanding the definition of the category of the development, the principles of SEPP 33 should be applied and an appropriate level of risk assessment undertaken. The Department considers that the proposal would be classified as “potentially hazardous” and “potentially offensive”, regardless of whether the proposal constitutes “industry”.

The Department considers the risk assessment presented in the Environmental Impact Statement is equivalent to a qualitative Preliminary Hazard Analysis (PHA), although the assessment has not been referred to as such. In this regard, the principles and objectives of SEPP 33 have been met in relation to risk. The Department has identified that further consideration must be given to the potential for explosions on the site (through the build-up of flammable gases in the remediation process) before a conclusive position could be established in relation to whether the proposal would be “hazardous”. Consideration of hazards and risk issues is included in section 5.8 of this report.

The application of the principles of SEPP 33 to the proposal would also categorise the development as “potentially offensive”. This is because the proposal requires an Environment Protection Licence (EPL) from the Environment Protection Authority (EPA). If the EPA indicates that it could issue an EPL, and provides General Terms of Approval (GTA), the proposal would not constitute “offensive” development. The EPA has requested additional information from the Applicant in order to complete its assessment of the proposed development. Should General Terms of Approval be issued by the EPA, the proposed remediation would not be “offensive”.

### **State Environmental Planning Policy No. 55**

*State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55)* makes the proposed remediation State significant development and makes the Minister the consent authority because the proposal is a class 1 remediation works on a remediation site.

SEPP 55 requires that the consent authority (in this case, the Minister) must not consent to the carrying out of a development on land unless:

- it has considered whether the land is contaminated;
- if the land is contaminated, it is satisfied that the land is suitable in its contaminated state (or will be suitable, after remediation) for the purpose for which the development is proposed to be carried out; and
- if the land requires remediation to be made suitable for the purpose for which the development is proposed to be carried out, it is satisfied that the land will be remediated before the land is used for that purpose.

The proposed remediation site is contaminated. The site requires remediation before it could be redeveloped for use as residential, open space or mixed use developments (as provided by *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula*). The purpose of the subject development application is to cause the remediation of the site to an acceptable level for these land uses. The Department considers that, in principle, the proposed development could achieve an appropriate level of remediation to permit these land uses. Further clarification has been sought from the Applicant to support the clean-up criteria established for the site. In particular, assumptions applied as part of the human health risk assessment must be justified to ensure that the clean-up criteria are appropriate for the intended future land use. This issue is detailed in section 5.1 of this report. Pending the satisfactory resolution of this matter, the Department considers that the requirements of SEPP 55 will have been met.

### **State Environmental Planning Policy No. 56**

*State Environmental Planning Policy No. 56 – Sydney Harbour Foreshores and Tributaries (SEPP 56)* applies to the proposed remediation site. Specifically, the site is listed as a “site of

strategic significance” in Schedule 2 to the SEPP (Map 16 – Rhodes Peninsula, Homebush Bay East). For sites of strategic significance the SEPP requires that a consent authority must not grant development consent unless:

- a master plan exists for the land to be developed;
- the consent authority has taken the master plan into consideration; and
- the development is consistent with the masterplan.

Clause 14(2) of SEPP 56 provides that the Minister may waive the requirements to comply with the above requirements because of:

- the nature of the development concerned;
- the adequacy of other planning controls that apply to the site; or
- any other such reason as the Minister considers sufficient.

The Department highlights that a Development Control Plan (DCP) has been developed for the Rhodes Peninsula under the *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula*. The DCP addresses those issues required of a master plan under SEPP 56. As such, the Department considers that existing planning controls applying to the site, and the Minister could waive the requirement for the preparation of a new master plan specifically for the proposed remediation site. Should the Minister determine to approve the proposed development, the Department would recommend that the Minister also waive the requirement for a master plan under SEPP 56.

SEPP 56 also provides a suite of guiding principles for all land to which the SEPP applies. These principles are provided in Appendix A.

### **Sydney Regional Environmental Plan No. 22**

The subject development application applies to land to which *Sydney Regional Environmental Plan No. 22 – Parramatta River* (SREP 22). The Plan requires that a consent authority must not grant development consent to a type of proposal listed in Schedule 6 to the SREP unless it has referred the development application to the Foreshores and Waterways Planning and Development Advisory Committee, and considered any submission consequently made by the Committee. The Applicant proposes to construct a seawall and undertake works constituting “dredging” as part of the remediation proposal. Seawalls and dredging are types of development listed under Schedule 6.

A copy of the development application and accompany Environmental Impact Statement and EIS Supplementary Report were forwarded to the Foreshores and Waterways Planning and Development Advisory Committee and considered at its meeting of 23 May 2003. The Committee raises no objection to the proposal as submitted and has provided general requirements for the design of the new seawall.

SREP 22 provides a series of aims and objectives, and matters for consideration by a consent authority in determining a proposal on land to which the SREP applies. These aims, objectives and matters for consideration are detailed in Appendix A.

### **Sydney Regional Environmental Plan No. 24**

*Sydney Regional Environmental Plan No. 24 – Homebush Bay* (SREP 24) applies to the Homebush Bay Area, which includes the Bay sediment extraction component of the proposed remediation. Clause 2(b) of SREP 24 also provides that the SREP applies to “land on which remediation of land is or is proposed to be carried out in Homebush Bay, being land adjoining or adjacent to the eastern boundary of the Homebush Bay Area”. As such, the remediation is subject to the provisions of SREP 24.

The Plan requires that for a development application on land to which the SREP applies the consent authority must seek the views of the Sydney Olympic Park Authority (SOPA), the local

Council and the Foreshores and Waterways Planning and Development Advisory Committee. The development application and accompanying documents were duly forwarded to each of these parties. The Department has received correspondence from the Foreshores and Waterways Planning and Development Advisory Committee and SOPA stating that these parties each have no objections to the remediation proposal. SOPA also raised a number of issues in its submission which have been duly noted and addressed as part of the Department's assessment of the proposed remediation.

To date, the Department has received no comment from Canada Bay Council in relation to the proposal. The SREP provides that the Minister may determine the development application in the absence of any comment from these parties, provided a period of 28 days has elapsed since the application was forwarded to the parties. The development application and accompanying documents were forwarded to Canada Bay Council in March 2003. As such, the required 28-day period has elapsed.

SREP 24 requires a number of matters to be considered in determining a development application on land to which the Plan applies. These matters are detailed in Appendix A.

### **Sydney Regional Environmental Plan No. 29**

*Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* (SREP 29) is the principal environmental planning instrument that makes the proposed remediation permissible with consent. The SREP also makes the Minister the consent authority for the proposal.

Provisions of SREP 29 generally relate to planning restrictions for potential redevelopment of the Rhodes Peninsula as residential, open space and mixed use zones. The SREP does, however, provide a number of overarching planning principles relevant to the proposed remediation. These principles are detailed in Appendix A.

### **3.6 Statutory Requirements Compliance**

The Department considers that the requirements of the Act regarding notification of landowners adjacent to the development site, advertising, exhibition and public involvement have been met.

The Department and the EPA have raised a number of issues with the proposed remediation that will require additional information/ clarification from the Applicant to adequately resolve, and thereby meet the requirements of the Act in relation to environmental impact assessment. As outlined in this report, the Department is satisfied in principle that the proposed remediation could be constructed and operated within appropriate environmental limits and that outstanding issues could technically be resolved.

#### 4. ISSUES RAISED IN SUBMISSIONS

As noted earlier in this report, the Department received a total of 17 submissions in response to the exhibition of the subject development application and accompanying Environmental Impact Statement. These submissions can be grouped as follows:

- 1 submission from a Government agency:
  - Sydney Olympic Park Authority (SOPA);
- 4 submissions from the public interest groups, including:
  - Nature Conservation Council;
  - Rhodes Residents' Group;
  - King Street Area Residents Group; and
  - Boat Owners' Association of NSW Inc.
- 12 submissions from 9 private individuals.

Of the 17 submissions received by the Department in relation to the proposed remediation, 29.4% objected to the proposed development, 58.8% stated no position (but raised concerns in relation to various environmental impacts), and 11.8% support the proposal. The majority of submissions that raised concerns with the proposal recognised and, in some cases, supported the need to remediate the site, but expressed concern with the environmental impacts that may be generated by the remediation process.

Submissions can be analysed by source area, as follows:

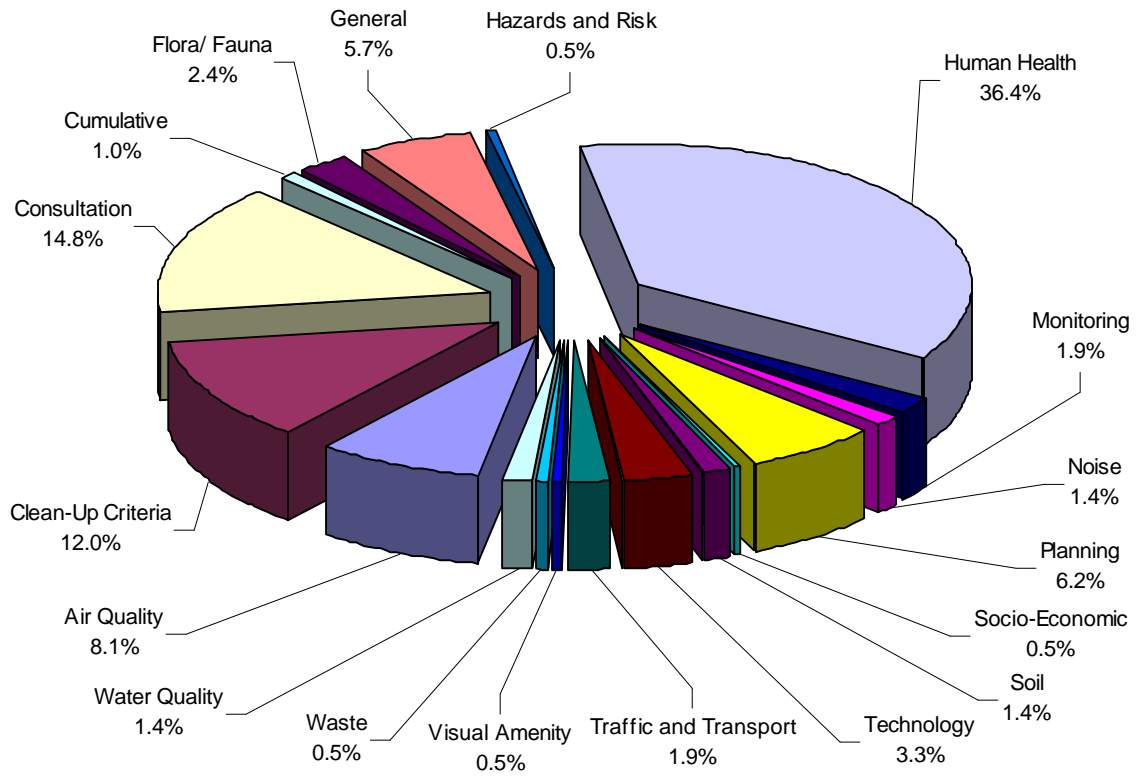
- 40.0% from the Rhodes and Concord West area;
- 26.7% from areas immediately to the north of the site and the Parramatta River;
- 20.0% from elsewhere in the Sydney metropolitan area; and
- 13.3% from outside of the Sydney metropolitan area.

Issues raised in submissions are considered in detailed under the relevant parts of section 5 of this report. The frequency of issues raised in submissions is illustrated in Figure 2. The key issues identified in submissions are:

- human health impacts associated with the remediated site and the remediation process (36.4%);
- community consultation prior to the lodgement of a development application, and on-going if the proposal is approved (14.8%);
- derivation of site clean-up criteria (12.0%);
- air quality impacts (8.1%);
- planning issues relating to the redevelopment of the Rhodes Peninsula (6.2%); and
- general issues (Applicant's credentials, compliance matters, and the quality of the Environmental Impact Statement) (5.7%).

Copies of all submissions made to the Department during the exhibition of the subject development application and Environmental Impact have been forwarded to the Office of the Commissioners of Inquiry for Environment and Planning to be considered during the Inquiry for the proposed remediation. Copies of these submissions are also reproduced as Appendix C to this report.

Figure 2 - Frequency of Issues Raised in Public Submissions



## 5. CONSIDERATION OF ENVIRONMENTAL ISSUES

The Department has reviewed the Environmental Impact Statement for the proposed development, and duly considered all submissions from Government authorities, local councils and the public. The proposed development has been assessed against the relevant provisions of the instruments as described in Section 3.5 of this report. Consideration of each of the issues as they relate to the development is provided from section 5.1 to section 5.13 of this report. The issues have been classified as being of significance or of major significance to environmental planning and assessment.

Issues identified as being of **major significance** to environmental planning and assessment:

- human health impacts;
- soil and groundwater impacts
- robustness of proposed remediation technology;
- air quality impacts; and
- noise impacts.

Issues identified as being of **significance** to environmental planning and assessment:

- surface water quality impacts;
- waste management impacts; and
- hazards and risk impacts;

Other important issues associated with the proposed development are:

- traffic and transport impacts;
- impacts on visual amenity;
- socio-economic impacts;
- impacts on flora and fauna; and
- impacts on heritage items.

### 5.1 Human Health Impacts

#### **Applicant's Position**

The Environmental Impact Statement highlights that there are two key matters for consideration as part of the assessment of human health impacts associated with the proposed development:

- health impacts associated with emissions from the proposed development during operation;
- on-going health impacts that may be associated after the site has been remediated (ie determination of appropriate clean-up criteria).

#### ***Air Quality Health Impacts (Operation)***

The Applicant initially undertook a human health risk assessment of the proposed remediation works based on direct thermal desorption technology and in the absence of emissions controls. The risk assessment was subsequently updated to include:

- a change to indirect heated thermal desorption technology;
- application of vapour control for treatment stockpiles; and
- more detailed estimation of emission rates for stage 1 and stage 2 of excavation.

The information provided below outlines a consolidated set of information for the updated human health risk assessment, rather than providing full details of the original assessment as well as the assessment update.

**Contaminant Screening**

The Applicant notes that there are four potential sources of materials posing human health impacts associated with the remediation of the subject site:

- the thermal treatment unit;
- excavation activities and excavation pits;
- verification stockpiles
- treatment stockpile

Potential contaminants from each of these sources was considered by the Applicant in the context of toxicity, volatility and odour to establish which contaminants posed a risk to off-site receptors. Based on this screening, the Applicant identified the following contaminants for inclusion in a more detailed assessment of human health impacts.

**Table 1 - Screening Results for Human Health Impacts (Operation)**

<b>Non-Volatile Contaminants (Carried Via Dust)</b>	<b>Volatile Contaminants (Gases)</b>	<b>Volatile Contaminants (Odorous)</b>
Dioxins	Dioxins	Ethylbenzene
Carcinogen PAHs	Benzene	Xylenes
Naphthalene	Chlorobenzene	Chlorobenzene
Tetrachlorobenzenes	Dichlorobenzenes	1,2-Dichlorobenzene
Pentachlorobenzene	Tetrachlorobenzenes	1,4-Dichlorobenzene
Hexachlorobenzene	Pentachlorobenzene	2-Chlorophenol
DDD	Hexachlorobenzene	Naphthalene
Dieldrin	Naphthalene	

**Emissions and Exposure Estimation**

The Applicant suggests that emissions from the site are likely to include those directly from the thermal treatment plant stack, as well as particulates, gases and odorous compounds from excavation and soil handling activities. Emission rates for dust and odours generated as part of the air quality assessment were applied to the health risk assessment, with the assumption made that contaminants adhered to particulates would be in pro-rata concentration ratios to the contaminant levels in various parts of the site. Emissions estimates for gas releases from excavation and soil handling activities were established noting that these emissions may be the result of volatilisation or the liberation of cells of trapped gas.

A number of exposure scenarios were identified by the Applicant as being credible for receptors surrounding the site. Exposure pathways considered were:

- inhalation;
- soil ingestion;
- dermal absorption; and
- ingestion of home grown produce.

Exposures to emissions from the remediation technology and excavation activities were considered over a five year period. Lifetime exposures to deposited material were included for a human lifetime (70 years).

**Risk Estimation**

The Applicant undertook air dispersion modelling of contaminants with potential human health impacts, taking into consideration estimated emissions from the site, likely receptors and local meteorology. Health risk calculations were based on the CAPCOA HRA96 program.

Health risk calculations indicate that receptors at the boundary of the site would not be exposed to an incremental life time cancer risk from the development of more than  $3 \times 10^{-7}$ . The nearest existing residential receptors would experience a lower cancer risk. The

Applicant highlights that existing and potential future receptors (on the former Allied Feeds site, for example) would not be exposed to a greater risk than is considered acceptable (1 x 10<sup>-6</sup> life time cancer risk).

In relation to non-cancer adverse health risk, the Environmental Impact Statement presents that hazard indices for contaminants at the site boundary generally lie below 1.0 as an aggregate. At existing residential areas, the hazard index is predicted to be of the order of 0.2, suggesting that there is unlikely to be adverse non-cancer effects at this location. While a hazard index of 1.0 is met at the western boundary of the site and encroaches onto the Former Allied Feeds site (northern boundary of the subject remediation site), the Applicant suggests that this would be acceptable in reality given the conservative nature of the health risk modelling and the resultant overestimation of health risks.

The Applicant concludes that the operation of the proposed remediation works, including thermal treatment and soil excavation and handling, would not pose an unacceptable human health impact.

### ***On-Going Health Impacts (Clean-Up Criteria)***

The Applicant has determined clean-up criteria for the site and undertaken a human health impact assessment of the site concurrently. Clean-up criteria have been established with the aim of protecting human health, human amenity (through odour impacts), and the biophysical environment generally, within acceptable limits.

### ***Existing Contaminant Levels***

The Environmental Impact Statement indicates that several investigations into the contaminant loads on the dry land and Bay sediment components of the development application area and surrounding areas have been conducted from 1988 to 2001. From these investigations, remedial activities on the site and past observations, the Applicant has established the following contaminants are fundamental in the consideration of clean-up criteria and on-going human health impacts associated with the site, once remediated:

- dioxins and furans;
- chlorobenzenes;
- chlorophenols;
- organochlorine pesticides and herbicides;
- polychlorinated biphenyls (PCBs);
- polycyclic aromatic hydrocarbons (PAHs);
- phenols and cresols;
- bisphenol A;
- aniline and derivatives;
- nitrobenzene;
- chlorinated anisoles;
- phthalates;
- amines;
- pyridine;
- petroleum hydrocarbons;
- BTEX compounds (benzene, toluene, ethylbenzene, xylene);
- acetone;
- methyl ethyl ketone;
- cumene;
- formaldehyde;
- ammonia;
- cyanide;
- thiocyanate;
- sulfides;

- sulfate;
- nitrate and nitrite;
- fluoride;
- total dissolved solids (TDS); and
- metals (including zinc, mercury, cobalt, copper, arsenic and lead).

#### *Contaminant Screening – Human Health*

To focus the human health impact assessment and derivation of clean-up criteria, the Applicant undertook a preliminary screening of relevant contaminants. In undertaking this screening, the Applicant applied screening criteria from:

- NSW EPA Guidelines (NSW EPA, 1994 and NSW EPA, 1998)
- *National Environmental Protection Measure (Assessment of Site Contamination)* (NEPC, 1999);
- Environmental Quality Objectives in the Netherlands (MHSPE, 199), where relevant to human health; and
- US EPA Region 9 Preliminary Remediation Goals (PRG) (US EPA, 2000).

