



***MODIFICATION ASSESSMENT
Remediation of the Former Lednez Site,
Rhodes, and Parts of the Bed of
Homebush Bay***

Environmental Assessment Report
Section 96(2) of the
Environmental Planning and Assessment Act 1979

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EXECUTIVE SUMMARY

In 2004, the then Minister for Infrastructure and Planning granted development consent for the remediation of the Lednez (former Union Carbide) site on the Rhodes Peninsula and parts of the adjacent Homebush Bay. The site, located approximately 15 kilometres north-west of the Sydney CBD and within the Canada Bay local government area, is contaminated with a range of hazardous and carcinogenic compounds as a result of past industrial operations and reclamation of land using industrial waste, including dioxin and furan compounds.

Soil excavation on the Lednez site commenced in May 2005 and has been ongoing since that time. Full-scale Bay remediation works have yet to commence. Indirect heated thermal desorption (IHTD) technology was the soil treatment methodology approved by the Minister, although this technology has yet to be installed on the site.

The construction and imminent occupation of new residential developments on the southern boundary of the Lednez site has prompted Thiess Services (the Applicant) to reconsider the impacts of the project on potentially affected residents in the area. Consequently, the Applicant has submitted a proposal for assessment under section 96(2) of the Environmental Planning and Assessment Act 1979 (EP&A Act) to modify some components of the remediation methodology. Specifically the Applicant proposes to: change the thermal desorption technology (from IHTD to directly-heated thermal desorption (DHTD)); relocate the thermal desorption plant within the site; change the method of excavating sediments in Homebush Bay; expand the area of Bay remediation; upgrade the emissions control performance of the pre-treatment building (PTB); and to provide an enclosure over the waste storage area.

The modification application was publicly exhibited from 18 October 2006 to 8 November 2006 and submissions invited. Ten submissions were received, five from Government agencies (including the DEC, NSW Maritime, Sydney Water, NSW Health and DPI-Fisheries), one from the neighbouring Ryde City Council, and four from the public and organisations.

The Applicant's environmental assessment of the proposed modifications indicates that the proposal will reduce the duration of thermal treatment operations by approximately seven months and the duration of Bay remediation activities by approximately five months, with a corresponding reduction in project duration and associated impacts. The Applicant's environmental assessment indicates that the modifications would allow odour and air emissions to be more effectively mitigated than under the currently-approved remediation approach. The proposed Bay remediation methodology would allow the Applicant to include a number of additional dioxin "hot spots" in the remediation area that were not previously included within the scope of the remediation works. The Applicant suggests that remediation of these areas would further lower average dioxin concentrations in sediments within the Bay. The Applicant also states that the change in thermal desorption technology will result in a reduction in air quality impacts and in heavy vehicle traffic movements.

The Department's assessment of the modification application identifies air quality impacts of the DHTD Plant, noise impacts, odour impacts, water quality impacts during Bay remediation, the extent of Bay remediation and cumulative human health impacts as key issues associated with the proposal. Following the assessment of these issues, including input from key agencies such as the Department of Health and the Department of Environment and Conservation, the Department has concluded that environmental and human health impacts identified for the project can be effectively managed through the implementation of recommended conditions of approval and the Applicant's proposed mitigation measures. In terms of potential air quality impacts, the relocation of the DHTD and PTB Plants, the enhanced emissions controls at the PTB and the enclosure of the waste storage area will provide for the control of air quality emissions to acceptable levels and for improvements as compared with the approved proposal. In this context, the performance of the Allied Feeds' DHTD Plant on the adjacent site to date provides further confidence of the ability of the proposed technology to achieve acceptable results. The proposed Bay excavation method will be subject to trials and a comprehensive monitoring program, and is not expected to cause significant impacts on water quality. Noise from the DHTD Plant and other site and off-site activities has the potential to impact on the nearest residential areas and therefore further confirmatory noise modelling, review and control measures have been required prior to commencement of construction.

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1. BACKGROUND

In 2004, the then Minister for Infrastructure and Planning granted development consent to Thiess Services Pty Ltd (the Applicant) to remediate the Lednez (former Union Carbide) site on the Rhodes Peninsula and parts of the adjacent Homebush Bay (both referred to in this report as the site).

Soil excavation on the Lednez site commenced in May 2005 and has been ongoing since that time. Bay excavation work did not commence at this time and has not been undertaken since. Indirect heated thermal desorption (IHTD) technology was the soil treatment methodology approved by the Minister, but the IHTD Plant has yet to be installed. Further details of the approved remediation project are provided in section 1.3 of this report.

The Applicant now proposes to modify some components of the remediation methodology, specifically changing the thermal desorption technology (from IHTD to direct heated thermal desorption), relocating the thermal desorption plant, changing the method of collecting sediments in the bay (from coffer dam's sediment removal to dredging) and expanding the area of bay remediation, upgrading the emissions control efficiency of the pre-treatment building (PTB) and providing an enclosure over the waste storage area. Details of the proposed changes are provided in section 2 of this report.

The site subject to remediation is located approximately 15 kilometres north west of the Sydney CBD, on the Rhodes Peninsula and within the Canada Bay local government area. The address for the Lednez site is 40 Walker Street, Rhodes and is Lot 10 DP 1007931. The adjacent bed of Homebush Bay subject to the remediation consent is described as part Vol. 5018, Fol.1 and is owned by NSW Maritime. The site is shown in Figure 1.

The site is contaminated with a range of hazardous and carcinogenic compounds as a result of past industrial operations and reclamation of land using industrial waste, including scheduled chemical wastes and dioxin compounds.

The site is subject to *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* which zones the land for a mix of residential, commercial and open space land uses. These uses cannot be undertaken until the site is remediated to an appropriate level.

Figure 1 - Location of the Remediation Site



1.1 Surrounding Land Uses

The land immediately surrounding the site includes the former Allied Feeds site (currently also subject to remediation) to the north, low density residential development to the east, and Homebush Bay to the west. Construction of a number of new residential buildings is currently occurring to the south of the site. The nearest sensitive receptors are the Statewide and Meriton medium density apartment developments which lie 50 metres to the south of the site. The Statewide and Meriton apartments are scheduled for occupation by 2007.

Other land uses within the vicinity of the site include the Parramatta River, open space, residential, commercial and industrial uses.

1.2 Original Application and Existing Development Consent

The original development application consisted of three main components: a method for removing contaminated sediment from the Bay; an excavation process for on-site soil contaminants; and a process for thermally treating the contaminated soil and sediment, as detailed below.

The approved methodology for removing contaminated sediment from the Bay involved construction of a series of coffer dams along the eastern foreshore of Homebush Bay which were to be drained and then progressively excavated to a depth of approximately 0.5 metres. Construction of the coffer dams would have required end-tipping soil from dump trucks into the bay and then soil spreading by bulldozer. The dam wall would have required a base of 26 metres. The exposed bay seafloor was then to be excavated and stockpiled adjacent to the seawall within the coffer dam, allowing free water to drain from the contaminated sediment. The excavated sediment was then to be transferred to the Lednez site remediation works for processing. Upon completion of sediment excavation, the excavated areas were to be re-instated to pre-remediation levels using backfill materials sourced from the dam walls. This operation was expected to occur over a 15 month period. Excavation of contaminated soil on site would be excavated using mobile equipment and transferred to the desorption plant for processing.

The approved thermal treatment process for remediation of materials on the site utilised indirect heated thermal desorption (IHTD) technology. The IHTD process involved feeding soil into an indirectly-heated rotary dryer which was to remove contaminants from the soil. The desorbed contaminants were then to be condensed and collected for transport for off-site processing. Off-site treatment of IHTD condensate was to use base catalysed dechlorination (BCD) and/ or plasma arc technologies as necessary. Treatment of the IHTD condensate was to occur in Queensland requiring monthly transport of the condensate by road. IHTD processing of the contaminated soils and sediment was anticipated to take up to 19 months.

Approval of the proposed remediation process was granted after a Commission of Inquiry was held to examine the environmental impacts of the proposal. The Inquiry was held in response to concerns raised in submissions from both the public and Government agencies during the exhibition of the Environmental Impact Statement. Concerns were principally focused on:

- air quality impacts: the emission of particulates was predicted to exceed NSW air quality goals under worst-case meteorological conditions and/ or elevated background particulate concentrations. In particular, concern existed regarding the health implications of high particulate concentrations;
- noise impacts: the proposal was expected to exceed noise criteria during the day despite the application of all reasonable and feasible noise mitigation measures. Concern was also raised that noise impacts may affect communication and learning ability;
- odour impacts: uncertainty regarding whether odour could be effectively managed to acceptable levels given the proximity of sensitive receptors and the difficulties associated with estimating odour generation rates as a consequence of biological activity in excavated sediment; and
- human health impacts: impact of noise and air emissions on the human health, in particular exposure to carcinogenic health risks posed by the remediation work.

After extensive consideration of these and other issues, the Commission of Inquiry concluded that proposal could be undertaken within acceptable environmental and safety limits provided that stringent conditions governed the remediation. It was considered that in the circumstances, the do nothing option (i.e. leaving the site/ Bay

untouched) was not appropriate. The Department concurred with this view, noting that while there would be some adverse impacts, on balance these impacts were acceptable within the context of the project and the benefits that would be delivered. It was viewed that if remediation was not to occur, the Rhodes Peninsula would be left in a state whereby a major contaminated site would exist in an area surrounded by occupied residential developments, and it would thereby present additional on-going human health risks to the local community.

Consistent with the Commission of Inquiry's recommendations, the Department recommended conditions of consent that required comprehensive and strict mitigation, monitoring and management of potentially adverse impacts. These recommended conditions were adopted by the Minister upon granting development consent.

2. PROPOSED MODIFICATION

2.1 Scope of Modification

The Applicant seeks approval under section 96(2) of the *Environmental Planning and Assessment Act 1979* for the following modifications to the existing development consent:

- modification to the methodology used to remove sediments from the Bay;
- extension of the footprint of sediment removal works in the Bay to encompass additional contaminated material;
- modification of the thermal desorption technology from indirectly-heated thermal desorption (IHTD) to directly-heated thermal desorption (DHTD);
- relocation of the approved location for the desorption plant and associated pre-treatment building (PTB);
- upgrade of emission controls for the pre-treatment building; and
- provision of an enclosure over the waste storage unit.

