Remediation and redevelopment of the Swan Portland Cement site, Burswood

Swan Portland Cement Ltd

Report and recommendations
of the Environmental Protection Authority

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Summary and recommendations

Swan Portland Cement Ltd proposes to demolish the existing buildings, remediate the land with respect to the soil contaminants and redevelop the Swan Portland Cement site at Burswood for residential, special commercial, tourist and recreational uses.

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for the Environment on the environmental factors, conditions and procedures relevant to the proposal.

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

Relevant environmental factors

Although a number of environmental factors were considered by the EPA in the assessment, it is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in the report:

(a) soil contaminants - health risk or groundwater or surface water contamination source during development or subsequent use of the site These are:

  (i) asbestos

  (ii) cement kiln dust

  (iii) kiln bricks

  (iv) hydrocarbons

(b) dust - dust nuisance to neighbouring premises;

(c) noise and vibration - impacts of remediation and construction work on neighbouring premises; and

(d) public safety - road safety relating to construction traffic.

Conclusion

The proposal by Swan Portland Cement Limited is to remediate the Swan Portland Cement site, by either removing or making safe the contaminated soil, and then to develop the site for other purposes, such as residential, commercial and recreational uses. The contaminants of principal concern are asbestos fibres, which could become airborne and be a health hazard, and cement kiln dust, which is a potential health hazard through inhalation or contact and which could cause further contamination of the groundwater.

The EPA established a Technical Committee, under the Chairmanship of Dr Jim McNulty AO, to provide advice on technical aspects of the remediation proposal for asbestos, and the preparation of this report by the EPA to the Minister has been greatly assisted by its consideration of that advice. The EPA has concluded that appropriate remediation can be achieved, but that particular care would need to be taken to manage, on an on-going basis, the potential impacts of the asbestos fibres and cement kiln dust. The project has health and planning implications. Accordingly, the EPA has concluded that a Development Plan should be prepared, and that this should be to the requirements of the Minister on advice from the Ministers responsible for Health, WorkSafe and Planning as well as the Environmental Protection Authority.

The EPA has also concluded that if contaminated soil is to remain on site, a clearly identified warning barrier should be placed over the contaminated soil and then covered by clean fill to a depth appropriate to the use for each area within the site. Furthermore, where contaminated soil remains, the areas should be subject to memorials on the land titles.

Subject to the above, the EPA has concluded that:

(1) demolition of buildings to ground level can be managed through WorkSafe Western Australia requirements and by implementing an approved Environmental Management Plan (EMP) for the management of off-site environmental effects;

(2) remediation can be managed in an environmentally acceptable manner in principle. Details of this management are to be provided in EMPs for each identified environmental factor; and

(3) development can be managed if it proceeds in accordance with the approved Development Plan, and any disturbances of residual contamination are managed in accordance with detailed management plans, which are to be provided by the proponent, for the disturbances. This is conditional upon satisfactory mechanisms being implemented to identify when disturbance of asbestos contamination will occur, who will be responsible for implementing and supervising the management plan and how this will be reported or audited, and, to identify when disturbance of cement kiln dust contamination will occur and ensuring that those responsible for the disturbance have the management plan for the disturbance.

Other Advice

There are three issues that are related to the redevelopment of the Swan Portland site, which are not considered under the environmental factors for the current proposal. These are:

(a) the potential for noise impacts on the Swan Portland Cement site from the adjoining landuses and the Burswood Dome;

(b) the need for on-going special management of public health risk on the site in the future, especially for further development or redevelopment; and

(c) the notification of contamination and transfer of liability for contamination to future purchasers of lots on the site.

Recommendations to the Minister have been made for each of these issues.

Recommendations

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA submits the following recommendations.

1. That the Minister notes that this proposal is about remediating a site which has been used for the production of asbestos and cement products, and then using the site for other purposes.

2. That the Minister considers the report on the relevant environmental factors and the EPA objectives set for each factor.

3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's objectives, but does impose constraints on the further use of the site that require a satisfactory implementation by the proponent of the recommended conditions.

4. That the Minister imposes the conditions and procedures set out in Appendix 4 of this report.

5. That the Minister notes that the development of the Swan Portland Cement site has the potential for the residents to be impacted at times by noise from the adjoining landuses, especially the Burswood Dome.

7. That the Minister notes that whilst the EPA has outlined a management strategy for the proposed development, the nature of the contamination will require on-going management in the event of there being any further development or redevelopment on the site.

8. That the Minister consults the Minister for Lands, Planning and Local Government to establish a mechanism for ensuring adequate on-going management of the site.

9. That the provisions of the Contaminated Site Legislation, when they become law, be applied to those lots on the Swan Portland Cement site which have residual contamination.

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1. Introduction and background

Swan Portland Cement Limited has operated at the Burswood site since 1927. James Hardie Industries operated at an adjoining site from the 1920's until 1981. Part of the original James Hardie site is included in the current Swan Portland site. As the result of the operations of the two companies, the current site is contaminated with asbestos waste from the James Hardie operations and cement kiln dust, kiln bricks and associated contaminated soil, and hydrocarbons from the Swan Portland Cement operations.

Swan Portland Cement Limited, the proponent, proposes to demolish the existing buildings, remediate the land with respect to the soil contaminants and redevelop the Swan Portland Cement site at Burswood for residential, special commercial, tourist and recreational uses (Figures 1 & 2).

This proposal was referred on 19 July 1996 and the level of assessment determined at Public Environmental Review (PER) with a four week public review. The public review of the PER (CMPS & F 1996) concluded on 18 November 1996.

Further description of the proposal is presented in Section 2 of this Report. Section 3 discusses environmental factors relevant to the proposal. Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. Other advice relevant to the proposal is presented in Section 5. Section 6 presents the EPA's conclusion and Section 7 the EPA's recommendations.

A list of people and organisations that made submissions is included in Appendix 1. References are listed in Appendix 2, the Report of the EPA Technical Committee forms Appendix 3 and recommended conditions and procedures and proponent's commitments are provided in Appendix 4.

The DEP's summary of submissions and the proponent's response to those submissions has been published separately and is available in conjunction with this report.

2. The proposal

The proposal is to demolish the existing buildings on site, remediate the site and redevelop it for a number of uses including residential, special commercial, tourist and recreational uses, as shown in the proposed Burswood Peninsula Precinct Plan (Figure 3). During the assessment process, it has become necessary for Swan Portland Limited to demolish some buildings on site in order to remove equipment. Permission for the demolition to be carried out has been given by the EPA, subject to no ground disturbance being caused and the provision of an Environmental Management Plan (CMPS & F 1997g) for off-site effects of the demolition.

Contaminants identified on the Swan Portland site are asbestos waste and asbestos-containing material, cement kiln dust, chromate kiln bricks and hydrocarbons. (Figures 4, 5 &6).

The proponent has proposed to remediate the asbestos contamination by:

(a) removing material containing asbestos and validating the area as having "no detectable levels of asbestos"; and/or

(b) covering material with asbestos content of greater than 1% by volume with a warning layer or barrier and 2 metres of clean fill and material with asbestos content of less than 1% by volume with a warning layer or barrier and 1 metre of clean fill (CMPS & F 1997d).

The proponent has proposed to provide an environmental management plan for the remediation of asbestos contamination and to install all services in over-excavated trenches backfilled with clean fill to prevent future disturbance of asbestos contamination. The proponent will also provide a plan to the Town of Victoria Park for inclusion with building licence approvals, for the management of disturbance of asbestos-contaminated material to reduce the risk of generating airborne asbestos fibres.

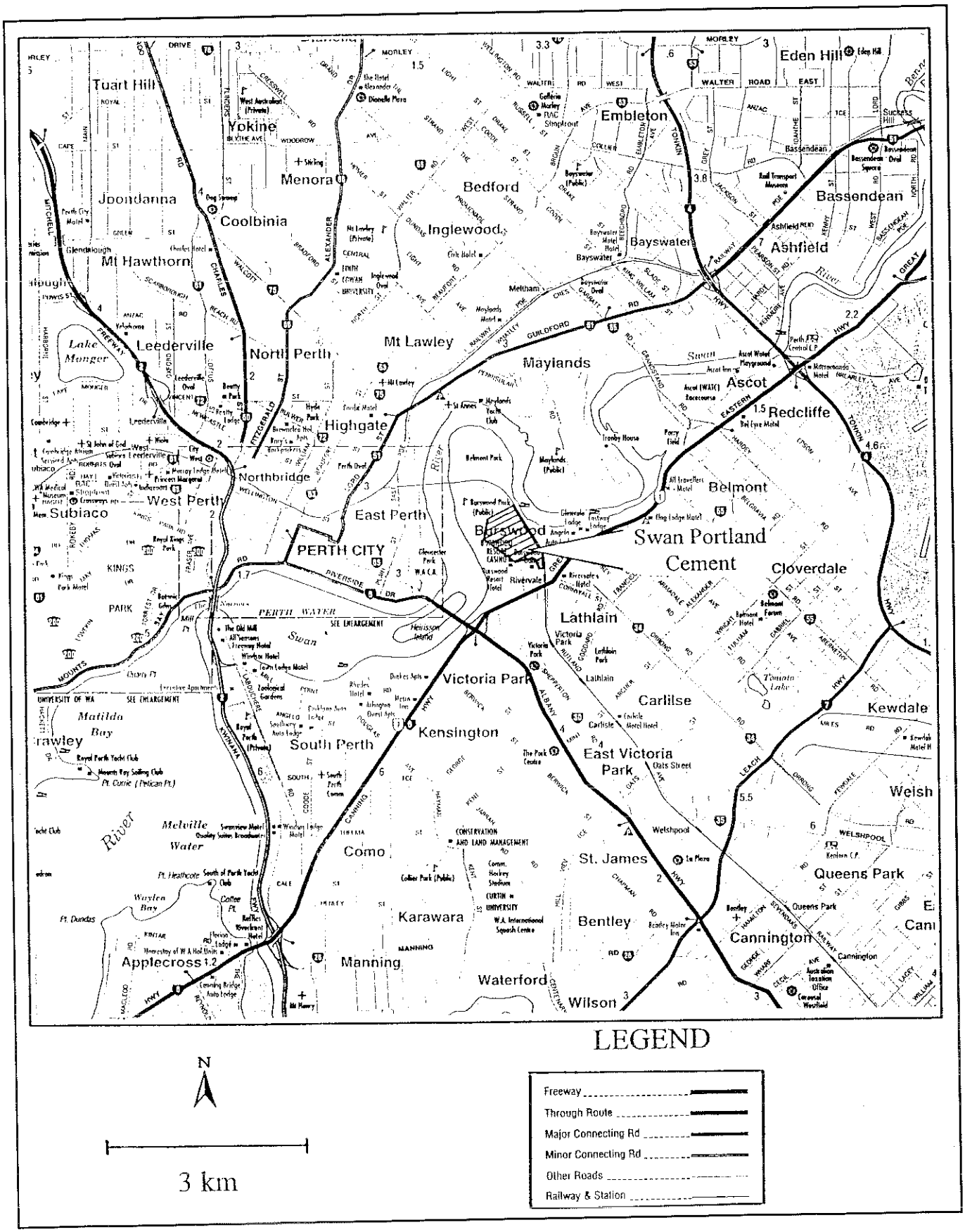

Figure 1. Swan Portland Cement site location.

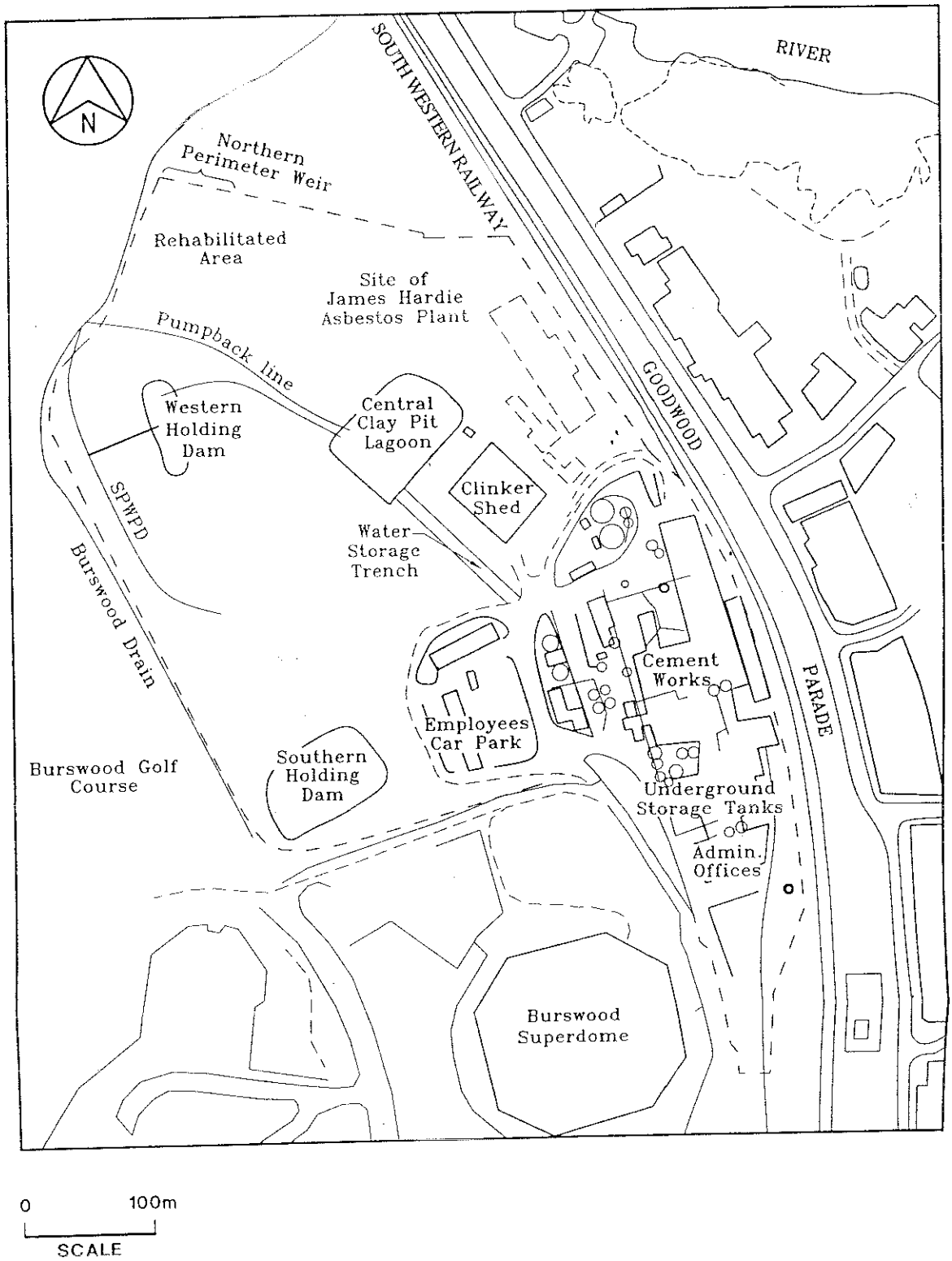

Figure 2. Swan Portland site layout.