Guidelines published by the NSW EPA provide health-based investigation levels for a number of land use categories including “residential”, “parks, recreational open space”, “residential with minimal opportunity for soil access” and “industrial/ commercial”. The Applicant highlights for the subject site, investigation levels for “open space/ parkland”, “high density residential” and “industrial/ commercial” are relevant to the land uses permitted under *State Environmental Planning Policy No. 29 – Rhodes Peninsula* and have been applied to the human health risk assessment screening process. The EPA guidelines also provide provisional phytotoxicity levels. Investigation levels established by the NSW EPA for service station sites have also been applied where no investigation levels have been provided in the *Guidelines for the NSW Site Auditor Scheme* or the NEPM.

The *National Environmental Protection Measure (Assessment of Site Contamination)* (NEPM) also provides health-based investigation levels for various land uses, including “standard residential with garden”, “parks, recreational open space”, “residential with minimal opportunities for soil access” and “commercial/ industrial”. The Applicant notes that the investigation levels provided by NEPM are similar to those advocated to the NSW EPA. The NEPM levels have also been applied to the screening process.

Dutch investigation values have also been used to screen relevant contaminants for further consideration as part of the human health impact assessment and derivation of clean-up criteria. The Applicant suggests that because these values include a range of different impacts (including human health and ecological effects), they have limited application to the subject human health impact assessment. However, the values have been applied where they have direct relevance to the protection of human health.

The Applicant has also applied Preliminary Remediation Goals (PRG) established by the US EPA. Because PRG values are based on multi-pathway exposures, they are generally more conservative than most screening criteria. PRG values have only been applied to the screening process where Australian or suitable Dutch investigation levels are not available for a particular contaminant. In relation to the application of PRG values, the Applicant highlights that:

- a hazard quotient of 1 should not be exceeded for non-cancer risks;
- for cancer risks, it has been assumed that the aggregate incremental lifetime cancer risk from all contaminants should not exceed  $1 \times 10^{-5}$ ; and
- based on the spatial distribution of contaminants on the site, and the aggregate risk that results, it is concluded that the risk associated with individual contaminants should not exceed  $3.5 \times 10^{-6}$ . As such, relevant PRGs have been multiplied by 3.5 (given that PRGs are based on a risk criterion of  $1 \times 10^{-6}$ ).

The Applicant compared the 95th percentile upper confidence level of the mean of each contaminant with the screening thresholds above to identify those pollutants that, on a human health risk basis, should be carried through to detailed risk assessment. This comparison indicates that further assessment of the following compounds is required in the context of human health:

- dioxins and furans;
- carcinogen polycyclic aromatic hydrocarbons (PAH) (as benzo(a)pyrene equivalent);
- naphthalene;
- hexachlorobenzene;
- tetrachlorobenzene; and
- other contaminants that have not been well characterised on the site, including cyanide, mercury, arsenic and lead.

#### *Contaminant Screening – Human Amenity (Odour)*

The Applicant recognises that although a contaminant may be present at a concentration below which a significant health impact may be experienced, the contaminant could still exceed a concentration at which it would generate an amenity impact (odour). As such, emission rates of pollutants from remediated soil have been calculated and compared with odour thresholds. Based on this consideration, the Applicant has identified that the following compounds have the potential to generate a significant odour impact and should be carried through for further assessment:

- 2-chlorophenol;
- 1,4-dichlorobenzene;
- ethylbenzene;
- naphthalene;
- xylenes; and
- other contaminants that have not been well characterised on the site, including chlorinated anisoles, nitrobenzene, amines, pyridine, aniline, bisphenol A, acetone, methyl ethyl ketone, cumene, formaldehyde and ammonia.

#### *Contaminant Screening – Ecological (Groundwater)*

The final consideration applied by the Applicant as part of the risk assessment screening process relates to impacts on the non-human biological environment. The primary mechanism for potential impacts in this context is the movement of contaminant groundwater from the site. The Applicant applied a similar process to screening for groundwater contaminants as it did for contaminants related to human health impacts. Guidance on acceptable concentrations for the protection of waters was sought from:

- *Guidelines for the Assessment of Service Stations* (NSW EPA, 1994);
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000);
- *National Environmental Protection Measure (Assessment of Site Contamination)* (NEPC, 1999), which are based on the ANZECC/ NH&MRC *Australian Water Quality Guidelines for Fresh and Marine Waters 1992*;
- *Environmental Quality Objectives in the Netherlands 1994*(MHSPE, 1994); and
- *Canadian Marine Water Quality Guidelines* (CCME, 2001).

Based on a comparison of 95th percentile upper confidence levels of mean contaminant concentrations on the site, with the guidance provided in the above documents, the Applicant established that the following contaminants required further consideration in the context of groundwater quality:

- benzene;
- chlorinated benzenes;
- phenols;

- DDT (including DDE and DDD);
- polycyclic aromatic hydrocarbons (PAHs);
- dioxins and furans; and
- other contaminants that have not been well characterised on the site, including those already identified through human health and amenity considerations.

*Human Health Risk Assessment*

The Applicant established that there would be background concentrations of contaminants that should be taken into consideration as part of the assessment of human health risks. In particular:

- background intake of dioxins has been set at 1.4 pg TEQkg<sup>-1</sup> (body weight), based on investigations in New Zealand into mean average lifetime daily exposures;
- an assumption that 90% of the exposure to naphthalene occurs from background sources; and
- 1,2,3,4-tetrachlorobenzene and hexachlorobenzene occur at very low concentrations in the urban environment, and as such, background levels can be assumed to be negligible.

A number of exposure scenarios were considered in the Environmental Impact Statement, based on possible receptors and likely exposure routes. The scenarios considered are summarised in Table 2 below.

**Table 2- Exposure Scenarios Considered (Human Health)**

Receptor	Location	Soil Depth	Exposure Pathway(s)
Residents	Under building	Surface soils (<1m) relative to building foundation	Indoor inhalation
Commercial worker	Under building	Surface soils (<1m) relative to building foundation	Indoor inhalation
Commercial worker (car park attendant)	Under building with basement	Surface soils (<1m) relative to building foundation	Indoor inhalation
Recreational User	Open space	Surface soils (<1m)	Outdoor inhalation Oral ingestion Dermal contact
		Subsurface soils (>1m, <5m)	Outdoor inhalation
		Deep soils (>5m)	Outdoor inhalation
Ground maintenance worker	Open space	Surface soils (<1m)	Outdoor inhalation Oral ingestion Dermal contact
		Subsurface soils (>1m, <5m)	Outdoor inhalation
		Deep soils (>5m)	Outdoor inhalation
Intrusive maintenance worker	Under building	Surface soils (<1m) relative to building foundation	Trench inhalation Oral ingestion Dermal contact
	Open space	Surface soils (<1m) and subsurface soils (>1m)	Trench inhalation Oral ingestion Dermal contact

Based on consideration of these scenarios, the Applicant calculated the maximum allowable concentration of key pollutants of concern in relation for human health in order that an incremental lifetime cancer risk of 3.5 x 10<sup>-6</sup> not be exceeded. For threshold pollutants and

dioxins, hazard indices were also taken into account. The Applicant notes that in the case of benzo(a)pyrene, this compound (representing all PAHs) does not determine the limiting remediation outcome in a number of cases. Calculated clean-up criteria for the protection of human health are reproduced below. Where multiple criteria were calculated for a single land use, the most stringent criterion was chosen.

**Table 3 - Soil Clean-Up Criteria (Human Health)**

Land Use	1,2,3,4-TCB (mgkg <sup>-1</sup> )	Dioxins (TEQ) (mgkg <sup>-1</sup> )	Naphthalene (mgkg <sup>-1</sup> )	HCB (mgkg <sup>-1</sup> )	Benzo(a)pyrene (TEQ) (mgkg <sup>-1</sup> )		
					1 x 10 <sup>-6</sup> (risk)	1 x 10 <sup>-5</sup> (risk)	3.5 x 10 <sup>-6</sup> (risk)
High density residential (no basement)	26.4	3.8 x 10 <sup>-4</sup>	0.32	6.5	4,260	42,600	14,190
Commercial (no basement)	1,060	1.5 x 10 <sup>-2</sup>	77.9	261	Not limiting	Not limiting	Not limiting
Building with basement carpark	2,830	4.0 x 10 <sup>-2</sup>	208	697	Not limiting	Not limiting	Not limiting
Open space (<1m)	160	8.5 x 10 <sup>-5</sup>	2.3	7.6	0.40	4.0	1.4
Open space (>1m)	1,130	1.6 x 10 <sup>-2</sup>	13.7	274	Not limiting	Not limiting	Not limiting
Open space (>5m)	13,200	0.085	138	3,020	Not limiting	Not limiting	Not limiting
Underground services	11.7	1.6 x 10 <sup>-4</sup>	0.88	2.9	427	4,270	1,495

*Odour Considerations*

To ensure that the remediated site will not generate a significant odour impact, the Applicant considered appropriate clean-up criteria to protect local amenity. Odour generation and dispersion was modelled, taking into consideration odour thresholds of relevant contaminants and volatilisation of contaminants from soils. Clean-up criteria determined to meet odour criteria for potential future residential receptors on the site are reproduced below. The Applicant highlights that the clean-up criteria for some pollutants based on odour impacts would be below those concentrations necessary to protect human health. These lower criteria should be applied in preference to those derived on a health basis.

**Table 4 - Soil Clean-Up Criteria (Odour)**

Contaminant	Residential (mgkg <sup>-1</sup> )	Commercial (mgkg <sup>-1</sup> )	Buildings with Carparks (mgkg <sup>-1</sup> )	Open Space (mgkg <sup>-1</sup> )		
				Surface Soil	>1metre	>5 metres
Ammonia	57	258	688	25	250	4,490
Aniline	31,000	136,800	371,400	13,700	Not limiting	Not limiting
2-chlorophenol	3.9	18	46	1.7	17	163
1,4-dichlorobenzene	54	244	652	24	236	2,730
Ethylbenzene	0.41	1.9	5.0	0.18	1.8	22
Methyl Ethyl Ketone	597	2,680	7,200	260	2,600	49,200
Naphthalene	263	1,180	3,160	114	1,140	11,600
Nitrobenzene	10	47	124	4.5	47	362
Pyridine	7.2	33	87	3.1	32	420

Xylenes	13	60	160	5.8	58	700
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### Groundwater Considerations

Clean-up criteria were also considered in relation for the potential to leach from the site and cause an environmental impact (ecological risk). Criteria based on groundwater considerations are reproduced below.

**Table 5 - Soil Clean-Up Criteria (Groundwater)**

Contaminant	Criteria (mgkg <sup>-1</sup> )
Chlorobenzene	0.8
1,4-dichlorobenzene	2
1,2-dichlorobenzene	4
1,2,3-trichlorobenzene	-
1,2,4-trichlorobenzene	8
1,3,5-trichlorobenzene	150
1,2,3,5-tetrachlorobenzene	1
1,2,4,5-tetrachlorobenzene	2
1,2,3,4-tetrachlorobenzene	1
Pentachlorobenzene	8
Hexachlorobenzene	0.3
Phenol	1
3-chlorophenol	0.1
4-chlorophenol	6
2,4-dichlorophenol	2
3,4-dichlorophenol	-
2,3,5-trichlorophenol	0.4
2,3,5,6-tetrachlorophenol	4
Pentachlorophenol	-
Naphthalene	5
Phenanthrene	0.6
Anthracene	0.6
Fluoranthene	9
Benzo(a)pyrene	12
DDE	0.1
DDD	0.6
DDT	2
Dioxins/ furans	0.003

### Issues Raised in Submissions

Human health impacts represent the most frequently raised issue of concern in submissions, with **36.4%** of all issues raised relating to human health impacts. Submissions focus on the on-going human health risks of the remediated site, and to a much lesser degree, health risks attributable to the remediation process itself. Key issues raised in relation to human health impacts are:

- concern in relation to the human health impacts of the excavation and remediation processes (**2.4%**), particularly:
  - fallout of dust on surrounding land uses, and associated health implications, including in relation to cultivation of produce and exceedence of 85 ppt dioxins at residential properties
  - general concern about the impacts on human health, include residential receptors, workers and train commuters, and the introduction of an emissions source with potential health implications
- opposition to the application of assumed background dioxin intake and dioxin body burden values considered not representative of the subject location (**12.0%**)

- the use of New Zealand data as representative of background dioxin intake for the Sydney region is not supported;
- background dioxin intakes and existing body burdens should be established for Sydney, taking into account historical exposures, consumption of fish from Sydney Harbour and factors such as obesity;
- the health risk assessment should be based on those groups most at risk, including those with 99.99th percentile body burdens;
- the impact on foetal development of the body burden of pregnant women or the impact of breast-feeding is not adequately considered;
- the exact extent of contamination of Homebush Bay is not known and is not reflected in the health risk assessment;
- there is no recognition of existing health problems caused by previous remediation proposals in the area;
- the health risk assessment does not take into account consumption of fish and the dioxin loads likely to be associated with fish from Sydney Harbour (**3.7%**):
  - greater consideration needs to be given to the additional dioxin intake from eating locally caught fish and the dioxin loads of those fish
  - no allowance is made for inadvertent or intentional breaches of a fishing ban in Homebush Bay if it is retained
  - the scope of works will not allow the removal of the health-based commercial fin fishing ban
- concern in relation to the extent of remediation and the level of clean-up achieved (**12.0%**)
  - public space should be remediated to an appropriate standard, including an additional safety margin
  - lead contaminated sediments off the former Orica site pose a significant risk of harm
  - more of Homebush Bay needs to be clean-up, including any hotspots
  - Homebush Bay is used for a number of recreational water activities. Water may be ingested, sediments contact, or sediments stirred up by boat propellers. The remediation will leave parts of the Bay unsuitable for recreational use
  - there needs to be more investigation of the possible health risks of the various chemicals left at depth
  - the method of layering soils of different contaminant concentrations is acceptable, provided there are no side-effects for future residents
- general concern with the quality, scope and content of the human health risk assessment (**5.3%**)
  - the risk assessment is difficult to understand, particularly in relation to the derivation of equivalent surface risk for each chemical
  - non-cancer effects have not been adequately considered in the risk assessment
  - there is no analysis of the sensitivity of the risk assessment to changes in assumptions, other than the separate scenario for a toddler
  - the risk assessment has not included changes in standards for dioxin intake.
- there are inconsistencies between the health risk assessments for the two remediation proposals on the Rhodes Peninsula (**1.0%**)

### **Department's Position**

#### ***Air Quality Health Impacts (Operation)***

The Department is generally satisfied that the Applicant has applied an appropriate methodology and assumptions to the consideration of human health impacts from the operation remediation proposal under normal operating conditions. The predicted incremental life time cancer risk of  $3 \times 10^{-7}$  lies below the accepted criterion of  $1 \times 10^{-6}$ , and as such, the proposed remediation could be undertaken within acceptable human health limits (for off-site receptors during normal operations). From risk contours presented in the Environmental Impact Statement, it is evident that the worst-case human health risk occurs at the south-

eastern and western site boundaries. For the nearest existing residential receptors in Rhodes, the predicted risk impact is slightly less, being of the order of  $1 \times 10^{-7}$ .

In relation to non-cancer health risks, the Department notes that the Applicant has demonstrated that the aggregate of hazard quotients is of the order of 0.5 at the site boundary (and less than 0.2 at the nearest existing residential area). This aggregate lies below 1.0, suggesting that the operation of the proposal remediation works would not generate a significant potential for off-site adverse (non-cancer) health effects. The Department notes concerns raised in submissions that health risk assessment has focused on cancer risk and not provided adequate consideration of other health implications of contaminants that may be emitted from the site. The Department is satisfied that this matter has been duly and appropriately addressed in the Environmental Impact Statement with consideration of threshold chemicals and the calculation of hazard quotients.

One matter the Department considers has not been fully and adequately addressed is the potential for an incident on the site to generate a significant health impact. The Preliminary Hazard Analysis (PHA) details a number of potential incidents on the site, and considers the potential for these incidents to cause an acute off-site impact (that is, fatality, injury or irritation over a short time frame). Equally, the human health risk assessment considers the operation of the proposed development under normal conditions and the consequent chronic health impacts (that is, longer-term health implications). However, there has been no consideration of the potential for an incident on the site to cause a chronic health impact. While an incident may not cause an unacceptable fatality, injury or irritation risk, there is potential for the release of contaminated materials during such an incident to pose a long-term impact. Therefore, the Department considers that the Applicant must provide further consideration of potential abnormal operations on the site (including, for example, failure of pollution control equipment or failure of coffer dam walls/ silt curtains) to cause a human health impact. Importantly, an assessment of the consequences of these types of incidents must be provided, with details of the likely frequency of an incident if there is potential for a significant consequence at the site boundary.

#### ***On-Going Health Impacts (Clean-Up Criteria)***

The Department considers that the Applicant has applied a reasonable approach to the derivation of clean-up criteria for the site to ensure consistency with the land uses permitted under *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula*.

The Department is satisfied with the assumptions made by the Applicant in relation to dioxin body burdens and background dioxin intakes. This position is based on advice from the EPA and NSW Health in relation to the acceptability of criteria applied. The Department considers that the application of New Zealand data is reasonable in this case, given the absence of comprehensive data for Australia or the Sydney region.

In relation to matters associated with the consumption of fish, fishing and existing fishing bans in the Homebush Bay area, the Department notes that the Environmental Impact Statement provides detailed consideration of dioxin ingestion pathways associated with the consumption of fish from Sydney Harbour. While the proposed remediation works will improve water conditions, and will assist in reducing dioxin loads in fish in the area, the Department highlights that dioxin loads in fish will not automatically drop as a result of the remediation. Rather, there will need to be a period of existing load attenuation. This situation will be carefully monitored by Government, and based on advice from NSW Fisheries, fishing bans would remain in place until such time as the level of risk drops to an acceptable level.

The Department is satisfied with the sensitivity analysis undertaken by the Applicant in relation to the derivation of health risk based clean-up criteria. The Applicant has demonstrated that overall the human health risk is conservative in its assumptions and results.

### **Contaminant Screening**

The Department considers that the Applicant has not provided sufficient justification for its approach to the application of PRG values as part of the contaminant screening process. In particular, the Applicant has not justified the assumption that a life time cancer risk of  $1 \times 10^{-5}$  is acceptable, given that the criterion applied as a standard in NSW is  $1 \times 10^{-6}$ . Following from this, the application of adjustment factors of 3.5 to PRG values has not been adequately justified. The net affect of the application of these factors may be that some contaminants were screened out of further assessment where additional health implications may result, and the application of a less stringent risk criterion may have generated clean-up criteria above what would be considered appropriate for the on-going protection of human health. The Department requires that the Applicant provide further information to address these issues, either through an appropriate justification of these key assumptions, or by updating the health risk assessment with more stringent risk criteria.

### **Conclusion**

The Department is satisfied with the approach taken in relation to the assessment of human health risks associated with the proposed remediation, both during operation and in an on-going context. The proposed development would not, in principle, pose a significant human health risk. This position, however, is based on clarification and justification of a number of assumptions applies to the risk assessment, and an appropriate level of assessment of health risks that may be generated by abnormal operations on the site.

## **5.2 Impacts on Soil and Groundwater**

### **Applicant's Position**

#### **Existing Levels of Contamination**

The Applicant highlights that the EPA has applied a notice under the *Contaminated Land Management Act 1997* to part of the area to which the subject development application applies. In particular, the notice relates only to areas of the bed of Homebush Bay, and exclusively to dioxin contamination. The notice tags the applicable area as posing a significant risk of harm. Notwithstanding that the same or similar notice does not apply to other contaminants nor does it apply to the dry land component of the proposal, these contaminants and land areas still pose an environmental and public health concern. In its unremediated state, the dry land component of the proposal would continue to pose a risk of further contamination or recontamination of Homebush Bay and would be inconsistent with the permissible land uses under *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* should the land be redevelopment.