The proposed sediment excavation technique would involve removing the sediment from the Bay using a mechanical dredging approach. This technique would allow the contaminated sediment to be extracted from the bed of the Bay without draining or drying the excavation area. The proposed technique would involve mounting an excavator on a secure barge in the Bay which would then lower a clamshell-like bucket into the seabed to extract the sediment. The sediment extracted by the bucket would then be emptied into a sealed hopper barge which would be moored alongside the dredging pontoon. Once the work area has been excavated to a depth of 0.5 metres, the excavator barge would rotate such that excavation on the adjacent area could be commenced. In this manner the excavator barge would excavate the site in a series of arcs sweeping across the work area. The sealed hopper upon being filled with excavated sediment would be emptied on shore where the sediment would be stockpiled to allow excess water to drain.

The use of this process is likely to disturb the seabed sediment, potentially releasing contaminated sediment into the greater Bay area. As such, the Applicant proposes to construct and operate a containment barrier system to ensure that disturbed sediment remains in the remediation area. Floating containment barriers would be used, extending from the water's surface to the seabed, and including permeable and impermeable curtains. A detailed description of the proposed containment barrier system is provided in section 5.4 of this report.

The area of the Bay to be remediated has been extended beyond the area envisaged in the original development consent, from 5.2 hectares to 7.6 hectares (a 45% increase in area to be excavated). This is proposed so as to include a number of contaminant "hot spots" that lie adjacent to the approved remediation area. The Applicant states that the result of the expanded footprint would be to reduce the average level of sediment contamination in the Bay area to levels below that which would have been achieved by the existing approval.

The thermal treatment process proposed by the Applicant as part of the subject modification application is Direct Heated Thermal Desorption (DHTD). This process involves thermally oxidising the contaminants after they have been desorbed from the contaminated soil/ sediment. Unlike Indirect Heated Thermal Desorption (IHTD), there is no condensate waste product requiring further processing. A similar DHTD facility to that proposed is currently operating on the adjacent Allied Feeds site.

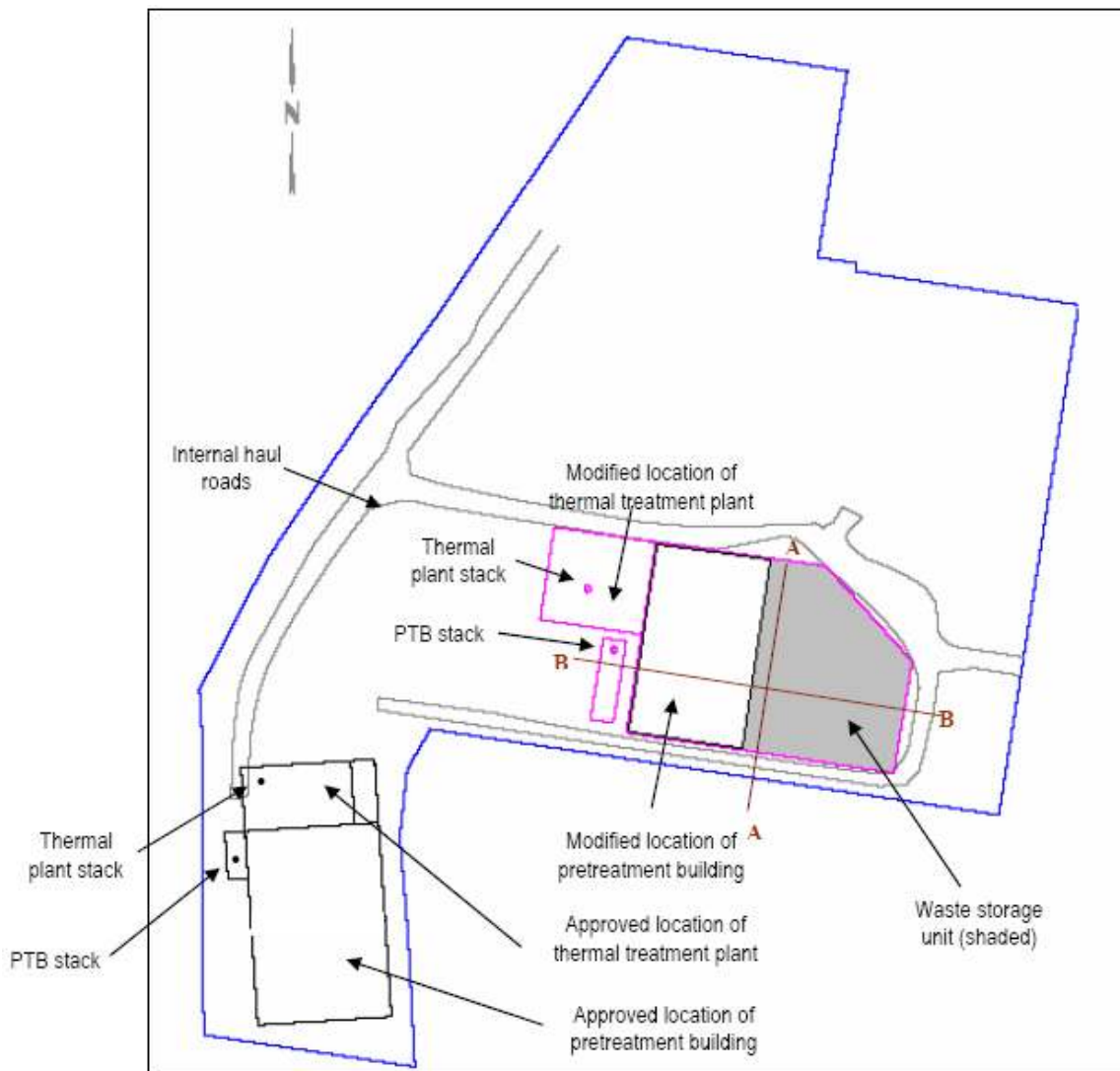
The proposed DHTD plant would contain similar emission control measures to that in use at the Allied Feeds plant. Measures would consist of a rapid quench to minimise the reformation of dioxins post thermal treatment and an acid gas scrubber to remove any hydrochloric acid that may be formed in the gas stream. The DHTD facility would process up to 30 tonnes per hour, 18 tonnes more per hour than that possible under the existing IHTD approval.

The pre-treatment building (PTB) is also proposed to be modified as part of the modification application. The Applicant states that the purpose of the modifications to the PTB is to improve dispersion efficiency and to increase the removal efficiency of volatile organic compounds from between 0% and 10% under the existing approval to a minimum removal efficiency of 90%. The increase would be achieved by increasing the size and usage rate of the proposed activated carbon bed filter.

The modification also seeks to relocate the approved location for the desorption plant. The proposed location is shown in Figure 2.

The waste storage unit (indicated in Figure 2), utilised for the temporary storage of material destined for thermal treatment, is proposed to be enclosed using a cable supported tent made of shade cloth-like material. The material proposed for the enclosure would be a heavy duty black woven high density polyethylene plastic. The enclosure is proposed to reduce odour emissions.

Figure 2 – Proposed (Modified) Desorption Facility Location



2.2 Need and Justification for the Modification

The construction and imminent occupation of new residential developments on the southern boundary of the Lednez site has prompted the Applicant to reconsider the impacts of the project on potentially affected residents in the area. It was considered that some of the issues identified with the approved method, such as odour and air emissions, would be compounded by the close proximity of the new residential developments to the remediation work.

In response, the Applicant proposes to modify the approved methodology such that the total impact of the remediation work on nearby residents is reduced. To achieve this, the Applicant proposes to relocate the thermal desorption facility further away from new residential areas, improve the emissions control measures of the pre-treatment plant, modify the excavation and soil / sediment desorption processing methods and enclose the waste storage area.

The proposed modifications are reported to reduce the duration of thermal treatment operations by approximately seven months and the duration of Bay remediation activities by approximately five months, with corresponding reduction in project duration and associated impacts. The Applicant's environmental assessment indicates that the modifications would allow odour and air emissions to be more effectively mitigated than under the approach currently approved. The proposed Bay remediation methodology would allow the Applicant to include a number of dioxin "hot spots" in the remediation area that previously would not have been remediated. The Applicant states that remediation of these areas would further lower sediment dioxin concentration within the Bay to levels below that which would have been achieved under the existing approval. The Applicant also states that the change in thermal desorption technology would result in a reduction in heavy vehicle traffic movements.

3. STATUTORY CONTEXT

3.1 Application of Section 96(2)

The Department is satisfied that the development, if modified, would be substantially the same as the development originally approved by the Minister. In particular, the scope and intent of the development will remain unchanged as a consequence of the current modification application. Alterations to treatment technology, materials handling methods and inclusion of Bay dioxin hot spots are not considered to substantially alter the remediation proposal. As such, it is appropriate to consider the proposed alterations to the development as a modification under section 96 of the *Environmental Planning and Assessment Act 1979*.

Having reviewed and considered the information provided by the Applicant in support of the subject modification application, the Department is of the view that the environmental impacts associated with the modification could not be simply described as “minimal”. These impacts are, however, within acceptable environmental limits, although the absolute magnitude of the impacts is significant. As a consequence, the modification application has been assessed under section 96(2) (modifications other than those of minimal environmental impact).

3.2 Environmental Planning Instruments

Both *Sydney Regional Environmental Plan No. 29 – Rhodes Peninsula* and *State Environmental Planning Policy No. 55 – Remediation of Land* govern the carrying out of the proposed remediation works. Remediation is permissible with development consent under both instruments.

3.3 Exhibition and Notification

The modification application and accompanying Statement of Environmental Effects were publicly exhibited for an extended period of three weeks (compared with the statutory minimum of 14 days), from 18 October 2006 to 8 November 2006. The application was made available for public inspection at the Department's head office and at the office of Canada Bay Council. In addition to written notifications to submitters to the original development application, an advertisement was placed in the local media advising of the public exhibition and inviting comment on the proposed modification.

4. CONSULTATION AND ISSUES RAISED

The Department received ten submissions during the exhibition of the modification application and accompanying Statement of Environmental Effects. Five submissions were received from Government agencies, one from the neighbouring Ryde City Council, and four were received from the public/ organisations. Consideration of the key issues identified in submissions and in the Department's review of the Applicant's environmental assessment is provided in section 5 of this report.