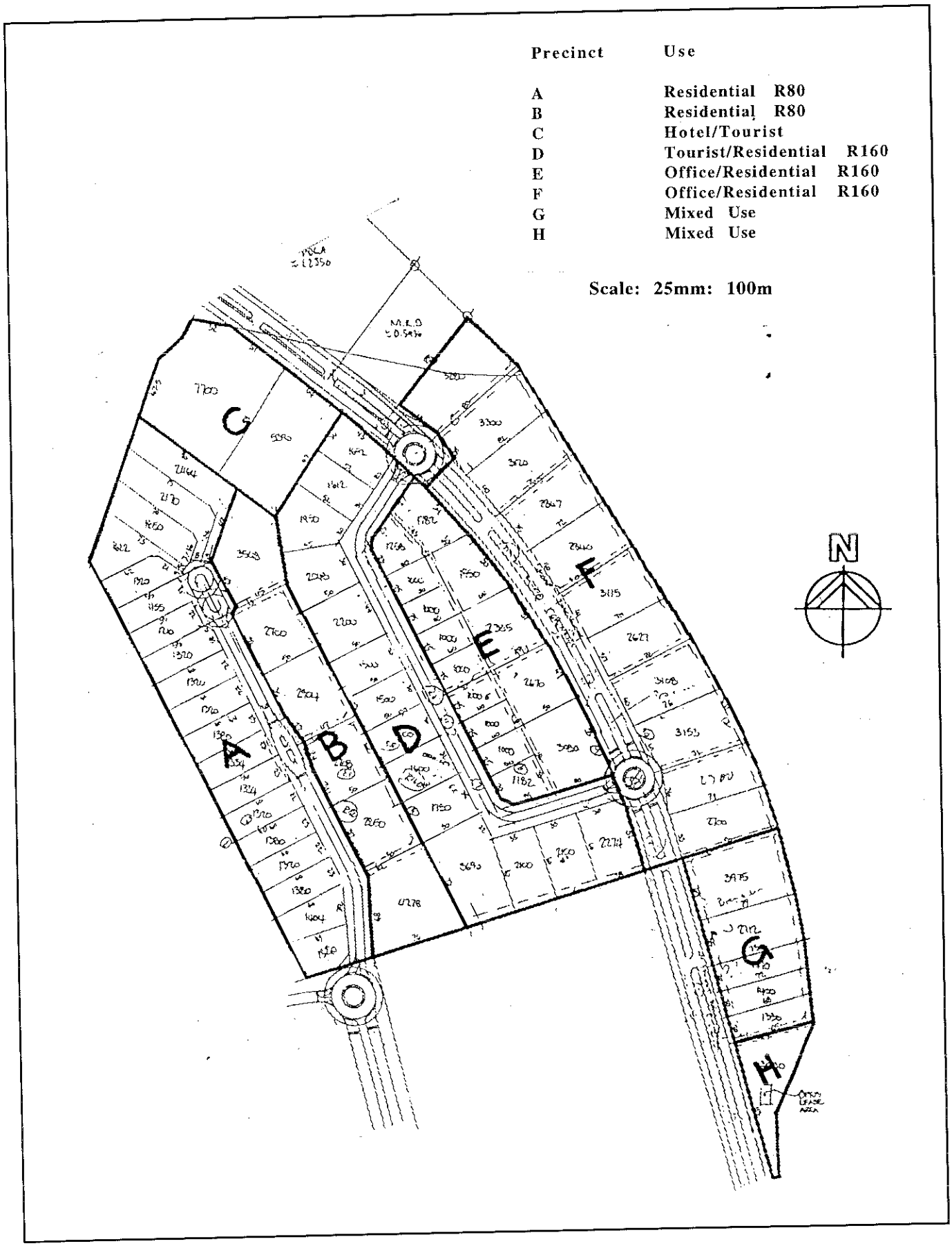

Figure 3. Burswood peninsual precinct plan.

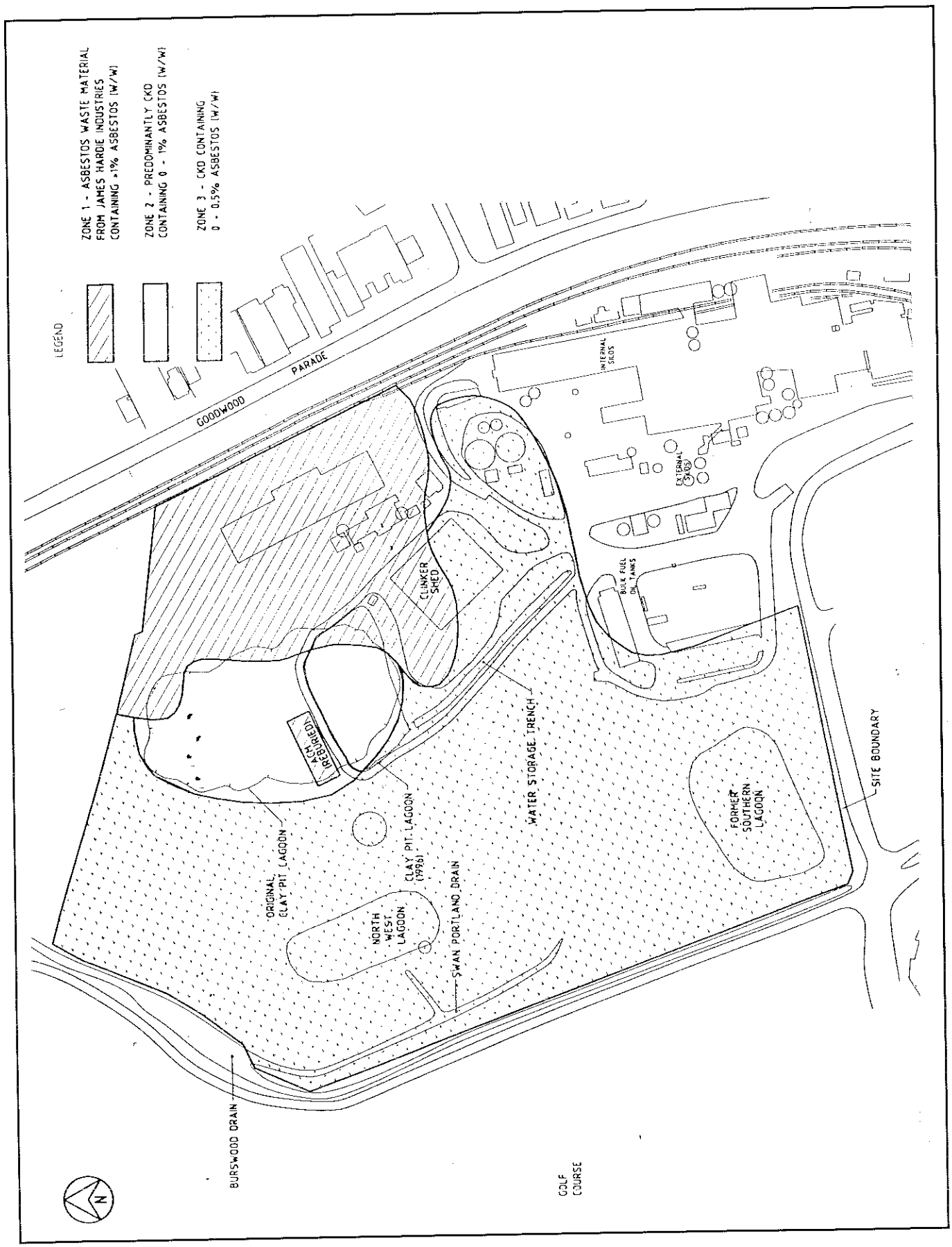

Figure 4. Location of asbestos contamination.

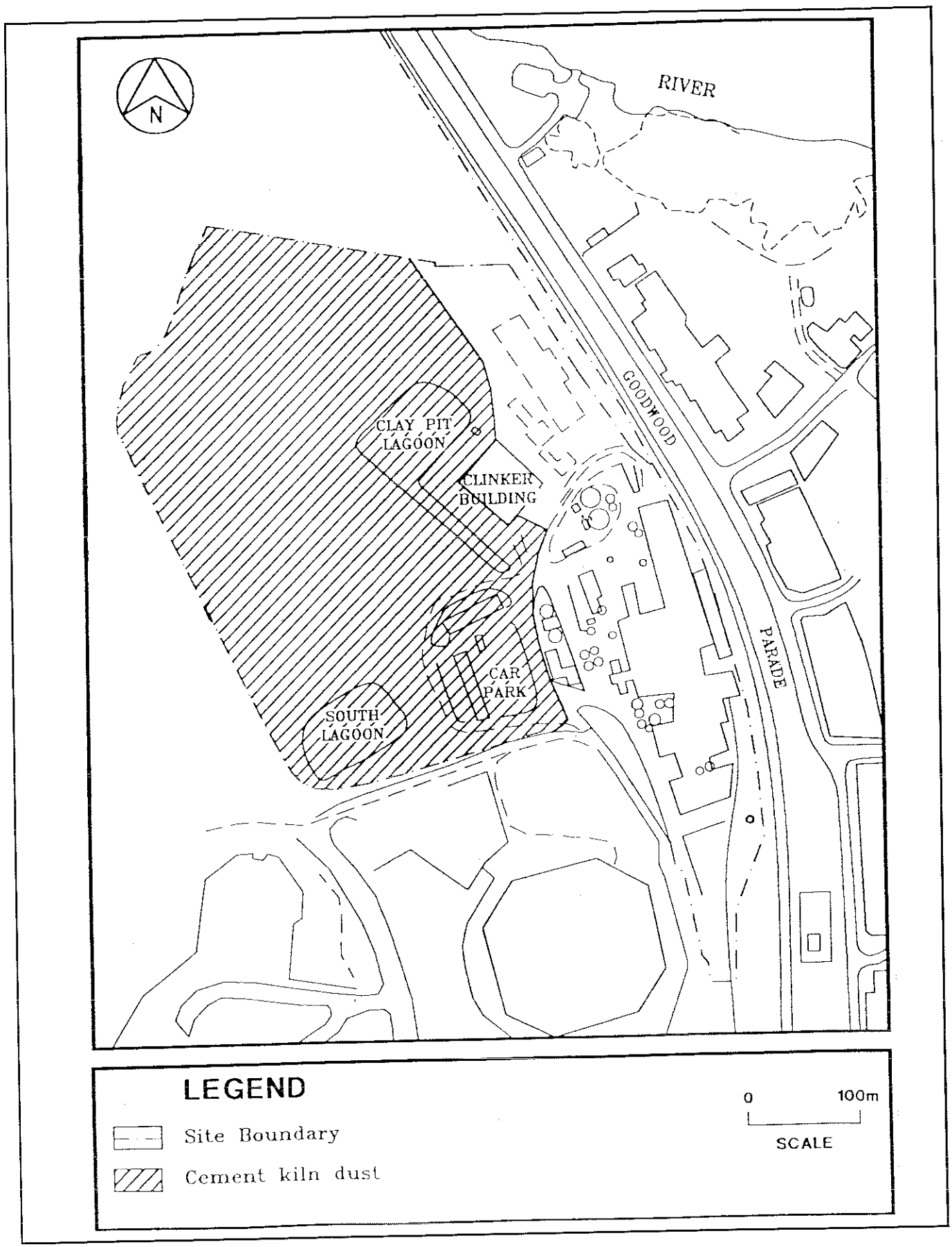

Figure 5. Swan Portland location of cement kiln dust.

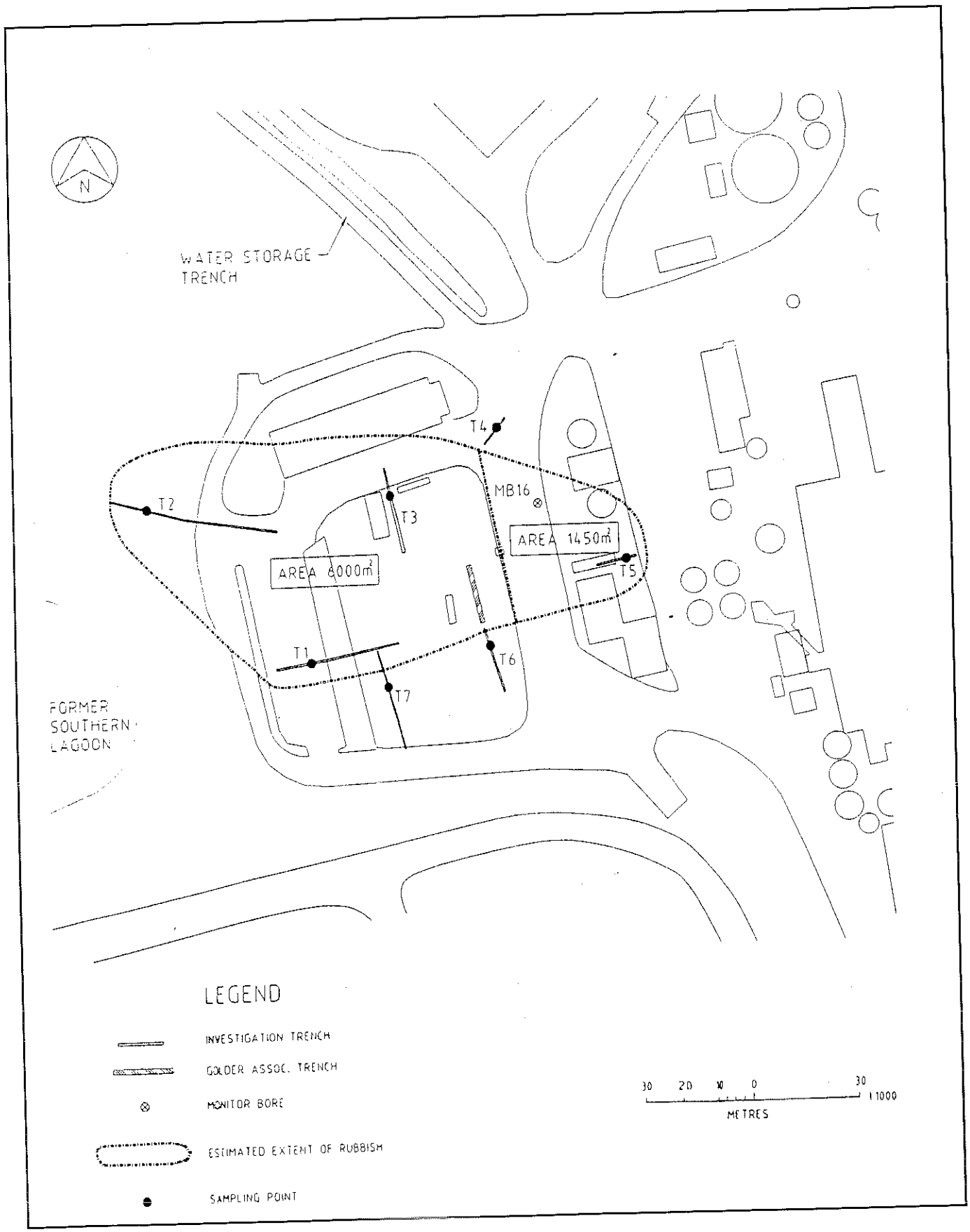

Figure 6. Swan Portland Cement location of rubbish dump containing buried kiln bricks.

Areas thought to be free of asbestos and remediated areas will be validated as having "no detectable levels of asbestos" ("no detectable levels of asbestos" has yet to be defined by an expert panel to be convened by the EPA).

The proponent has proposed to leave the cement kiln dust, estimated at 750,000m^3, on site and to manage its effects upon public health, groundwater and surface water. Management of the health affects of the cement kiln dust would be achieved by covering the cement kiln dust with 1 metre of clean fill (CMPS & F 1997f) to prevent contact with the material and to prevent the generation of dust. The proponent will provide an environmental management plan for the remediation.