The Environmental Impact Statement lists numerous studies that have been undertaken into the concentrations and distribution of contaminants in the Homebush Bay sediments and on the dry land component of the development. From these studies, the Applicant has been able to establish a solid picture of the contaminant loads in Bay sediments and in the dry land component of the development application area. Full details of contaminant loads across the site are provided in the Environmental Impact Statement.

#### **Clean-Up Criteria**

Based on an assessment of potential human health impacts, groundwater impacts and odour impacts posed by the remediation site, the Applicant established site clean-up criteria, as detailed in section 5.1 of this report.

#### **Acid Sulfate Soils**

The Applicant suggests that it is highly likely that acid sulfate soils would be encountered as part of the proposed remediation, particularly in the sediments removed from Homebush Bay.

As such, the Applicant intends to assume that all of the soils disturbed are acid sulfate soils and to undertake testing of soil samples for oxidisable sulphur.

Excavated materials would be classified based on the results of testing, and appropriately treated with lime before stockpiling of the materials. In the event that temporary storage of acid sulfate soils is required prior to treatment, the Applicant proposes to implement a management system including:

- regular monitoring of the pH of the stockpiles;
- collection and management of any waters that drain from the stockpiles;
- regular watering of stockpiles;
- maintaining a stock of lime on-site to be available to immediately balance pH conditions where acid conditions occur.

### Groundwater

The Environmental Impact Statement presents data in relation to contaminant concentrations in groundwater and seepage water established during investigations of the site in 1999. The results of these investigations are summarised in Table 6 below.

**Table 6 - Recorded Groundwater and Seepage Water Contaminant Concentrations**

Contaminant	Groundwater Concentration ( $\mu\text{gL}^{-1}$ )	Seepage Water Concentration ( $\mu\text{gL}^{-1}$ )	Assessment Criteria ( $\mu\text{gL}^{-1}$ )
Total petroleum hydrocarbons	up to 6,003	not detected	-
Naphthalene	up to 180	not detected	70
Benzo(a)pyrene	not detected	not detected	0.2
Total PAHs	up to 180	not detected	3
2,3-dichlorophenol	up to 160	not detected	31
Chlorobenzene	0.81 to 960	up to 0.22	55
Hexachlorobenzene	up to 0.65	not detected	0.1
1,2,3,4-tetrachlorobenzene	up to 580	up to 0.13	4
DDT	up to 1.5	up to 0.19	0.01
Dioxins (TEQ)	4 to $157 \times 10^{-6}$	up to $30 \times 10^{-6}$	$10 \times 10^{-6}$

The Applicant highlights that based on criteria established during the derivation of clean-up levels for the site, the existing concentrations of contaminants in groundwater under the site exceed levels protective of Homebush Bay.

The Applicant suggests that there are four key ways in which the proposed remediation could impact on the quality of groundwater:

- mobilisation of contaminants resulting from disturbance during excavation and removal of contaminated material;
- release of contamination to shallow groundwater during stockpiling or treatment of contaminated soil;
- discharge of contaminated water to the ground; and
- long-term migration of chemicals from reinstatement of materials

The Applicant suggests that there is limited potential for contaminants to be mobilised as a result of disturbance of soils during excavation due to the hydrophobic nature of most contaminants present on the site. Further, given the conditions likely to be experienced at excavation areas, the potential for colloidal particles with adsorbed contaminants to become suspended in solution is minimal. Notwithstanding, the Applicant highlights that dirty water that maybe generated during excavation, including as a result of possible dewatering activities, would be monitored and treated where necessary as part of the dirty water system for the site.

To ensure that stockpiles of contaminated soils do not release contaminants into underlying clean soil and groundwater, the Applicant intends to only store contaminant soil above other contaminated material. All dirty water collected from contaminated soil stockpiles would be directed to the dirty water system for management, monitoring and treatment where necessary. Collection basins forming part of the dirty water system would be lined with low permeability material.

The Applicant does not intend to discharge highly contaminated water to Homebush Bay. All potential dirty water would be retained and tested to ensure relevant water quality objectives were met prior to discharge of the water. The Applicant argues that provided water is monitored and managed effectively, there is minimal potential for a significant impact on groundwater and Homebush Bay.

In order to assess the potential for residual contamination on the site after remediation to migrate and impact on groundwater and Homebush Bay, the Applicant undertook contaminant transport modelling. The modelling included consideration of hydrophobic sorption effects, but did not include other processes including biological degradation, hydrolysis, other sorption reactions and volatilisation due to difficulties in simulating these processes accurately. The Applicant highlights that each of the process not included in the transport modelling act to attenuate contaminant concentrations, and the absence of these process from the modelling provides a highly conservative result. The results of the contaminant transport modelling suggest that:

- generally contaminants will migrate horizontally down the hydraulic gradient;
- in the case of the regrade borrow excavation area beneath Shoreline Avenue (through the centre of the site), contaminants will generally move upwards into shallow fill;
- the migration of most chemicals is not expected to extend more than 15 to 20 metres from the up-gradient contaminant source;
- breakthrough of naphthalene, chlorobenzene and phenol is expected at the sea wall from 2,800 years (phenol) to 80,000 years (naphthalene);
- maximum concentrations of naphthalene, chlorobenzene and phenol at the point of breakthrough are not expected until after more than 19,100 years (for phenol, the fastest migrating contaminant to breakthrough) and would not be expected to exceed concentrations of  $37\text{mgL}^{-1}$  for phenol,  $18\text{mgL}^{-1}$  for chlorobenzene and  $11\text{mgL}^{-1}$  for naphthalene.

The Applicant suggests that groundwater monitoring may be required after remediation to confirm the results of the modelling. It is also recommend that any redevelopment of the site not extend to the groundwater table (<0.5 metres AHD) to prevent preferential flow pathways for residual contaminants. As an additional precautionary measure, the Applicant suggests that a “clean” barrier be installed on the site along the sea wall comprising at least three metres of clean compacted clay and a high permeability zone of material such as crushed risk or aggregate immediately behind the seawall. With the application of these measure, and in light of the results of the contaminant transport modelling, the Applicant suggests that the remediated site poses a minimal risk to the environment through contaminant migration.

### **Issues Raised in Submissions**

A total of **1.4%** of issues raised in public submissions relate to impacts on soil and groundwater. These key issue raised in this regard relates to the site being geotechnically unsuitable for redevelopment once it has been remediated.

### **Department's Position**

#### ***Soil Contamination***

The Department notes that the aim of the proposed remediation is to reduce soil contaminant concentrations to an acceptable level, protective of human health, groundwater quality and

ecology. The net effect of the proposed remediation will be positive with respect to soil contamination.

### **Potential Redevelopment Configuration**

The derivation of clean-up criteria is based on the intended final use of the site for residential, open space and mixed uses, as permitted under *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula*. The Environmental Impact Statement provides proposed final site contours for the subject land based on a draft masterplan and redevelopment concept determined by the Applicant for the redevelopment works.

The Department highlights that at this stage, no masterplan for the site (or a development application for redevelopment of the land) has been lodged or approved. It is possible that the subject remediation proposal will be determined prior to lodgement and/ or determination of the masterplan and redevelopment applications by the Minister. In this case, the Department considers it important to generally specify the remediation outcomes relative to land uses, rather than specify the outcomes in a spatial context. This would provide an appropriate level of flexibility should the masterplan or redevelopment application be modified through the respective assessment processes. If the Minister determines to approve the proposed development, the Department recommends that the instrument of consent be drafted to reflect:

- a mechanism to link the placement of soils on the site consistent with an approved masterplan/ redevelopment proposal for the site;
- basic requirements for the placement of soils relative to the boundaries of the site, particularly the western boundary adjacent to Homebush Bay; and
- minimum requirements for the placement of soils relative to intended land uses, to be interpreted in the context of an approved masterplan/ redevelopment proposal for the site.

It is highlighted that this is a different approach than that taken during the assessment of the proposed remediation of the former Allied Feeds site. This is due to the fact that the Allied Feeds site would be remediated to a uniform level across the site. In the case of the subject remediation proposal, remediation will be conducted to varying degrees with soils of varying qualities placed to achieve relevant outcomes for a particular land use (with each land use having different requirements).

### **Management of Residual Contaminant Levels**

A key aspect of the Applicant's remediation proposal is the intended layering of soils on the site. In broad terms, the Applicant intends to place soils with the greatest contaminant loads at depth, with a decreasing contaminant concentration towards the soil surface (or proposed soil-building interface). Subject to resolution of outstanding matters associated with the consideration of human health impacts after remediation, this approach would achieve outcomes relative to the proposed land uses under which the soils are to be placed.

An inherent assumption applied to the assessment of on-going human health risks is that the soils, once placed on site, would not be disturbed or in some manner relocated to a position at which the relevant health and environmental outcomes were no longer achieved. It is possible that future excavation works or redevelopment of the site could disturb these materials. While the Department recognises that the potential for these types of activities is minimal in the short-term, there is potential for residual contaminants to be disturbed much further into the future.

To address this matter, the Department considers it of fundamental importance that a mechanism be put in place to alert relevant parties of two things:

1. that there is residual contamination buried at depth on the site, and the location of that residual contamination; and

2. a warning that the residual contamination should not be disturbed, or a direction that the residual contamination must not be disturbed.

Further to the requirement to “flag” that the site is the subject of some on-going contaminant load, the Department suggests that there may need to be a mechanism to identify possible on-going management requirements for the residual contaminant load, and to specify which party or parties is ultimately responsible for the issue.

The Department has held a number of meetings with the Applicant, the EPA and the landowner (Waterways Authority) to discuss this issue and potential mechanisms to achieve the desired outcome. While all parties are in general agreement that there needs to be a mechanism to “flag” the contamination at depth, the most appropriate mechanism has yet to be agreed. Discussions will continue between the Department, the EPA, the Applicant and the Waterways Authority with the aim of establishing which of a suite of options could and should be applied to provide an appropriate identification and notification mechanism. At this stage the Department reinforces that it intends to recommend to the Minister that should consent be granted, such a mechanism should be in place, whether it is imposed through the planning system or another appropriate avenue.

### **Acid Sulfate Soils**

The Department concurs with the Applicant’s observation that there is a high likelihood of acid sulfate soils being uncovered during excavation of the Homebush Bay sediments, and to a lesser degree, areas of the “dry land” component of the proposal. The proposed mitigation measures, including monitoring and management, presented in the Environmental Impact Statement are supported by the Department.

To reinforce the Applicant’s acid sulfate soil management and monitoring commitments, the Department would recommend that appropriately worded conditions be included in any development consent that may be issued by the Minister.

### **Groundwater**

The Department is satisfied that the Applicant has applied an appropriate methodology to the modelling and assessment of potential groundwater impacts. However, this position is based on the assumption that the site is remediated to an acceptable consistent with the clean-up criteria established for the site, and attainment of appropriate soil carbon content. The contaminant transport modelling is based on the assumption of adsorption of contaminants to carbon in the soil, effectively reducing the rate of movement of the contaminants. As such, the Department considers it critical that an adequate level of carbon in the remediated soil is established to ensure that modelling predictions are achieved in reality. The remediation process is likely to remove much of the organic carbon content of soils, and this carbon load must be replaced. The Applicant has not indicated how this will be achieved and must therefore demonstrate that appropriate measures will be implemented to address this issue.

There is a clear need for groundwater monitoring after completion of remediation of the subject site to confirm the predictions of the contaminant transport modelling. This could be required through conditions of consent, if the Minister determines to approve the proposed development. Equally, the Department considers that any consent should reflect the Applicant’s commitment to implementation of management measures to ensure that groundwater is not contaminated further during the remediation process (particularly excavation and soil handling activities).

The Department highlights that over time, the net effect of the proposed remediation on groundwater quality will be positive.

### **Geotechnical Suitability**

The Department notes that a submission received during the exhibition of the development application raises concern that the remediated soil will not be geotechnically suitable for redevelopment. The Department notes that the remediation technology would volatilise and decompose/ destroy soil contaminants. It is not considered likely that the technology would alter the fundamental soil matrix to such an extent to make it any less suitable for the support of structures than the soil in its current state. The geotechnical capability of the soil is, however, an important issue relevant to the possible redevelopment of the site. This issue would need to be appropriately assessed a part of any development application for redevelopment of the site.

### **Conclusion**

The Department is satisfied, in principle, that the proposed remediation will have a positive impact on soil and groundwater, provided the remediation works are appropriately and adequately managed. Outstanding matters that need to be clarified in relation to soil and groundwater are:

- details of how organic carbon loads in soil will be re-established; and
- details of any requirement to import soil to the site.

The Department is currently progressing discussions and investigations with the Applicant, the EPA and the Waterways Authority with the aim of establishing the most appropriate mechanism to identify residual contaminants on the site, and to prevent those contaminants from being disturbed in future. The outcome of these discussions and investigations is to be established prior to the determination of the development application.

## **5.3 Robustness of Proposed Remediation Technology**

### **Applicant's Position**

#### **Selection of Remediation Approach**

The Environmental Impact Statement presents the Applicant's consideration of possible strategies to address contamination of the site. The Applicant's review of options focussed on three key criteria:

- ability to achieve desired outcomes, in particular:
  - managing the types of contaminants that in the bay sediments and on the Lednez site;
  - reducing the on-going risk from sources of dioxin to human, aquatic and birdlife that use Homebush Bay;
  - ensuring remediation of the Lednez site;
  - using technologies with a proven track record;
  - using an experienced remediation team;
  - using reliable technology and contractors;
  - achieving long term performance.
- proposal efficiency, in particular:
  - achieving the proposal objectives within the budget allocated;
  - meeting regulatory approval requirements;
  - utilising efficient and effective rates of remediation;
  - ensuring compatibility with other technologies in the process stream;
  - ensuring compatibility with site conditions;
  - considering transportability of equipment and materials.
- proposal safety, including:
  - environmental performance of technology;
  - remediation risks;
  - emissions;
  - community, social and public acceptability.

Applying the general criteria listed above, five approaches to the remediation of the site were identified and considered by the Applicant, as presented in

**Table 7 - Evaluation of Remediation Options**

Option	Consideration of Potential Issues			
	Commercial	Environmental	Health	Ecological
Do nothing	<ul style="list-style-type: none"> <li>• Lowest cost</li> <li>• On-going maintenance cost</li> </ul>	<ul style="list-style-type: none"> <li>• On-going contamination</li> </ul>	<ul style="list-style-type: none"> <li>• On-going and proven risk</li> </ul>	<ul style="list-style-type: none"> <li>• On-going and proven risk</li> </ul>
Cap and cover within Bay	<ul style="list-style-type: none"> <li>• Relatively low cost</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance and monitoring of cap</li> <li>• Community acceptance may be low</li> <li>• Loss of Bay access</li> </ul>	<ul style="list-style-type: none"> <li>• Minimised through limited exposure pathway</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced availability of contaminated food</li> </ul>
In-situ treatment of immobilisation	<ul style="list-style-type: none"> <li>• Uncertain cost</li> </ul>	<ul style="list-style-type: none"> <li>• Monitoring for leaching/leakage</li> <li>• Potential acid sulfate soils</li> <li>• Effects on fish and benthic population</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced risk of leaching</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced availability of contaminated food</li> </ul>
Removal of sediment with storage on land	<ul style="list-style-type: none"> <li>• Moderate cost</li> <li>• On-going maintenance and monitoring costs</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance and monitoring</li> <li>• Community acceptance may be low</li> <li>• Potential transfer of contaminants through dredging</li> </ul>	<ul style="list-style-type: none"> <li>• Health risks associated with removal</li> </ul>	<ul style="list-style-type: none"> <li>• Long term risk reduced as significant proportion of contaminants removed</li> </ul>
Removal of sediment with treatment and reuse on land	<ul style="list-style-type: none"> <li>• High cost</li> </ul>	<ul style="list-style-type: none"> <li>• Potential transfer of contaminants through dredging</li> <li>• Effects on fish and benthic population during operation</li> <li>• Potential acid sulfate soils</li> </ul>	<ul style="list-style-type: none"> <li>• Significant reduction in long-term health risks</li> </ul>	<ul style="list-style-type: none"> <li>• Long term risk reduced as significant proportion of contaminants destroyed</li> </ul>

Based on its consideration of remediation approaches, the Applicant considers that to do nothing is not appropriate and would not achieved the desired outcomes of the remediation proposal.

While capping and containing the contaminants represents a low capital cost proposal, the Applicant notes that the there is an on-going cost associated with the monitoring and management of the containment cell. Further, there may be an associated public perception that contaminants are leaching from the cell. In reality this may be the case if the containment cell were not appropriately and adequately engineered. As such, the Applicant does not consider that capping and containing contaminated material is an appropriate option. The Applicant notes that similar issues would arise with storage and immobilisation.

In relation to treatment of contaminated material, the Applicant notes that this may be undertaken in-situ, ex-situ on the dry land component of the proposed development site, or the contaminated material may be transported elsewhere for treatment. The Applicant does not support the treatment of the material off-site as this essentially moving the problem elsewhere and would generate additional risks due to the transport of the material, particularly if it were to

travel through residential areas. In relation to in-situ treatment, the Applicant suggests that in-situ treatment options are currently not commercially or technically proven.

The Applicant's preferred option is the excavation of contaminated material and treatment on the proposed development site. Although this option is more capital intensive than other options considered, the Applicant highlights that this option would facilitate clean-up for the site for possible redevelopment and would not involve on-going risks and costs associated with containment and monitoring of contaminants. The Applicant suggests that this approach is also supported by the National Health and Medical Research Council (NH&MRC).

### **Selection of Remediation Technology**

Having established that the preferred remediation approach would involve removal and treatment of contaminated on-site, the Applicant further considered technologies available to remediate the soils/ sediments. Consideration of technologies focussed on a number of primary factors:

- contaminants to be addressed;
- implementation status of the technology;
- achievement of project objectives;
- track record on similar projects;
- regulatory approval;
- public acceptability/ opinion;
- safety;
- cost.

Secondary factors also considered by the Applicant in its consideration of possible remediation technologies were:

- quantity of soil/ sediment to be treated;
- materials handling issues;
- rates of remediation;
- reliability of the technology;
- long-term performance;
- remediation risks;
- emissions; and
- availability of the remediation equipment.

The possible remediation technologies considered by the Applicant included:

- Bioremediation – has not been demonstrated on a commercial scale for the treatment of dioxin-contaminated materials.
- Dechlorination – while this technology has been used to successfully destroy dioxins in the past, problems exist with the application of the technology directly to soils. Dechlorination may be an option if combined with another technology as a pre-treatment step.
- Gasification – gasification technology has yet to be proven on dioxin-contaminated soils, and has yet to be tested or commercialised in Australia.
- Incineration – this technology has been widely used to treat dioxin waste in a cost-efficient and effective manner. However, public opinion and Government policy make this technology an unviable option.
- Molten media process – chlorinated compounds, such as those characterising the proposed remediation site, cannot be treated effectively with molten media technology.
- Plasma arc (including an associated indirect heated thermal desorption unit) – there are a number of disadvantages associated with plasma arc technology including extremely high cost, few examples of effective treatment of dioxins, lack of commercial availability and similarities with incineration (which may generate public opposition).

- Solvated electron process – trials of this technology have not progressed sufficiently, with unverified trials having been conducted in the United States and not in Australia.
- Stabilisation/ solidification – this approach has been demonstrated as effective in the past, but the final volume of treated material would be significant and may require some off-site disposal. Further, the final concentrations of contaminants may exceed relevant criteria for some compounds and consequently could not be backfilled on-site.
- Supercritical water oxidation – this technology has been successfully trialed, but not on soils or sediments.
- Thermal desorption – this technology has been successfully implemented and demonstrated on more than 70 sites across the United States. Destruction efficiencies are high (greater than 99.9999%), although the technology itself can be expensive (although not prohibitively so).
- Vitrification – this technology has been tested and approved at both laboratory and commercial scales in the United States, but not operated on a commercial scale in Australia. The vitrified product would make redevelopment of the site difficult for residential land uses with basements as recommended in the Development Control Plan for the Rhodes Peninsula.