4.1 Submissions from the Public/ Organisations

A total of four submissions were received from the public and organisations. Of these submissions, three were generally supportive of the proposal however they did highlight concerns regarding certain potential short and long term impacts of the modification proposal. The key issues identified in submissions from organisations and the public included:

Remediation Level

- support the intent to remediate to lower dioxin levels through the inclusion of nominated "hot spots";
- should raise health of bay such that current fishing ban in the bay can be lifted;
- should ensure no bay "hot spots" remain;
- further surveying of bay area to obtain current contaminant profile of the bay is required as the contaminant profile of the bay may have changed since the original data was collected;
- will not allow recreational water use, such as swimming, within the bay;
- remediation work area should be expanded to allow for further contaminant reduction; and
- remediation should occur to dioxin contaminant levels equivalent to that found naturally in the Parramatta River.

Air Quality Impacts

- no explanation of the air quality modelling method given;
- support for pre-treatment building emissions control measures proposed; and
- dioxin emissions need to be eliminated, not minimised, per the ultimate goal of the Stockholm Convention on Persistent Organic Pollutants.

Odour Impacts

- impacts of odours due to naturally occurring elements in the sediment combined with man-made odours (volatile organic compounds) is unknown;
- Allied Feeds site regularly breaches licence conditions regarding odour and this is not addressed;
- licence requirements must be enforced and this should address combined impacts; uncovered sediment, material being transported onsite and stockpiled material; and
- means for managing odour during unloading, dewatering, transport and stockpiling have not been addressed.

Noise Impacts

- Allied Feeds regularly breaches noise limits, particularly at night, therefore impact of the proposed plant on Lednez site may be similar or worse given potential for two plants to be operating simultaneously;
- despite noise suppression measures being undertaken at the Allied Feeds site, noise remains an issue; and
- supports move to relocate plant due to close proximity to future residents on the Meriton and Statewide sites.

Hazards and Risk Impacts

- impact and management of river / bay traffic on the remediation work environment needs addressing;
- Bay access restrictions should be imposed and Rivercat personnel informed of work;

- must address management of unintended intruders to the bay remediation work area; and
- continuous monitoring of floating containment barrier is required so as to manage any unforeseen or accidental incidents that may reduce the effectiveness of the barrier system.

Community Consultation

- communication of the remediation methodology, impacts and management needs to be provided in high visibility community areas so that new residents to the area are familiar with the work to be undertaken; and
- noise / air / odour monitoring programs and results need to be communicated to the community.

4.2 Submissions from Government Agencies

Five submissions were received from Government agencies: the Department of Environment and Conservation; the Department of Primary Industries; NSW Health; NSW Maritime and Sydney Water Corporation. None of the agencies objected to the proposal, but raised a number of key issues for further consideration. Issues included concerns regarding noise levels, air quality impacts, cumulative human health impacts and the level of Bay-wide average dioxin concentration reduction. Submissions made by each agency are summarised below.

Department of Environment and Conservation (DEC)

- the control and minimisation of chemical mobilisation resulting from both the solubilisation of chemicals and the disturbance of contaminated sediment particles is critical;
- an excavation trial should be undertaken to clarify chemical mobilisation issues;
- description of trial requirements including sampling, testing and measurement;
- contingency plans should be developed based on the outcomes of the trial and any further testing required;
- contingency plans should be developed if during the commissioning phase, results do not meet the established limits / trigger values;
- contingency plans for immediate actions based on instantaneous monitoring and actions based on results from laboratory testing must be determined for the operational phase;
- semi-permeable membrane devices must be trialled to monitor persistent organic pollutants;
- description of monitoring requirements for commissioning monitoring and ongoing monitoring at each barrier, critical stage monitoring;
- limits and trigger values for each barrier;
- requirement to prepare and Operational Management Plan;
- odour generated from stockpiling, in particular sediment dewatering, will be a significant source of odour that may overwhelm any reduction in odour from the proposed methodology;
- the proposed direct heated thermal desorption plant does not comply with all the requirements of the Protection of the Environment Operations (Clean Air) Regulation 2002;
- the air quality impact of the modification to the thermal treatment technology and the changed location is not clear; and
- General Terms of Approval.

NSW Health

- predicted noise impacts are substantial, particularly at the Statewide building (53-62 dB(A));
- predicted noise levels substantially exceed both the Applicant's amended goals and the World Health Organisation guidelines for levels below which adverse health affects are expected;
- while wet excavation has been demonstrated to produce less odour than the approved method, proposed method has potential to increase odour intensity through excavating 46% more bay sediment over a shorter time frame;
- concern regarding the cumulative effect of multiple environmental stressors (noise, odour, dust, chemicals) should the Statewide buildings be occupied.

Department of Primary Industries

- an Environmental Management Plan needs to be established to ensure that any fish trapped within the containment system are removed and released back into the bay;
- an Acid Sulphate Environmental Management Plan needs to be established to ensure that there are no acid sulphate releases which have harmful affects on marine biota and fish;
- impacts of the dredging work on marine vegetation, particularly mangroves, saltmarsh communities and key fish habitats is unclear; and
- fill material needs to be of a nature that will sustain and encourage marine benthos to colonise it.

NSW Maritime

- wet excavation approach removes the uncontrolled soil cap that the approved excavation methodology (coffer dam method) would have provided;
- uncontrolled soil cap proposed by the approved methodology served to lower bay-wide average dioxin levels below that stated in the original approval;
- effectively the uncontrolled soil cap lowered bay wide average dioxin levels to that which are proposed (1.4 ug/kg TEQ);
- 500 mm cap of clean soil over an area equivalent to the uncontrolled soil cap lost through the proposed modification should be undertaken, resulting in a reduction in bay-wide average dioxin levels by approximately 30% from that currently approved when the effect of the uncontrolled soil cap is taken into consideration;
- recommended conditions for excavation and validating excavation depth before and after excavation;
- recommended conditions for the use of reinstatement material, including a Reinstatement Material Management Plan;
- recommended conditions for the use of geofabric material; and
- recommended conditions for requiring and undertaking bay survey work.

Sydney Water

- no 'in-principle' objections to the proposal;
- current trade waste consent must be modified;
- Applicant will need to obtain a compliance certificate from Sydney Water confirming it has met Sydney Water design requirements; and
- the Applicant must fund any adjustments to Sydney Water infrastructure that may result from the modification.

4.3 Submissions from Local Government

A submission was received from the City of Ryde Council, stating neither support nor objection to the majority of the changes proposed by the modification. However, Council did not support the proposed change from IHTD to DHTD technology. The submission also raised a number of matters that Council believed should be given careful consideration as part of the assessment of the proposal. The key matters are as follows:

- thorough assessment required;
- public health and environmental safety risks need to be fully considered; and
- an EIS would provide for a more appropriate level of environmental and community impact assessment to be undertaken.

With respect to the issue of thermal desorption technology, Council expressed a preference for IHTD over DHTD, because:

- IHTD is safer because destruction of contaminants occurs off-site;
- IHTD should remain because it is safer; and
- best available technology and best environmental practice per the Stockholm Convention on Persistent Organic Pollutants needs to apply.

4.4 Applicant's Response to Issues Raised in Submissions

A Submissions Report dated 18 December 2006 was prepared by the Applicant and submitted to the Department. The Submissions Report provided responses to the various issues raised in the submissions. In addition, the Applicant prepared a response to the DEC and the Department dated 16 November 2006 regarding noise issues, and responded to the NSW Maritime submission in an email to the Department dated 6 December 2006. The main responses provided by the Applicant to issues raised in submissions are summarised below:

- The Applicant committed to conducting a complete acoustical study once the design of the various process systems is completed so that further mitigation measures might be identified where appropriate.
- The Applicant agreed to night time noise limits rather than goals.
- The Applicant provided revised night time limits in its response dated 16 November 2006 following the discussions with the DEC.
- The Applicant will provide actual monitoring information and will work with the NSW Health and the DEC in order to revisit previous health risk assessment conducted during the planning phase in relation to cumulative effect of multiple environmental stressors.
- An emergency and contingency plan will be developed to manage accidents or incidents involving wayward watercraft.
- The work area in the bay has already been marked with lighted buoys in accordance with NSW Maritime requirements.
- The impact of wave action from watercraft travelling the Parramatta Rive has been incorporated in the containment barrier system design.
- The existing sediment dioxin data is from several investigations undertaken over the past ten years which have consistently shown the same pattern of spatial and vertical distribution of dioxins in the bay. Further, a study of hydrodynamics and sediment transport in the bay from 1985 to 1996 showed that the rate of sediment accretion along the eastern side of the bay is very low (0-20mm/annum), and this was confirm by recent surveys which showed no significant change to previous survey results.
- Odour testing at the DHTD stack at Allied Feed indicates that emissions are in compliance with DEC licence requirements.
- The Bay sediment dewatering process is unchanged by the proposed "wet" excavation method. The on-site water treatment plant has significantly more capacity than is currently need for the project.
- The air quality modelling conducted for the modification will be submitted in its entirety.
- The water quality monitoring equipment proposed will be "real" time so date is collected every 15 minutes for comparison and decision making. The Water Quality Management Plan will be updated to include details of monitoring and sampling regimes for the bay works. The Applicant also provided a number of comments on the DEC's monitoring requirements.
- The manufacturer of the containment system will be involved in the construction and establishment. Monitoring of the system will be the responsibility of the Applicant. The Manufacturer will be working closely with t the Applicant to support and provide ongoing inspections and maintenance of the system.
- The wear life of the geotextile fabric to be laid on the bed of the bay is 50 years or more.
- Barge movements will be performed in the deepest water to the extent possible. If a barge becomes stuck it will require off loading into another barge for transport to shore. Works may need to cease until the tide rises and the draft of the barge is able to free itself again and be relocated.
- The proposed DHTD plant configuration is the same as that currently being used on the Allied Feeds site. Accordingly the air emissions criteria sought in the s.96 application are the same as those approved under the development consent and EPA licence for that project. The Applicant claims that the 'default' criteria requirements of the *Protection of the Environment Operations (Clean Air) Regulation 2002* are not appropriate on this project. It also noted that it is presently working with the DEC on the air emissions criteria for the proposed DHTD Plant and criteria should not be stated in the consent.

5. ASSESSMENT OF ENVIRONMENTAL IMPACTS

After consideration of the modification application, submissions, and the responses of the DEC, DPI, NSW Health and NSW Maritime, the Department has identified the following key environmental issues associated with the proposal: air quality impacts of the DHTD plant; noise impacts; odour impacts; water quality impacts during Bay remediation; extent of Bay remediation; and human health impacts.