Groundwater within the cement kiln dust has a high pH and is artificially mounded. In order to manage this and prevent discharge of contaminated groundwater off-site, the proponent proposes to limit groundwater recharge by the percolation of surface water through the cement kiln dust. As surface water travels through the cement kiln dust it becomes alkaline by dissolving lime contained in the cement kiln dust. By preventing surface water recharging the groundwater, the groundwater will not become more alkaline and the groundwater levels will decline, reducing the artificial mound and potential for contaminated water to move off-site and the amount of cement kiln dust occurring within the shallow aquifer. In order to limit the groundwater recharge, surface water will be managed to prevent infiltration into the ground. To achieve this the proponent will install a surface water drainage system to collect storm water from roofs and hardstand areas. The surface water drainage system will discharge via pollutant traps to a sedimentation basin and then to the river. The proponent will continue to monitor groundwater quality and levels and surface water quality.

The proponent proposes to remove all identified chromate bricks and associated contaminated soil from the site to a suitable landfill and to confirm that the contaminants have been removed by validation sampling. Initial testing has shown that most of the contaminants are suitable for a Class III landfill but some hot-spots may have to be disposed of to a Class IV landfill as the leachable chromium fraction exceeds Class III criteria (CMPS & F 1997h). The proponent will provide an environmental management plan for the remediation.

The proponent proposes to excavate and bio-remediate all hydrocarbon-contaminated soil and return this to the site when it meets residential land use criteria (based on the Victorian EPA's requirements for the Bayside site, Port Melbourne for total petroleum hydrocarbons and on Imray and Langley (1996) for polycyclic hydrocarbons) or dispose of it to landfill when it meets landfill classification criteria (DEP 1996b). The proponent will provide an environmental management plan for the remediation.

In addition to soil contaminants, the environmental factors of dust, noise and vibration and public safety were identified. The proponent proposes to maintain dust within the criteria established for residential areas by the Kwinana Environmental Protection Regulations (EPA 1992), maintain noise within limits specified by the Noise Regulations (1997) and vibration within limits specified by Australian Standard 2670.2 "Evaluation of human exposure to whole-body vibration. Part 2". The proponent will provide an environmental management plan for dust, noise and vibration for remediation and redevelopment.

Changes to the proposal made by the proponent since the release of the PER include:

- asbestos management. The original proposal was to remove all material containing asbestos in a concentration greater than one percent by volume;
- cement kiln dust management. The original proposal was for 0.5m of clean fill cover over the cement kiln dust; and
- surface water management. The original proposal was to pipe all storm waters collected from buildings and hardstand areas directly to the Swan River.

Table 1 - Key characteristics of proponent's proposal

Proposal Aspect	Description
SITE IDENTIFICATION	Part lot 66 (6.9609 ha), lot 10604 (1.5989 ha),part lot 35 (1.3264 ha), part lot 35 (8.9953 ha), part lot 1 (0.0486 ha).
CURRENT ZONING	Urban (Metropolitan Regional Scheme) Residential R60 (Town Planning Scheme), with non-conforming use right.
PROPOSED ZONING	Special use, including residential R80 and R160, tourism/recreation, office/residential and special commercial.
DEMOLITION	Hazardous materials assessment of buildings and plant equipment; site occupational health and safety plan approved by WorkSafe, provide environmental management plan for off-site dust, wind-blown debris and noise.
REMEDIATION	
asbestos	removing material containing asbestos and validating the area as "no detectable levels of asbestos"; and/or covering material with asbestos content of greater than 1% by volume with a warning layer or barrier and 2 metres of clean fill and material with asbestos content of less than 1% by volume with a warning layer or barrier and 1 metre of clean fill.
cement kiln dust	cover with at least 1 metre of clean fill.
kiln bricks and associated contamination	remove and dispose to a suitable landfill, estimated volume 19 000 cubic metres.
hydrocarbons	excavate and bioremediate hydrocarbon-contaminated soil, return remediated soil or dispose to landfill.
MANAGEMENT	
asbestos	validate uncontaminated areas, provide and implement environmental management plan for remediation.
cement kiln dust	provide and implement environmental management plan for remediation.
kiln bricks and associated contamination	provide and implement environmental management plan for remediation, validate remediation.
hydrocarbons	provide and implement environmental management plan for remediation, validate remediation.
groundwater	limit alkaline recharge and lower artificial mounding by management of surface water, maintain monitoring bores and monitoring.
surface water	provide and implement environmental management plan for remediation.
dust	provide and implement environmental management plan for remediation, maintain dust levels within criteria established for residential areas by the Kwinana Environmental Protection Regulations (EPA 1992).
noise and vibration	provide and implement environmental management plan for remediation, maintain noise within limits specified by the Noise Regulations (1997) and vibration levels within limits specified by Australian Standard 2670.2 "Evaluation of human exposure to whole-body vibration. Part 2"
public safety	provide and implement site safety plan.

REDEVELOPMENT	
asbestos	install services in clean fill channel; provide management plan for disturbance of asbestos contamination to the Town of Victoria Park for supply with building licences, WorkSafe to supervise disturbances of asbestos contamination.
groundwater	monitor levels and quality.
surface water	provide sealed drainage system with pollutant traps and treatment basin to collect storm water from roofs and hardstand areas in cement kiln dust contaminated area; monitor water quality of water discharging to the Swan River.
dust	provide and implement environmental management plan for redevelopment maintain dust levels within criteria established for residential areas by the Kwinana Environmental Protection Regulations (EPA 1992).
noise and vibration	provide and implement environmental management plan for redevelopment, maintain noise within limits specified by the Noise Regulations (1997) and vibration levels within limits specified by Australian Standard 2670.2 "Evaluation of human exposure to whole-body vibration. Part 2"
public safety	provide and implement site safety plan.

3. Environmental factors

3.1 Relevant environmental factors

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

It is the EPA's opinion that the following are the environmental factors relevant to the proposal, which require detailed evaluation in this report:

(a) soil contaminants - health risk or groundwater or surface water contamination source during development or subsequent use of the site These are:

  (i) asbestos

  (ii) cement kiln dust

  (iii) kiln bricks

  (iv) hydrocarbons

(b) dust - dust nuisance to neighbouring premises;

(c) noise and vibration - impacts of remediation and construction work on neighbouring premises; and

(d) public safety - road safety relating to construction traffic.

The above relevant factors were identified from the EPA's consideration and review of all environmental factors (preliminary factors) generated from the PER document and the submissions received, in conjunction with the proposal characteristics (including significance of the potential impacts), the adequacy of the proponent's response and commitments, and the effectiveness of current management. The identification process is summarised in Table 2.

The relevant environmental factors are discussed in Sections 3.2 to 3.5 of this report and Table 3 summarises the EPA's objectives, assessment and advice relating to the relevant environmental factors.

Table 2. Identification of relevant environmental factors

Factors	Relevant Area	Proposal Characteristics	Government Agencies and Public Comments	Identification of Relevant Environmental Factors
Pollution Management				
Soil contaminants				
a) Asbestos	Swan Portland site, specifically contaminated zones 1,2, and 3 and remainder of the site, provisionally classified as uncontaminated Airborne asbestos: Burswood Peninsula bounded by Great Eastern Highway to the south and area surrounding the site to a distance of 2 kilometres.	**Original proposal:** • remove all contamination containing >1% asbestos; **Modified proposal:** • zones 1,2 & 3 remove contamination and/or cover areas of >1% asbestos with warning layer and 2m fill, cover areas of <1% with warning layer and 1m of fill; • EMP for asbestos disturbance in short term; • EMP for disturbance of warning layer and contamination in longer term; • airborne asbestos monitoring • validation testing of areas considered "uncontaminated"	**Government Agencies:** Health Dept - need adequate sampling policy to fully determine extent of contamination; liaise with them for criteria and air-sampling protocol; full validation study needed; WorkSafe - wet screening and upward current classification not recommended; recommendation for aircon filters for trucks, must specify respiratory protection, identify action level criteria, must have aircon filters on water carts, reference NOHSC CoP, discourage disturbance of any contamination after remediation; DEP - need statistically valid systematic sampling programme over suspect areas for validation; DRD - considers proponent will appropriately treat and dispose of waste Min for Planning - support rigorous environmental and rehabilitation program; **Public:** Request for details of Code of Practice for removal; concern about airborne fibres, public perceptions; request for independent third party audit on success of decommissioning; request for contingency plans for undetected hazardous waste.	Considered to be a relevant factor.

Factors	Relevant Area	Proposal Characteristics	Government Agencies and Public Comments	Identification of Relevant Environmental Factors
b) Cement Kiln Dust	Swan Portland site, Burswood Peninsula bounded by Great Eastern Highway to the south for dust discharge and adjoining properties and the Swan River where water discharge from the site is received	**Original proposal:** • cover contaminated area with 0.5m of clean fill; • no discharge of contaminated water to river; • surface water piped to river post development to prevent recharge and contamination of groundwater; • groundwater quality and levels monitoring to ensure no discharge of contaminated groundwater off-site or to river. **Modified proposal:** • cover contaminated area with 1m clean fill; • no discharge of contaminated water to river; • surface drainage system with pollutant traps feeding to sedimentation basin before discharge to river post development, to prevent recharge and contamination of groundwater; • groundwater quality and levels monitoring to ensure no discharge of contaminated groundwater off-site or to river.	<u>Health and environment</u> **Government Agencies:** Health Dept - CKD not normally acceptable for residential purposes, but could be allowed due to high density development allowing restricted contact; if dust minimised during remediation to requirements of DEP, significant public health risk unlikely; DEP - concerned about effects of CKD on people and river; **Public:** 0.5m was considered minimal cover; questioned whether 0.5m of topsoil is sufficient for vegetation to grow; disturbance of topsoil may lead to problems and concerns about maintaining coverage after development; impact of chemicals in CKD on vegetation; engineering structural reports needed; concern about the effect of CKD on cars, buildings and public facilities. <u>Groundwater and surface water</u> **Government Agencies:** Water and Rivers - groundwater could contain high salts, pH and aluminium. Have not demonstrated that groundwater discharge to river has been adequately managed; may get chromium leaching; DEP-prevent alkaline water leaving site; will be monitored during development phase, but treatment not specified; no provision for dealing with alkalinity after subdivision constructed; suggests surface water drainage on top of CKD to stop groundwater recharge; DRD - approves collection of stormwater and piping to river; **Public:** On-going monitoring was considered essential, proponent responsible for remediation; master drainage plan with all occupants of Peninsula recommended, with responsibility for construction, maintenance and monitoring; extensive monitoring of groundwater along boundary, especially near golf course due to pH sensitivity of turf, requested; stormwater in contact with waste should be contained and removed during remediation; stormwater could contain contamination and should not be piped to river without treatment, artificial wetlands suggested.	Considered to be a relevant factor.

Factors	Relevant Area	Proposal Characteristics	Government Agencies and Public Comments	Identification of Relevant Environmental Factors
c) Kiln bricks	Swan Portland site	• remove all bricks and contaminated soil that are found from site.	**Government Agencies:** Waters and Rivers - extent of contamination uncertain, chromium levels above ANZECC investigative levels in areas; Health Dept - cleanup criteria consistent with NHMRC/ANZECC guidelines; if dust minimised during remediation to requirements of DEP, significant public health risk unlikely; validation program needed; DEP - need full validation programme prior to end of public review period; DRD - considers proponent will appropriately treat and dispose of waste; Min for Planning - support rigorous environmental and rehabilitation programme; **Public:** Request to remove chromium bricks; Code of Practice wanted for the removal of each waste; independent third party audit on success of decommissioning requested; contingency plans for undetected hazardous waste needed.	Considered to be a relevant factor.
d) Hydrocarbons	Swan Portland site	**Original proposal:** • oil drums and contaminated soil to be excavated and treated by bio-remediation. • tanks to be removed and soil sampled. Any contaminated soil to be removed or treated. **Modified proposal:** • additional commitment to further investigation and PAH testing.	**Government Agencies:** Water and Rivers - possibility of hydrocarbons in groundwater; need more comprehensive sampling programme for hydrocarbons including PAHs; Health Dept- need adequate sampling for oil before remediation commences; test for PAHs at drum and tank sites; full remediation programme needed, with sampling to give statistical confidence; cleanup criteria consistent with NHMRC/ANZECC guidelines; DEP - criteria for landfarming hydrocarbons needed; sampling prior to landfarm and validation needed; need full validation programme prior to end of public review period; DRD - considers proponent will appropriately treat and dispose of waste; Min for Planning - support rigorous environmental and rehabilitation programme; **Public:** Acceptability of bioremediation of oil and validation questioned; Code of Practice wanted for the removal of each waste; validation certificate wanted from EPA, independent third party audit on success of decommissioning requested; contingency plans for undetected hazardous waste needed.	Considered to be a relevant factor.

Factors	Relevant Area	Proposal Characteristics	Government Agencies and Public Comments	Identification of Relevant Environmental Factors
Dust (uncontaminated)	Swan Portland site and surrounding areas -Burswood Peninsula bounded by Great Eastern Highway to the south	**Original proposal:** • commitment to keeping dust discharges within relevant criteria. **Modified proposal:** • additional commitment to detailed plan in EMP to be approved by DEP, Health Dept and Water and Rivers.	**Public:** Concern expressed over demolition dust, site dust, wind blown debris; request for complaints register.	Considered to be a relevant factor.
Noise and Vibration	Burswood Peninsula bounded by Great Eastern Highway to the south	**Original proposal:** • commitment to keeping noise discharge within relevant criteria. **Modified proposal:** • further undertaking to implement noise monitoring programme.	**Public:** Lacks detail on control of noise; noise monitoring programme required; complaints register requested; concern for golf course users and resort patrons.	Considered to be a relevant factor.
Social				
Public Safety	Great Eastern Highway, Hamburger Hill railway station and access ways to Burswood casino and golf course and Swan Portland site	**Original proposal:** • all material transported from site to be carried in appropriately equipped and labelled trucks consistent with relevant codes. **Modified proposal:** • further commitment to site safety plan, emergency procedures for transport of asbestos to be addressed in EMP.	**Public:** Town of Vic Park should be included as key agency if local roads used for transport; concerns about traffic effects; concern for safety of rail users and public with respect to traffic, welding flashes, demolition lighting, steel cutting; concerned about times and timing of work.	Considered to be a relevant factor.

3.2 Soil contaminants

3.2.1 Asbestos

Description

During the hazardous materials assessment of buildings and plant equipment asbestos sheeting was found in parts of the buildings and in electrical boards and asbestos was found in the interior lining of laboratory ovens and was possibly present in the slag drier chimney.

Since the PER was released the proponent has carried out further testing on the site for asbestos. Initially it was thought that the contamination was confined to the James Hardie site and areas bordering this site. The asbestos contamination has now been defined in three zones with differing levels and types of contamination (CMPS & F 1997a). Three forms of asbestos have been identified on site, namely chrysotile, crocidolite and amosite. There is a fourth zone of the site that is assumed to be uncontaminated and which will be confirmed as such by validation testing.

The three contaminated zones (Figure 4) are:

zone 1:

- approximate volume of asbestos-containing material, 68 000 cubic metres
- asbestos content greater than 1% by volume
- form of asbestos - broken and off-specification asbestos cement sheeting and loose asbestos material disposed of as landfill

zone 2:

- approximate volume of asbestos-containing material, 150 000 cubic metres
- asbestos content mainly 0 - 1% by volume, but with regions of greater concentration at depth
- form of asbestos - finely disseminated asbestos mixed with cement kiln dust invisible to the naked eye and pieces of asbestos cement sheeting and thin lenses of asbestos fibre sludge
- extends up to 15 metres below ground level (includes an area of 3 200 cubic metres classified as zone 1, containing reburied material with greater than 1% asbestos content)

zone 3:

- approximate volume of asbestos-containing material, 180 000 cubic metres within 600 000 cubic metres of cement kiln dust, at undefined locations
- asbestos content 0 - 0.5% by volume
- form of asbestos - finely disseminated asbestos mixed with cement kiln dust invisible to the naked eye. 30% of samples analysed from this area contained asbestos between 0.05% and 0.5% by volume

The issue that arises from the presence of asbestos is one of public health. Whilst it is present in soil, the asbestos presents no danger to the public. Significant health risks may arise from the inhalation of airborne asbestos fibres (NOHSC: 2002, 1988). It is activities or wind erosion on the site that may cause respirable fibres (less than three micrometres in diameter) to become airborne that represent a danger to public health. Fibrosis of the lung (asbestosis), changes in one or both surfaces of the pleura, bronchial carcinoma, mesothelioma of the pleura and peritoneum and possibly cancers of other sites are associated with exposure to respirable asbestos fibres (Environmental Health Criteria 53, 1986).