Based on the above consideration, the Applicant has established thermal desorption as the preferred remediation technology for the subject development site. The Applicant notes that this technology can be applied in two forms: direct thermal desorption, and indirect thermal desorption. A comparison of these two technology configurations is provided in

**Table 8 - Comparison of Direct and Indirect Heated Thermal Desorption**

Parameter	Direct Heated	Indirect Heated
Common design types	Rotary kiln	Rotary kiln and thermal screw
Maximum soil temperature	800°C	500°C
Feed contaminant concentrations	<2 to 4%	<40%
Contaminant fate	Destroyed in afterburner	Captured. Further treatment step required
Heat transfer	Efficient	Inefficient
Processing rate	30 to 50 tonnes per hour	5 to 20 tonnes per hour
Cost per tonne to treat	\$100	\$200
Potential Emission Rates		
Difficult organics	Low	Very low
Dioxins	Low	Very low
Particulates	Very low	Very low
Carbon monoxide	Very low	Very low
Total hydrocarbons	Very low	Very low
Residuals for further treatment/ disposal	None	High
Cost	Moderate	High

The Applicant has selected indirect thermal desorption technology as the preferred option for the remediation of soils on the site. It is proposed that the liquid waste stream generated by the technology would be transported to a Based Catalysed Desorption (BCD) system at Narangba in Queensland for treatment (the only existing option in Australia). Should treatment at Narangba not be viable, the Applicant suggests that the liquid waste could be treated through a similar BCD plant established on the proposed remediation site.

**Robustness of Proposed Technology**

The Environmental Impact Statement provides a general list of remediation projects for which thermal desorption technology has been employed, and lists remediation projects conducted by the Applicant. No detailed information is provided in the Environmental Impact Statement

to demonstrated that indirect thermal desorption is a robust technology and that it is capable of achieving desired remediation outcomes. There is, however, anecdotal evidence provided that suggests that similar types of contaminants have been successfully treated with the proposed remediation technology in the past.

### **Issues Raised in Submissions**

The issue of technology selection and robustness was raised **3.3%** of the time in public submissions. Only one submission objected to the use of indirect thermal desorption technology. All other submissions support the use of the proposed technology, and in the case of the submission from the Sydney Olympic Park Authority (SOPA), comment was made that the technology had successfully remediated land at Sydney Olympic Park. In particular, SOPA highlighted that schedule X wastes had been remediated, with contaminants of the order of 900,000 ppm having been reduced to less than 50 ppm.

### **Department's Position**

#### ***Selection of Remediation Approach***

The Department supports, in principle, the Applicant's position that the treatment of contaminated soils on the site is the most appropriate alternative for the remediation of the site.

The "do nothing" option is not considered appropriate. Such an approach is inconsistent with the principles of sustainable development and would not address the issue of parts of the site currently presenting a "significant risk of harm" (indicated by a notice under the *Contaminated Land Management Act 1997*). Equally, by not addressing the contamination of the site, the land to be remediated remains in a state that is not appropriate for future use. Remediation of the site to an appropriate standard would allow the value of the site for industrial, or in this case residential, open space and mixed use, to be realised. This is particularly important given the site's location along the foreshore of Sydney Harbour. Similarly, the Department considers that stabilisation or containment of the contaminated material on the site is inappropriate. While these approaches may address the issue of the site posing a "significant risk of harm", there is no assurance that the site will not become an issue in future (for example as a result of containment failure). Should such a situation occur with development on the site, the resultant impacts could be significant.

The Department does not support the movement of the contaminated soil off-site for treatment elsewhere. Where an on-site treatment alternative exists that can be implemented within appropriate environmental and safety limits, the Department considers that the preferred approach should be on-site treatment. The movement of contaminated soil introduces additional risk factors that could be potentially more complex to manage, including the potential for road accidents, and potential conflicts with sensitive land uses and traffic that may exist along, or utilise, haulage routes. Further, off-site treatment is essentially moving the problem of soil remediation elsewhere, which unless significantly more remote and significantly less environmentally sensitive than the subject site, would generate similar environmental impact issues as on-site treatment (thereby achieving no particular advantage).

In short, the Department concurs with the Applicant's conclusion that on-site treatment of contaminated soil is the most appropriate alternative for the long-term management of the site. Provided the proposed treatment technology is capable of meeting relevant environmental and risk impact criteria, the Department is satisfied that treatment of contaminated soil on-site is an appropriate management option.

#### ***Selection of Remediation Technology***

The Department is satisfied that the Applicant has applied a reasonable screening and assessment process to potential treatment technologies for the proposed remediation. The screening process applied by the Applicant appears to be balanced in its approach with

consideration of public opinion, environmental impacts and ecological values as well as commercial considerations. The Department notes that the Applicant's choice of indirect thermal desorption, while not representing the lowest capital and processing cost, is likely to achieve lower air emissions than other technologies considered.

A potential negative factor associated with the proposed treatment technology is the generation of a waste stream that must be appropriately treated. The Applicant's preferred option for the management of this waste stream is to transport the waste off-site for treatment in Queensland. While the Department has highlighted that the transportation of hazardous materials introduces additional risks that must be fully considered, it is the Applicant's responsibility to demonstrate that these risks lie within acceptable limits. Should the environmental impacts associated with the transport of this waste stream, or the practicalities of the transport of the waste and treatment in Queensland, prevent this management option being pursued, it is noted that the Applicant intends to pursue on-site treatment with Base Catalysed Dechlorination technology. An appropriately level of environmental impact assessment would need to be applied to such an option.

It is not apparent from the information provided by the Applicant as to the exact basis on which the decision to employ indirect heated thermal desorption, rather than a direct heated process has been based. The Department notes that while the preferred remediation technology is more expensive than its direct heated counterpart, information in the Environmental Impact Statement suggests that it has a broader applicability to higher contaminant loads with reduced air emissions. From submissions received in response to the exhibition of the development application, it would seem that the use of indirect heated thermal desorption has a high level of community support.

Overall the Department considers that the ultimate aim of the technology selection process has been met. That is, the Applicant has managed to establish thermal desorption generally, and indirect heated thermal desorption specifically, as the preferred treatment option for the remediation proposal.

**Robustness of Proposed Technology**

While the Environmental Impact Statement provides general comment on instances in which the remediation technology has been successfully applied to contaminated sites, it fails to provide supporting evidence to support these claims.

Consideration and comparison of direct and indirect thermal desorption technology was presented in detail at the Commission of Inquiry into the proposed remediation of the adjacent, former Allied Feeds site. At that Inquiry, the Department presented a review of the proposed direct thermal desorption technology undertaken by an independent expert contracted by the Department. To address issues raised in public submissions that indirect thermal desorption technology is preferable to the direct heated configuration, the independent expert provided general comment on the applicability of both technologies. The independent expert suggested that either technology configuration has the capability to achieve desired remediation and environmental outcomes, and provided the following outline of the design parameters for the indirect thermal desorption option (and compared these with the equivalent for direct thermal desorption).

**Table 9 - General Design Parameters for Indirect Thermal Desorption**

System Parameter	Design Constraints
Soil types	Sand, silt, clay, gravel
Feed size	2" topsize (50 mm), although indirect heated thermal desorption may require screening to a smaller size
Moisture content	Up to 30%. Indirect heated thermal desorption can go higher, but will lose capacity with higher water content
Feed organic concentration	50%. Indirect heated thermal desorption has been used to treat 50% by

	weight diesel fuel drilling mud
Types of organics	Gasoline, jet fuel, diesel, through No. 6 oil, PAHs chlorinated waste. Higher concentrations of chlorinated waste require corrosion protection for indirect heated thermal desorption.
Maximum soil temperature	482 to 537°C. Temperatures above 510°C are rarely required or used
Treated soil residue	Less than 1 ppm individual organic compounds. Organics in treated soil vary with product soil temperature, matrix, feed concentration and boiling point. Indirect heated thermal desorption has passed requirements on multiple sites.
Capacity	Up to 20 tonnes per hour with pre-dryer, 7 to 10 tonnes per annum without pre-dryer
Air pollution control system	Condensers, oil coalescing mist eliminators, oxidiser, flare or activated carbon to polish final vent gas. Indirect thermal desorption carbon use is high for high concentration waste
Stack volume	Very low. Proportional to plant capacity.
Stack emissions	Meets requirements. Stack requirements may differ on a mass basis relative to dispersion for indirect heated thermal desorption.
Explosion potential	Higher than direct heated thermal desorption because indirect heated thermal desorption has a rich, hot gas mixture
Cost	High

The Department is satisfied, in principle, that indirect heated thermal desorption technology could be applied to the proposed remediation and achieve appropriate remediation outcomes.

However, it is recognised that each remediation site is unique and that it is not possible to conclusively predict the exact outcomes of the application of the preferred remediation technology on the subject site. From consideration of the design parameters of the remediation technology it has been possible to establish that, in principle, the technology could achieve an appropriate outcome. The Department considers, however, that due to the uniqueness of the site, a precautionary approach should be applied to the remediation. As recommended for the proposed remediation of the adjacent former Allied Feeds site, the Department recommends that a staged commissioning approach be applied. Commissioning should be staged to demonstrate that at increasing contaminant loads, and for the variety of soils and contaminants that are present on the proposed remediation site, the technology could achieve appropriate environmental and safety performance in practice. This demonstration would also provide a level of comfort to the community and demonstrate appropriate performance under conditions with minimal potential for health and environmental impacts before permitted the remediation technology to operate at intended maximum capacity.

At this stage the Applicant has not provided details of how commissioning of the technology could be undertaken. This matter could be resolved through conditions of consent if the Minister determines to approve the proposal. However, the Department considers it appropriate for this matter to be explored further as part of the Commission of Inquiry and for the basic framework of a staged commissioning program to be development. This approach would afford the community and interested parties the opportunity to comment on, and input into, the development of a staged commissioning program.

**Base Catalysed Dechlorination**

The Department accepts the Applicant’s proposal to transport liquid waste to Queensland for treatment, subject to resolution of outstanding risk and waste management issues detailed in sections 5.8 and 5.7 of this report.

A key concern highlighted by the Department is the feasibility of treatment of the waste at the existing BCD facility at Narangba in Queensland. At this stage the Applicant has not provided evidence that the operator of the Narangba facility is willing or capable of accepting the liquid

waste stream. An important consideration in this regard is any necessary approval that may be required from the Queensland EPA for this treatment option could be implemented.

A risk associated with the Applicant's proposal to treat liquid waste in Queensland is that the operator of the BCD facility or the Queensland EPA could refuse to endorse the preferred treatment approach. In this case the Applicant intends to pursue the application of similar technology on the proposed remediation site. However, the Environmental Impact Statement does not provide a full assessment of the on-site BCD option, and in the absence of this information the Department could not support approval of a BCD contingency plan for the site. This matter must be resolved by the Applicant by:

- the Narangba BCD facility being able to and willing to accept and process the liquid waste stream; and/ or
- a demonstration that a BCD facility could be constructed and operated on the proposed remediation site within acceptable environmental limits.

### **Conclusions**

The Department concludes that the proposed technology is capable, in principle, of achieving the desired remediation outcomes. There is also need to develop a staged commissioning program for the proposed development (preferably through the Commission of Inquiry process), to provide a mechanism to demonstrate that the technology could be operated to meet remediation and environmental outcomes.

Further information/ clarification is also required from the Applicant to demonstrate that an appropriate option(s) exists for the management and treatment of the liquid waste stream generated by the remediation technology.

## **5.4 Air Quality Impacts**

### **Applicant's Position**

This section of the Department's primary submission focuses on the short-term impacts of air emissions on the region and the locality, the longer-term global implications of air emissions (greenhouse gases). Longer-term, chronic impacts associated with flow-on human health effects (cancer risk) are assessed in section 5.1 of this report.

### **Dust Generation (Non-Process)**

The Applicant highlights that dust emissions from the proposed remediation will be at a maximum during stages 2 and 3 of the proposal. Annual dust loads emitted from excavation and soil handling activities on the site during these stages using emission factors established by the US EPA and National Energy Research and Demonstration Centre (NERDC). Predicted dust emissions are presented in the table below.

**Table 10 - Estimated Annual Dust Emissions**

Activity	Dust Emissions (kgyr <sup>-1</sup> )	
	Stage 2	Stage 3
Vehicles moving on unpaved areas	38,245	30,451
Wind erosion from exposed areas	2,943	2,943
Loading from and dumping to stockpiles	1,158	1,158
Excavation	327	327
<b>Total</b>	<b>42,673</b>	<b>34,878</b>

The Applicant undertook air quality modelling of dust emissions from excavation and soil handling activities, taking into account predicted dust emissions from the site and local

meteorological conditions. The results of this modelling are presented below with relevant dust criteria provided for comparison.

**Table 11 - Predicted Dust Impacts From Excavation and Soil Handling Activities**

Particulate Measure	Background	Stage 2	Stage 3	Criteria
PM <sub>10</sub> (24-hour maximum) (µgm <sup>-3</sup> )	-	37	24	50
PM <sub>10</sub> (annual average) (µgm <sup>-3</sup> )	17	6	4	30
TSP (annual average) (µgm <sup>-3</sup> )	40	12	8	90
PM <sub>2.5</sub> (annual average) (µgm <sup>-3</sup> )	10	0.8	0.6	-
Deposition (gm <sup>-1</sup> month <sup>-1</sup> )	≈ 2	0.5	0.4	4

From the information provided above, the Applicant highlights that dust impacts are generally low. This is primarily because the soil being excavated is characterised by a high moisture content. Dust emissions are dominated by the movement of vehicles moving on unpaved areas.

In the case of maximum 24-hour concentrations of the PM<sub>10</sub> dust fraction, the Applicant notes elevated predicted concentrations. Further assessment of PM<sub>10</sub> (24-hour) dust concentrations were considered for receptors in the area. The Applicant notes from this consideration that exceedences of the 24-hour PM<sub>10</sub> criterion could be experienced at the currently-vacant Statewide site, to the south of the proposed remediation site. In the event that this site become occupied during the remediation works, the Applicant suggests that additional dust mitigation measures may be required.

**Emissions Characterisation (Remediation Process)**

The Environmental Impact Statement suggests that emissions from the indirect thermal treatment stack would be as provided in Table 12 below.

**Table 12 - Indirect Thermal Treatment Plan Stack Emissions Characteristics**

Pollutant	Concentration (gNm <sup>-3</sup> )	Emission Rate (gs <sup>-1</sup> )
NO <sub>x</sub>	0.07	0.21
CO	0.003	0.012
PM <sub>10</sub>	0.054	0.162
SO <sub>2</sub>	0.0024	0.007
HCl	0.14	0.42
Chlorine	-	-
PAHs	1.74 x 10 <sup>-7</sup>	4.36 x 10 <sup>-7</sup>
Dioxins and furans (TEQ)	2.43 x 10 <sup>-13</sup>	7.27 x 10 <sup>-13</sup>
Benzene	3.39 x 10 <sup>-6</sup>	1.01 x 10 <sup>-5</sup>
Chlorobenzene	4.89 x 10 <sup>-6</sup>	1.46 x 10 <sup>-5</sup>
Dichlorobenzene	6.39 x 10 <sup>-6</sup>	1.95 x 10 <sup>-5</sup>
Phenol	1.74 x 10 <sup>-7</sup>	5.2 x 10 <sup>-7</sup>

**Air Quality Modelling and Assessment**

The Applicant modelled the air quality performance of the proposed development during operation, based on estimated emissions concentrations and employing local meteorological data and background pollutant concentrations. The maximum predicted ground-level concentrations of air emissions are reproduced in Table 13 below, with relevant ambient air quality criteria included for reference. In some cases, criteria are expressed in terms of lifetime risk. The results of air quality modelling of relevant compounds, expressed as a risk value, are reproduced in Table 14.

**Table 13 - Predicted Maximum Ground-Level Concentrations**

Pollutant	Predicted Maximum Concentration ( $\mu\text{gm}^{-3}$ )	Criterion ( $\mu\text{gm}^{-3}$ )
CO (1-hour)	1.8	31,000
CO (8-hour)	0.94	10,000
NO <sub>x</sub> (as NO <sub>2</sub> ) (1-hour)	31.4	245
NO <sub>x</sub> (as NO <sub>2</sub> ) (annual)	1.9	60
PM <sub>10</sub> (24-hour)	8.74	50
PM <sub>10</sub> (annual)	1.41	30
SO <sub>2</sub> (1-hour)	1.05	570
SO <sub>2</sub> (24-hour)	0.4	225
SO <sub>2</sub> (annual)	0.06	60
Dioxins and furans (1-hour)	$1.09 \times 10^{-10}$	$3.05 \times 10^{-5}$
Hydrogen chloride (3-minute)	60.8	200
Benzene (annual)	$8.89 \times 10^{-5}$	16
Chlorobenzene (3-minute)	0.002	200
Dichlorobenzene (3-minute)	0.003	10,000
Phenol (3-minute)	$7.53 \times 10^{-5}$	36

**Table 14 - Predicted Lifetime Risk**

Pollutant	Lifetime Risk
Benzo(a)pyrene	$3.3 \times 10^{-7}$

The Applicant highlights that the results of the air quality modelling are for emissions from the thermal desorption unit, as maximum ground-level concentrations. The modelling does not take into account elevated receptors that may be present on nearby sites during the remediation process. Maximum ground-level concentrations of the pollutants considered are predicted to occur on the remediation site.

Background concentrations for air toxics (such as dioxins, hydrogen chloride, benzenes etc) are considered to be very low. Monitoring data from the EPA's monitoring site at Lidcombe have been used to consider the combined effect of the development with existing background concentrations of NO<sub>x</sub>, CO and particulates. In the case of NO<sub>x</sub>, the Applicant notes that background concentrations have experienced a maximum of 146  $\mu\text{gm}^{-3}$  in recent years (NO<sub>2</sub>). If all NO<sub>x</sub> from the development was conservatively assumed to be in the NO<sub>2</sub> form, the combined impact of 266  $\mu\text{gm}^{-3}$ , which represents a slight exceedance of the goal of 245  $\mu\text{gm}^{-3}$  (1-hour).

Background levels of carbon monoxide are generally low, with the Applicant noting a typical concentration of 2-3  $\mu\text{gm}^{-3}$ . The predicted maximum carbon monoxide contribution of 12  $\mu\text{gm}^{-3}$  is therefore not expected to cause an exceedance of the 1-hour goal of 31  $\mu\text{gm}^{-3}$  (sic).

In relation to particulates (PM<sub>10</sub>), background concentrations are typically below 20  $\mu\text{gm}^{-3}$ , so a contribution of some 11.2  $\mu\text{gm}^{-3}$  from the proposed remediation would not generate an exceedance of the 24-hour goal of 50  $\mu\text{gm}^{-3}$ . The Applicant notes, however, that during 1999/2000, maximum PM<sub>10</sub> concentrations were recorded at 52.5  $\mu\text{gm}^{-3}$  (with the second-highest reading of 43.9  $\mu\text{gm}^{-3}$ ). While maximum ground-level concentrations from the development and maximum recorded background PM<sub>10</sub> concentrations may exceed 50  $\mu\text{gm}^{-3}$ , the Applicant highlights that the 24-hour goal for PM<sub>10</sub> is permitted to be exceeded five times per year.

### **Odour Impacts**

The Applicant identified that the following compounds are present on the site in concentrations sufficient for there to be potential for an off-site odour impact:

- ethylbenzene;
- xylenes;
- chlorobenzene;
- 1,2-dichlorobenzene;
- 1,4-dichlorobenzene;
- 2-chlorophenol; and
- naphthalene.