5.1 Air Quality Impacts of the DHTD Plant

Issues

Potential impacts on air quality and associated impacts on human health of the thermal desorption process were identified as a key issue in the original remediation application. At the time, the Applicant concluded that emissions from the IHTD Plant were unlikely to result in any exceedances of applicable air quality goals or unacceptable levels of risk.

To update the assessment of air quality impacts, a revised impact assessment was undertaken by Holmes Air Sciences (August 2006 and 18 January 2007) as part of the modification application to determine whether the emissions from the proposed DHTD Plant and PTB would comply with applicable ambient air quality criteria. Particulates, dioxin and furan emissions were identified to be the key contaminants of concern for the original application. The air quality impact assessment examined the impact of relocating the DHTD plant and PTB, as well as the change from IHTD treatment to DHTD treatment. The operating scenarios considered were:

1. operation of the proposed relocated DHTD plant at the Lednez site in isolation;
2. operation the proposed relocated DHTD plant at the Lednez site combined with the operation of the existing DHTD plant at the Allied Feeds site; and
3. operation of the approved IHTD plant at the approved location at the Lednez site in isolation.

Dispersion modelling of predicted site emissions was conducted as part of the assessment. Dispersion modelling was undertaken using AUSPLUME version 6, and taking into account meteorological conditions and local terrain. The contaminants considered reflected those identified as key contaminants of concern for the original application, namely dioxins, furans and particulates (PM₁₀). Other modelling parameters included stack heights and locations, and emission rates used in previous studies on the Peninsula. The emissions rates used in the model for dioxins, furans and particulates, as well as the stack flow rate and exit velocities for the proposed DHTD and PTB Plants are the same as those from the already installed (and being commissioned) Allied Feeds' plants. The results from the dispersion modelling are presented in Table 1 below and represent the highest concentration predicted for the nearest sensitive receptor (i.e. at the adjacent Statewide development). Maximum predicted air pollutant concentrations have been predicted across a range of heights to allow the impact of receptor height on predicted emissions to be compared between potential Statewide receptors at ground-level, half building height (15-metre) and at the top of the development (27-metre).

Table 1 - Summary of Air Quality Impact Assessment Results

Pollutant	Receptor Height	DHTD Lednez	DHTD Lednez & Allied Feeds	Currently Approved IHTD Lednez	NSW Air Quality Goals*
PM ₁₀ (24-hour maximum) (µgm ⁻³)	ground-level	5.40	6.10	4.60	50
	15m	5.50	6.70	4.50	
	27m	7.50	12.50	20.50	
PM ₁₀ (annual average) (µgm ⁻³)	ground-level	0.65	0.80	0.55	30
	15m	0.68	0.95	0.63	
	27m	0.85	1.50	2.00	
Dioxins and furans (1-hour maximum) (pgm ⁻³)	ground-level	0.21	0.24	0.30	2
	15m	0.18	0.32	0.30	
	27m	0.25	0.55	0.70	

Consideration

The air quality modelling indicates that the potential air quality impacts of the proposed modified DHTD plant and PTB will comply with relevant air quality goals. Table 1 shows that when considered in either isolation or cumulatively with the Allied Feeds plant, the DHTD plant and PTB emissions are consistently below the relevant NSW air quality criteria for the key contaminants described. The assessment also demonstrates that the proposed DHTD plant is predicted to perform notably better than the approved IHTD plant for the key contaminants at 27-metres. At lower heights, air emission performance is predicted to be slightly higher for PM₁₀ emissions, but notably better for dioxin and furan emissions. In light of this information, the Department considers that air quality impacts due to the proposed relocated DHTD and PTB plants will generally be better overall than the approved IHTD and PTB plants.

The air quality modelling assessed the cumulative impacts of two DHTD Plants operating simultaneously (ie. Allied Feeds and Lednez Plants) but it did not consider cumulative impacts with other works currently being undertaken on the Peninsula (particularly construction works associated with residential developments), and therefore the reported results could have been, to some extent, underestimated. It is important to highlight that the key cumulative impact in this case relates to particulates, rather than specific hazardous chemical compounds. It is noted that actual ambient air quality monitoring data since remediation operations commenced indicates that dust levels (a key parameter of existing air quality in the area given the scale of remediation and excavation in the Peninsula) have generally been well within the criteria with occasional exceedances reported. In addition, the proposed enclosure over the waste storage unit is expected to further reduce dust emissions from the site. It is also noted that, by the time the Lednez DHTD plant is installed, remediation activities on the adjacent Allied Feeds site will likely be close to completion (or completed) and therefore the impacts on air quality from the Allied Feeds site is expected to be reduced from that assumed in air quality modelling. It is also likely that the two DHTD plants will only operate simultaneously for a few weeks or that they will not operate simultaneously at all. Based on that, the Department considers that the cumulative air quality impact of the proposed modifications will not likely be significant. Notwithstanding, the Department recommends imposition of stringent air emissions limits as part of any approval of the subject modification application, to take into account the worst-case eventuality of remediation and redevelopment works on the Peninsula.

In addition, the Department has recommended a Commissioning and Proof of Performance Program to ensure that the treatment technology is capable of meeting the stipulated air quality criteria prior to the commencement of full-scale operation. A series of trials would be conducted to incrementally assess operational performance. The trials that would be established would work as a series of performance gateways. Successful performance with no soil would permit a trial of clean soil; successful performance with clean soil would in turn permit a trial of contaminated samples. Contaminated soil would be representative of the possible contaminant constituents, contaminant concentrations and range of soil matrices to be processed thereby ensuring that the process has the capacity to manage the broad range of possible feed material that would be encountered under real operating conditions.

While the above requirements serve to provide an understanding of the predicted air quality impacts associated with the proposal, it is important that detailed management procedures and control measures are established prior to commissioning to ensure that the predicted levels are achieved when the project is operational. To this end, the Department has recommended the Applicant be required to prepare an updated Air Quality Management Plan to reflect the potential issues associated with the modified proposal. The Air Quality Management Plan would need to meet the requirements of the DEC and be undertaken in consultation with NSW Health. The Plan would identify processes for monitoring emissions in accordance with the requirements of the DEC; pro-active and reactive response mechanisms for dealing with potential elevated air quality impacts; detailed measures to address exceedances or scenarios likely to result in an exceedance; and contingency plans to manage incidents or process upset conditions which may result in air quality exceedances.

The Department has also recommended comprehensive air monitoring requirements for operational plant and ambient air quality consistent with the requirements of the DEC. Such requirements would assist in ensuring that the level of performance established by the Proof of Performance Program is maintained throughout the life of the project.

Overall, the Department believes that provided all the recommended conditions are implemented, the resultant air quality impacts of the DHTD and PTB plants would be within acceptable levels. Other air quality benefits of the modified treatment method include a reduction in the duration of thermal treatment operations by approximately seven months. The Department also notes that the experience gained by the Applicant in commissioning the Allied Feeds DHTD Plant and the satisfactory performance results of such plant, as reported in the "DTD Commissioning and Proof of Performance Report - Remediation of the former Allied Feeds Site" (Thiess December 2006). These real-life data provide further confidence that the proposed DHTD Plant can be operated safely and in compliance with human health risk criteria.

5.2 Noise Impacts

Issues

Noise impacts associated with the remediation of the Lednez site were identified to be a key issue during the assessment process of the original development application. Since the original application was determined, a number of residential developments have been constructed immediately adjacent to the site. It is likely that these developments will be occupied at some time during the proposed remediation period. Subsequently, understanding the potential noise impacts associated with the proposed modification is important so that the impacts on existing and future sensitive receptors can be understood.

To this end, the Applicant conducted two noise impact assessments to determine the predicted noise impacts of the proposed excavation method compared with the approved excavation method; and to determine the noise impacts associated with operating the proposed relocated DHTD plant.

The noise impact assessment of the proposed excavation method assessed the cumulative effect of the sound power levels for each plant item that would be involved in the excavation process. The proposed barge-clamshell method was then able to be compared with the approved coffer dam method. The assessment concluded that the proposed barge-clamshell method would have a combined sound power level of 120 dB(A) (assuming simultaneous operation of all equipment), which was marginally higher than the combined sound power level of 119 dB(A) for the approved coffer dam approach. The Applicant concluded that the day time noise impact of the respective bay remediation methodologies is effectively equivalent, but with respect to night time noise, the proposed modified proposal is superior as it does not involve any night time activities. The sound power level of the equipment that would be used for both excavation methods is compared in Table 2 below.

Table 2 - Comparison of Acoustic Performance of Excavation Methods

Approved Cofferdam Method		Proposed Barge/Dredging Method	
Plant Item	Sound Power Level dB(A)	Plant Item	Sound Power Level dB(A)
Dump truck	108	30-tonne Excavator	110
Bulldozer	112	Sheet Piling Rig	120
30 Tonne Excavator	110	Establishment works	100
Dewatering Pump	107		

The noise impact assessment of the relocated DHTD plant was conducted to determine the potential noise impacts associated with this component of the proposal. The assessment determined project specific noise criteria generally in accordance with the requirements of the NSW Industrial Noise Policy (INP). Day time noise goals and night time noise limits were subsequently revised following discussions with the DEC (as per the Applicant's letter dated 16 November 2006 and DEC submission on noise issues dated 24 November 2006).

The assessment considered intrusive noise impacts and the impact on local noise amenity under neutral atmospheric conditions. The effect of adverse weather conditions were not considered as part of the assessment. The modelled results included noise controls utilising the existing boundary container barriers, source control to the stack exhaust motor and source control to the ID fans. No other control measures were included in the model simulation. The noise impact assessment results for the relocated DHTD plant are detailed in Table 3. Predicted exceedances of INP noise criteria are highlighted in red.

Table 3 – Predicted Noise Impacts from the Relocated DHTD Plant

Site	Noise Criteria L _{Aeq} (15 minute) dB(A)			Predicted Noise Impact dB(A)
	Day	Evening	Night	
Rhodes Residential Areas	50 – 55*	47	44	41 - 45.5
Meadowbank Residential Areas	48	44	41	36.5
Statewide Ground level	59	50	45	31.5 – 56
Statewide 10 metres	70	52.5	47.5	31.5 – 61
Statewide 20 metres	70	55	50	35.5 – 62
Meriton Ground level	67	46.5	45	39.6
Meriton 10 metres	67	49	47.5	46.6
Meriton 20 metres	67	50.5	48	47.8
McRoss Ground level	55	39	39	39.6
McRoss 10 metres	61	46	46	46.6
McRoss 20 metres	62	47	47	47.8
Marquet Street	44 - 53	44	42	36.5

* Day time noise goals change as project progresses from Stages 1 to 4 identified in the original DA application documentation.