Currently there is no criterion for the level of asbestos in soil below which there is no danger of airborne fibres being generated. Work by Imray and Neville (Imray, P and Neville, G, 1993) has concluded that there is no scientific basis for setting an "acceptable" level of asbestos in soil. The need for strict control of activities on asbestos-contaminated sites is emphasised by Imray and Neville. WorkSafe Western Australia classifies material containing greater than 0.1% asbestos as a designated hazardous substance, requiring management or assessment of health risk (Occupational Safety and Health Regulations, 1996).

In addition there are no Australian ambient exposure criteria for the concentration of airborne fibres below which asbestos does not pose a health risk, that is, there is no level of exposure below which there is known to be no adverse health effect. The air quality guidelines for Europe (Chen, OECD Documents, 1995) estimates that a lifetime exposure to 0.0005 fibres per millilitre gives a risk of 10^{-6} - 10^{-5} for lung cancer (1 in a million to 1 in 100 000) and 10^{-5} to 10^{-4} for mesothelioma (1 in 100 000 to 1 in 10 000).

Submissions on this factor identified the need for a valid systematic sampling program to identify the areas of contamination and to validate remediated areas or prove areas free of contamination. The need for liaison with the Health Department of Western Australia regarding air monitoring protocols is also identified. Concern was also expressed at the possible generation of airborne fibres and the public perception of a danger from asbestos.

Assessment

The area considered for assessment is the Swan Portland site for asbestos in soil and the Burswood Peninsula and area surrounding the site to a distance of 2 kilometres for airborne asbestos fibres.

The EPA's objective in regard to this environmental factor is to ensure that the health of nearby current and future residents is protected from adverse impacts from asbestos fibres and to ensure that the site is managed in the long term to protect the public from adverse impacts from asbestos fibres.

It is the EPA's preference that remediation of a contaminated site follows the following guidelines (EPA 1997):

- contaminated soil will preferable be either treated on-site and the contaminants reduced to acceptable levels or be treated off-site and returned for reuse after the contaminants have been reduced to acceptable levels; and
- the EPA prefers proponents to seek other options rather than either disposal to an approved landfill or the implementation of 'cap and contain' isolation measures. These options will only be considered if treatment of the contaminated material is not practicable, and will need to be undertaken in an environmentally acceptable manner.

The asbestos on this site is scattered over a wide area of the site at various depths. Due to the volume of material that would need to be treated to remove all asbestos fibres, some of which are microscopic, it is not considered practicable to treat the asbestos contaminated soil. Disposal to landfill or other dedicated area or 'cap and contain' of asbestos contamination are the only feasible options.

The proponent has committed to remove all asbestos found in buildings and equipment in accordance with Code of Practice NOHSC: 2002 (National Occupational Health and Safety Council, 1988) and with WorkSafe requirements (WA Occupational Health and Safety Regulations 1996) and the Health (Asbestos) Regulations 1992 (Health Act 1911). In addition air-borne dust will be monitored for asbestos during demolition and any asbestos monitored over 0.0002 fibres per millilitre will result in a change of work practices (CMPS & F 1997g)

The proponent's initial proposal was to remove all asbestos above 1% by volume in concentration and dispose of it to a suitable landfill site. Removal of the asbestos was considered by the DEP and other agencies to be an acceptable solution to the contamination. The EPA questioned the 1% criterion proposed and required the proponent to show that asbestos in soil at this concentration did not pose a health risk to occupiers of the site.

When requested to justify 1% criteria by health risk analysis, the proponent maintained that this was not possible as:

- the dose response relationship at low exposures is poorly defined due to lack of data;
- a direct relationship between soil asbestos concentrations and airborne respirable asbestos fibres cannot be made, therefore risk cannot be realistically estimated;
- the probability of disturbance of asbestos in surface soils or within wastes beneath a surface cover is difficult to assess; and
- very little data is available on the natural background level of asbestos in air or surface soil against which levels at a contaminated site can be compared.

The proponent proposes a risk management approach to the contamination, as outlined in Section 2, to restrict the pathway for asbestos fibres becoming airborne.

Although this approach in theory would mitigate the possibility of asbestos becoming airborne, the DEP and other agencies expressed concern about implementing it in practice. The amount of cover proposed would mean that asbestos contamination would be disturbed for a number of activities occurring on the site, for example, the installation of services, foundations, basements, swimming pools, gardening and outdoor structures, not only in the initial development but for the foreseeable future. This disturbance, if not properly managed, could lead to the cross contamination of clean fill with asbestos and to the generation of airborne fibres. The DEP is able to control initial activities on the site through Ministerial Conditions, for as long as the site is under one ownership or a limited number of owners who are all proponents. However once subdivision of the site takes place and lots are sold off to individual owners, Ministerial Conditions become unworkable as all owners would have to become proponents and be jointly and severally liable for the proposal.

The EPA formed a Technical Committee (EPA Technical Committee 1997) to provide advice on the short and long term management of the site and mechanisms for the implementation of the management. The Committee made fifteen recommendations and presented a minority opinion from WorkSafe Western Australia. The report of this Technical Committee is presented in Appendix 3.

The recommendations of the Committee were:

1. in the absence of a development plan the Committee's advice can only be on broad-based general terms;
2. the co-ordination of remediation with development will be essential. Remediation cannot be carried out before a development plan exists (unless remediation consists of the removal of asbestos-containing material) This report provides possible options for remediation, but remediation needs to be suitable to the development proposed ;
3. in its current condition, the site does not pose a threat to public health, provided there is no disturbance of asbestos-contaminated material;
4. the issue of removal of asbestos from buildings on the site and demolition of buildings with asbestos building materials is adequately covered by existing WorkSafe legislation;
5. it is not possible to determine a scientifically valid health investigation level for asbestos in soil;
6. the following remediation methods or combination of methods could be applied to all contaminated zones on the site:
    a) removal of material containing asbestos, which is to be validated by approved sampling and analytical methods;
    b) covering material containing greater than 1% asbestos with a warning layer/barrier and 2m of clean fill, and
    c) covering material containing up to 1% asbestos with a warning layer/barrier and 1m of clean fill;

7. it is the Committee's preferred option that the areas of greatest asbestos contamination ie zone 1 areas comprising of 68 000 m^3, are removed to a suitable site;

8. the proponent prepares a plan that describes methods of sampling and analysis and detection levels. This plan should be approved by an expert group, including WorkSafe WA, Department of Environmental Protection and the Health Department prior to implementation of the project;

9. technically the safe installation of major services and remediation can be achieved with appropriate management. It is envisaged that implementation of this management can be achieved through Ministerial Conditions imposed on the proposal and existing WorkSafe and Health Department legislation and audited through the DEP audit procedures and an independent auditor's report;

10. construction and minor works beneath the warning layer can technically be achieved without danger to public health provided that appropriate precautions to reduce risk of air-borne asbestos fibres are taken. In this regard the Committee acknowledges that there may be deficiencies in the currently available legislation for policing and enforcing conditions. WorkSafe would be concerned about the health of workers and would require the approval of a management plan before work commenced;

11. for any disturbance of the warning layer, a management plan should be required and will need to be approved by the relevant authorities;

12. disclosure should be made that blocks are affected by asbestos contamination at any sale or resale;

13. long-term risk is managed by recommending to the WA Planning Commission that memorials warning of the hazard of asbestos and directing owners to seek advice before undertaking work on the block be placed on the titles of affected blocks. It is considered essential that this occur;

14. no public exposure to air-borne asbestos fibres above the current background level of the Perth Metropolitan area should be permitted as a result of activities on the Swan Portland site; and

15. ambient air monitoring should occur at the boundary or boundaries, as appropriate, of any site where asbestos is being disturbed to confirm that air-borne asbestos is not leaving the site and that air monitoring should continue at the site as a whole beyond the time that all construction activity has ceased for a length of time to be determined.

It should be noted that the 1% asbestos level for the different treatments is an arbitrary figure, not based on any scientific determination of health risk. It is adopted for ease of management, being the level at which asbestos is likely to be detected with the naked eye. It should not, therefore, be taken as a precedent for determining what level of asbestos is a health risk. Material containing less than 1% of finely disseminated asbestos may pose a greater health risk than material containing more than 1% of asbestos in cement sheeting.

A minority view from WorkSafe Western Australia disagreed with recommendations 9,10 and 11 and expressed the view that areas of greater than 1% asbestos contamination should not be disturbed and should either become containment cells or if no disturbance cannot be guaranteed, the asbestos should be removed. WorkSafe Western Australia also disagreed with recommendation 6 and considered that 1m of fill was not sufficient depth to prevent disturbance of less than 1% asbestos and recommended greater coverage depending on the use of the site.

The EPA has considered the Committee's recommendations and the concerns of WorkSafe Western Australia. The EPA has adopted the Technical Committee's recommendations although the EPA has extended recommendations 6, 9 and 10 in its advice to the Minister which is as follows:

(a) Asbestos contamination at concentration greater than one per cent by volume of asbestos.

These areas may be treated by either method (i) or (ii) or combination of (i) and (ii) as given below.

(i) removal of contaminated material from the site to an approved disposal site and validation of remediated area;

(ii) covering of contaminated material with a physical warning barrier and a minimum of two metres of clean fill material (certified as containing no contaminants above soil criteria for residential use) and not developing the area so treated, except for construction of hardstand areas, planting shallow-rooted vegetation or other uses as may be established as acceptable to the Minister for the Environment. The warning barrier shall be permeable to water and long-lasting and also resistant to alkaline attack, if being used in areas contaminated with cement kiln dust. Possible barriers suggested by the Technical Committee were perforated PVC liner, sprayed bitumen or a form of geo-cloth.

Areas where asbestos contamination remains will be subject to a memorial on the title of the land.

(b) Asbestos contamination at concentration less than one per cent by volume of asbestos.

These areas may be treated by either method (i) or (ii) or combination of (i) and (ii) as given below.

(i) removal of contaminated material from the site to an approved disposal site and validation of remediated area;

(ii) covering of contaminated material with a physical warning barrier and a depth of clean fill material (certified as containing no contaminants above soil criteria for residential use). The warning barrier shall be permeable to water and long-lasting and also resistant to alkaline attack, if being used in areas contaminated with cement kiln dust. Possible barriers suggested by the Technical Committee were perforated PVC liner, sprayed bitumen or a form of geo-cloth.

In order to reduce to a minimum the post-remediation disturbance of asbestos contamination and the potential for generation of airborne fibres, the proponent should determine the depth of clean fill required by condition (ii) above according to the use proposed for each area (eg service area, building with undercroft area or basement, deep foundations, shallow foundations, residential use, potential for swimming pool, parkland, etc). Alternatively the proponent may determine which use of the site will cause disturbance at the greatest depth, and apply a depth of cover in excess of this depth to areas of less than one per cent asbestos contamination.

The final development plan detailing the depth of fill required relating to specific planned uses of the site, requires approval by the Minister for the Environment, on advice of the Ministers responsible for Health, WorkSafe and Planning, and also the EPA;

Areas where asbestos contamination remains will be subject to a memorial on the title of the land and could be subject to restrictive caveats limiting the depth to which development can take place;

Disturbance of asbestos contamination should be avoided. However where it can be demonstrated that disturbance of asbestos contamination is essential, as it will be for the construction of piles at depth, it may take place provided that prior to disturbance a plan for the management of disturbances below the barrier is prepared to the satisfaction of the EPA on the advice of the Health Department of Western Australia and WorkSafe Western Australia. This plan should detail how the need for management will be identified, the supervision and the reporting or auditing of the management.

In formulating this advice in (a) and (b) above, the EPA has taken into account the preferred option of the Technical Committee for the removal of asbestos greater than 1% and their acknowledgment that despite considering various mechanisms, there are still concerns about the adequacy of legislation to ensure management of any disturbance of asbestos in the long term and when Ministerial Conditions can no longer be applied.

In adopting this approach the EPA recognises the permanency of the asbestos contamination and the fact that no quantifiable health risk can be assigned to the presence of asbestos in soil.

Measures to reduce the potential for disturbance of asbestos have been adopted to ensure long term safety of the public beyond the period of initial site development. Any further development of the site in the future should follow this approach.

The EPA recommends that the areas of the site contaminated with asbestos are remediated before development of uncontaminated areas is commenced. This is to ensure that the site is not occupied prior to remediation, during which there is the greatest potential for the generation of airborne fibres.

The EPA also recommends that the proponent disclose at the sale of the land, contamination and environmental considerations that affect the use of the land to prospective purchasers in accordance with recommendation 12 of the Technical Committee.

There are still some issues that are unresolved, namely, on the rare occasions where some disturbance of the contamination is unavoidable, a mechanism for triggering the plan for management of that disturbance is needed, as well as responsibility for supervision and reporting of the management. The proponent must determine these issues to the requirements of the Minister for the Environment before commencing the proposal. In addition, sampling and analysis plans including the definition of "no detectable levels of asbestos", need to be approved by the expert panel as recommended by the Technical Committee (Recommendation 8).

The Technical Committee has recommended that no asbestos fibres should be emitted from the site. In effect this means that the ambient air standard is the background level for Perth. This was measured in the early 1990's as 0.0002 fibres per millilitre (advice from Environmental Health Section of Health Department of Western Australia) The proponent has previously monitored for airborne fibres and found less than 0.0002 fibres per millilitre, and it is proposed that this figure be taken as the background level. If asbestos fibres are monitored over this level changes in work practices will be required.

The proponent has made commitments regarding the management of asbestos. These are:

- to fully describe the method of asbestos removal in their Environmental Management Plan (EMP);
- to adhere to the NOHSC Code of Practice for the Safe Removal of Asbestos and to liaise with WorkSafe WA;
- to carry out an air monitoring program for asbestos dust before, during and after remediation works, in consultation with the Health Department of Western Australia and WorkSafe WA. If results show a potential hazard is developing, work practices will be changed;
- to transport of asbestos waste in accordance with the Department of Minerals and Energy's requirements for asbestos and Class 9 dangerous goods in accordance with the Australian Dangerous Goods Code, with Part 4 of the Health (Asbestos) Regulations 1992 as administered by the Waste Management Division of the Department of Environmental Protection and with WorkSafe Western Australia requirements as given in NOHSC Code of Practice 2002 (1988) and Guidance Notes 3002 (1988);
- to dispose of asbestos waste in accordance with DEP Waste Management Division requirements (Part 4 of Health (Asbestos) Regulations 1992);
- to carrying out a validation program, which will be prepared in consultation with the DEP, the Health Department of Western Australia and WorkSafe WA, to ensure that sampling and validation techniques to be used, meet criteria;
- to commission a public relations consultant to liaise with neighbours with regard to the remediation program, and to keep them fully informed; and
- to audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to:

(a) the proponent's commitments for demolition of the buildings and plant and remediation of the site; and

(b) the advice of the EPA's Technical Committee,

it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's objective for asbestos, provided that the following are met:

(a) the adoption of the management strategy to minimise disturbance of asbestos and the potential for the generation of airborne fibres, as outlined in this Bulletin;

(b) the requirement for a management plan for disturbances of asbestos contamination in both the short and long term, to be approved by the Health Department of Western Australia, WorkSafe Western Australia and the DEP before the commencement of the proposal;

(c) the requirement that prior to sale (of all or part of the site), the proponent shall make full disclosure of residual contamination and other environmental considerations constraining development and/or use of the site to prospective purchasers;

(d) the requirement for memorials to be placed on the titles of affected blocks warning of asbestos contamination at depth;

(e) the government recognise the need for long term management of the site; and

(f) remediation of asbestos contamination, prior to development of the site.