The Applicant modelled odour emissions from the site for a worst-case combined stage 1 and stage 2 operation. Results of this modelling indicate that odour impacts of 2 odour units, the odour criterion for residential populations greater than 2,000, would be generally contained within the site. Areas along the western boundary of the site would marginally exceed this criterion. The Applicant highlights that the site is bounded to the west by Homebush Bay and is not the subject of a residential population. The closest residential area to the east of the site would experience less than 0.5 odour units. The Applicant considers that the proposed development would not exert a significant odour impact, even under worst-case conditions.

### **Greenhouse Gases**

The Applicant estimated the greenhouse gas performance of the proposed development based on the natural gas, diesel and electricity consumption likely for the life of the proposal. A summary of this greenhouse gas calculation is reproduced below in Table 15.

**Table 15 - Predicted Greenhouse Gas Performance**

<b>Fuel Source</b>	<b>Predicted CO<sub>2</sub>-Equivalent Emissions (tonnes over life of proposal)</b>
Natural Gas	14,850
Diesel	29,589
Electricity	60
<b>TOTAL</b>	<b>44,499</b>

The Applicant highlights that the total quantity of greenhouse gases generated over the entire life of the proposed development represents only 0.002% of Australia's 1999 greenhouse gas emissions.

### **Issues Raised in Submissions**

Air quality impacts associated with the proposed development were raised as an issue of concern in most submissions received by the Department, with **8.1%** of all matters raised relating to air quality. Issues raised fall into six broad categories, as follows:

- impacts of dust generation and deposition (**3.3%**).
  - general concern in relation to the potential for dust to be generated on the site
  - management of dust generation and suppression of dust generation wherever possible. Dust control is seen to be critical.
  - dust will deposit on surrounding land uses and consequently affect locally-grown produce. There is no capacity for residences in Rhodes to receive additional dioxin contamination through dust deposition without exceeding 85 ppt of dioxins.
- Air quality monitoring (**1.9%**)
  - monitoring of stack emissions for NO<sub>x</sub>, SO<sub>x</sub>, CO, CO<sub>2</sub> and dioxins is required, with monitoring at regular, frequent intervals
  - real-time monitoring should be provided for dust and emissions
  - particulates should be carefully monitored as they are closely linked to dioxin formation

- electronic odour detection and recording should be investigated
- Odour generation and potential impacts (**1.0%**)
  - Particular attention needs to be given to the control of odour
  - Odour control is a major issue given the odour history of Rhodes, the nature of contaminants, the need to expose and dry large areas of sediments, the history of sediment smelling when disturbed
- Cumulative air quality impacts of two remediation proposals (**1.0%**). Cumulative impacts should be based on two sites operating under the worst-case scenario experienced at either of the sites.
- Air emissions discharge limits (**0.5%**), particularly for dioxins, which should be limited to a world's best practice limit of  $0.1 \text{ ngm}^{-3}$
- General concern in relation to air emissions (**0.5%**)

## **Department's Position**

### ***Dust Generation***

The Department is generally satisfied that dust generated through excavation and soil handling activities would not generate an unacceptable air quality impact. Annual averages for dust impacts, as well as dust deposition rates, are well below acceptable criteria.

In relation to maximum 24-hour concentrations of  $\text{PM}_{10}$ , the Department notes that exceedences of environmental criteria have been predicted for the Statewide site to the south of the proposed remediation site. The Department highlights that it is currently in receipt of a development application for the use of this land for residential purposes. If approved, it is likely that the proposed residential development would be constructed and occupied within the timeframe of the proposed remediation works. This presents potential for a land use conflict and a significant impact on residents that may move onto the Statewide site. As such, the Department requires that the Applicant outline additional dust mitigating measures that it would apply to protect the health and amenity of these residents. Further, the Department considers that particular attention should be given to demonstrating that all reasonable and feasible measures have been applied to equipment moving on unsealed haulage roads, given that this source represents the dominant and most significant source of dust from the site.

### ***Emissions Characterisation***

The Department notes that the emissions characteristics for the proposed remediation process presented in the Environmental Impact Statement appear generally consistent with descriptions of the indirect heated thermal desorption technology and its emission levels compared with the direct heated configuration of the remediation process.

However, the Applicant has not provided supporting information to support the source of the stated emissions characteristics, nor provided details and assumptions that may have been applied to the derivation of the emissions concentrations and rates. The Environmental Impact Statement seems to imply that emissions characteristics have been based on practical experience with the technology. No details of this practical experience have been provided.

The Department requires that the Applicant clarify the source of the emissions data applied to the air quality impact assessment for the proposal. Where the data have been calculated, details of the calculations and assumptions applied must be provided. If the data have been obtained or extrapolated from previous experience with the technology, justification must be supplied to support the application of this data to the subject development site (as opposed to a potentially significantly different site and operating conditions).

### ***Air Quality Modelling and Assessment***

The Department is satisfied that the Applicant has applied an appropriate methodology to the modelling and assessment of air pollutants discharge from the indirect heated thermal desorption unit. In all cases predicted maximum ground level concentrations of pollutants lie

well below relevant air quality criteria. To illustrate this point, the Department has calculated “safety margins” for each pollutant considered to establish what percentage of the relevant ambient air quality limit is “consumed” by the remediation technology. This representation is provided in Table 16. Calculated “safety margins” are for indicative purposes only.

**Table 16 - Indicative "Safety Margins" to Ambient Air Quality Criteria**

Pollutant	Predicted Maximum Concentration ( $\mu\text{g m}^{-3}$ )	Criterion ( $\mu\text{g m}^{-3}$ )	“Safety Margin” (%)
CO (1-hour)	1.8	31,000	0.006
CO (8-hour)	0.94	10,000	0.009
NO <sub>x</sub> (as NO <sub>2</sub> ) (1-hour)	31.4	245	12.8
NO <sub>x</sub> (as NO <sub>2</sub> ) (annual)	1.9	60	3.2
PM <sub>10</sub> (24-hour)	8.74	50	17.5
PM <sub>10</sub> (annual)	1.41	30	4.7
SO <sub>2</sub> (1-hour)	1.05	570	0.18
SO <sub>2</sub> (24-hour)	0.4	225	0.18
SO <sub>2</sub> (annual)	0.06	60	0.1
Dioxins and furans (1-hour)	$1.09 \times 10^{-10}$	$3.05 \times 10^{-5}$	0.0004
Hydrogen chloride (3-minute)	60.8	200	30.4
Benzene (annual)	$8.89 \times 10^{-5}$	16	0.0006
Chlorobenzene (3-minute)	0.002	200	0.001
Dichlorobenzene (3-minute)	0.003	10,000	0.00003
Phenol (3-minute)	$7.53 \times 10^{-5}$	36	0.0002

The above table illustrates that in most cases, pollutant concentrations are less than 1% of what would be considered acceptable. Key criteria pollutants (NO<sub>x</sub> and particulates) lie below 20% of the limits. The most significant impact is associated with hydrogen chloride emissions, which at 30.4% are still significantly lower than the accepted concentration limit.

The Applicant notes in the Environmental Impact Statement that ambient pollutant concentrations have been calculated at ground level, and that there may need to be further assessment of air quality impacts in the event that elevator receptors are established near the proposed remediation site. The Department considers it quite probable that elevator receptors could be introduced on the Statewide and former Allied Feeds site prior to the completion of remediation works on the subject site. This represents potential for land use conflicts with potential exceedence of air quality criteria at elevated receptors, if introduced. Therefore, the Department seeks further consideration from the Applicant to demonstrate the likely air quality impacts at elevated receptors on adjacent sites should such receptors occupy those areas prior to the completion of remediation works on the subject site.

The Applicant has not considered fugitive emissions from soil handling activities inside soil preparation buildings. These emissions must be estimated and taken into consideration in the context of air quality impacts.

**Odour Impacts**

The Department concurs with the Applicant conclusion that the proposed remediation would not generate a significant odour impact. It is noted that the 2 odour unit criterion for residential areas (>2,000 residents) would be exceeded just outside the western boundary of the site. The Department does not consider that this represents a significant environmental impact given that this area is the unpopulated Homebush Bay.

**Greenhouse Gases**

The Department considers that there is little scope for the reduction in greenhouse gases emitted from the proposed development, as these emissions are directly dependent upon the

quantity of fuel and electricity consumed. An attempt to reduce emissions from these sources would affect the operation of the remediation process (reduced fuel consumption may lead to a lower level of remediation). Given that the remediation is only expected take some five years, and there will be an environmental benefit associated with a remediated site (as opposed to the current contaminated state), the Department considers that any negative impact associated with the generation of greenhouse gases is adequately offset. Any redevelopment of the subject remediation site for residential or open-space may include revegetation, which would provide an additional greenhouse gas off-set, although comparatively small.

**Conclusion**

The Department considers that in general, the Applicant has demonstrated that major air quality impacts could be adequately mitigated and managed. However, the Department seeks additional information in relation to a number of issues, primarily to serve in support of information provided to date, to clarify data and to identify and quantify potential land use conflicts that may occur with adjacent sites prior to the completion of the remediation works. Particularly, the Department seeks information/clarification in relation to:

- further clarification of the method used to establish air emissions concentrations from the proposed development;
- further consideration of potential dust impacts at elevated receptors that may be established on adjacent sites;
- demonstration that all reasonable and feasible measures have been applied to reduce dust generated during excavation and soil handling activities, particularly as a result of traffic movements on unpaved parts of the site and in the context of maximum 24-hour concentrations of PM<sub>10</sub>;
- further consideration of potential air quality impacts at elevated receptors that may be established on adjacent sites; and
- inclusion of fugitive emissions from buildings in the consideration of air quality impacts/

**5.5 Noise Impacts**

**Applicant’s Position**

**Background Noise**

In order to characterise the existing acoustic environment surrounding the proposed development site, the Applicant undertook a number of noise surveys at Marquet Street, Blaxland Road and Meadowbank Crescent. The results of these surveys during the day, evening and night are reproduced below.

**Figure 3 - Rating Background Levels**

Location	Existing Background Noise Levels (dB(A))		
	Day	Evening	Night
Marquet Street	40	40	36
Blaxland Road	42	41	37
Meadowbank Memorial Park	41	40	35

**Noise Impacts**

The Applicant notes that remediation of the site will include activities characteristic of both construction and operation throughout the five year life of the proposal. As such, assessment has been based on the more stringent operation noise criteria specified in the EPA’s *Industrial Noise Policy*. Based on measure background noise levels, the Applicant has established noise criteria for the proposed development, as summarised in Table 17 below. The noise criteria are based on intrusive noise requirements during the day, and amenity criteria at night (the more stringent criterion has been applied for each time period). The Applicant has not specifically considered the evening period (8:00 pm to 10:00pm), given that only two operation

timeframes are expected (essentially day operation with outdoor equipment, and night operation with only the thermal desorption unit and front-end loader). As the night-time noise criteria are more stringent than for the evening period, compliance with the night-time criteria would also imply compliance with the evening criteria, where relevant.

**Table 17 - Noise Criteria**

Location	Noise Criteria (dB(A))	
	Day	Night
Marquet Street	45	40
Blaxland Road	47	40
Meadowbank Crescent	46	40

The Applicant highlights that activities on the site will be limited at night, with the bulk of equipment only used during the day. The thermal treatment unit and a front-end loader would operate 24 hours per day.

To assess compliance of the proposed development with operation noise criteria, the Applicant undertook noise modelling under a series of calm and adverse weather conditions. During the day, the remediation process and excavation activities will be conducted concurrently. To assess a range of activity combinations on the site during the day, the Applicant considered four scenarios:

- scenario 1 – typical operations during months 0 to 6 of the proposed development;
- scenario 2 – typical operations during months 6 to 24 of the proposed development;
- scenario 3 - – typical operations during months 24 to 42 of the proposed development; and
- scenario 4 - – typical operations during months 42 to 60 of the proposed development.

Results of noise modelling during each of the operational scenarios is presented in the Environmental Impact Statement and reproduced below. Exceedances of noise criteria are highlighted in red.

**Table 18 - Predicted Noise Impacts (Day)**

Location	Scenario 1 (dB(A))	Scenario 2 (dB(A))	Scenario 3 (dB(A))	Scenario 4 (dB(A))	Criterion (dB(A))
Marquet Street	54	52	55	56	45
Blaxland Road	60	61	62	62	47
Meadowbank Crescent	53	47	49	49	46

Noise impacts were also modelled for night-time operations. Results of modelling for night-time noise impacts are presented in Table 19.

**Table 19 - Predicted Noise Impacts (Night)**

Location	Predicted Noise Impact (dB(A))	Criteria (dB(A))
Marquet Street	32	40
Blaxland Road	40	40
Meadowbank Crescent	30	40

The Applicant notes that at night-time, noise criteria will be met. However, during the day, noise criteria will be exceeded by some 7-11 dB(A) at Marquet Street and some 13-15 dB(A) at Blaxland Road. Predicted noise levels at Meadowbank Crescent will generally be within

3dB(A) of the noise criterion at that location, except for during the first six months of the proposal.

The Environmental Impact Statement lists a number of noise mitigating measures that may be applied to the development:

***At Blaxland Road***

- application of noise controls on individual plant items. Sound power levels for plant items considered in noise modelling was conservative and could be reduced with the installation of measures such as high-performance mufflers and engine shrouding. A reduction in noise of 2-3 dB(A) could be expected in this case.
- reduction in the number of plant items operating concurrently. The number of items included in the noise modelling was conservatively high. The Applicant suggests that by halving the number of plant items operating concurrently, noise levels could be reduced by 2-3dB(A).
- construction of an eight-metre noise barrier along the eastern boundary of the site. The Applicant notes that a barrier of this height would be difficult and expensive to construct. A barrier of less than four metres in height would have little effect.
- construction of a two to three-metre noise barrier along the eastern side of the railway reserve. This would have the same effect as the eight-metre barrier considered above.

***At Marquet Street***

- construction of a six-metre noise barrier along adjacent to Gauthorpe Street.
- construction of a six-metre noise barrier along the far southern boundary from the water line to beyond the line of the existing building.
- installation of enclosures for pumps located south of the second barrier, given a noise impact reduction of some 5dB(A).

***At Meadowbank Crescent***

- silencing of pumps and control of noise from excavators, although the Applicant considers that these measures would require significant design changes and may not be operationally possible.

The Applicant also notes that given the proposed timeframe for the remediation of the site, new residential developments are receptors may be established on adjacent sites that are currently vacant. The Applicant suggests that there is little scope for the mitigation of noise impacts at these receptors, should they be established.

Given that noise impacts from the proposed development are predicted to be significantly in excess of relevant noise criteria during the day, the Applicant proposes to prepare and implement a Noise Management Plan. A draft of this Plan is provided in the Environmental Impact Statement and includes:

- continuous monitoring of noise at locations representative of residences at Marquet Street, Blaxland Road and Meadowbank Crescent;
- comparison of measured noise with relevant noise criteria;
- implementation of one or more of the above noise mitigation measures in the event that measured noise exceeds relevant noise criteria;
- continuation of noise monitoring for at least two months, or until such time as compliance with noise criteria is achieved'
- a mechanism to respond to noise complaints;
- provision of noise monitoring data to the Community Liaison Group.

***Vibration Impacts***

The Applicant suggests that the only equipment proposed for use on the site that has the potential to generate a significant vibration impact is the compactor. The compactor will be used at least 150 metres from the nearest residence or other vibration-sensitive receptor. At these distances, the Applicant considers that vibration impacts will be imperceptible.

### Traffic Noise Impacts

The Environmental Impact Statement presents an assessment of the noise impacts associated with the proposed remediation. Consideration of traffic noise impacts generated by the proposed remediation has been based on worst-case scenarios including 28 vehicles per hour on Blaxland Road (three of which are heavy vehicles) and 20 vehicles per hour on Averill Street (all passenger vehicles). A summary of traffic noise impacts modelled during the morning and afternoon peak periods are provided below.

**Table 20 - Predicted Traffic Noise Impacts**

Period of Day	Blaxland Road		Averill Street	
	Existing Noise (dB(A))	Noise Increment (dB(A))	Existing Noise (dB(A))	Noise Increment (dB(A))
6:00 am to 7:00 am	60	0.6	>60	<0.6
6:00 pm to 7:00 pm	59	0.8	>59	<0.8

The Applicant notes that existing traffic noise exceeds the goals specified in the document *Environmental Criteria for Road Traffic Noise* (ECRTN). That is, between the hours of 7:00 am and 10:00 pm, traffic noise exceeds 55 dB(A), and between 10:00pm and 7:00am it exceeds 50dB(A). Under these circumstances, the ECRTN specifies that additional traffic noise generation should not increase background noise levels by more than 2 dB(A). The Applicant highlights that traffic generated by the proposed remediation meets this requirement.

### Issues Raised in Submissions

Noise impacts were raised in public submissions **1.4%** of the time. Submissions highlight concern in relation to the following.

- general concern in relation to noise impacts (**0.5%**);
- concern that night-time noise generation should be minimised to prevent impacts on residences (**0.5%**); and
- noise from the site should be monitored continuously and in a real-time context (**0.5%**).

### Department's Position

#### Background Noise

The Department is generally satisfied that the noise surveys undertaken by the Applicant to establish rating background noise levels are accurate and appropriate. Comparison of the results of the surveys presented in the Environmental Impact Statement for the proposed remediation, and the results of the noise surveys for the Allied Feeds site remediation indicate that measured background noise levels are generally consistent. In some cases, background noise levels differ by some 1-2 dB(A), but the Department considers that these variations are within reasonable limits given that background noise levels would vary slightly depending on the situation and exact measurement location. As noise criteria are also based on existing background noise levels, the Department is satisfied that the noise criteria established for the proposal, as presented in the Environmental Impact Statement are appropriate, and have been determined in accordance with the EPA's *Industrial Noise Policy*.

#### Noise Impacts

The Department notes that the noise modelling presented in the Environmental Impact Statement suggests that noise criteria would be exceeded by a significant margin at most locations throughout most of the life of the proposed development. This is considered unacceptable where reasonable and feasible measures exist to reduce these noise impacts.

While the Department supports the application of a conservative approach to the consideration of noise impacts, the Applicant itself recognises that a greater number of heavy of equipment were included in the noise modelling than are expected to be operating on the site concurrently. The Department considers it important that further assessment of the likelihood

of all of these items being operated at once be provided. Although conservatism in modelling is important, a realistic approach should be applied. Further review of equipment requirements may also identify means by which works on the site could be scheduled to avoid concurrent operation of the most noisy equipment. This consideration could yield additional noise impact reduction.

Further, while the Applicant has indicated that the noise modelling included consideration of windy conditions, there has been no analysis provided of the frequency of these windy conditions and how wind would affect noise impacts relative to calm conditions. A comparison of noise impacts under still conditions and windy conditions would better elucidate the frequency of noise exceedences. For example, if noise criteria could be met under still conditions, and extreme windy conditions occurred infrequently, the operation of the remediation works could, in principle, be managed in such a manner as to prevent operation of noisy equipment under windy conditions. The Department considers that this matter requires further consideration by the Applicant.

The Environmental Impact Statement provides a number of noise mitigating measures identified by the Applicant. The Applicant has generally not accepted the application of these measures to the proposed remediation due to cost or practical reasons. However, no justification has been provided to demonstrate that the application of these measures is not reasonable or feasible. In particular, the installation of equipment mufflers, shielding of equipment and scheduling of works are measures that need to be further considered by the Applicant.

In relation to night-time noise, the Department notes that modelling results demonstrate that noise criteria will be met. Additional noise mitigation measures are therefore not required at night. However, should the Minister determine to approve the proposed development, the Department would recommend that night-time noise be monitored to ensure on-going compliance with noise criteria.