The assessment found that the DHTD plant would operate within the noise goals during daytime operation under neutral weather conditions. It is important to note that daytime noise goals have been derived using a scaled approach to better manage the elevated noise levels posed by open excavation adjacent to residential areas. The Applicant states that the scaled approach used reflects the approach adopted for the original IHTD application. The levels adopted were identified as a suitable means of establishing noise goals that could be reasonably and feasibly adhered to by the Applicant given the noise impacts typical of excavation works and the proximity of sensitive receptors.

The assessment further concluded that some noise exceedances are predicted during both the night and evening periods, with noise impacts noted to increase with increases in elevation. The largest exceedance (13.5 dB(A)) is predicted at the Statewide site at an elevation of 10 metres. The Statewide site is also likely to be the most adversely affected receiver, with noise impacts predicted to range between 56 dB(A) (ground-level) to 62 dB(A) at 20-metre elevation. Predicted noise impacts for this site are above the recommended night time maximum noise amenity level for urban areas (50 dB(A)) described in the NSW Industrial Noise Policy. Lesser exceedances of the noise limits occur at the McRoss site and some Rhodes residential areas. These predicted noise impacts lie below the recommended night time maximum noise amenity level.

Consideration

The Department is generally satisfied that the assessment approach employed by the Applicant with respect to noise impacts is consistent with the requirements of the NSW Industrial Noise Policy (INP) and that it has provided a realistic indication of the potential noise impacts that are likely to result from the proposed modification. However, it is noted that the assessment has been limited to an assessment of the component parts of the proposal, and has not addressed the likely larger impacts that would be posed by the cumulative work on site or in adjacent areas.

With regards to the noise assessment of the proposed bay excavation techniques, the Department considers that the predicted sound power level associated with the proposed barge-clamshell method is likely to be lower than that stated in the modification application. The Department notes from Table 2 above that the sheet piling rig will be the principal dominant source of noise with a sound power level of 120 dB(A), compared with other sources being the excavator (110 dB(A)) and establishment works (100 dB(A)). However, the Applicant has stated that the sheet piling work described in the noise assessment is not included as part of this application and that this work will be completed prior to the commencement of Bay excavation. In light of this, it is reasonable to conclude that the sound power level of the barge-clamshell method is likely to be lower than that of the approved coffer dam method given the relative sound power levels of the equipment described (refer to Table 2).

In the event that sheet piling was to be undertaken during the course of Bay excavation, this method would exceed the sound power level of the currently-approved method by 1 dB(A). However, the Applicant highlights that the cumulative advantages of the proposed excavation method outweigh the marginal difference in noise impact; suggesting that the proposed method would be completed in a third of the time required for the coffer dam approach and further, it would not require the continuous operation of a dewatering pump (107 dB(A)) as per the currently-approved method, and it will not require night time works. The Applicant notes that continuous operation of the dewatering pump, as required under the coffer dam method, would likely result in some night time noise amenity impacts. The Department concurs with this conclusion and considers that on balance the potential noise impacts associated with the proposed barge-clamshell excavation method would be less than that of the approved coffer dam method.

With regards to the noise assessment of the proposed DHTD plant, the Department notes that the evening and night time noise impacts are predicted to be elevated, and in the case of the Statewide site are substantially higher (12 dB(A)) than the recommended maximum noise amenity level for urban environments established in the NSW INP. Concerns over potential noise impacts of the DHTD plant, as well as cumulative noise impacts of the remediation activities, have been raised in a number of submissions, including those from NSW Health and local residents. The Applicant notes that the noise modelling and hence the predicted exceedances do not include potential cumulative impacts from the existing approved Lednez and Allied Feeds operations. Further, it is stated that an assessment of potentially annoying sound characteristics or potential sleep disturbance impacts has not been undertaken.

However, the Department is satisfied that the Applicant has, at this stage of engineering design, applied all reasonable and feasible noise mitigation measures to the development in an endeavour to minimise noise impacts as far as practicable. This assessment will need to be revisited once detailed design has been undertaken to confirm and ensure that the final design of plant and equipment has continued this mitigation philosophy. As a component of revisiting noise predictions at the time of detailed design, the Department considers it appropriate to account for relevant cumulative impacts at that time, based on actual knowledge of the status of other remediation and redevelopment projects on the Peninsula. In this manner, specific detailed design measures and confirmatory noise modelling could be undertaken to reflect the real situation, rather than attempting to predict future circumstances now. This approach has been adopted in the recommended modification approval, which includes a condition requiring the Applicant to undertake a confirmatory cumulative noise impact assessment prior to commencement of construction of the DHTD plant (based on the final detailed design of the plant) to demonstrate compliance with the adopted noise criteria (ie. the final design of the DHTD Plant must incorporate the necessary controls to ensure that the model results demonstrate compliance with the noise criteria).

While the Department appreciates that there will clearly be elevated amenity impacts on the Rhodes Peninsula in the medium term, affecting in particular the Statewide site, it is important to consider the transient nature of these impacts and the ramifications of not proceeding with remediation in a timely manner. There is little scope for the application of additional noise reduction measures, at least in a practical and economic sense, to further reduce noise impacts from the development. It is, however, unacceptable to prevent remediation of the Lednez site (and for that matter, the Allied Feeds site), and a balance must therefore be reached between the need for remediation and the need to protect local acoustic amenity. The Department considers that a practical balance has been reached, and appreciates that concessions will be necessary from all stakeholders – from the point of view of elevated noise impacts on residential receptors and the need for proactive and comprehensive noise management on the part of remediators.

The Department has also recommended a range of conditions to manage the potential noise impacts associated with the proposal. In particular, the Department recommends restrictions be placed on the hours of site preparation, construction and excavation; in addition to limiting mobile equipment activity within parts of the site. Noise generation from excavation work and mobile equipment were identified to be significant sources of noise associated with the original development and subsequently these conditions seek to manage the anticipated elevated noise levels that would be generated from their operation. Consistent with this approach, noise goals have been recommended for day-time activities while strict noise limits apply to evening and night-time periods. It is necessary that some (limited) flexibility be provided through the imposition of day-time noise goals, rather than strict limits, to ensure timely and practicable progression of remediation works, while minimising local

acoustic impacts. This reflects the approach developed during the original development assessment process and is consistent with the NSW INP, which allows for practical noise levels to be developed in certain circumstances where noise limits cannot be met but significant social, environmental or economic benefit would result from the project being undertaken. It is acknowledged that this approach was applicable and appropriate in this instance. The environmental / social benefit, combined with the inherent difficulties that using heavy excavation equipment in residential areas provides, outweighs the relatively short term adverse day-time noise impact.

Notwithstanding this, the Department recommends that the Applicant be required to prepare and submit an updated Site Establishment and Construction Noise Management Protocol and an updated Operation Noise Management Protocol for the approval of the DEC. Both programs would require the Applicant to clearly establish monitoring locations and frequency as well as provide a detailed description of noise mitigation measures that would be implemented in the event that noise generated results in exceedances of the noise goals (daytime) and limits (evening/night-time). Each program would require regular monitoring, reporting and corrective action in the event of a noise exceedance. Further, the revision of the Operation Noise Management Protocol must be undertaken following consultation with local residents most likely affected by the development modification and must incorporate the controls included in the detailed design of the DHTD plant resulting from the cumulative noise impact assessment required under the modified consent.

5.3 Odour Impacts

Issues

Odour was identified to be one of the key issues associated with the original development application due to the potentially odorous nature of excavated sediments and the close proximity of sensitive receptors. Since the commencement of excavation in 2005 and in turn the disturbance of contaminated soil on the Lednez site, odour impacts from the excavation work have resulted at times in numerous odour complaints and the implementation of various additional mitigation methods to assist in managing odour. The potential for odour impacts has been raised as a key issue in several submissions to the current modification application. NSW Health's submission expressed concern about the potential for increased odour intensity during Bay remediation and the DEC's submission expressed concern on potential odours from drying stockpiled excavated sediments. Resident's submissions raised concerns over the potential for odour from barge downloading operations and from the DHTD plant's stack.

Odour impacts remain as a key issue on the Peninsula, and it is therefore important to understand the potential sources and level of impact likely to be incurred by the modified excavation proposal. To this end, the Applicant has undertaken a comparative odour impact assessment to assess the relative merits of the alternative Bay excavation methods in the context of odour generation potential. The assessment involved two components – odour sampling to compare odour concentrations and specific odour emission rates for both excavation methods; and dispersion modelling of odour to compare the predicted odour impacts on nearby sensitive receptors from the two excavation methods.

Odour concentration and odour emission rates were determined by sampling sediment from the Bay adjacent to the Lednez site. The sediment was separated into two; one sample being directly exposed to the atmosphere to simulate the coffer dam approach with the other being covered with approximately one metre of Bay water (ratio water to sediment of about 5:1 followed by vigorous stirring to simulate worst case scenario) to simulate excavation using the proposed barge-clamshell technique. Results from the odour sampling are detailed in Table 4.

The liquid-covered samples showed both lower odour concentration and lower specific emission rates when compared to the directly exposed sediment samples. Unstirred liquid over sediment samples showed lower odour concentration and specific odour emission rate when compared with the liquid over stirred samples.

Table 4 – Odour Sampling Results

Sample	Odour concentration (OU)	Specific odour emission rate (OUm ³ m ⁻² s ⁻¹)
1A Sediment	3160	2.095
3B Sediment	2440	1.618
5C Sediment	2440	1.618
7D Sediment	2900	1.923
Average value for simulation of coffer dam scenario	2735	1.813
2A Liquid over sediment - stirred	1620	1.074
4B Liquid over sediment - stirred	2030	1.346
6C Liquid over sediment - unstirred	960	0.601
8D Liquid over sediment - unstirred	1020	0.676
Average value for simulation of clamshell excavation method	1407	0.9242

Dispersion modelling stated as consistent with the DEC Draft Odour Policy (DEC, 2001) was undertaken to assess the impact of odour on nearby sensitive receptors. As excavation would be likely to extend over several months, the Applicant included three different scenarios to assess the impact of seasonal variation on odour. The three scenarios examined were commencement of excavation in January, commencement of excavation in May and commencement of excavation in September, with eight months of excavation assumed for the coffer dam method and four months of excavation assumed for the barge-clamshell method. The dispersion modelling was then used to generate a series of odour impact profiles which demonstrated the 99th percentile and maximum hourly concentration predicted across the site and adjacent areas.