3.2.2 Cement kiln dust

Description

Cement kiln dust, which is a by-product of cement production, has been deposited on the site as a landfill material for the 70 years of the operation of Swan Portland Cement Limited. It is estimated to occupy a volume of 750 000 cubic metres spread over approximately two thirds of the site and is up to 15 metres deep in the area of the old clay pit lagoon and up to 10 metres deep in other areas.

Cement kiln dust represents a health hazard due to its fine particulate nature, which could lead to respirable particles causing lung damage, and high alkalinity which could irritate mucous membranes and soft tissue, particularly of the eyes, nose, throat and skin on contact (Health Department of Western Australia, 1997).

Cement kiln dust also contains low levels of heavy metals, of which only barium has been found above ANZECC (ANZECC/NHMRC 1992) background levels (CMPS & F 1996). Barium is not a marine pollutant and although some compounds of barium can cause irritation of the eyes, mucous membranes and skin (Proctor and Hughes 1978), restricted contact will not pose a health risk at the levels found. Toxicity Characteristics Leaching Procedure (TCLP) tests have not shown any results (CMPS & F 1996) in excess of Class II landfill criteria (DEP 1996b). Monitoring of groundwater on and off site (CMPS & F 1997b) leads to the conclusion that aluminium, barium and calcium could be leaching from the cement kiln dust.

Prior to establishment of the factory, the western portion of the site consisted of tidal river flats inundated by saline river water. It is this portion of the site where the cement kiln dust has been mostly deposited. The area of higher land beneath the Swan Portland Cement and James Hardie factory sites consisted of a narrow white sand spit. It is thought that originally the shallow aquifer beneath the Burswood Peninsula contained saline groundwater with an interface with fresh groundwater flow occurring south of the site. A thin, minor freshwater lens probably existed beneath the white sand spit but elsewhere the groundwater is likely to have been saline. It is considered likely that the quality of the groundwater in the shallow aquifer and the position of the saltwater interface has not greatly changed since development. The freshwater discharge is likely still to occur beneath the southern margin of the site and not into the current bed of the Swan River (CMPS & F 1997b).

The current situation is that local groundwater recharge at the site within the area filled with cement kiln dust, will be slowly mixing with saline to brackish groundwater. The estuarine muds beneath the cement kiln dust are likely to have a low permeability and acidic nature, leading to slow mixing and possible neutralisation of the alkaline groundwater leakage from the cement kiln dust fill (CMPS & F 1997b).

Groundwater within the cement kiln dust is artificially mounded due to water leakage from the base of a water storage trench (Figure 7). Groundwater within the cement kiln dust has exhibited a pH of up to 13.2. This renders it a hazard to health and unsuitable for irrigation and for direct discharge to the Swan River.

Storm water runoff and waste water from the Water Storage Trench is discharged from the site via the Swan Portland and Burswood Drains (Figure 8). The Burswood Drain also receives water from runoff from the Burswood Dome carpark, from the adjacent bitumen paved road and soil water drainage via several pipes from the Burswood Park Golf Course. Current monitoring of the drain waters shows some presence of heavy metals. During 1995/6 at sampling point D16 concentrations exceeding the ANZECC guidelines for the protection of aquatic ecosystems for chromium, lead and silver were detected. These excedences were not constant and taking into account the dilution occurring in the River, should not affect aquatic ecosystems adversely. Sediment testing at the Drain discharge area has not revealed the accumulation of heavy metals, total petroleum hydrocarbons, total nitrogen or total phosphorus in sediments. (CMPS & F 1997i).

Previously there has been some concern at the discharge of calcareous silt from the Burswood Drain. This has been attributed to scouring of cement kiln dust into the Swan Portland Drain and fine particles of cement kiln dust within process water discharged to the Drains.

Submissions on this factor identified concerns with heavy metal levels which have since been addressed by further monitoring (CMPS & F 1997b), concern with surface water discharge which has since been addressed by a modification to the proposal (CMPS & F 1997e), and concerns for long term monitoring and contingency plans for unacceptable water quality. Concern about contaminated dust leaving the site and the ability of cement kiln dust to support vegetation was also raised.

Assessment

The area considered for assessment is the Swan Portland site and adjoining areas, and the portion of the Swan River where water discharged from the site is received.

The EPA's objective in regard to this environmental factor is:

- to ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with ANZECC/NHMRC (1992) criteria or Dutch B criteria (Assink and Van den Brink, 1986)where ANZECC criteria are not available;
- that contaminated material should be preferably treated on-site or off-site and returned to the site. Where this is not feasible, contaminated material should be disposed of off-site at an appropriate land fill facility or managed on-site to prevent further groundwater contamination or risk to public health; and
- to prevent contamination of river water due to discharge of contaminated groundwater or surface water in accordance with the requirements of the Water and Rivers Commission and EPA's draft WA Water Quality Guidelines for Fresh and Marine Waters (EPA 1993).

Treatment of the cement kiln dust on-site is not feasible due to the volume present (estimated at 750 000 cubic metres). Removal is similarly not a feasible option as finding a landfill capable of accepting such a volume would present a problem. Additionally as some of the cement kiln dust occurs below river level in the clay pit lagoon and western areas of the site, retrieving this would present engineering problems. Management on-site has been selected as the best practical option.

The proponent has proposed to manage the health effects of the cement kiln dust by covering it with one metre of clean fill, so that dust generation and contact with the material is prevented.

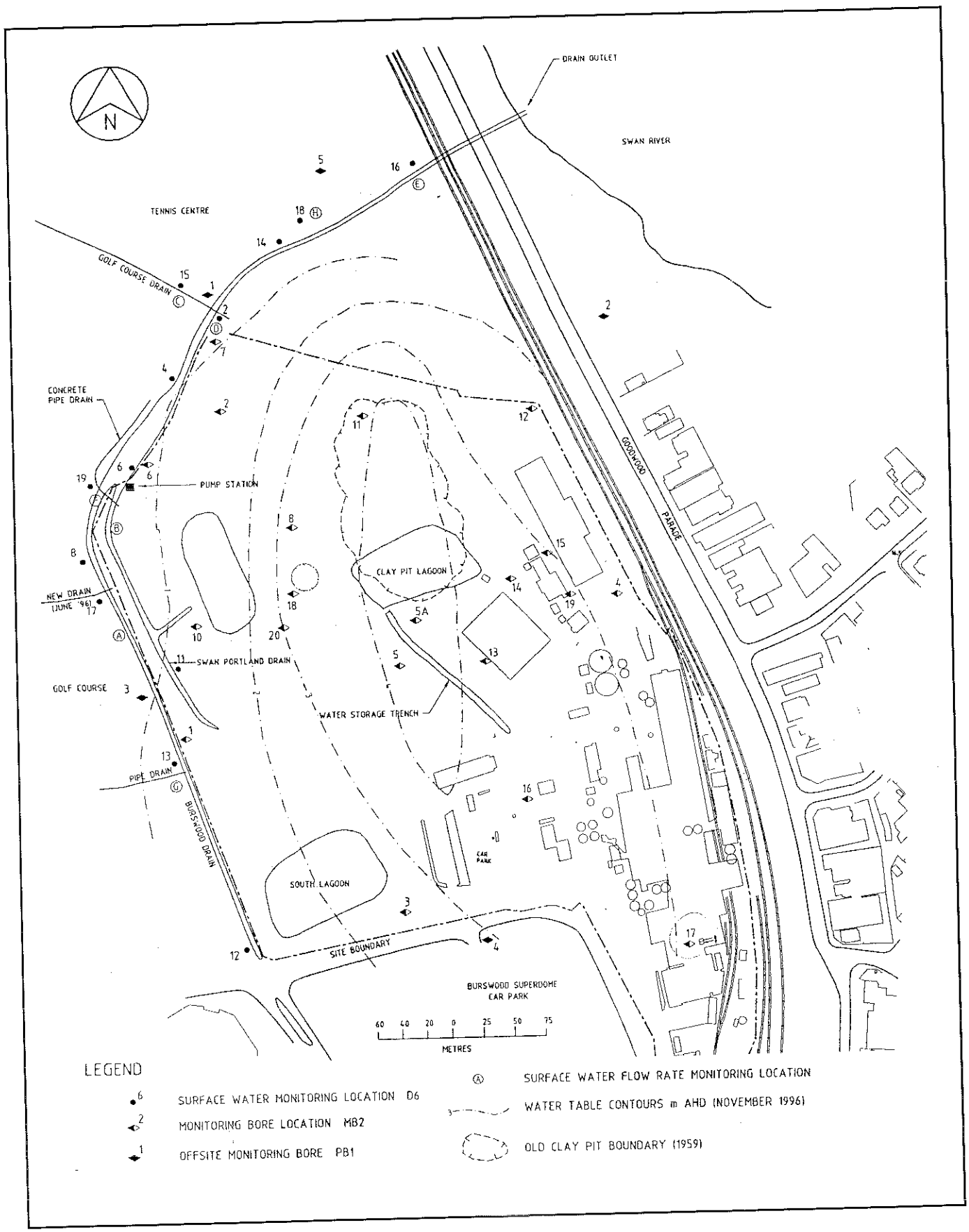

Figure 7 . Swan Portland site remediation monitoring network.

This is an increase in the original half metre of clean fill proposed in the PER and will reduce the risk of accidental exposure of the cement kiln dust and improve the ability of the site to support vegetation.

In order to prevent accidental exposure of the cement kiln dust and reduce cross contamination of clean fill with cement kiln dust, the EPA recommends that it is covered with a physical barrier and a minimum of one metre of clean fill. Where areas of the site are contaminated with both asbestos and cement kiln dust, requirements for asbestos management take precedence. This barrier should be resistant to alkaline conditions, long lasting and permeable to water. Possible barriers suggested by the Technical Committee were perforated PVC liner, sprayed bitumen or a form of geo-cloth.

In addition the proponent should supply a plan to manage any disturbance of cement kiln dust, including dewatering procedures, which should be made available to owners or occupiers of blocks containing cement kiln dust. The EPA further recommends that memorials be placed on the titles of blocks contaminated with cement kiln dust to alert the owners to this potential danger. An Environmental Management Plan is required for the remediation stage for the prevention of dust generation and the management procedures for the material.

The proponent has made commitments to:

- install services in clean fill in excavated trenches or conduits;
- manage dust during excavation, grading and stockpiling;
- validate the clean-up of any remediated areas;
- transport all waste material in accordance with relevant codes;
- dispose of waste in accordance with DEP requirements; and
- audit the success of the project in fulfilling environmental commitments and conditions.

Monitoring of groundwater at five off-site bores has shown a slightly elevated pH at only one bore, which is probably due to cement kiln dust extending over the boundary of the Swan Portland site. Due to the water mounding in the cement kiln dust there is the potential for groundwater to flow in a northerly and westerly direction but the lack of elevated pH at off-site bores 1,3 and 5, (Figure 8) indicates that alkaline groundwater is not leaving the site.

The concentrations of metals in the groundwater do not cause concern for the aquatic ecosystem as groundwater does not discharge directly to the river. It is estimated that the lower reaches of the Burswood Drain could be below the watertable level and groundwater could discharge to the Drain. However, within the lower reaches of the Drain cement kiln dust occurs above the watertable and the level of the drain up to Station D2 (Figure 8). Within the upper reaches of the Burswood and Swan Portland Drains, the watertable occurs below the drain base but within the cement kiln dust. This suggests that direct groundwater flow through the cement kiln dust does not enter the drain. Where groundwater enters the lower reaches of the drain, it probably travels through peat, estuarine muds and sandy clay, which are likely to reduce the pH and alkalinity of any alkaline leachate entrained in the groundwater flow upgradient (CMPS & F 1997b).

In terms of human exposure, the high pH and high barium content of groundwater within the cement kiln dust make this groundwater unsuitable for human use and therefore it is recommended that no domestic water bores are permitted within areas contaminated with cement kiln dust .

Some nitrate below drinking water standards, has been detected in one off-site bore but this is probably due to surrounding land uses and does not originate from the Swan Portland site.

In order to prevent further contamination of the groundwater, the proponent has proposed to prevent recharge of groundwater alkalinity from surface water percolating through the cement kiln dust. Reducing the amount of surface water will have the additional effect of lowering the artificial water mound thus reducing the potential for groundwater flow off the site and the amount of cement kiln dust occurring within the groundwater table. At the western side of the site and in the clay pit lagoon, cement kiln dust occurs below river level and it is not possible to

lower the groundwater table below the cement kiln dust level. Limiting the recharge of groundwater will be achieved by installing a storm water drainage system which will collect surface water from roofs and hardstand areas and pipe it via a sealed system to pollutant traps and a sealed artificial wetland/treatment basin (CMPS & F 1997e).

The proponent will continue monitoring of groundwater levels and quality both on-site and off-site for three years after remediation, and longer if the results show that groundwater levels are not dropping as anticipated and groundwater quality is unsatisfactory. It is anticipated that a groundwater level of approximately 1.0m to 2.0m Australian Height Datum (AHD) will be achieved on the western boundary and 2.5m to 3.5m AHD on the eastern boundary. The water quality criteria agreed to by the Water and Rivers Commission are the Recreational Water Quality Guidelines (ANZECC, 1992) with a trigger level of 75 % of the respective guideline for each compound. There is a need for contingency plans if results are unacceptable on advice of the Water and Rivers Commission (WRC).

During remediation the proponent will use the existing water storage trench or similar to capture rainfall runoff, potential chemical spills and prevent sediment entering the Burswood Drain. Alternative or additional temporary sediment traps will be constructed on site as required. Discharge of water to the Burswood Drain will be via the Swan Portland drain or a temporary pipe. The proponent will continue to monitor the quality of water in the major water storages and at the discharge point. Water management procedures will be reviewed if the pH approaches 9 or total dissolved solid levels approach 1500 milligrams per litre. Exposed cement kiln dust will be covered with a minimum of one metre of clean fill to prevent erosion and transport of the underlying material (CMPS & F 1997e).

During remediation the proponent will also continue monitoring water within the Burswood Drain and report results to the Swan River Trust (SRT).

At redevelopment the proponent will install a piped drainage system to collect water from sealed areas and roofs, which will discharge through pollution traps to a treatment basin, before discharge to the Burswood Drain and the Swan River. The design of the system will have the following features:

- it is to be designed to collect and treat stormwater runoff from sealed surfaces over 90% of developable area (13 hectares) in the event of a Q10 (once in ten years) rainfall event, with a two hour retention capacity;
- all surfaces of pollution control structures contacting the soil are to be sealed to prevent seepage of collected water into the subsoil;
- sediment traps are to be designed to collect about 500 cubic metres of material and to allow for easily accessible maintenance without damage to the liner;
- primary pollutant traps (sediment, fuel/oil) are to be strategically located to collect a volume of liquid of 200 litres during a Q10 rainfall event from an area such as a major carpark;
- wetland vegetation is to be included within the treatment basin to trap any nutrients and provide aesthetically pleasing feature; and
- easy access for ongoing maintenance is to be provided to the primary pollutant traps and the treatment basin (CMPS & F 1997e).