As noted in the assessment of the air quality impacts of the proposed development, there is potential for new receptors to be located adjacent to the proposed remediation site. In this case, noise impacts at these new receptors would be even greater than the predicted noise exceedences at existing receptors. To address this issue, the Department considers that the Applicant should look more closely at reasonable and feasible noise mitigation measures and demonstrate that all such measures have been applied to reduce noise impacts at existing receptors to a slow as reasonably possible. In the case of potential new receptors, the Department requires the Applicant to demonstrate the noise impact that may be expected at these receptors and full details of how this issue would be addressed, should it arise.

### ***Vibration Impacts***

The Department is satisfied that the Applicant has adequately demonstrated that the proposed development will not generate an unacceptable vibration impact. Vibration impacts generated by a compactor will drop to  $2\text{mms}^{-1}$  at distance of 20 metres from the operating compactor. The human comfort criterion for vibration is  $2\text{mms}^{-1}$ , and as such, this criterion would not be exceeded at the nearest residence, some 150 metres from the proposed operation of the compactor on the site. Compliance with the human comfort criterion also implies compliance with the less stringent structural integrity criterion.

### ***Traffic Noise Impacts***

The Department is satisfied that the Applicant has adequately demonstrated that the proposed development will not generate an unacceptable traffic noise impact. In particular, the Department notes that the traffic noise increment attributable to the proposed development is less than the 2dB(A) increment recommended for existing traffic noise levels exceeding relevant goals.

## 5.6 Surface Water Quality Impacts

### Applicant's Position

#### **Existing Environment**

The remediation site is characterised by drainage patterns generally originated on the eastern side of the site and travelling down gradient to the west and Homebush Bay. Drainage flows are altered by an existing mound of approximately 9 metres AHD near the centre of the site, and a depression currently used as a sediment basin on the southern boundary of the site.

The Applicant undertook a study in early 2002 to establish existing water quality characteristics for the site and the adjacent waters of Homebush Bay. From these investigations, the Applicant notes that water quality generally meets the values set out in *Australian And New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000), with the following exceptions:

- total nitrogen and total phosphorous concentrations exceeded adopted water quality criteria in all wet and dry weather samples;
- endrin exceeded the adopted water quality criterion during wet weather;
- lead and zinc exceeded the adopted water quality criteria in all wet and dry weather samples;
- copper exceeded the adopted criterion for all wet weather samples, and at one location during dry weather;
- mercury exceeded the adopted water quality criterion for all dry weather samples;
- dioxins and furans guideline values provided in *Canadian Water Quality Guidelines* (CCME, 1999, 2001) were exceeded for all samples, particularly at one location during both wet and dry weather.

The Applicant highlights that water quality in Homebush Bay is generally fair, with the exception of dioxins and furans. Water quality is also characterised by elevated concentrations of nutrients (nitrogen and phosphorous), metals and some organic compounds.

#### **Surface Water Management**

The Applicant proposes to classify wastewaters generated on the site as follows:

- clean water – water that is not contaminated water, for example, rainfall that has not been in contact with contaminated materials;
- contaminated water – water that requires recovery, treatment, recycling and disposal to enable the works to proceed;
- grey water – water that is suitable for irrigation and dust suppression. Grey water must comply with criteria specified in the draft *Environmental Guidelines for Industry – The Irrigation of Treated Effluent by Irrigation*; and
- sewer quality water – water that has been either treated or not treated and meets the Trade Waste Criteria for discharge to sewer as given in the Trade Waste Licence to be established with Sydney Water.

The Applicant intends to implement a water management hierarchy on the site to minimise the volumes of contaminated water generated. The hierarchy may be summarised as follows:

1. prevention of surface water from mixing with contaminated materials or contaminated water;
2. no treatment or removal of contaminated water from an area where the water would naturally degrade and attenuate without impact on the environment over a period acceptable to the programming requirements of the project;
3. removal of contaminated water from an area where it is mildly contaminated and use of the water for irrigation or dust suppression;
4. removal of contaminated water from an area where it is mainly contaminated by suspended sediment or organic compounds with a short half-life;

5. removal of contaminated water from an area and discharge to sewer without prior treatment; then
6. removal of contaminated water from an area and treatment of the water in an on-site water treatment plant.

A preliminary water balance for the site presented in the Environmental Impact Statement suggests that 5,100 kilolitres of clean water would be generated per day; 1 kilolitre of water would be generated per day for discharge to sewer; and 118.3 kilolitres per day would require treatment.

Water management infrastructure for the site includes:

- surface and groundwater control measures;
- water storage facilities;
- pipelines to move contaminated water;
- treatment facilities; and
- disposal facilities.

### ***Discharge Criteria (Environment)***

The Applicant indicates that it intends to monitor the quality of water discharged from the site to Homebush Bay. These discharges would need to be licensed by the EPA under the *Protection of the Environment Operations Act 1997*. The Applicant suggests that it would establish discharge criteria consistent with relevant guidance documents and in consultation with the EPA where necessary.

### ***Discharge Criteria (Sewer)***

The Applicant indicates that discharges to sewer would meet the requirements specified in a Trade Waste Agreement to be established with Sydney Water Corporation.

### ***Flooding***

The Environmental Impact Statement draws attention to a study undertaken in 1998, *Powells Creek and Saleyards Creek Flood Study*, into the flooding characteristics relevant to the proposed remediation site. That study concludes that a one in one hundred year average recurrence interval (ARI) flood event would not lead to a flood height of more than 1.4 metres Australian Height Datum (AHD). The same study quotes a design flood level of 3.21 metres for a probable maximum flood event.

The Applicant notes that the remediation site lies above the flood plain for the Parramatta River and would not be affected by a one in one hundred year ARI flood event. However, the most extreme flood event (probable maximum) would affect the site.

### **Issues Raised in Submissions**

Surface water quality impacts represent **1.4%** of all issues raised in public submissions. Particular issues raised are:

- appropriate measures must be in place to contain and treat run-off after heavy wind or rainfall events during the remediation process (**0.7%**); and
- general support for the preferred Bay remedial methodology, including excavation behind coffer dams and relocation of contaminated sediments to land for treatment (**0.7%**).

### **Department's Position**

#### ***Surface Water***

The Department is supportive of the Applicant's proposal to segregate waters of varying qualities and to manage/ treat water to an acceptable standard before discharge to sewer or the environment.

However, the Applicant has provide few details of how water will be segregated and managed on the site. The Department requires that the Applicant provide further details of water management infrastructure on the site, including indicative design capacities for drainage and collection/ storage structures. A clear plan needs to be developed to indicate which areas of the site will include catchments for water of varying quality. Further, details of management systems is required to demonstrate how the water management system proposed by the Applicant in broad terms to date will be applied.

Any application of water to land must be supported with a demonstration that the irrigation/ dust suppression water is of a suitable quality so as not to generate an unacceptable environmental impact.

#### ***Discharge Criteria (Environment)***

The Department notes that while the Applicant has indicated that only water of an appropriate quality would be discharge from the site, it has not specified quality specifications or demonstrated that these specifications could be met. The Department requires a demonstration from the Applicant that water could be managed in such a way so as not to generate an unacceptable environmental impact. To achieve this, the Department considers that the Applicant must first establish discharge criteria and then, based on likely quantities and qualities of surface water that would be generated on the site, demonstrate the water is suitable for discharge, and where necessary, an appropriate treatment option is available and capable to achieve required discharge outcomes. To date this information has not been provided, and must be furnished by the Applicant before the Department could establish whether relevant water quality outcomes could be achieved.

#### ***Discharge Criteria (Sewer)***

In a similar manner as for discharges to the environment, the Department considers that the Applicant has not adequately demonstrated that water quality outcomes can be achieved for discharge of wastewater to sewer. This issue has also been raised by Sydney Water Corporation and identified by the EPA as being of concern. A key factor relates to current restrictions on compounds that are permitted to be discharged to sewer and compliance with discharge criteria from the Sydney Water system (in this case, from Malabar sewage treatment plant).

The Department has convened discussions with the Applicant, Sydney Water and the EPA with the aim of resolving this issue. At this stage, options for the management of wastewater include:

- discharge to sewer to meet existing trade waste restrictions;
- discharge to sewer under altered trade waste restrictions, if environmentally acceptable;
- application to land; or
- disposal elsewhere off-site.

Discussions continue in an attempt to resolve this matter, with the following work being undertaken:

- derivation of appropriate sewer discharge limits in order to achieve required environmental outcomes at the Malabar sewage treatment plant and to meet current restrictions on materials permitted to be accepted to sewer;
- demonstration that water treatment processes to be applied on the site are capable of meeting the derived sewer discharge limits;
- if limits cannot be met, investigation of:
  - options for application of wastewater to the site, within appropriate environmental limits;
  - options for off-site disposal of wastewater where environmentally acceptable; and
  - possible alterations to the current restrictions on water that may be accepted by sewers, while maintaining desired environmental outcomes of the sewer system.

The Department is facilitating discussions and investigations in relation to this matter, for resolution within the timeframe of the Commission of Inquiry for the proposed remediation.

### **Flooding**

The Department notes from the topography and elevation of the remediation site, both during remediation and after the site is remediated, would lie above the one in one hundred year ARI. Some proposed basement areas of the site, if redeveloped, lie at 0.5 metres AHD, which is below this flood level. The issue of potential flooding of basement areas of the site, if redeveloped, lies outside the scope of assessment of the subject remediation works, but would need to be appropriately considered as part of the assessment of any redevelopment proposal for the site.

While it has been established that the maximum probable flood event would affect the site (at 3.21 metres AHD), the Department considers it appropriate to consider the impacts of flooding in the context of one in one hundred year ARI levels only. This approach is based on consideration of flooding risk and the likelihood of a flood event occurring. The maximum probable flood event is considered to be sufficiently infrequent to afford a significant level of comfort that the site will not be impacted to this degree. The Applicant, however, intends to construct coffer walls to a height of 3.5 metres AHD, which would mitigate any potential impacts from a maximum probable flood event.

### **Conclusion**

The Department considers that further information, clarification, justification and investigation is required into most areas of the water management system for the proposed remediation before it can conclusively establish whether water quality outcomes can be achieved. In summary, outstanding issues are:

- details of water management infrastructure proposed on the site;
- derivation of criteria for discharge of water to the environment, and demonstration that these criteria can be met;
- derivation of criteria for discharge of water to sewer, and demonstration that these criteria can be met;
- derivation of criteria for application of water to land, and demonstration that these criteria can be met.

## **5.7 Waste Management Impacts**

### **Applicants Position**

The Environmental Impact Statement lists wastes expected to be generated on the site, and proposed waste management measures for each, as reproduced in Table 21 below.

**Table 21 - Waste Generation and Management**

<b>Waste Stream</b>	<b>Management Measure</b>
Food scraps and waste generated from the site office	Collection and disposal by a licensed contractor
Paper and cardboard waste	Collection for recycling by licensed contractor
Asbestos waste	All asbestos waste would be disposed off-site at a waste depot licensed to receive this material. A licensed contractor would be employed to remove such materials
Demolition materials (excluding asbestos)	Masonry recycled. Timber recycled off-site
Solid chemicals	Spent solids classified as hazardous waste would be recycled in the treatment process as appropriate. Otherwise, collection and disposal would be by licensed contractor
Wastewater	The site would be managed via a hierarchy to minimise the volumes of contaminated waters. It would be classified as clean, contaminated, grey or suitable for disposal in the

	sewer and used as appropriate
Liquid chemicals	Spent liquids classified as hazardous would be recycled in the treatment process as appropriate. Otherwise, collection and disposal would be by licensed contractor.

### Issues Raised in Submissions

Of all issues raised in public submissions, waste management was highlighted as being of concern **0.5%** of the time. Submissions suggested that a base-catalysed dechlorination (BCD) unit should be installed and operated on the site to treat the liquid waste stream from the thermal desorption unit.

### Department’s Position

The Department is not satisfied that the Applicant has applied an appropriate level of consideration to the potential environmental impacts of waste generated on the site and means to be employed to manage those wastes.

The Applicant has identified a number of wastes that may be generated by the proposal, but has not identified all waste streams that may be produced throughout the life of the remediation works. Examples of wastes that have not been identified include cleared vegetation, wastewater treatment wastes (such as sludges), maintenance wastes, process equipment wastes (such as carbon filters), personal protective equipment and unexpected or oversized materials that may be uncovered during excavation. A comprehensive list of wastes must be established with clear management measures detailed for each.

Further, the Applicant has not identified the likely quantities of wastes that may be generated by the proposal and the impacts of these wastes. This must be completed, with details of how the generation of wastes requiring off-site disposal will be minimised.

While the Department notes that the transport of liquid waste from the site introduces a risk that must be considered and assessed (refer to section 5.8 of this report), it highlights that the configuration of technology on the remediation site must be established by the Applicant and demonstrate to be operable within appropriate environmental limits. The Applicant has not proposed a BCD plant on the site, but has suggested that this may be an option if transport to Queensland for treatment is not viable. As noted earlier in this report (section 5.3), if the Applicant intends to pursue an on-site BCD option, it must provide sufficient information to demonstrate that such a facility could be constructed and operated within appropriate environmental limits. At this time such information has not been provided, nor has the Applicant indicated that it intends to pursue an on-site BCD facility.

## 5.8 Hazards and Risk Impacts

This section of the Department’s primary submission outlines an assessment of the acute hazards and risk impacts associated with the proposed development. Longer-term, chronic impacts (human health implications) are considered in section 5.1 of this report.

### Applicant’s Position

As noted in section 3.5 of this report, the Applicant sought advice from the Department as to the applicability of the *State Environmental Planning Policy No. 33 – Hazardous and Offensive Industrial Development* (SEPP 33) to the proposed remediation and the requirement to prepare a Preliminary Hazard Analysis (PHA). The key issue in relation to this advice was the definition of the proposed development as “industry”. The Department concurred with the Applicant that the proposal did not strictly constitute development for the purpose of industry, and as such, the proposal would not strictly be defined as “potentially hazardous *industry*”. However, the Department advised the Applicant that, notwithstanding the exact definition of

the proposed development as industry or otherwise, the principles of SEPP 33 should be applied and an appropriate level of assessment of incidents and potential risk impacts be undertaken and clearly articulated as part of the Environmental Impact Statement for the proposed development.

### **Characterisation of Dangerous Goods**

The Environmental Impact Statement for the proposed development lists a number of dangerous goods (as defined by the *Australian Dangerous Goods Code*) that will be stored and/ or used as part of the remediation proposal. A summary of these materials is provided in Table 22.

**Table 22 - Dangerous Goods Stored and Handled On-Site**

<b>Material</b>	<b>Dangerous Goods Class</b>	<b>Quantity Stored</b>
Natural gas	2.1	Mains supply only, no storage
Oil/ sludge residues	9	20,000 litres
Hydrated lime (thermal desorber)	8(III)	10 tonnes
Hydrated lime (earthworks)	8(III)	5 tonnes
Diesel	3(III)	< 2m <sup>2</sup>
Petrol	3(II)	< 2m <sup>3</sup>
Lubrication oils	3(III)	< 2m <sup>3</sup>
Sodium hydroxide	8(II)	25 tonnes

Based on the quantity of dangerous to be stored on the site, the Applicant concludes that a Preliminary Hazard Analysis is not required for the proposed development.

### **Hazard Identification and Screening**

Notwithstanding that the Applicant considers that a Preliminary Hazard Analysis (PHA) is not required for the proposed development, the Applicant continued to identify and consider potential incidents on the site. A summary of incidents considered, including a qualitative assessment of resultant risks with, and without, risk-mitigating measures is summarised below. Full details of the consideration of consequences and frequencies are provided in the Environmental Impact Statement.

**Table 23 - Hazard Identification and Qualitative Assessment**

<b>Incident</b>	<b>Risk Without Mitigation</b>	<b>Risk With Mitigation</b>
Continuous operating plant causing noise impact	Moderate	Low to very low
Vapours, gases and dusts causing toxic or odour impact	Moderate to high	Very low
Emergency shutdown with unplanned emissions	Low	Very low to insignificant
Insufficient lime present for neutralisation, causing greater HCl in gas stream	High	Very low to insignificant
Failure of sodium hydroxide supply stream, with HCl formation causing equipment corrosion	Low	Very low to insignificant
Salt water in sediment causing equipment corrossions	Low to moderate	Very low
Spillages from plant	High	Very low
Drainage of excess moisture and contamination of site	Moderate to high	Insignificant
On-site stormwater contamination	Moderate	Insignificant
Anaerobic sediment generating odour	Moderate to high	Insignificant
Sediment composed of fine particulates causing increased dust generation	Very low	Insignificant
Operating equipment and machinery generating noise	High	Moderate to low
Excavation causing landslip	Low to moderate	Low to very low
Contamination of clean areas	Moderate to high	Low
Volatile compounds exposed to atmosphere causing toxic impacts	Moderate to high	Low
Rainwater drainage from stockpiles with contamination of soils	Low to moderate	Insignificant

On-site stormwater contamination from spillages	Moderate	Insignificant
Anaerobic odorous compounds exposed to atmosphere	Low to very low	Very low to insignificant
Contaminated materials partly composed of fine particulates causing increased dust generation	Low to moderate	Very low
Operating equipment and machinery including for crushing rocks/ concrete generating noise	High	Moderate to low
Landslip caused by excavation and piling operations affecting utilities	Low to moderate	Low to very low
Contaminated materials tracked off-site	Moderate to high	Low
Volatile compounds exposed to atmosphere releasing toxic compounds	Low to very low	Very low to insignificant
Residual contamination of soils	Moderate to low	Low to very low
Treated soil composed of very fine particles, causing increased dust generation	Low	Very low
On-site stormwater contamination by treated soils	Low to moderate	Very low
Handling and backfilling/ compacting machinery generating noise	High	Moderate to low
Compacting operations causing vibration	Low to moderate	Low to very low

The Applicant concludes that based on the assessment provided in the table above, the proposed remediation would not pose an unacceptable off-site risk.

The haulage of dangerous goods to the site is also outline in the Environmental Impact Statement. From consideration of the quantities of materials to be transported to the site, and frequencies of deliveries, the Applicant concludes that transport of dangerous goods does not represent a significant risk. This position is based on guidance provided in the Department's document *Applying SEPP 33*.

### Issues Raised in Submissions

Of all the issues raised in public submissions, **0.5%** of all concerns relate to hazards are risk impacts. The need for an effective emergency system and community notification procedures was highlighted in submissions as being fundamental to the safe operation of the proposal.

### Department's Position

At the outset it is important to highlight that the Applicant consulted with the Department during the preparation of an Environmental Impact Statement for the proposed remediation in relation to the applicability of *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33). The Applicant sought advice as to whether a Preliminary Hazard Analysis (PHA) would be required for the proposal given that it technically did not constitute development for the purpose of industry.

The Department agreed with the Applicant that, strictly speaking, the proposal does not constitute industry. However, the Department highlighted that notwithstanding that the proposal is not "industry", and therefore not technically "potentially hazardous industry" as defined under SEPP 33, there was a clear need to undertake an appropriate level of risk assessment of the remediation proposal. While it could be argued that SEPP 33 does not strictly apply, the Department notified the Applicant that the principles of SEPP 33 should be applied to the development as if it were able to be conclusively defined as industry. The Department considers that the proposal is "potentially hazardous". That is, in the absence of risk mitigating measures, the development would pose a significant off-site risk to the human and biophysical environment. As such, the application of the principles of SEPP 33 would require the preparation of a PHA to demonstrate that the proposal is not "hazardous".

The Environmental Impact Assessment asserts that the proposal is not "potentially hazardous", that SEPP 33 does not apply and that a PHA is not required. The Department

does not support this approach. Despite the Applicant's assertions, the Environmental Impact Statement includes a risk assessment which the Department considers is equivalent to a qualitative PHA, although the Environmental Impact Statement does not refer to the risk assessment in this way. The Department considers that a qualitative PHA, or equivalent terminology, as an appropriate approach to the assessment of potential hazards and risks associated with the proposed remediation. The assessment is generally consistent with guidance provided in the Department's relevant guidance documents.