The dispersion modelling found the coffer dam method to exceed the NSW odour goal for continuously operating facilities in urban residential areas (2 odour units) under all scenarios, with odour concentrations anticipated to be between 2 and 7 odour units for most residences on the Rhodes Peninsula. The Applicant notes, however, that the odour concentration at this level would not exceed the NSW odour goal for individual residences (7 odour units) at these locations. The Applicant also notes that for the coffer dam excavation method, the Statewide and Meriton developments are predicted to be the most affected sensitive receptors (7-20 odour units).

For the proposed barge-clamshell method, the dispersion modelling predicted some exceedance of the NSW odour goal for continuously operating facilities in urban residential areas (2 odour units) under all scenarios. The Applicant notes that the impact is less than that predicted by the coffer dam method by a factor of two. The dispersion modelling demonstrates that the odour footprint is significantly reduced by the use of the proposed barge-clamshell excavation technique. Similar to the coffer dam method, the Statewide and Meriton developments are predicted to be the most affected sensitive receptors, albeit at a reduced level of impact (5-10 odour units) compared with the currently approved excavation method (7-20 odour units).

Predicted maximum concentrations for both excavation techniques are elevated. Maximum odour levels on the Rhodes Peninsula are predicted to be between 10 and 100 odour units for the coffer dam method and between 10 and 50 odour units for the proposed barge-clamshell method. The Statewide and Meriton developments are predicted to again be the most affected sensitive receptors

Consideration

The Department is generally satisfied that the assessment of potential odour impacts has been carried out in accordance with the DEC Draft Odour Policy (NSW, 2001). The Applicant concludes that when compared with the coffer dam excavation method, the proposed barge-clamshell method is likely to result in less odour generation and reduced community impact due to the shorter time period required for excavation (reduction of approximately five months).

However, the Department highlights that while the assessment has provided a reasonable indication of the relative odour merits of the two excavation methods, it is evident that the assessment has not considered the

likely full potential odour that may result from the proposal. In particular, the assessment has not considered the cumulative odour impacts of all on-site activities (including bay remediation, excavation and operation of the DHTD Plant) occurring simultaneously with the remediation activities at the adjacent Allied Feeds site (including excavation and operation of the DHTD Plant). Similarly, it may also change the predicted impacts of the two excavation techniques. It is possible that the impact of sediment stockpiles may have a greater impact on the proposed barge-clamshell method because a larger volume of sediment (approximately 45% more bay sediments) is proposed to be removed but within a significantly shorter period of time (60 weeks reduced to 40 weeks) than that indicated for the coffer dam method. There is therefore the potential for an increase in odour intensity during the Bay remediation period.

Consequently, the Department has included conditions in the recommended modifying instrument requiring the Applicant to review the Air Quality Management Plan and to incorporate mitigation and management measures to address potential cumulative odour effects in context of other remediation activities in the Peninsula. The updated Air Quality Management Plan will be required to address the requirements of the DEC and the results of consultation with NSW Health, as well as the outcomes of the detailed design of the development.

In relation to the proposed enclosure over the waste storage unit, the Department concurs with the Applicant's proposed measure as it will assist in controlling odour emissions from the waste storage area. Activities in the waste storage area, such as re-excavation, deposition of material or loading of material will now be undertaken within the enclosure.

The Department acknowledges that some odour would be likely to be experienced – particularly at the nearest sensitive receivers. However, the Department considers that on balance these potential odour impacts are acceptable within the broader context of removing a major contaminated site which is surrounded by residential areas.

5.4 Water Quality Impacts During Bay Remediation

Issues

The currently-approved Bay remediation methodology involves the construction of a number of coffer dams by end-tipping soil from dump trucks and spreading it by bulldozer, dewatering the area enclosed by each coffer dam followed by dry excavation of sediments in the enclosed areas. Each coffer dam was proposed to be approximately 3.5 metres high, with a width of approximately five metres at the top and of a variable base width depending on the stiffness and thickness of the bay sediment at any particular location. The Applicant has indicated that based on recent geotechnical investigations undertaken as part of the detailed design process, the batter slopes of the coffer dams would likely be 3H:1V, implying a based width of approximately 26 metres. The approved area for sediment remediation occupied an area of approximately 5.2 hectares, extending on average 45 metres from the existing seawall and over a length of 1160 metres. Within this area, sediment was to be removed to a depth of 0.5 metres, and the excavation reinstated with clean material from the Lednez site.

The Applicant now proposes to remove sediments by using a mechanical dredging technique. The proposed wet removal of sediments would be undertaken by a specially designed sealed "clamshell" type bucket operated by an excavator mounted on a steel pontoon with hydraulically operated piles extended into the underlying sediment. A barge would transport the dredged sediments to a temporary off-loading area. The Applicant also proposes to increase the footprint of bay remediation to 7.6 hectares, or approximately 45% greater than currently approved, by remediating a number of dioxin "hotspots" located outside the approved remediation footprint. The Applicant has indicated that the proposed modified method would reduce the duration of Bay remediation by approximately five months (ie. from 15 months duration estimated for the coffer dam methodology to about 10 months estimated for the dredging removal of sediments).

Removal of sediments by dredging was considered in the original development application but the dredging option was discarded largely on concerns of increased water turbidity and potential redistribution of contamination. Sediment removal within coffer dams was selected by the Proponent as the preferred option in the original application, which at the time was assessed to create lesser turbidity than dredging. It was however recognised that the construction of the coffer dam would result in significant disturbance of the bay floor and sediment deposition effects from placing large quantity of dam material underwater.

In recognition of potential increased water turbidity of the proposed dredging method, the Applicant has designed a multiple barrier containment system, including impermeable membranes, around the dredging area as shown in Figure 3 and including:

- the Excavator Working Area Barrier (EWAB) is the primary control constructed from an impermeable membrane attached to the pontoon barge and designed to fully encapsulate the excavator working area. It would cover an area of approximately 12-metre square;
- the segregation barrier (SB) would separate completed work areas from the active work area (i.e. the section to be excavated and the area being excavated). The SB would consist of floating conventional permeable geotextile membranes;
- the Works Encapsulation Barrier (WEB) would surround the broader area within which the waterborne craft would operate and excavation would occur. The WEB would be held in place with timber or steel piles and would consist of an impermeable PVC coated membrane anchored to the piles. Filtering sections constructed of geotextile would be provided in the upper 300 millimetres of the barrier to permit tidal equilibration across the membrane. Adjustable impermeable flaps would be provided on both sides of the filter sections so that water flows in and out of the WEB can be controlled during tide cycles. Impermeable flaps would be folded down to cover the permeable section when excavation activities are located nearby. A fixed continuous impermeable curtain has been designed at the connection to the shore;
- an outer perimeter barrier (OPB) would encapsulate the total bay area that is undergoing remediation. It would comprise a traditional floating geotextile curtain
- an unloading area barrier (UAB) located around the barge unloading area and consisting of a traditional floating geotextile curtain.

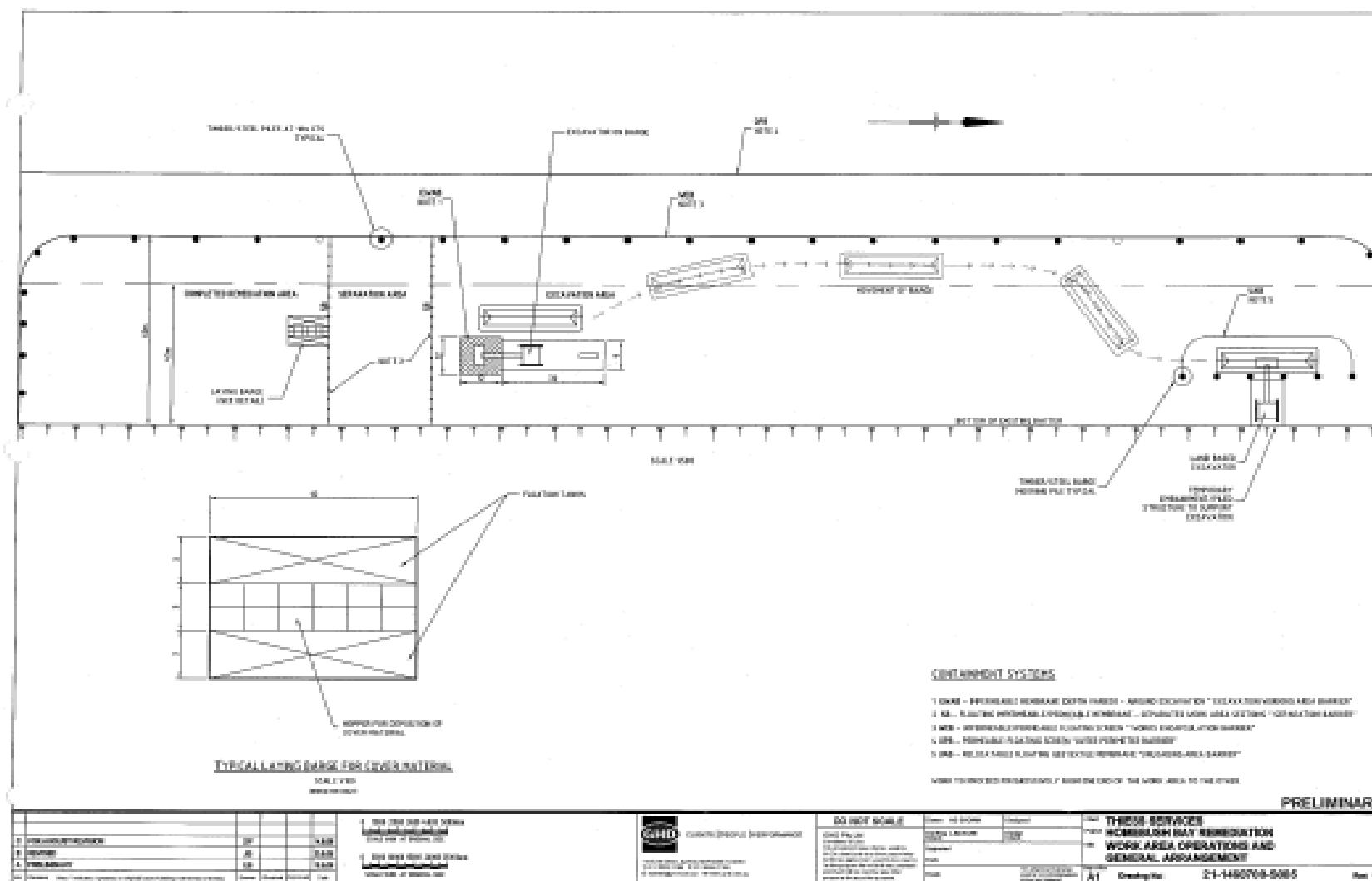
The multiple barrier containment system proposed by the Applicant in the modification application was selected following consideration of a number of containment system options, including perimeter embankments (ie coffer dams), synthetic flexible inflatable barriers, sheet pile system around the immediate excavation working area, solid displacement pump dredging systems, steel sheet pile systems and the option discussed above. The Applicant indicates that the multiple barrier containment system described above is preferred based on better performance over other options considered.