The proponent will monitor the discharge from the proposed treatment basin and the Burswood Drain to the River for 3 years after development and longer if required. The discharge to the River is required by the Swan River Trust to meet the ANZECC criteria for the protection of aquatic ecosystems in marine waters (ANZECC 1992) with a trigger level of 75% of the respective guidelines for remedial action. There is a need for contingency plans if results are unacceptable on advice of the Swan River Trust.

The EPA recommends that the agency responsible for the long term maintenance of drainage system, basin and pollutant traps should be identified and that the proponent should enter into an agreement, acceptable to the Minister for the Environment, with the agency to ensure the long term management. The proponent should also detail in the Environmental Management

Plan, contingency plans to manage unacceptable groundwater and surface water quality. In addition the proponent should ensure that suitable pollutant traps are provided.

It is also recommended that the proponent request the Town of Victoria Park to prohibit the installation of soakwells as a condition of building approval and require all landowners to connect their premises to the storm water drainage system.

Health risk from the contaminated groundwater can be managed by prohibiting the installation of domestic bores, which can be achieved by placing restrictive caveats or memorials on the titles of affected blocks.

The proponent has made commitments to:

- monitoring on-site and off-site wells prior to, during and after works, for water levels and contaminants which are of concern to WRC, and which will be reported to WRC;
- giving detailed environmental management measures in an Environmental Management Plan;
- retaining all storm water generated from the site during works to be treated or disposed of;
- collect storm water from the future development and piping it to a lined treatment basin via a closed drainage system and pollutant traps;
- sealing all ornamental water features;
- discharge from the lined basin and Burswood Drain will be monitored and will comply with Swan River Trust criteria; and
- to audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to:

(a) the proponent's commitments; and

(b) the advice of the Water and Rivers Commission and Swan River Trust;

it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for cement kiln dust, provided that:

(a) the cement kiln dust is covered with a physical barrier and a minimum of one metre of clean fill. Where areas of the site are contaminated with both asbestos and cement kiln dust, requirements for asbestos management take precedence;

(b) the proponent supplies a plan to manage any disturbance of cement kiln dust, including dewatering procedures, and ensures there is a mechanism by which it will be available to owners or occupiers of blocks containing cement kiln dust;

(c) memorials are placed on the titles of blocks contaminated with cement kiln dust to alert the owners of this potential danger;

(d) an Environmental Management Plan is prepared and implemented for the remediation stage for the prevention of dust generation and the management procedures for the material;

(e) the proponent identifies the agency responsible for the long term maintenance of drainage system, basin and pollutant traps and enters into an agreement, acceptable to the Minister for the Environment, with the agency to ensure the long term management;

(f) the proponent details in the Environmental Management Plan, contingency plans to manage unacceptable groundwater and surface water quality;

(g) the proponent ensures that suitable pollutant traps are provided;

(h) construction is not commenced until the proponent ensures that there is a mechanism to prohibit the installation of soakwells and require all landowners to connect their premises to the storm water drainage system; and

(i) the proponent ensures that restrictive caveats or memorials are placed on the titles of affected blocks prohibiting the installation of domestic bores.

3.2.3 Kiln bricks and associated contaminated soil

Description

Kiln bricks which were used to line the kilns at Swan Portland Cement have been disposed of on-site, mostly beneath the employee car park but also on other unidentified areas of the site. Some contaminated soil and kiln coating material is associated with the bricks.

Analysis of the chromate and alumina kiln bricks, kiln coating and soil (CMPS & F 1996) shows levels of chromium, a small proportion of which is in the hexavalent form, in excess of the ANZECC clean up standard and the kiln coating and soil have levels of barium above the ANZECC investigation level (ANZECC/NHMRC 1992). Chromium in the hexavalent form and hexavalent chromates pose a health hazards (Proctor and Hughes 1978). Inhalation of chromium (VI) materials can cause lung cancer and severe irritation of the throat, lungs and skin. Advice from Health Department of Western Australia is that there is unlikely to be a significant public health risk provided airborne dust is minimised (Health Department of Western Australia 1996). Chromium is also an environmental pollutant and a toxicant to aquatic ecosystems. Some compounds of barium can cause irritation to the eyes, mucous membranes and skin. TCLP tests carried out on the materials (CMPS & F 1996 and 1997h) show leaching of chromium, arsenic and boron in excess of Class II landfill criteria, and one sample shows chromium leaching in excess of Class III landfill criteria (DEP 1996b).

Submissions on this factor identified the need for dust suppression and a validation program for the removal of the kiln bricks and associated material and contingency plans for the discovery of undetected hazardous waste.

Assessment

The area considered for assessment is the Swan Portland site.

The EPA's objective in regard to this environmental factor is to ensure the rehabilitation of the impacted area to an acceptable standard that is compatible with the intended residential land use and protection of the environment in accordance with ANZECC/NHMRC criteria or 1986 Dutch B Criteria (Assink and Van den Brink, 1986), where these are applicable.

The kiln bricks occupy a small volume of an area filled with general rubbish. The bricks are friable and associated with kiln coating, a powdery substance. It is impractical to retrieve the bricks from the surrounding rubbish in order to treat them separately. It is therefore proposed that all rubbish is disposed of to landfill.

The proponent has proposed to excavate all kiln bricks and associated material below the car park (which includes cement kiln dust and general rubbish), a volume of approximately 19 000 cubic metres (revised down from 47 000 cubic metre in the PER following further testing), and dispose of it to an appropriate landfill. Initial testing has found that most of the contaminants are suitable for a Class III landfill but some hot-spots may have to be disposed of to a Class IV landfill as the leachable chromium fraction exceeds Class III criteria (CMPS & F 1997h). Precautions against dust generation will be described in the Environmental Management Plan.

Should any bricks remain undiscovered, contamination of the groundwater is not considered to be a problem as the bricks are not in contact with groundwater and the groundwater is alkaline (up to pH 13.2) which inhibits the dissolution of chromate compounds. Continued monitoring of groundwater should reveal any problems that may result from undiscovered kiln bricks. Contingency plans for undetected hazardous wastes will be addressed in the Environmental Management Plan for the removal of wastes.

It is recommended that validation programs for remediated areas are based on "Sampling Design Guidelines" for contaminated sites (EPA (NSW) 1995).

The proponent has made commitments to:

- removing all chromate bricks and contaminated soil (estimated volume 19,000 cubic metres, including general rubbish) and appropriate disposal;
- give details of excavation, removal and disposal of kiln brick contamination in an EMP;
- manage dust during excavation, grading and stockpiling;
- validate remediated areas;
- disposal of waste in accordance with DEP landfill criteria;
- give details of contingency plans in the event that undetected hazardous material is found, in the EMP;
- transport all waste material in accordance with the relevant codes and DEP requirements; and
- audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to the:

(a) the proponent's commitments; and

(b) advice from the Health Department of Western Australia,

it is the EPA's opinion that the proposal can be managed meet the EPA's objective for kiln bricks and associated material.

3.2.4 Hydrocarbons

Description

Hydrocarbon contamination has resulted from the burial of drums of used oil on the site and may be present near underground and above ground fuel tanks. An area of buried drums and contaminated soil has been identified west of the lagoon area (Figure 8). So far investigations in the region of the fuel tanks have not identified any hydrocarbon products above Dutch B criteria for total petroleum hydrocarbons, benzene, toluene, ethylbenzene or xylene(BTEX) or polyaromatic hydrocarbons (PAHs) in the ground (Golder Associates 1996) .

Hydrocarbons in the soil are environmental pollutants and present a potential danger to aquatic ecosystems. Waste oil may contain polycyclic aromatic hydrocarbons (PAHs) which pose a risk to human health and the environment.

Submissions identified the need for further testing to define the area of contaminated soil and groundwater, and for PAHs, benzene, toluene, ethyl benzene and xylene (BTEX) and lead. Identification of criteria and a validation program for the clean up are also needed.

Assessment

The area considered for assessment is the Swan Portland site.

The EPA's objective in regard to this environmental factor is to ensure the rehabilitation of the impacted area to an acceptable standard that is compatible with the intended residential land use and protection of the environment in accordance with ANZECC/NHMRC criteria or 1986 Dutch B Criteria, where these are applicable.

The proponent's proposal for on-site treatment of hydrocarbon-contaminated soil and return of the soil to site is in accordance with the EPA's remediation preferences. If the residential criteria for remediation of the soil cannot be achieved within a reasonable time, it may be necessary to dispose of the contaminated soil to landfill.

In response to submissions the proponent has committed to undertaking further testing to define the area and identify the contaminants associated with the hydrocarbon contamination. In-tact drums will be recovered for liquid waste treatment. Before soil can be returned to the site it should meet residential land use criteria based on ANZECC/NHMRC 1992, the Victorian

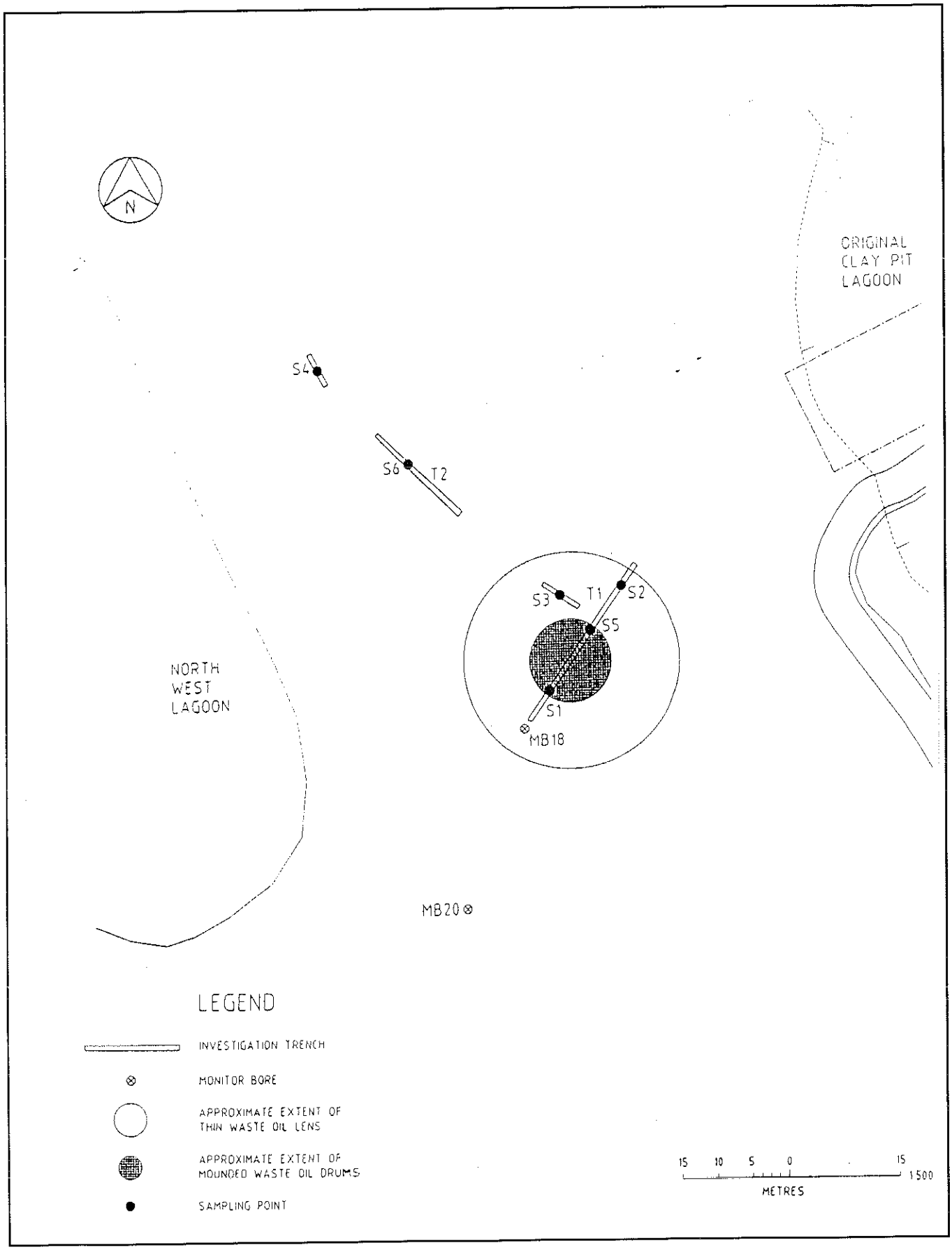

Figure 8. Location of waste oil dump trenches and sampling points.

EPA's requirements for the Bayside site, Port Melbourne for total petroleum hydrocarbons and on Imray and Langley (1996) for polycyclic aromatic hydrocarbons. Before returning the soil to the site, it will be necessary to validate the remediation and ensure that other contaminants, such as heavy metals, meet residential criteria. It is recommended that validation programs for remediated areas are based on "Sampling Design Guidelines" for contaminated sites (EPA (NSW) 1995).

As some of the oil contamination lies below the groundwater table, it will be necessary to remediate or dispose of contaminated groundwater when dewatering the area.

The proponent has made commitments to:

- investigate extent and severity of contamination at the drum disposal site and fuel tank sites;
- excavate oil drums, with removal of intact drums for liquid waste treatment and bioremediation of contaminated soils;
- provide an Environmental Management Plan detailing environmental management measures for excavation, treatment and disposal program of hydrocarbon-contaminated soil;
- validate remediated areas;
- disposal of waste in accordance with DEP landfill criteria;
- transport all waste material in accordance with relevant codes and DEP requirements; and
- audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal is capable of being managed to meet the EPA's objective for the soil contaminant, hydrocarbons, provided that the proponent remediates or removes for treatment and disposal any hydrocarbon-contaminated groundwater during remediation.

3.3 Dust

Description

Activities on the site have the potential to generate a dust nuisance to neighbours. Monitoring for airborne asbestos fibres is dealt with in Section 3.2.1.

The proposal will involve the demolition of buildings and removal of plant, removal of soil from the site, excavations on the site, movement of soil on the site and importation of soil to the site. Dust could be generated from each of these activities.

In submissions concern was expressed about the generation of dust during demolition and site works, particularly contaminated dust, and a request was made for a complaints register to be kept. Concern was also expressed over wind-blown debris on neighbouring premises.

Assessment

The area considered for assessment is the Burswood Peninsula bounded by Great Eastern Highway to the south.

The EPA's objective in regard to this environmental factor is to ensure that the health and amenity of nearby residents are protected from adverse dust impacts in accordance with the dust control guidelines for "Land development sites and impacts on air quality", 1996 (DEP 1996a).

The WA Environmental Protection Policy (Atmospheric Wastes) Kwinana (EPA 1992) specifies an ambient dust limit (averaged over 24 hours) for land used predominantly for residential and rural purposes (Area C) of 150$\mu g/m^3$ with a standard (a concentration which is desirable not to exceed) of 90$\mu g/m^3$. Total suspended particulates at the site boundary should not exceed 1000 micrograms per cubic metre in any 15 minute period. It is proposed that these criteria are applied to the Swan Portland Cement site. Dust control guidelines have been developed for and applied to development sites through Part V of the Act (DEP, 1996a).

The site should be classified as class 4, considered high risk, under the guidelines "Land development sites and impacts on air quality", 1996, because of the potential for contaminated dust generation.