The Department generally concurs with the outcomes of the Applicant's risk assessment. However, it considers that insufficient consideration has been given to the potential for the accumulation of flammable gases to lead to an explosion in the remediation process. The remediation technology employs natural gas and generates a process gas stream (which is subsequently condensed) rich in hydrocarbons. Both of these materials pose a potential explosion (and fire) hazard. The Department requires further consideration of potential explosion incidents and necessary mitigation measures (management and infrastructure) to demonstrate that the proposed development does not pose an unacceptable off-site risk impact (as fatality, injury or irritation risk).

In relation to the transport of dangerous goods, the Department notes that the information presented in the Environmental Impact Statement indicates that the relevant thresholds for undertaking a transport of hazardous materials study are not exceeded. However, the Applicant has focussed on the haulage of dangerous goods and provided not consideration of the transport risks associated with the movement of liquid waste from the proposed remediation site to Queensland for treatment. The Department requires further consideration of the risks that may be associated with the transport of this waste, with a clear indication of hazard mitigation and management measures that would be applied to vehicles carrying this material.

Should the Minister determine to approve the proposed development, the Department would recommend that the Applicant be required to prepare and implement a comprehensive emergency plan for the site.

## **5.9 Traffic and Transport**

### **Applicant's Position**

The Environmental Impact Statement indicates that intended hours of operation will be between 7:00 am to 6:00 pm weekdays. As such the Applicant anticipates that the peak light vehicle load is between 6:30 to 7:00 am and between 6:00 pm to 6:30 pm on weekdays. There is expected to be 45 persons working on site each day (a maximum of 45 light vehicles).

The Applicant asserts that the most intensive traffic period is expected to occur on the days when three heavy vehicles are accessing the site concurrently with the regular workforce. The Applicant notes that if each heavy vehicle is considered to be equivalent to 3 light vehicles, then peak traffic is equivalent to 54 passenger car units (pcus).

There are three intersections which could possibly be utilised to access the site. These are:

- Concord Road/ Blaxland Road intersection (controlled signals);
- Concord Road/ Denham Street intersection (controlled by signs); and
- Concord Road/ Averill Street intersection (controlled by signs).

The Applicant has assessed the requirements for heavy vehicles and considers that the Blaxland road intersection is the most appropriate with respects to turning space, sight distance and the fact that it is controlled by signals. As such, the Applicant proposes to ensure that all heavy vehicles will utilise the Blaxland Road/ Concord Road intersection, irrespective of whether the heavy vehicle is travelling to/ from the north or the south of the site. Light

vehicles would be able to access the site by the most appropriate intersection (Denham Road/ Concord Road intersection or Averill Road/ Concord Road intersection to/ from the north and Blaxland Road intersection to/ from the south).

The Applicant assumed a traffic split for vehicles accessing the site to be 23 to/ from the north and 31 to/ from the south. The Applicant predicts that during the morning peak period there will be:

- 20 light vehicles (20 pcus) accessing the site via the Averill Road intersection (travelling from the north);
- 1 heavy vehicle (3 pcus) accessing the site via the Blaxland Road intersection (travelling from the north); and
- 25 light vehicles and 2 heavy vehicles (31 pcus) accessing the site via the Blaxland Road intersection (travelling from the south).

During the afternoon peak period the Applicant predicts there will be:

- 20 light vehicles (20 pcus) leaving the site via the Averill Road intersection (travelling to the north);
- 1 heavy vehicle (3 pcus) leaving the site via the Blaxland Road intersection (travelling to the north); and
- 25 light vehicles and 2 heavy vehicles (31 pcus) leaving the site via the Blaxland Road intersection (travelling to the south).

Using these assumptions, the Applicant undertook an intersection analysis (using the aaSIDRA intersection simulation model) to determine the impact on intersection performance due to the increased traffic movements associated with the proposed development during peak periods. The results for each local intersection are described below:

- **Blaxland Road/ Concord Road**  
The modelling indicates that the project generated peak morning traffic will increase average delay at the intersection marginally but that the level of service (LOS) will remain satisfactory (LOS C). The Applicant identifies that the key morning peak movements at this intersection are right turns in and the left turns in and that the LOS for these movements will not change (E and C respectively). For peak afternoon traffic the modelling suggests that the intersection will be subjected to a similar marginal increase of average delay, but that the LOS will remain satisfactory (LOS C). Again, for the key afternoon movements of left turns out and right turns out, the intersection currently performs worse (at capacity – LOS E), but increased traffic does not impact on this level of service.
- **Blaxland Road/ Leeds Street**  
This intersection currently operates at LOS A for both morning and afternoon peak periods, except for the key movement of morning left turns in where it operates at LOS B. The addition of extra traffic associated with the proposed development does not impact these levels of service.
- **Averill Street/ Concord Road**  
The modelling identifies that the intersection currently operates at a satisfactory level of service (LOS C) during both the morning and afternoon peak periods, and that the existing LOS is not changed by the extra traffic contributed by the proposal. However, for the afternoon peak period, the traffic generated by the development causes the intersection to operate at LOS E (at capacity). Further, the model predicts that for the morning right turns in and the afternoon left turns out, the intersection currently operates at LOS F (above capacity), but this LOS is not changed due to the increased traffic. The Applicant argues that the LOS F predicted by the model is due to the model utilising a random statistical pattern for traffic, when the traffic flow is not random due to upstream traffic signals controlling the flow. As such, the Applicant conducted a Gap Acceptance

Survey during the afternoon peak at the intersection, and argues that the extra 20 pcus expected from the development is well within the spare capacity, recorded at some 56 vehicles. Further, the Applicant notes that there is an additional 127 vehicles worth of spare capacity at the Denham Street/ Concord Road intersection. With regards to the morning peak period, the Applicant did not undertake any further surveys, but notes that some 106 vehicles make the right turn in and that the additional 20 pcus is likely to be within the expected maximum capacity. Further, the morning traffic generation associated with the proposed development occurs earlier than the peak period on the road, mitigating the predicted impact. As such, the Applicant argues that the impacts associated with the development at this intersection would be insignificant.

As such, the Applicant concludes that the traffic generated can be carried on the existing network, without requiring upgrades, without deteriorating levels of service.

### **Issues Raised in Submissions**

Traffic and transport impacts were raised in a number of public submissions, and constitute **1.9%** of all issues raised. Key issues raised are:

- the EIS does not provide an assessment of the traffic impacts of bringing soil to the site for geotechnical and rehabilitation reasons (**1.4%**); and
- 6,000 additional residents on the Rhodes Peninsula will cause significant traffic problems.

### **Department's Position**

The Department is satisfied that the Applicant has applied an appropriate modelling approach for the assessment of traffic impacts, and has investigated relevant routes and intersections. While it is recognised that such intersections in the vicinity of the proposed development site are currently operating at poor levels of service, the Department does not consider that restrictions that may be placed on vehicle routes would improve the situation or significantly mitigated the minimal traffic impacts associated with the operation of the proposal. This position is supported with the observation that the proposed development will not contribute significant volumes of traffic to the local road network and is not predicted to alter levels of service in general.

The assumptions applied by the Applicant in relation to the worst-case traffic generation during operation of the remediation works are considered reasonable. However, the Environmental Impact Statement provides no comment on, or assessment of, the likely traffic generation during site establishment. The Department highlights that during the initial stage of the proposal, significant numbers of heavy vehicles may be generated as equipment and process components are brought to the site. The Department requires that the Applicant provide further consideration of this phase of the development. In particular, the numbers of heavy vehicle movements must be considered, and a broad schedule for site establishment provided. Where vehicle movements are predicted to exceed the worst-case scenario assumed for operation, an appropriate level of traffic assessment must also be undertaken.

In relation to concerns raised in submissions that additional residents on the Rhodes Peninsula will cause traffic problems, the Department highlights that this matter lies outside the scope of the subject development application. The application does not include redevelopment of the site. Traffic impacts will, however, be an important issue for consideration as part of any application for the redevelopment of the site and will be fully considered during the assessment of any such development application.

## 5.10 Impacts on Visual Amenity

### Applicant's Position

#### *Existing Environment*

The Applicant states that the regional landscape surrounding the site is typified by an urban environment with a mosaic of residential areas, industrial areas and parklands. The proposed remediation site is located on the shores of Homebush Bay with the Parramatta River located just to the north of the site.

The site itself has been cleared and contains little vegetation. The Applicant notes that the site has been reshaped during previous remediation works, resulting in the area to the north of the site being at a greater elevation than the southern section.

Land to the north of the site is characterised by cleared land with some regrowth, whilst factories and residential buildings dominate to the south. A railway line and residential buildings are located to the east, and a mix of industry and residential are located on the opposite shore of Homebush Bay, to the west. The Applicant notes that wetlands are also present at the southern end of the Bay and form part of Bicentennial Park.

#### *Impacts of Remediation Works*

The Applicant notes that large vehicles and equipment such as bulldozers, graders, excavators and trucks would be used for on-site excavation, transport and the storage of large quantities of soil and fill material. The Applicant states that these activities will create a visual impact. The Applicant notes that dust generated from excavation and transportation of materials may also create a visual impact.

The Applicant states that at any one time, there would be an area of 4,200m<sup>2</sup> of stockpiling at the site with a height of up to 20 metres. The Applicant considers that such bulk and scale will create off-site visual impacts. Similarly, the construction of a coffer dam in Homebush Bay, to a height of 3.5 metres, is expected to have an impact on the visual amenity of the area.

The Applicant notes that the pre-treatment enclosure would be approximately six metres high, and that depending on the final configuration of the thermal plant, parts of the plant outside the enclosure could be up to 20 metres high. The Applicant states that it is also likely that steam vented from the plant would be visible at certain times.

#### *Assessment of Visual Impact*

The Applicant selected eight viewpoints to assess the potential visual and landscape impacts of the proposed remediation works. The Applicant states the viewpoints were selected on the basis that they provided a representative view of the site from locations where the site is likely to be visible from. A summary of the likely views each vantage point will have of the site is presented below:

**Table 24 - Assessment of Visual Impacts at Local Receptors**

Viewpoint	Location relative to site	Impact of Proposal
VP1 – Meadowbank Memorial Park (open space/residential)	Approximately 200m from site with restricted views to the north. Some screening provided from trees.	Views of the coffer dam with a moderate to high visual impact.
VP2 – Adelaide Street, Meadowbank (residential)	Approximately 1km from site with elevated views slightly restricted by trees along Parramatta River.	Limited views due to the surrounding topography and vegetation along the River. Low to moderate visual impact
VP3 – Bartlett Park, Ermington (residential/industrial)	Approximately 2km with restricted, elevated, long-distance views of the site.	Restricted view due to distance, topography, and intervening buildings and vegetation. Low visual impact
VP4 – Burroway Street, Homebush (Industrial)	Approximately 200m from site with unrestricted views of the entire length.	All activity above ground level will be visible. Visual impact is likely to be

		high.
VP5 – Bennelong Rd near Powells Creek, Homebush Bay (residential apartments)	Approximately 800m from the site with unrestricted views of the SW portion of the site.	Coffer dams would be visible from all apartments with the higher apartments able to see some land-based activities. Visual impact is likely to be high.
VP6 – Marquet Street, Rhodes (industrial)	Approximately 50m to the south of the site with restricted views and some screening from vegetation.	Close foreground visual impacts are expected, however, views are screened by existing vegetation at the site and further, the viewpoint is in an industrial area. Visual impact is expected to be moderate to high.
VP7 – Walker Street, Rhodes (road/railway easements)	Less than 20m from the site with slightly restricted views.	Close foreground visual impacts, however, any views of the site would be from passing vehicles and commuters on trains. Visual impacts are likely to be low
VP8 – Blaxland Road, Rhodes (residential)	Approximately 50m from the site with restricted views. Site is screened by vegetation and fencing.	Views are restricted by the railway easement, vegetation and fencing therefore the visual impact will be low.

In order to reduce the visual impact of the site to surrounding properties, the Applicant states it will undertake a number of mitigation measures. These include:

- erecting shade cloth fencing on the northern, eastern and southern boundaries of the site;
- where possible, maintaining screening vegetation;
- staging the construction of the coffer dams;
- staging of excavation treatment works to limit exposed areas; and
- appropriate selection of the positioning and colouring of buildings and equipment to limit the visual impact.

At the conclusion of the remediation works, the Applicant states the site would be reshaped to integrate with the next stage of development. The Applicant notes that surfaces would be turfed to limit the fugitive dust emissions from the site, coffer dams would be removed and the seawall replaced such that it looks similar to the existing seawall. The Applicant considers that the visual impacts following the completion of the remediation works will be minimal.

## Issues Raised in Submissions

### **Public Submissions**

Visual amenity impacts were raised in a number of submissions and represent **0.5%** of all issues raised. There is general concern that residential buildings to be built on the site would be ugly.

### **Department's Position**

The Department concurs with the findings of the Applicant's assessment of visual amenity impacts associated with the proposed remediation. The most significant lines of sight towards the site are afforded from vantage points to the west, across Homebush Bay. These areas are largely industrial, and as such the visual amenity impacts are not considered to be significant given the nature of the receptors.

There is potential for visual amenity impacts at residential areas towards the south west of the site. These impacts are minimised due to the angle of the line of site towards the site relative to the remediation site shoreline. While there will some visual amenity effect at these receptors, the Department considers the impact will be adequately minimised through the application of the mitigation measures proposed by the Applicant.

Views towards the north of the site will be shielded by remediation activities on the former Allied Feeds site. The Department notes that if sites adjacent to the subject development site are redeveloped prior to the completion of remediation works, there will be a clear visual

amenity impacts that cannot be mitigated. The relatively short duration of these impacts is expected to reduce visual amenity effects to a certain degree.

The Department highlights that the urban design of potential redevelopment of the site lies outside the scope of the subject development application. This issues will be fully considered through the planning and assessment process associated with any proposal to redevelop the site that may be lodged with the Department for the Minister's determination.

## **5.11 Socio-Economic Impacts**

### **Applicants Position**

#### ***Investment and Employment***

The proposed remediation would involve a capital investment of approximately \$52.4 million. During stages one and two of the proposal, the remediation works would support 50 direct employment positions. During stages three and four, 30 employment positions would be supported.

#### ***Community Consultation***

The Applicant undertook a number of community consultation activities during the preparation of the Environmental Impact Statement for the proposed development. These activities included:

- identification of local stakeholders and understanding their interest in the proposal;
- preparation and distribution of information about the investigation and assessment process, the proposal and aspects of the assessment studies;
- provision of a range of opportunities for the two-way exchange of information and where study team members could provide information and answer questions;
- description of the proposed remediation process and seeking Government and agency requirements for the proposal;
- identification of preliminary Government and community issues for the proposed remediation; and
- consideration, management and documentation of community and stakeholder comments and issues of concern.

In order to disseminate information about the proposed remediation, the Applicant released information about the proposal as follows:

- an initial information document, *Answers to Questions Raised by Rhodes Residents Group*, responding to questions raised in relation to dust control, water pollution, treatment of sediments, earthworks, transport and noise impacts, the proposed remediation process and the community consultation process;
- development of a website for the proposal, including information on the proposed remediation process, and details of how to receive regular bulletins via email;
- an initial proposal summary as at September 2001;
- four household updates distributed in September 2001, November 2001, December 2001 and April 2002 to up to 6,000 local properties;
- a community information morning held on 22 September 2001, advertised through local newspapers;
- community site inspections held on 10 November 2001, and advertised through local newspapers;
- notification of some 60 local businesses.

The Environmental Impact Statement also lists a number of forums in which consultation with affected and interested parties was undertaken:

- five community meetings consisting of one information morning and one morning of site tours, during the preparation of the EIS, and three meetings during the initial consultation phase;
- five meetings with local government, consisting of two meetings during the preparation of the EIS, and three meetings during the initial consultation phase;
- 18 meetings with State Government agencies;
- nine meetings of the Community Liaison Group; and
- an additional meeting of the Community Liaison Group after lodgement of a development application for the proposal.

### **Issues Raised in Submissions**

Consultation and socio-economic impacts represent **14.8%** and **0.5%** of all issues raised in public submissions respectively. In particular, submission raised the following:

- support for the community consultation activities undertaken by the Applicant and comment that the consultation was appropriate and effective (**5.2%**);
- the existing Community Liaison Group, or similar, should continue if the proposed remediation is approved (**3.3%**);
- the community should be provided with copies of all reports, monitoring data, plans, logs and other information relevant to the environmental and safety performance of the development. Information should be made readily available in an appropriate format, including provision on the internet (**3.8%**);
- appropriate community notification mechanisms should be in place, particularly in the event of an incident or an emergency on the site (**1.0%**);
- the community should be consulted during the development of environmental management systems for the site (**0.5%**);
- independent technical advice should be made available to the community and funded by the Applicant (**1.0%**); and
- Homebush Bay and the Parramatta River are tourist highlights and must be protected (**0.5%**).

### **Department's Position**

#### ***Investment and Employment***

The Department considers that the proposed remediation will have a neutral, and at best a minimal, socio-economic impact in terms of investment and employment. Investment in the proposal will not directly impact the local or regional economy to a significant degree. While there may be some flow on benefits in terms of contracts for transport and supply of materials (eg gas, lime, diesel etc), these benefits are not expected to be significant. Further, the Department considers it unlikely that the proposed remediation would stimulate or support associate industries. In terms of employment generation, the Department notes that the proposal will support up to 50 jobs for a period of no more than five years. While these employment positions are important, the Department recognises that their short-term nature will not generate a significant positive socio-economic impact.

Should the remediation proceed, the outcome of the proposal will be the remediation of a significant parcel of foreshore land. This, combined with the removal of a contaminated site in an urban environment, is likely to have a positive impact on public perception of the area and potentially land values.

#### ***Community Consultation***

The Department considers that the Applicant has undertaken a particularly broad and inclusive community consultation program during the scoping and preparation of the Environmental Impact Statement for the proposed development. Positive comments in support of the Applicant's efforts provided in public submissions bear testimony to the success of the

community consultation activities. The Department is satisfied that the Applicant has effectively engaged, informed and consulted with the local community and interested parties and has made a concerted effort to ensure that issues of concern were addressed through community consultation activities and the Environmental Impact Statement.

In relation to on-going community consultation, the Department considers it important that consultation be maintained throughout the life of the development to keep the public informed of the performance of the development and to allow community input into its environmental management. To this end, the Department intends to recommend that any consent require the Applicant to maintain the function of the existing Community Liaison Group. An additional issue highlighted by public submissions is the highly technical nature of the proposed treatment technology and a perception that “technical jargon” is a means by which the community is misled and denied active involvement. It is recommended that an appropriately worded condition be incorporated into any consent to require the Applicant to bear the reasonable cost of an appropriately qualified, independent party to interpret environmental performance data from the proposed development.

To ensure that all relevant information is available to the community during the life of the proposed remediation, the Department considers that any development consent should require the Applicant to provide all monitoring data, and details of environmental and safety performance to the public in an appropriate forum and format.

## **5.12 Impacts on Flora and Fauna**

### **Applicants Position**

#### ***Estuarine Ecology***

The Applicant highlights that the proposed remediation would have not direct impact on mangroves or saltmarshes, since the nearest examples of these are some 410 metres from the site. However, the proposal does pose the potential to indirectly impact on flora through smothering of roots, and deposition of dust. Modelling of estuarine and air dispersion indicates that neither mangroves nor saltmarshes would be affected by these indirect mechanism. As such, the Applicant concludes that the proposal will not significantly impact on estuarine flora.