The modification application's environmental assessment provided calculated estimates of the potential flux of sediments through the proposed silt containment system and the approved coffer dam system. The sediment flux investigations took into account the results of sediment sampling in the remediation area, geotechnical testing, sediment deposition rates, permeable silt curtain tests and tidal cycles and flows. The specialist's investigations indicate that, under the coffer dam option, an area approximately equal to the Bay rehabilitation zone would have been significantly disturbed first by the construction and then by the removal of the coffer dams.

The Applicant also notes that the resultant sediment "flux" from the coffer dam option would have been expected to exceed that in total volume that from the proposed wet excavation method and to impact significantly on turbidity, allowing of a maximum NTU of 100 immediately outside the permeable silt curtain proposed. The study estimated that up to 98 kilograms of sediment per tidal cycle could escape from the proposed containment system, compared to 1,950 kilograms from the coffer dam option. The Applicant concludes that the results of this study demonstrate that turbidity is not expected to increase discernible above the background water quality beyond the proposed containment systems.

The Applicant also carried out two solubility trials using contaminated sediments from Homebush Bay and water sourced from the Bay adjacent to the Lednez site. The trials were based upon the United States Environmental Protection Agency (USEPA) elutriate test procedure designed to predict the release of contaminants to the water column resulting from dredging and disposal of sediments in open waters. The water was tested for chemicals of concern prior to and following the trial, which involved the mixing of sediments with water in a ratio of 1:4, followed by stirring of the mixture for 30 minutes to simulate dredging conditions. The results of the trials indicate that the majority of chemicals do not increase concentration in the elutriate (water stirred with sediment) compared with the existing concentrations in the water. Based on the results of these trials, the Applicant concluded that the solubilisation of chemicals during the proposed Bay works is not anticipated to represent a significant risk to bay water quality.

Figure 3 – Proposed Multi-Barrier Containment System



Consideration

Submissions received in response to public exhibition of the modification application either generally supported the proposed methodology to remove sediments or made no comment on the modified method. The submission submitted on behalf of the Rhodes Community Consultation Committee and a submission by a resident both provide general support to the changed methodology for sediment removal, but raised issues associated with potential disturbance of surface waters by watercraft (eg Rivercat), the relevance of the sediment's dioxin data set, the need for additional control measures for odour, and for monitoring and providing safety systems to the containment barrier. The DEC has indicated that the proposed Bay excavation methodology and sediment control system is generally acceptable to minimise sediment mobilisation during the removal of the contaminated sediments. It also notes that critical to the success of the sediment excavation works will be the control and minimisation of mobilisation of chemicals of concern resulting from both the solubilisation of these chemicals and the disturbance of contaminated sediment particles. In its submission, the DEC provided recommended conditions of approval, including with respect to monitoring and sampling programs and operational limits for the project.

The Department considers that the two key water quality issues associated with the removal of contaminated sediments from the Bay, either by excavation within the confines of coffer dams or by using a dredging technique, are:

- turbidity generated by remediation works leading to contaminated suspended particles escaping the remediation area; and
- mobilisation of soluble contaminants from the sediments into the water column.

The Department is generally satisfied with the design of the proposed multiple barrier containment system and its ability to contain sediment migration from the Bay remediation area. During Bay remediation excavation, sediments would largely be contained within the impermeable EWAB. Moving the EWAB from an excavated area to another section would release some sediments from the EWAB to the next containment system (the WEB). The WEB is, however, largely impermeable except for the permeable flap section that allow tides to flow in/out the system. Permeable flaps would be folded/closed down to cover the permeable section when excavation activities are located in the vicinity of the permeable window. Some sediments can potentially escape the WEB through the permeable open flaps during ebb tide (ie. tidal flows receding) however the permeable open flaps would be at some distance from the excavation area and therefore potential sediment releases would be minimal. Any residual sediment escaping the WEB will be contained within the last containment system, the OPB, consisting of a traditional floating geotextile curtain. The Department considers that the successful implementation of the proposed multiple containment barrier would minimise the release of sediments outside the remediation area to acceptable levels.

The success of the multi-barrier containment system to control suspended sediment releases would depend to a significant extent on the correct installation and integrity of the system during sediment removal, and the proper operation/maintenance of the containment system by the operators. The Applicant proposes to trial the multiple barrier sediment containment system prior to its implementation on a large scale. The Department considers that the proposed trial would be critical in refining the design of the containment system and therefore a condition has been included in the modifying instrument requiring the Applicant to submit details of the trial's methodology and monitoring for the approval of the DEC and the Director-General. During the trial, monitoring of water quality will be undertaken and the integrity of the system will be tested on a smaller scale. The Department has also included conditions requiring the preparation of a Bay Remediation Management Protocol, for the approval of the DEC and the Director-General, which must incorporate all of the monitoring requirements, trigger levels and limits, contingency actions, safety procedures, containment system installation procedures and for the continuous inspection and maintenance of the barrier containment system during operation. The results of the containment system trial would be used in the development of the Bay Remediation Operational Management Plan.

In relation to the mobilisation of soluble contaminants from the sediments into the water column, the Department considers that controlling sediment generation will assist in minimising the solution of chemicals in water. The Department also considers that given the significance of this issue further information of potential chemical mobilisation during sediment excavation is required prior to Bay remediation. From the solubility elutriate testing conducted as part of the modification application's investigations the Applicant concluded that the solubilisation of

chemicals during the proposed bay works was not anticipated to represent a significant risk to bay water quality. The Department considers that elutriate testing provided some positive results but that no definite conclusions could be made on such investigations. In this regard, the Department acknowledges the difficulties in replicating in the laboratory the conditions that will occur during dredging. The Department also notes that the elutriate samples analysed as part of the modification application were settled for 18 hours (instead of one hour settlement required under the USEPA elutriate test method) and therefore there is the risk that concentrations may have been underestimated. To this end, the Department believes that further refinement of this data is necessary prior to implementation is required.

A number of conditions have been included in the recommended approval to address the solubilisation of chemicals during dredging operations. Water quality sampling will be undertaken during the containment system trial and that will provide the most accurate representation of the water quality conditions that will be expected during bay remediation. The Applicant will also be required to undertake additional solubility testing if the impact of soluble chemicals has not been addressed prior to the bay remediation works to the satisfaction of the DEC. The results of these investigations will be used to further reduce the risk of chemical mobilisation into the water column.

The Department considers the management of water quality impacts would also largely depend on having a comprehensive water quality monitoring program and contingency response system in place during the Bay remediation works. The monitoring program must be ongoing during Bay remediation in order to allow the implementation of contingency actions, in accordance with a contingency plan, if water quality trigger values within the multi barrier containment system are exceeded. Monitoring requirements for a commissioning period (including continuous turbidity monitoring and daily monitoring of other parameters for the first week of Bay excavation which must include at least two full movement of the pontoon (ie. two arcs of the excavator)) and for operation have been included in the recommended modifying instrument. As part of these requirements, the Applicant is required to install an alarm in the probe carrying out continuous monitoring of turbidity during commissioning and operation which will go off when trigger levels or concentrations limits are exceeded. Bay monitoring requirements have been developed by the DEC and submitted as recommended conditions of approval. It is noted that the results of the containment system trial, including monitoring undertaken during the trial, would be used to further refine the monitoring program for the Bay remediation works.

5.5 Extent of Bay Remediation Works

Issues

The approved Bay remediation area extends on average 45 metres from the existing seawall over a length of 1160 metres, covering an area of approximately 5.2 hectares. The Applicant proposes in its modification application to increase the footprint of bay remediation to 7.6 hectares, or approximately 45% greater than currently approved, by including a number of dioxin “hotspots” located outside the approved remediation footprint.

The proposed increase in the area of Bay remediation is generally supported in the submissions received on the modification application. However, the Sydney Harbour and Foreshores Committee and NSW Maritime recommend further expanding the remediation area. NSW Maritime in particular indicates that under the approved scope, the removal of the coffer dams upon completion of Bay remediation would have resulted in an additional “uncontrolled” soil cap extending an average 30 metres beyond the perimeter of the directly-remediated area. NSW Maritime notes that the proposed modification will result in the loss of any benefit derived from the “uncontrolled” soil cap and recommends the introduction of a 500 millimetre cap of clean soil over an area equivalent to the “uncontrolled” soil cap lost through the proposed change in addition to the remediation area proposed by the Applicant (ie. about 3.4 hectares of additional capping). NSW Maritime also notes that when the true effect of the “uncontrolled” soil cap is considered, the Applicant’s proposal offers no net improvement in Bay-wide average dioxin concentration beyond that covered by the original development application.

In response to NSW Maritime’s submission, the Applicant questioned the benefits of any “uncontrolled” capping provided by the approved coffer dams removal. The Applicant notes that the material that would remain at the base of the dams would be highly disturbed and mixed with contaminated sediment and therefore there would be little, if any, reduction in the surface dioxin concentration in the area of the dam. The Applicant notes that NSW Maritime’s analysis assumes that the dams could be placed without lateral disturbance of the underlying sediment

(ie. displacement of contaminated sediment under the dams to locations further out in the Bay). The Applicant also indicates that the proposed modification would result in Bay-wide average dioxin concentrations lower than those indicated in the NSW Maritime analysis and lower than those predicted in the EIS for the coffer dam proposal.

To discuss the NSW Maritime's recommendation of extending the capping area, a meeting was held on the 13 December 2006 attended by representatives of NSW Maritime, Department of Planning, the DEC and the Applicant. At the meeting the parties agreed that the NSW Maritime's recommendation was outside the scope of the current modification application. However, and despite differing views, it was noted that at worst, the current modification will have a neutral effect with respect to the extent of Bay remediation, and at best, an improvement in the order described by the Applicant.