The proponent has made the following commitments to:

- prepare an Environmental Management Plan with detailed environmental management measures for dust and wind-blown debris control during demolition works;
- prepare an Environmental Management Plan with detailed environmental management measures for dust control for remediation and redevelopment;
- manage dust discharges in accordance with "Land development sites and impacts on air quality", 1996 guidelines for remediation and redevelopment;
- develop and implement a dust monitoring program to meet criteria in WA Environmental Protection Policy (Atmospheric Wastes) Kwinana for remediation and redevelopment;
- maintain a complaints register for the site to cover demolition, remediation and redevelopment stages;
- address the management of wind-blown debris in the EMP; and
- audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for dust, provided the recommended criteria (residential criteria given in WA Environmental Protection Policy (Atmospheric Wastes) Kwinana) are adopted.

3.4 Noise and vibration

Description

The demolition, earthmoving, and construction works on the site have the potential to generate noise and vibration from machinery and vehicles which may impact upon neighbouring premises.

The issue of noise impacting on the Swan Portland site from the neighbouring Burswood Dome is considered under Section 5 (Other Advice).

Submissions on this factor raised concerns about the lack of detail on noise control measures in the PER, requests for a noise monitoring program and complaints register and concern about the impacts on neighbouring premises.

Assessment

The area considered for assessment is the Burswood Peninsula bounded by Great Eastern Highway to the south.

The EPA's objective in regard to this environmental factor is to protect the amenity of nearby land users from noise and vibration impacts in accordance with the Environmental Protection (Noise) Regulations 1997.

Noise levels for projects within Western Australia are subject to the Noise Regulations 1997, which are currently the prescribed standard for noise under the *Environmental Protection Act 1986*. These regulations specify the assigned noise levels for various types of noise-receiving premises for different times of the day.

Vibration criteria in Australian Standard 2670.2 "Evaluation of human exposure to whole-body vibration. Part 2" apply to the vibration caused by remediation and redevelopment. Residential standards as given in Annex A apply to the Burswood Hotel and office standards to the Burswood Dome.

In the PER and in response to submissions the proponent has made commitments to:

- provide detailed environmental measures for noise management in an Environmental Management Plan for demolition;

- provide detailed environmental measures for noise and vibration management in an Environmental Management Plan for remediation and redevelopment;
- ensure that noise and vibration discharges from the site do not exceed established criteria during remediation and redevelopment;
- implement a noise monitoring program and vibration monitoring program if necessary during remediation and redevelopment;
- to maintain a complaints register to cover demolition, remediation and redevelopment stages; and
- audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for noise and vibration.

3.5 Public safety

Description

Site works at the site have the potential to impact on public safety, in terms of safety of pedestrians accessing the Burswood Casino and Park sites and for road users of the Great Eastern Highway. Burswood railway station is near the entry to the Swan Portland site and some passengers using this service cross the access road to the site. Trucks and machinery will also be using this access road. The intersection of the access road to the Swan Portland site and the Great Eastern Highway is uncontrolled and trucks entering and leaving the site will contribute to the risk of traffic accidents.

Demolition work is limited to Mondays to Saturdays between 0630 and 1700 hours by the demolition licence.

Movement of commercial vehicles and heavy traffic is limited to 0700 - 1800 hours Monday to Saturday, due to noise requirements.

Submissions on this subject identified concerns for pedestrians, road traffic, welding flashes, demolition lighting and steel cutting.

Assessment

The area considered for assessment is the Great Eastern Highway, Burswood railway station and access ways to Burswood casino and golf course and Swan Portland site.

The EPA's objective in regard to this environmental factor is to ensure that impacts from the proposal do not impact on public safety.

The proponent has stated that the level of traffic from the site should decrease once decommissioning begins as Swan Portland Cement Limited current receives and despatches large quantities of materials. Safety of pedestrians will be the responsibility of the contractors.

The proponent has made the following commitments in the PER and responses to submissions:

- to provide detailed environmental measures for traffic management in the EMP;
- to develop a site safety plan which develops, identifies and manages safety issues to ensure the health and safety of nearby landusers is protected;
- to commission a public relations consultant to liaise with neighbours with regard to the remediation program and to keep them fully informed; and
- audit the success of the project in fulfilling environmental commitments and conditions.

Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective for public safety.

Table 3. Summary of assessment of relevant environmental factors.

Relevant Environmental Factor	Relevant Area	EPA Objectives	EPA Assessment	EPA's Advice
Pollution Management				
Soil contaminants				
a) Asbestos	Swan Portland site, specifically contaminated zones 1,2, and 3 and remainder of the site, provisionally classified as uncontaminated. Airborne asbestos: Burswood Peninsula bounded by Great Eastern Highway to the south and area surrounding the site to a distance of 2 kilometres.	• To ensure that the health of nearby current and future residents is protected from adverse impacts from asbestos fibres.	The EPA established a Technical Committee to provide advice on the management of asbestos on the site. In considering the Committee's advice, the EPA has made the following recommendations: • asbestos contamination in zone 1 areas to be removed or capped with warning layer and 2m of fill, and become a containment cell, not to be developed; • contamination in zones 2 & 3 to be covered with a warning layer and a depth of fill to reduce risk of asbestos becoming airborne during development in that area, but no less than 1m; • proponent to provide management strategy for asbestos in short and long term, and management plan for any disturbance of asbestos before the proposal commences; • management plan to include mechanism to trigger plan, party responsible for implementing plan and auditing or reporting mechanism; management plan should ensure that no airborne asbestos leaves any site where asbestos contamination is being disturbed; and • the development plan for area contaminated with asbestos is to be referred to the EPA for approval. **Proponent's Commitments:** • to carrying out a validation program, which will be prepared in consultation with the DEP, the Health Dept and WorkSafe WA, to ensure that sampling and validation techniques to be used, meet criteria; • to commission a public relations consultant to liaise with neighbours with regard to the remediation program, and to keep them fully informed; • to fully describe the method of asbestos removal in their environmental management program (EMP). • to adhere to the NOHSC Code of Practice for the Safe Removal of Asbestos and to liaise with WorkSafe WA; • to carry out an air monitoring program for asbestos dust before, during and after remediation works, in consultation with the Health Dept and WorkSafe WA. If results show a potential hazard is developing, work practices will be changed; • to transport of asbestos waste in accordance with the relevant agencies' requirements; • to dispose of asbestos waste in accordance with Waste Management Division requirements; and • to audit the success of the project in fulfilling environmental commitments and conditions.	Having particular regard to: • the proponent's commitments; and • the advice of the EPA's Technical Committee, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective, provided that the following are met: • the adoption of the principles of the management strategy to minimise disturbance of asbestos and the potential for the generation of airborne fibres, as outlined in this Bulletin; • the requirement for a management plan for disturbances of asbestos contamination in both the short and long term, to be approved before the commencement of the proposal; • the requirement that prior to sale (of all or part of the site), the proponent shall make full disclosure of residual contamination and other environmental considerations constraining development and/or use of the site to prospective purchasers • the requirement for memorials to be placed on the titles of affected blocks warning of asbestos contamination at depth; • the government recognise the need for long term management of the site; and • remediation of asbestos contamination, prior to development of the site.

Relevant Environmental Factor	Relevant Area	EPA Objective	EPA's Assessment	EPA's Advice
b) Cement Kiln Dust	Swan Portland site Burswood Peninsula bounded by Great Eastern Highway to the south for dust discharge and adjoining properties and the Swan River where water discharge from the site is received	• Ensure the rehabilitation of the site to an acceptable standard that is compatible with the intended land use, consistent with appropriate criteria. • Contaminated material should be treated on-site or disposed of off-site at an appropriate landfill facility. Where this is not feasible, contaminated material should be managed on-site to prevent further groundwater contamination or risk to public health; • To prevent contamination of river water due to discharge of contaminated groundwater or surface water in accordance with the requirements of the Water and Rivers Commission and EPA's draft WA Quality Guidelines for Fresh and Marine Waters (1993)	<u>Health and Environment</u> • CKD poses a health risk and environmental risk due to its respirable nature and alkalinity. Recommended that CKD covered with a warning layer and at least 1m of clean fill to prevent inadvertent exposure and cross-contamination of clean fill; • proponent required to supply management plan for the disturbance of CKD; • memorials to be placed on titles of affected blocks warning of existing contamination; and • an EMP for the remediation of soil contamination be supplied before proposal proceeds. **Proponent's Commitments:** • to cover the CKD with a minimum of 1.0m of clean topsoil; • services to be installed in clean fill in excavated trenches or conduits; • to manage dust during excavation, grading and stockpiling; • to validate any remediated areas; • transportation of all waste material in accordance with relevant codes; • to dispose of waste in accordance with DEP requirements; and • to audit the success of the project in fulfilling environmental commitments and conditions. <u>Groundwater and surface water</u> • high alkalinity of groundwater poses a health hazard and discharge of this water to the river could affect aquatic ecosystems; • EMP should detail contingency plans to manage unacceptable groundwater quality; • a procedure for dewatering should be included in the EMP for future site management, should dewatering be required due to excavations intersecting the groundwater table; • EMP should detail contingency plans to manage unacceptable surface water quality; • provision of suitable pollutant traps required; and • the proponent identifies the agency responsible for the long term maintenance of drainage system, basin and pollutant traps and enters into an agreement, to ensure the long term management. **Proponent's Commitments:** • to monitor on-site and off-site wells prior to, during and after works, for water levels and contaminants which are of concern to Water and Rivers, and which will be reported to Water and Rivers; • to give detailed environmental management measures in EMP. • to retain and manage all storm water generated from the site during works; • to collect storm water from future development and pipe it to a lined sedimentation basin via a closed drainage system and pollutant traps; • to seal all ornamental water features; • to monitor discharge from the lined basin and Burswood Drain and ensure compliance with SRT criteria; and • to audit the success of the project in fulfilling environmental commitments and conditions	Having particular regard to: • the proponent's commitments; and • the advice of the WRC and SRT; it is the EPA's opinion that the proposal can be managed to meet the EPA's objective provided that: • the CKD is covered with a physical barrier and a minimum of one metre of clean fill; • the proponent supplies a plan to manage any disturbance of CKD, including dewatering procedures, and makes it available to owners or occupiers of blocks containing CKD; • memorials are placed on the titles of blocks contaminated with CKD to alert the owners of this potential danger; • an Environmental Management Plan is prepared and implemented for the remediation stage for the prevention of dust generation and the management procedures for the material; • the proponent identifies the agency responsible for the long term maintenance of drainage system, basin and pollutant traps and enters into an agreement, acceptable to the Minister for the Environment, with the agency to ensure the long term management; • the proponent details in the Environmental Management Plan, contingency plans to manage unacceptable groundwater and surface water quality; • the proponent ensures that suitable pollutant traps are provided; • the proponent ensures a mechanism exists to prohibit the installation of soakwells and require all landowners to connect their premises to the storm water drainage system; and • the proponent places restrictive caveats or memorials on the titles of affected blocks to prohibiting the installation of domestic bores.

Relevant Environmental Factor	Relevant Area	EPA Objectives	EPA Assessment	EPA's Advice
c) Kiln bricks	Swan Portland site	To ensure the rehabilitation of the impacted area to an acceptable standard that is compatible with the intended land use and protection of the environment in accordance with ANZECC/ NHMRC criteria or 1986 Dutch Criteria, where these are applicable	• Removal of kiln bricks and contaminated soil will prevent groundwater contamination and any health hazard; • if a number of bricks are not discovered, any effect on groundwater will be seen during monitoring; • bricks and contaminated soil can be removed safely if standard practices followed, including the minimisation of dust; and • EMP, including validation program, required prior to commencement. **Proponent's Commitments:** • to remove all chromate bricks and chromate contaminated soil (estimated volume 19,000m^3 including general rubbish) and appropriate disposal; • to give details of excavation, removal and disposal of kiln brick contamination in an EMP; • to manage dust during excavation, grading and stockpiling; • to validate remediated areas; • to disposal of waste in accordance with DEP landfill criteria; • to give details of contingency plans in the event that undetected hazardous material is found, in the EMP; • to transport all waste material in accordance with relevant codes and DEP requirements; and • to audit the success of the project in fulfilling environmental commitments and conditions.	Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.
d) Hydrocarbons	Swan Portland site	To ensure the rehabilitation of the impacted area to an acceptable standard that is compatible with the intended land use and protection of the environment in accordance with ANZECC/ NHMRC criteria or 1986 Dutch Criteria, where these are applicable	• Further investigation of the contaminated area is needed and proponent has made a commitment to this; • contaminated soil can be remediated by bioremediation; • validation that treated soil meets existing criteria needed before soil is returned or disposed of; • EMP, including validation program, required prior to commencement; and • remediation or removes for treatment and disposal, of hydrocarbon-contaminated groundwater required during remediation. **Proponent's Commitments:** • to investigate extent and severity of contamination at the drum disposal site and fuel tank sites; • to excavate oil drums, with disposal of intact drums and bioremediation of contaminated soils; • to give detailed environmental management measures for excavation, treatment and disposal program for oil in an EMP; • to validate remediated areas; • to disposal of waste in accordance with DEP landfill criteria; • to transport all waste material in accordance with relevant codes and DEP requirements; and • to audit the success of the project in fulfilling environmental commitments and conditions.	Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective provided that the proponent remediates or removes for treatment and disposal any hydrocarbon-contaminated groundwater during remediation.

Relevant Environmental Factor	Relevant Area	EPA Objective	EPA's Assessment	EPA's Advice
Dust	Burswood Peninsula bounded by Great Eastern Highway to the south	To ensure that the health and amenity of nearby residents are protected from adverse dust impacts in accordance with guidelines for "Land development sites and impacts on air quality", 1996 and the WA Environmental Protection Policy (Atmospheric Wastes) Kwinana, 1992.	• Demolition, remediation, and redevelopment activities all have potential to generate nuisance dust; • nuisance dust can be controlled by appropriate management practices; • recommended criteria of maximum dust level of 1000µg/m³ measured over 15 minutes and 24 hour average to meet Kwinana Area C dust criteria; and • recommend site classification 4 for all works due to potential for contaminated dust to be generated. **Proponent's Commitments:** • to prepare an Environmental Management Plan with detailed environmental management measures for dust and wind-blown debris control during demolition works; • to prepare an EMP with detailed environmental management measures for dust control during remediation and redevelopment; • to manage dust discharges in accordance with "Land development sites and impacts on air quality", 1996 guidelines during remediation and redevelopment; • to develop and implement a dust monitoring program to meet criteria in WA EPP (Atmospheric Wastes) Kwinana for remediation and redevelopment; • to maintain a complaints register for the site to cover demolition, remediation and redevelopment stages; • to address the management of wind blown debris in the EMP; and • to audit the success of the project in fulfilling environmental commitments and conditions.	Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.
Noise and Vibration	Burswood Peninsula bounded by Great Eastern Highway to the south	To protect the amenity of nearby landusers from noise and vibration impacts in accordance with the Environmental Protection (Noise) Regulations 1997 and vibration standard AS 2670.2	• Demolition, remediation and redevelopment activities have the potential to generate unacceptable levels of noise and vibration; • noise and vibration can be controlled by appropriate management practices; and • the EPA notes that the site could be subject to noise from the adjoining premises. **Proponent's Commitments:** • to give detailed environmental measures for noise and vibration management in an EMP; • to limit noise and vibration discharges from the site to established criteria during remediation and redevelopment; • to implement a noise monitoring program and vibration monitoring program if necessary during remediation and redevelopment; • to maintain a complaints register to cover demolition, remediation and redevelopment stages; and • to audit the success of the project in fulfilling environmental commitments and conditions.	Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective..