As part of the remediation works, approximately 0.5 metres of sediment will be removed from parts of Homebush Bay. The Applicant recognises that this activity will remove organisms with the extracted sediments and impact on organisms at greater depths. Although this impact would be significant at areas from which sediment is removed, the Applicant highlighted that the Bay is colonised by very similar organisms. The abundance of these fauna would provide an origin from which disturbed areas could be repopulated after completion of excavation works. While the Applicant recognises that there will be a negative impact on benthos, it suggests that this impact would not be significant given the extent of the works and the potential for repopulation.

The Applicant does not expect that there will be a significant impact on fish and other estuarine invertebrates, given the mobility of these species. Short-term displacement of species is not considered to be a significant issue as similar appropriate habitat is located elsewhere in Homebush Bay. To minimise the potential for fauna species to become trapped in Bay excavation areas, excavation works would be staged with coffer dams used to separate excavations into eight smaller parts.

#### ***Terrestrial Ecology***

In undertaking the assessment of terrestrial ecology, the Applicant considered:

- flora and fauna that is listed under the *Threatened Species Conservation Act 1995* or the *Environment Protection and Biodiversity Conservation Act 1999*, which may occur within ten kilometres of the proposed remediation site; and
- flora and fauna listed under the above legislation that occurs within two kilometres of the proposed remediation site.

No threatened flora species or nationally endangered ecological communities were identified on the proposed development site. The Applicant suggests that other than clearing of remnant vegetation on the site, the remediation proposal could only impact on flora through dust emissions and dust deposition. As the nearest area that contains any flora of significance is one to two kilometres to the south west of the remediation site, the Applicant suggests that it is unlikely that a significant would be posed to terrestrial flora.

The Applicant notes that no threatened terrestrial fauna has been identified on the site. However, the site provides potential habitat for the Green and Golden Bell Frog (*Litoria aurea*). The closest recording of this species is some two kilometres to the south-west of the proposed remediation site. The Applicant considers it unlikely that the proposed remediation works would adversely impact on this species given its current distribution in the area and the distance to the closest recording of the species.

In relation to migratory birds that may utilise habitat to the south west of the remediation site, the Applicant notes site does not represent significant habitat for these species. Equally, the Applicant considers the remediation proposal to be sufficient distance from known key habitat to not pose a significant impact on migratory birds.

### **Issues Raised in Submissions**

Matter relating to impacts on flora and fauna represent **2.4%** of all issue raised in submissions. Concerns raised relate to:

- the site is in proximity to the the unique Bicentennial Park Waterbird Refuge
- the proposal fails to provide for a Riparian Protection Zone in accordance with the NSW State Rivers and Estuaries Policy
- a 50 metre nature strip (Riparian Protection Zone) must be reinstated for the entire foreshore to provide a more eco-friendly development design, to provide some habitat for migratory birds, and to comply with NSW Fisheries Policy and Guidelines for Aquatic Habitat Management and Fish Conservation 1999
- NPWS or NSW Fisheries should conduct recovery plans for any species, population or community that is threatened by the process of remediation
- on-going monitoring of the recovery of the entire ecosystem should be conducted through performance indicators, population

### **Departments Position**

The Department generally concurs with the Applicant's position that vegetated areas of the proposed development site are highly degraded and are unlikely to constitute habitat areas of significant value. Similarly, the Department concurs that the proposal is unlikely to have a significant impact upon threatened species, populations or endangered ecological communities or their habitats.

This is strengthened by the location of high quality, natural habitat at the Homebush Bay Olympic site and Bicentennial Park. Further, the Department considers that the potential benefits resulting from the remediation of contaminated soil on the site far outweigh the loss of existing vegetation of the site. Should the proposal be approved, the Department recommends a condition to ensure that all necessary sediment and erosion control measures are in place prior to any disturbance to the sea wall and foreshore areas so as to minimise the potential for contaminated material leaving the site via surface water or groundwater.

Consideration of the treatment of the foreshore, including any requirement for a dedicated riparian zone were considered in the preparation of *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* and the Development Control Plan under that instrument.

### **5.13 Impacts on Heritage**

#### **Applicants Position**

##### ***Land Based Heritage***

##### ***Indigenous Heritage***

The Applicant investigated the terrestrial indigenous cultural heritage values of the site by examining previous land use activities and heritage registers as well as consulting with the relevant authorities. Due to the extent to which the site has been disturbed in the past, the Applicant did not undertake any field surveys.

The Applicant notes that the site has a long history of continuous industrial use from 1938 until the mid 1980s, including the construction of factory buildings and other industrial structures and remediation works between 1988 and 1993. Given these past land uses, the Applicant considers there is little potential for the original land component of the site to contain items of indigenous heritage significance.

Consultation with the Aboriginal and Torres Strait Islander Commission, Metropolitan Land Council, the Native Title Tribunal and National Parks and Wildlife Service has verified that there are no known indigenous items located on the site.

The Applicant states that if any archaeological material is uncovered during the remediation works, work would cease and the National Parks and Wildlife Service would be contacted so that an assessment of the item's significance could be undertaken before work continued. As part of the site management procedures, the Applicant states it will engage a person experienced in indigenous archaeology to administer a training program to site staff so they could recognise any possible indigenous items uncovered during earthworks.

##### ***Non-Indigenous Heritage***

The Applicant investigated the terrestrial non-indigenous cultural heritage values of the site within a 2 kilometre radius through a review of previous land use activities, and an examination of heritage registers, relevant environmental planning instruments and the Resource Inventory in the *Parramatta River Foreshores Manual*.

The site inspection and document review identified a number of state-listed heritage items either on or within a two kilometre radius of the site. A disused office building is located in the north-east corner of the site as well as a brick façade along the Walker Street boundary and a disused substation at the southern end of the main building. The buildings are not, however, covered by any heritage listings. The Applicant states that a building report prepared in 1999 to assess the structural state of the building, described the buildings as being heavily vandalised and in poor condition.

Surrounding the site, the Applicant identified the following items as being of heritage significance:

- Meadowbank rail bridges over Parramatta River and Rhodes railway station group;
- Various wetlands including Homebush Bay Wetlands (also known as Bicentennial Park), Brays Bay, Haslam Creek and the Silverwater Salt Marsh and the Parramatta and Lane Cover Rivers Landscapes;
- Yaralla House;
- Joanna Walker Children's Memorial Hospital;
- Homebush Bay Scuttling Yard; and

- Industrial sites and buildings and structures contained within, including the former Phillips Industries site, former Tullock's Phoenix Ironworks, former CSR site, former Berger Paint site, and the Rider and Bell Factory building.

The Applicant states that the building in the north-east corner of the site as well as the substation and brick wall would be demolished as a result of the remediation works. The Applicant states that this is consistent with the recommendations made in the 1999 study of the site. A photographic record of these structures would however, be completed before their demolition. The Applicant does not consider that the proposed remediation would detract from the site's cultural value.

### **Marine Heritage**

#### *Indigenous Heritage*

In 2002, a study was commissioned by the NSW Heritage Office to investigate the potential maritime archaeology present in the seabed of Homebush Bay. The report identified that the seabed that existed before the reclamation could be largely undisturbed and may have been used as campsites in times when the sea levels were lower (more than 14,000 years ago). The study states that scatters of stone artefacts, rock shelters or shell middens may be present.

The Applicant highlights that due to the historical depositional environment in Homebush Bay, any indigenous site present would likely be at a depth of greater than 0.5m. As excavation into the marine sediments is only proposed to a depth of 0.5m, the Applicant considers it unlikely that the remediation would have any impact on such sites.

The Applicant states that work would cease immediately should any manufactured object or feature be uncovered that is not associated with the known submerged cultural remains identified in previous reports.

#### *Non-Indigenous Heritage*

The Applicant notes that Homebush Bay is considered to be significant in maritime heritage as it is one of the few remaining areas that was dedicated to ship breaking and that contains physical remnants of this activity. An assessment undertaken by Cosmos Archaeology in 1999 identified remnants of at least 5 individual vessels as having some significance and it is considered likely that there are a number of other unreported vessels that may also have some significance.

It is considered unlikely that reclaimed areas that exist on the site contain vessel remains, since ship-breaking activities commenced after construction of the original seawalls. Although unlikely, it is considered possible that some remains may have been incorporated into the seawall during subsequent repairs. The report also notes that the shallow nature of the eastern portion of the bay may be due to accumulated detritus from ship-breaking activities.

The Applicant has identified the following items as being associated with the historical activities on the site:

- Jetty, constructed in the 1930s;
- Wharf and dolphins located to the north of the jetty and represented in Maritime Services Board plans from 1950;
- Seawall built in 1939 to allow reclamation of land; and
- Seawall built in 1950-1958 that was commenced at the southern end of the site and extended north to the former Allied Feeds site to allow reclamation of land.

The study also suggested that there may be other remnants submerged in the reclaimed areas of the site or in Homebush Bay including, small jetties and/or slips associated with early

agricultural activity, waste materials or discarded machinery from industry and accidentally dropped cargo or tools near the jetty.

As a result of the proposed remediation works, the Applicant states that a number of items considered 'relics' including the 1930s jetty, the 1950s wharf and dolphins and the 1939 and 1958 rock seawalls, will be destroyed. The Applicant highlights however, that the study undertaken by Cosmos Archaeology considered these items to be of minimal to low significance.

The Applicant states that a number of mitigation measures will be undertaken to preserve the heritage significance associated with Homebush Bay including taking photo records of the 1950s seawall before remediation works take place and taking photo records of the features associated with the 1930s jetty and the 1939 seawall, should they still be intact and identifiable. The Applicant states that work would cease immediately should any object considered to be of potential significance be uncovered and the relevant authorities notified.

### **Issues Raised in Submissions**

There were no submissions received that indicated concern in relation to the impacts of the proposed development on heritage items.

### **Department's Position**

The Department concurs with the Applicant's position that the proposed remediation site presents minimal potential for the presence of indigenous heritage items of significance. In relation to non-indigenous heritage, the Department notes that some existing structures on the site do carry heritage value. However, the removal of these structures is critical to the realisation of the remediation outcomes for the land. To this end, the Department considers it unavoidable that these structures would need to be demolished. In order to preserve the heritage values represented by the structures, the Department supports the Applicant's proposal to accurately record relevant details of the structures through appropriate written and photographic records. This commitment could be reflected through conditions of consent, should the Minister determine to approve the proposed development. Heritage records would need to be developed to meet the requirements of the NSW Heritage Office.

There is minimal potential for indigenous heritage items to be uncovered during activities in Homebush Bay, given the depth to which the Applicant intends to excavate Bay sediments. In the unlikely event that an artefact of significance is uncovered, the Department considers that its recovery may be difficult given the levels of contaminants in the Bay sediments. Recovery of these items would only prove viable if their heritage value was deemed to be of such significance that it outweighed the difficulties and costs of decontamination.

Similarly, potential items of non-indigenous heritage that may be submerged in Homebush Bay or buried in sediments would need to represent significant heritage value before recovery would be feasible. The Department suggests that the Applicant should develop a protocol to identify any heritage items that might be uncovered during Bay works, and to assess the heritage significance of these items in the context of the difficulties and costs of recovery. The requirement for such a protocol could be reflected through the development consent, if granted by the Minister.

## 6. CONCLUSIONS

As detailed in section 5 of this report, the Department has identified a number of outstanding matters that must be resolved before the environmental impact assessment of the proposed development could be finalised. Notwithstanding, the Department considers that technical solutions to these matters are achievable, and seeks further information and clarification from the Applicant to facilitate the resolution of outstanding issues. Outstanding matters to be resolved can be grouped as follows:

Issues fundamental to the assessment of the proposed development:

- **human health impacts:** clarification of, and justification for, a number of key assumptions applied to the health risk assessment as these assumptions relate to the accepted lifetime risk criterion and correct factors applied as part of contaminant risk screening. Further, consideration of chronic health impacts associated with incidents on the site (abnormal operations) must be provided;
- **technology application:** demonstration that the existing BCD facility at Narangba, Queensland is, in principle, capable and willing to accept liquid waste from the remediation process. Otherwise, full and appropriate assessment of the option to locate a similar BCD facility on the proposed remediation site;
- **air quality impacts:** further consideration of air quality impacts, both dust and gaseous, at elevator receptors that may be established adjacent to the site;
- **noise impacts:** demonstration that all reasonable and feasible measures have been applied to mitigate noise impacts, and consideration of the noise impacts at receptors that may be established adjacent to the site; and
- **hazards and risk:** further consideration of the potential for explosions on the site, and consideration of the transportation risks associated with the haulage of liquid waste to Queensland.

Minor points of clarification and supporting information that should be resolved through the Commission of Inquiry process and before determination:

- **technology application:** development of the framework for a staged commissioning program;
- **air quality:** clarification of the process used to determine air emissions from the remediation technology;
- **water quality:** further details of the water management and treatment systems on the site, and derivation of discharge water quality criteria;
- **traffic impacts:** consideration of the traffic implications of vehicle movements generated during site establishment.

Issues for which the Department is actively coordinating discussions between the Applicant and relevant Government agencies to establish the most appropriate outcome from a number of possible options:

- **residual contamination:** consideration of options to identify residual contaminants on the site and to highlight that the contamination must not be disturbed. These discussions involve the Applicant, the Department, the Waterways Authority and the EPA; and
- **sewer discharges:** consideration of restrictions that may be applied to sewer discharges or alternative options for the management of wastewater on-site. These discussions involve the Applicant, the Department, the Waterways Authority and the EPA.

Public submissions generally expressed support for, and understanding of, the need to remediate the site. However, the community is understandably concerned that the proposed remediation should be undertaken in a manner that does not pose a significant risk to the

environment, human health and public safety. It is therefore important that the environmental impacts of the proposal are comprehensively considered with full public participation and consultation. The Commission of Inquiry provides a forum for the Applicant to present all relevant information to the community, and for interested and affected members of the community to be involved in the assessment process in an open and transparent manner.

Should the Minister determine to approve the proposed development, the Department considers that a precautionary approach to commissioning of the remediation technology would afford the community a level of assurance that the environment, human health and public safety will not be compromised. A staged commissioning approach, with independent verification of performance at each stage, and disclosure of monitoring and performance data to the public, is considered by the Department to be an appropriately cautious means to address community concerns and practically demonstrate the ability of the technology to meet environmental and performance criteria imposed on its operation.

## APPENDIX A- ENVIRONMENTAL PLANNING INSTRUMENTS

Relevant provisions of environmental planning instruments applicable to the proposed remediation are detailed below.

### State Environmental Planning Policy No 56—Sydney Harbour Foreshores and Tributaries.

#### 7 Guiding principles

All decisions made in the administration of the Act or an instrument under the Act relating to the planning and development of land to which this Policy applies are to take the following matters into consideration:

- (a) increasing public access to, and use of, land on the foreshore,
- (b) the fundamental importance of the need for land made available for public access, or use, on the foreshore to be in public ownership wherever possible, particularly land that is within the foreshore area as defined in the *Sydney Harbour Foreshore Authority Act 1998*,
- (b1) if public ownership of foreshore land is not possible, the use of appropriate tenure mechanisms to safeguard public access to, and public use of, that land and to ensure the rights of public authorities to determine the design of, use of, and amenities on, the land over time,
- (c) the retention and enhancement of public access links between existing foreshore open space areas,
- (d) the conservation of significant bushland and other natural features along the foreshore, where consistent with conservation principles, and their availability for public use and enjoyment,
- (e) the suitability of the site or part of the site for significant open space that will enhance the open space network existing along the harbour foreshores,
- (f) the protection of significant natural and cultural heritage values, including marine ecological values,
- (g) the protection and improvement of unique visual qualities of the Harbour, its foreshores and tributaries,
- (h) the relationship between use of the water and foreshore activities,
- (i) the conservation of items of heritage significance identified in an environmental planning instrument or subject to an order under the *Heritage Act 1977*,
- (j) the scale and character of any development, derived from an analysis of the context of the site,
- (k) the character of any development as viewed from the water and its compatibility and sympathy with the character of the surrounding foreshores,
- (l) the application of ecologically sustainable development principles,
- (m) the maintenance of a working-harbour character and functions by the retention of key waterfront industrial sites or, at a minimum, the integration of facilities for maritime activities into development and, wherever possible, the provision of public access through these sites to the foreshore,

- (n) the feasibility and compatibility of uses and, if necessary, appropriate measures to ensure coexistence of different land uses,
- (o) increasing opportunities for water-based public transport.

### **Sydney Regional Environmental Plan No. 22—Parramatta River.**

#### **Matters for consideration in determining development applications**

**20.** A consent authority must not consent to the carrying out of development unless it is satisfied that the proposed development is consistent with development of the land to which this plan applies in accordance with the objectives of this plan, and it has considered such of the following matters as are of relevance to the development:

- (a) the appearance of the development from the waterway and the foreshores;
- (b) whether the development will cause pollution or siltation of the waterway to an extent that would jeopardise any existing or potential uses of the waterway;
- (c) whether the development will have an adverse effect on wetlands or flora and fauna habitats;
- (d) the noise likely to be generated by the development and any adverse effect that any such noise would have on existing uses of the waterway or nearby land;
- (e) whether the development will have an adverse effect on drainage patterns or cause shoreline erosion;
- (f) whether the development will cause excessive congestion of, or generate conflicts between, people using the waterway or the waterfront;
- (g) the demand for storage space for boats on the Harbours or on the Parramatta River;
- (h) whether the development warrants a foreshore location;
- (i) whether the development will have an adverse effect on the views to and from the waterway as a result of the size of the vessels capable of being accommodated within the development;
- (j) \* \* \* \* \*
- (k) the Australian Standard AS 3962-1991—Guidelines for design of marinas;
- (l) \* \* \* \* \*
- (m) any other relevant plan of management, urban design or other development control guidelines that apply to Parramatta River and its foreshores and which has been notified and provided to the consent authority by a public authority;
- (n) the effects of that development on the heritage significance of a heritage item, its site, its vicinity or on a conservation area;
- (o) any representations of the Committee;
- (p) whether the development will affect swimming in the locality;
- (q) the provision of pedestrian access in the locality of the development and the impact of the development on existing pedestrian access;
- (r) the importance of giving priority to onshore access to the foreshore and waterway rather than access by means of boardwalks;
- (s) any development control plan prepared in respect of this plan or, until such a plan has been prepared, the "Design and Management Guidelines for Parramatta River" a copy of which is available at the Head Office of the Department.

### **Sydney Regional Environmental Plan No. 24—Homebush Bay Area**

#### **Matters for consideration in determining development applications**

**13.** In determining a development application, the consent authority must (in addition to considering the other matters required to be considered by section 79C of the Act) consider such of the following matters as are of relevance to the development the subject of the application:

- (a) any relevant master plan prepared for the Homebush Bay Area;

- (b) any development control plans prepared for the land to which the application relates;
- (b1) to the extent to which it applies to land within Sydney Olympic Park, the  
    `**Environmental Guidelines**` within the meaning of the Sydney Olympic Park  
    Authority Act 2001 and any plan of management referred to in section 34 of that  
    Act,
- (c) the appearance, from the waterway and the foreshores, of the development;
- (c1) the impact of the development on significant views,
- (d) the effect of the development on drainage patterns, ground water, flood patterns and  
    wetland viability;
- (e) the extent to which the development encompasses the principles of ecologically  
    sustainable development;
- (f) the impact of carrying out the development on environmental conservation areas and  
    the natural environment, including flora and fauna and the habitats of the species  
    identified in international agreements for the protection of migratory birds;
- (g) the impact of carrying out the development on heritage items, heritage conservation  
    areas and potential historical archaeological sites;
- (h) the views of the public and other authorities which have been consulted by the consent  
    authority under this plan,
- (i) the issues listed in Schedule 7.

**APPENDIX B – ADDITIONAL INFORMATION REQUESTS AND RESPONSES**

**APPENDIX C – SUBMISSIONS RECEIVED**