Consideration

The Department is satisfied with the Applicant's proposal to increase the bay remediation area as it provides for an increase of approximately 45% of bay remediation area and reductions in the bay-wide average dioxin concentration as compared with the current approved works when the effect of any "uncontrolled" capping provided by the coffer dams is not taken into account.

The Department notes that the original EIS for the coffer dam proposal did not take into account the effect of "uncontrolled" capping in reducing bay-wide average dioxin levels. The EIS stated that "coffer dam materials would be progressively reused in the construction of subsequent dams or taken onto the Lednez site for use in accordance with the site criteria". The post-remediation bay-wide average dioxin concentration of the approved footprint was estimated as 2.033 µg TEQ/kg and did not take into account the "uncontrolled" capping effect of removing the coffer dams. The NSW Maritime analysis however concludes that when considering the "uncontrolled" capping effect of the coffer dams, then the resulting bay-wide average dioxin concentration would be 1.71 µg TEQ/kg, which is similar to that resulting from the Applicant's modification application.

As noted above, the current modification will, at worst, have a neutral effect with respect to the extent of Bay remediation, and at best, an improvement in the order described by the Applicant. The Department considers that the principal and fundamental outcome of removing the current significant risk of harm to the environment and human health will be met under the proposed modified remediation approach. This position is supported by the DEC. Having satisfied itself that acceptable environmental and human health outcomes will be maintained under the proposed modification, the Department notes that NSW Maritime, as landowner in this instance, may seek to negotiate additional works in future and that such works would be subject to separate environmental impact assessment if and when a commercial agreement is reached between the parties. Until such time, the Department considers that the Applicant's modified Bay remediation proposal should not be delayed and approval should be granted, subject to the recommended conditions of approval.

5.6 Human Health Impacts

Issues

Human health risk assessments associated with the original remediation application were undertaken during the EIS and Commission of Inquiry. The assessments quantified human health risks of the project for a range of exposure pathways, scenarios and potential receptors. The assessments concluded that the worst case incremental lifetime carcinogenic health risk posed by the remediation process at the most affected receiver (ie. on the Statewide site) was 6.69×10^{-7} , which is an order of magnitude lower than the acceptable criterion of 1×10^{-6} (lifetime carcinogenic risk). In relation to non-carcinogenic health risks posed by the approved remediation process, the assessment showed that, under worst-case conditions, the non-carcinogenic hazard index of 1 could be marginally exceeded for potential residential occupants on the Statewide and Allied Feeds sites if occupied within the first two years of remediation. While hazard indices below 1 are generally considered as acceptable, impacts above this do not necessarily imply an unacceptable impact, but require consideration and management. The Commission of Inquiry concluded that provided the remediation was undertaken using best practice control and management procedures, and in a timely way, impacts on air quality on air quality resulting from dust generation and stack emissions during the remediation were unlikely to result in exceedances of recognised cancer and non-cancer health risk criteria.

A revised human health risk assessment has not been undertaken as part of the current modification application. However, the modification application addressed individually air quality, noise and odour impacts and compliance with relevant criteria and also provided a qualitative assessment of the likely change to anticipated health risks as a result of the modification.

The Applicant has stated that the proposed modifications would result in a significant reduction to the anticipated human health risks associated with the development. The Applicant highlights that upgrades to the PTB emission control system; reduced emissions from waste handling activities; reduced dioxin and dust emissions; and the reduced duration of thermal treatment operations by approximately 50% would all serve to reduce the carcinogenic and non-carcinogenic health risks associated with the project.

The Applicant indicated that for the location with the maximum reported cancer risk in the originally approved remediation project (Statewide at 20-metre elevation) the risk was derived from earthworks volatiles (0.6%), earthworks particulates (53%), PTB volatiles (42%), PTB particulates (3.6%) and the thermal plant (<0.1%). It also noted that the maximum hazard index was derived from the earthworks volatiles (99.7%) and earthworks particulates (0.3%). The Applicant states that the upgrade to the PTB, whereby 90% of volatile gases would be treated (compared with 0-10% for the currently-approved technology), would result in reduced volatile emissions from the PTB and would proportionally reduce the contribution of the PTB to cancer (carcinogenic) health risks. This would be enhanced by reduced particulate and dioxin emissions from the thermal plant and PTB exhaust. Further the reduced duration of operations of the thermal desorption plant (due to higher processing rates) would again reduce health risks due to reduced exposure time.

The Applicant also suggests that emissions from waste handling activities would be reduced. Earthworks were identified during the original assessment to be a potentially significant contributor to both carcinogenic and non-carcinogenic health risks. The Applicant argues that the enclosure of the waste storage unit and the relocation of the PTB would serve to lower emissions from these sources, thereby lowering the human health risk further.

Consideration

The Department considers that the elements of the proposed modification that can alter the health risks identified in the approved remediation project are the modified thermal treatment technology, the relocation of the plant, the enhanced air emission controls from the PTB, the enclosure of the waste storage area and the modified Bay remediation works method.

While a full health risk assessment has not been undertaken as part of the modification application, the Applicant has addressed air quality, noise and odour impacts individually and has also provided a qualitative assessment of the likely change to anticipated health risks as a result of the modification. The proposed changes have also been assessed by NSW Health, and comment has been provided. NSW Health provided specific comment in relation to the predicted elevated noise levels, odour impact and the impact of contaminant mobilisation due to sediment excavation.

The Department generally concurs with the Applicant's conclusion that that upgrades to the PTB emission control system; reduced emissions from waste handling activities; reduced dioxin and dust emission; and the reduced duration of thermal treatment operations would all serve to reduce the carcinogenic and non-carcinogenic health risks associated with the project. The Department however highlights the comments made by NSW Health in regards to concerns on health impacts of the project as discussed below. Further discussion on air and noise impacts is provided in Sections 5.1, 5.2 and 5.3.

With regards to noise, NSW Health noted that predicted noise impacts are higher than that of the approved methodology, particularly during the night-time at the Statewide site where noise levels would exceed World Health Organisation guidelines for levels below which adverse health effects are not expected. However, NSW Health notes that the modification also presents distinct advantages in that the overall time required to treat the material is reduced and this in turn reduces the duration of any noise impacts. Further, NSW Health suggests that the noise increases are due to increased background levels and a better understanding of the noise impacts associated with thermal desorption plant. NSW Health is of the opinion that such an understanding is also beneficial, in that it suggests that the Applicant will be better able to mitigate noise impacts. Subsequently, NSW Health has stated that all feasible and reasonable noise mitigation measures should be investigated and

implemented. The Department has adopted these recommendations and these measures, and if approved, would be undertaken by the Applicant. Specifically, the Department has recommended that a detailed cumulative noise confirmatory investigation (including modelling) be undertaken before construction of the DHTD plant (and based on the detailed design of the plant) which demonstrates compliance with the adopted criteria. Such assessment must incorporate all controls necessary to ensure that cumulative noise from the remediation projects does not significantly impact on residential areas.

With regards to odour, NSW Health observes that while the odour per tonne of material is likely to be less using the proposed methodology, it is possible that odour impacts may be increased by processing 46% more material in a third less time than that under the current development consent. NSW Health requests that the Applicant develop a proactive odour management plan to reduce volatile emissions from the excavated material. The Department acknowledges this potential source of odour, and as discussed in section 5 of this report, has recommended that the Applicant update the Air Quality Management plan to take into account the proposed modifications.

With regards to contaminated waste storage and potential community exposure, NSW Health concludes that the modification to enclose the waste storage area is likely to significantly reduce community exposure to odour and volatile chemicals. The Department concurs with NSW Health and also considers that the enclosure will reduce emissions of particulates during tipping and re-excavation operations at the waste storage area and hence will assist in reducing human health risks.

With regards to sediment excavation, NSW Health has stated concern regarding the potential for the sediment excavation technique to mobilise contaminants which may subsequently impact on human health through either ingestion of marine biota or recreational contact. The Department has recommended conditions which require the Applicant undertake a trial of the sediment containment system prior to the commencement of operation to ascertain the likelihood of this occurrence, and where relevant, to develop and implement additional mitigation measures to further reduce any identified risk. The Department has also included conditions, on advice from the DEC, requiring the development and implementation of a comprehensive monitoring program and associated contingency program. As part of these requirements, the Applicant is required to install an alarm in the probe carrying out continuous monitoring of turbidity during commissioning and operation which will go off when trigger levels or concentrations limits are exceeded.

NSW Health also stated that it continues to have concerns regarding the cumulative effect of multiple environmental stressors (dust/ particulates, odour, noise, chemicals) associated with the development and the close proximity of sensitive receptors. It is important to note that while the modification proposes a number of changes, these key health concerns identified in NSW Health's submission and during the assessment of the original application remain unchanged; although it is possible that certain concerns may be more or less relevant than what they were when the original application was examined. To this end, NSW Health has requested that the Applicant supply monitoring data (gathered already through the conditions of the existing approval) of existing conditions at the Lednez site, such that the potential health risks associated with the proposal can be updated with real data. This information should allow the human health impact of these environmental stressors to be individually and cumulatively assessed by NSW Health and a more definitive opinion developed in this regard.

With regards to air quality impacts of the DHTD plant the Department has concluded that provided all of the recommended conditions are successfully implemented the resultant air quality and human health impacts of the DHTD and PBT plants would be within acceptable levels (refer to Section 5.1). This conclusion is reinforced by the Allied Feeds' DHTD plant performance which has been providing satisfactory results to date.

6. CONCLUSIONS AND RECOMMENDATIONS

The Department has assessed the environmental assessment documentation, submissions received on the proposed modification and the Applicant's submissions report and responses to issues, and is satisfied that the impacts of the proposal can be mitigated and/or managed to ensure an acceptable level of environmental performance.

Noise impacts, air quality and odour impacts, water quality impacts of the Bay remediation works, extend of bay remediation and cumulative human health impacts have been identified as key issues in the proposal. Following the assessment of these issues and the advice from relevant agencies, the Department concludes that environmental and human health impacts identified for the project can be effectively managed by the recommended conditions of approval.

The Department recommends that the Minister for Planning consider the findings and recommendations of the Departments report and grant consent to the proposed modification, subject to the recommended conditions of approval.

APPENDIX A – RECOMMENDED CONDITIONS OF APPROVAL