Relevant Environmental Factor	Relevant Area	EPA Objective	EPA's Assessment	EPA's Advice
Social				
Public Safety	Great Eastern Highway, Burswood railway station and access ways to Burswood casino and golf course and Swan Portland site	To ensure that impacts from the proposal do not impact on public safety	• Activities on the site could increase danger to users of Great Eastern Highway and pedestrians; • public safety can be protected with appropriate management practices **Proponent's Commitments:** • detailed environmental measures for traffic management will be given in the EMP; • develop a site safety plan which develops, identifies and manages safety issues to ensure the health and safety of nearby landusers is protected; • to commission a public relations consultant to liaise with neighbours with regard to the remediation program and to keep them fully informed; and • to audit the success of the project in fulfilling environmental commitments and conditions.	Having particular regard to the proponent's commitments, it is the EPA's opinion that the proposal can be managed to meet the EPA's objective.

4. Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide specific commitments to ameliorate the impacts of the proposal on the environment. The commitments are considered by the EPA as part of its assessment of the proposal, and following discussion with the proponent the EPA may seek additional commitments.

The EPA recognises that not all of the commitments are written in a form which makes them readily enforceable, but they do provide a clear statement of the action to be taken as part of the proponent's responsibility for and commitment to continuous improvement in environmental performance. The commitments then form part of the conditions to which the proposal should be subject if it is to be implemented.

The EPA may, of course, also recommend conditions additional to that relating to the proponent's commitments.

Having considered the proponent's commitments and the information provided in this report, the EPA has developed a set of conditions which the EPA recommends be imposed if the proposal by Swan Portland Cement Limited to remediate and redevelop the Swan Portland site, Burswood, is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include:

(a) fulfilment of the commitments made by the proponent in the Consolidated Commitments statement set out as an attachment to the recommended conditions in Appendix 4;

(b) acceptable remediation and management methods for asbestos contamination;

(c) acceptable remediation and management methods for cement kiln dust contamination;

(d) the requirement for approval of the Development Plan for asbestos contaminated areas of the site, by the Minister for the Environment, on advice of the Ministers responsible for Health, WorkSafe and Planning as well as the Environmental Protection Authority;

(e) the requirement for the proponent to prepare, prior to implementation of the proposal, environmental management system documentation with components such as those adopted in Australian Standards AS/NZ ISO 14000 series;

(f) the preparation and implementation by the proponent of an approved Environmental Management Plan for asbestos, including a sampling and analysis plan for asbestos, criteria for asbestos measurement and management plan for any disturbance of residual asbestos;

(g) the preparation and implementation by the proponent of an approved Environmental Management Plan for cement kiln dust, including a management plan for any disturbance of residual cement kiln dust ;

(h) Environmental Management Plans to be made available to the public;

(i) provision for long term maintenance of the surface water drainage system, pollutant traps and treatment basin by the proponent;

(j) prevention of the installation of domestic bores;

(k) accessibility of groundwater monitoring bores;

(l) contingency plans for remediation of groundwater and surface water, should proposed remediation be unsuccessful;

(m) provision for the connection of all buildings and hardstand areas to the piped drainage system;

(n) provision for the treatment of hydrocarbon-contaminated groundwater;

(o) disclosure of residual contamination and other environmental considerations constraining development and/or use of the site to potential buyers by the proponent;

(p) requirements of the Environmental Protection (Noise) Regulations 1997; and

(q) provision of performance reviews and compliance report by the proponent as required by the Minister for the Environment.

5. Other Advice

5.1 Potential noise

In relation to the factor, noise, the EPA recognises the Swan Portland site has the potential to be affected by noise from road and rail facilities near the site and also from the Burswood Dome should this venue apply for and receive special exemption to exceed the standard noise levels under the Environmental Protection (Noise) Regulations. Currently the Burswood Dome does not have an exemption to exceed noise criteria and has not submitted an application for exemption. In the context of the circumstances related to this redevelopment, should the owners/operators apply for such an exemption under Section 17 of the Environmental Protection (Noise) Regulations, five possible outcomes are:

(a) the Minister may refuse the exemption. This would mean that the Dome would have to comply with current noise regulations which could impose restrictions on the type or number of events that could be hosted at the Dome. Alternatively the owners/operators of the Dome would have to find ways of complying with criteria for noise emissions or modifying the impact of emissions on the neighbouring sites;

(b) the exemption may be granted without recommendation for restrictions on the Dome or on development at adjoining sites. In this case the "buyer beware" principle would apply and buyers at adjoining sites would be expected to be aware of the proximity of the Dome and the potential for noise;

(c) the exemption may be granted with restrictions applying to the Dome. These restrictions may be to limit the number of events that can exceed noise levels or set a limit on the level to which noise may exceed the criteria;

(d) the exemption may be granted subject to restrictions being placed on the adjoining sites. These restrictions may be the placement of memorials on the titles of lots created by subdivision that are affected by noise, or restrictions on development of the site such as the requirement for a buffer area around the Dome, or the requirement that buildings are designed acoustically to give noise protection; and

(e) a combination of outcome (c) and (d).

It is recommended that the Minister for the Environment consults with the Minister for Planning, the Town of Victoria Park and the management of the Burswood Dome to determine a strategy for the management of noise from the Dome. It is further recommended that this issue is resolved before subdivision of the Swan Portland Cement site or construction, beyond remediation, on the site.

5.2 Ongoing management of public health risk

The EPA advises the Minister for the Environment that if the development proceeds, the government should recognise the on-going need for special management of this area to ensure that risks to public health from asbestos and cement kiln dust are maintained at acceptable levels. Any further development of the site in the future should follow the strategy for asbestos

and cement kiln dust management outlined in this Bulletin. Consultation between the Minister for the Environment and Ministers for Lands, Planning and Local Government is recommended to establish a mechanism for ensuring adequate on-going management of the site.

5.3 Notification of residual contamination

The proposed Contaminated Sites Legislation provides for the mandatory disclosure of contamination to prospective purchasers of contaminated sites and for the transfer of liability for the contamination to the purchasers (DEP, 1997). However, as this legislation has not as yet been enacted, there is currently no mechanism to ensure that this occurs, once the site is subdivided and in the ownership of a number of individual owners who are not proponents. Memorials on the titles of the lots appear to be the only mechanism to warn prospective purchasers of contamination. It is recommended that when the Contaminated Sites Legislation comes into law, the provisions of the legislation be applied to lots on this site with residual contamination.

6. Conclusions

The proposal by Swan Portland Cement Limited is to remediate the Swan Portland Cement site, by either removing or making safe the contaminated soil, and then to develop the site for other purposes, such as residential, commercial and recreational uses. The contaminants of principal concern are asbestos fibres, which could become airborne and be a health hazard, and cement kiln dust, which is a potential health hazard through inhalation or contact and which could cause further contamination of the groundwater.

The EPA established a Technical Committee, under the Chairmanship of Dr Jim McNulty AO, to provide advice on technical aspects of the remediation proposal for asbestos, and the preparation of this report by the EPA to the Minister has been greatly assisted by its consideration of that advice. The EPA has concluded that appropriate remediation can be achieved, but that particular care would need to be taken to manage, on an on-going basis, the potential impacts of the asbestos fibres and cement kiln dust. The project has health and planning implications. Accordingly, the EPA has concluded that a Development Plan should be prepared, and that this should be to the requirements of the Minister on advice from the Ministers responsible for Health, WorkSafe and Planning as well as the Environmental Protection Authority.

The EPA has also concluded that if contaminated soil is to remain on site, a clearly identified warning barrier should be placed over the contaminated soil and then covered by clean fill to a depth appropriate to the use for each area within the site. Furthermore, where contaminated soil remains, the areas should be subject to memorials on the land titles.

Subject to the above, the EPA has concluded that:

(1) demolition of buildings to ground level can be managed through WorkSafe Western Australia requirements and by implementing an approved EMP for the management of off-site environmental effects;

(2) remediation can be managed in an environmentally acceptable manner in principle. Details of this management are to be provided in EMPs for each identified environmental factor; and

(3) development can be managed if it proceeds in accordance with the approved Development Plan, and any disturbances of residual contamination are managed in accordance with detailed management plans for the disturbances, which are to be provided by the proponent. This is conditional upon satisfactory mechanisms being implemented to identify when disturbance of asbestos contamination will occur, who will be responsible for implementing and supervising the management plan and how this will be reported or audited and to identify when disturbance of cement kiln dust contamination will occur and ensuring that those responsible for the disturbance have the management plan for the disturbance.

7. Recommendations

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for the Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

The EPA submits the following recommendations.

1. That the Minister notes that this proposal is about remediating a site which has been used for the production of asbestos and cement products, and then using the site for other purposes.
2. That the Minister considers the report on the relevant environmental factors and the EPA objectives set for each factor.
3. That the Minister notes that the EPA has concluded that the proposal can be managed to meet the EPA's objectives, but does impose constraints on the further use of the site that require a satisfactory implementation by the proponent of the recommended conditions.
4. That the Minister imposes the conditions and procedures set out in Appendix 4 of this report.
5. That the Minister notes that the development of the Swan Portland Cement site has the potential for the residents to be impacted at times by noise from the adjoining landuses, especially the Burswood Dome.
6. That the Minister consults with the Minister for Planning, the Town of Victoria Park and the management of the Dome and determine a strategy for the management of noise from the Dome.
7. That the Minister notes that whilst the EPA has outlined a management strategy for the proposed development, the nature of the contamination will require on-going management in the event of there being any further development or redevelopment on the site.
8. That the Minister consults the Minister for Lands, Planning and Local Government to establish a mechanism for ensuring adequate on-going management of the site.
9. That the provisions of the Contaminated Site Legislation, when they become law, be applied to those lots on the Swan Portland Cement site which have residual contamination.

Appendix 1

List of submitters

List of organisations who made submissions

Public:

Town of Victoria Park

Conservation Council of Western Australia Inc

Burswood International Resort Casino and the Burswood Park Board

Government:

WorkSafe Western Australia

Department of Resources Development

Health Department of Western Australia

Ministry for Planning

Water and Rivers Commission and Swan River Trust

Department of Environmental Protection

Appendix 2

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Appendix 3

Report of the EPA Technical Committee

REPORT OF
THE EPA TECHNICAL COMMITTEE
ON THE
MANAGEMENT OF ASBESTOS ON THE SWAN PORTLAND SITE, BURSWOOD

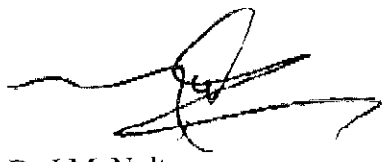
FOREWORD

In accordance with the terms of reference for the EPA Technical Committee on the management of asbestos on the Swan Portland Cement site, Burswood I have pleasure in presenting the report of the Committee.

In doing so, I would like to thank the members of the Committee for their attendance and contribution to the Committee. I would also like to thank Ann Barter for her assistance in writing the report.

The members were:

Dr Jim McNulty AO	Chairman
Mr Ray Perry AO	Independent member
Mr Alan Forbes	Swan Portland Cement
Mr Brian Callander	Town of Victoria Park
Dr Kevin Buckett	Health Department of Western Australia
Mr Luciano Muriale	WorkSafe WA
Dr Alan Tingay	representing Burswood Park Board
Dr Tom Riggert	representing Burswood International Casino
Ms Ann Barter	Department of Environmental Protection



Dr J McNulty
CHAIRMAN

30 September 1997

ERRATUM

Asbestos concentrations in this report are expressed by volume, not by weight as stated.

REPORT OF THE EPA TECHNICAL COMMITTEE ON THE MANAGEMENT OF ASBESTOS ON THE SWAN PORTLAND SITE, BURSWOOD

Summary

The Committee has considered the asbestos contamination existing on the Swan Portland site, Burswood, and the management measures that should be undertaken to render the site suitable for residential development.

In addressing the terms of reference the Committee has come to the following conclusions and recommendations:

1. that in the absence of a development plan the Committee's advice can only be on broad-based general terms;
2. that the co-ordination of remediation with development will be essential. Remediation cannot be carried out before a development plan exists (unless remediation consists of the removal of asbestos containing material) This report provides possible options for remediation, but remediation needs to be suitable to the development proposed ;
3. that in its current condition, the site does not pose a threat to public health, provided there is no disturbance of asbestos contaminated material;
4. that the issue of removal of asbestos from buildings on the site and demolition of buildings with asbestos building materials is adequately covered by existing WorkSafe legislation;
5. that it is not possible to determine a scientifically valid health investigation level for asbestos in soil;
6. that the following remediation methods or combination of methods could be applied to all contaminated zones on the site:
   a) removal of material containing asbestos, which is to be validated by approved sampling and analytical methods;
   b) covering material containing greater than 1% asbestos with a warning layer/barrier and 2m of clean fill, and
   c) covering material containing up to 1% asbestos with a warning layer/barrier and 1m of clean fill;
7. that it is the Committee's preferred option that the areas of greatest asbestos contamination ie zone 1 areas comprising of 68 000 m^3, are removed to a suitable site;
8. that the proponent prepares a plan that describes methods of sampling and analysis and detection levels. This plan should be approved by an expert group, including WorkSafe WA, Department of Environmental Protection and the Health Department prior to implementation of the project;
9. that technically the safe installation of major services and remediation can be achieved with appropriate management. It is envisaged that implementation of this management can be achieved through ministerial conditions imposed on the proposal and existing WorkSafe and Health Department legislation and audited through the DEP audit procedures and an independent auditor's report;

10. that construction and minor works beneath the warning layer can technically be achieved without danger to public health provided that appropriate precautions to reduce risk of air-borne asbestos fibres are taken. In this regard the Committee acknowledges that there may be deficiencies in the currently available legislation for policing and enforcing conditions. WorkSafe would be concerned about the health of workers and would require the approval of a management plan before work commenced;

11. that for any disturbance of the warning layer, a management plan should be required and will need to be approved by the relevant authorities;

12. that disclosure should be made that blocks are affected by asbestos contamination at any sale or resale;

13. that long-term risk is managed by recommending to the WA Planning Commission that memorials warning of the hazard of asbestos and directing owners to seek advice before undertaking work on the block be placed on the titles of affected blocks. It is considered essential that this occur;

14. that no public exposure to air-borne asbestos fibres above the current background level of the Perth Metropolitan area should be permitted as a result of activities on the Swan Portland site; and

15. that ambient air monitoring should occur at the boundary or boundaries, as appropriate, of any site where asbestos is being disturbed to confirm that air-borne asbestos is not leaving the site and that air monitoring should continue at the site as a whole beyond the time that all construction activity has ceased for a length of time to be determined.

REPORT OF THE EPA TECHNICAL COMMITTEE ON THE MANAGEMENT OF ASBESTOS ON THE SWAN PORTLAND SITE, BURSWOOD

Introduction

The asbestos contamination on this site has originated from the James Hardie site, which was adjacent to the Swan Portland site. Part of the original James Hardie site is included in the current Swan Portland site.

The contamination can be defined in three zones with differing levels and types of contamination. Three forms of asbestos have been identified on site, namely chrysotile, crocidolite and amosite. There is a fourth zone of the site which is assumed to be uncontaminated and which will be confirmed as such by validation testing.

The three contaminated zones are (Figure 1):

zone 1 : approximate volume of asbestos containing material - 68 000 m^3
asbestos content >1% w/w
form of asbestos - broken & off-specification asbestos cement sheeting and loose asbestos material disposed of as landfill

zone 2: approximate volume of asbestos containing material - 150 000 m^3
asbestos content mainly 0 - 1% w/w, but with regions of greater concentration at depth
form of asbestos - finely disseminated asbestos mixed with cement kiln dust invisible to the naked eye and pieces of asbestos cement sheeting and thin lenses of asbestos fibre sludge
extends up to 15m below ground level
(includes an area of 3 200 m^3 classified as zone 1, containing reburied material with greater than 1% asbestos content)

zone 3: approximate volume of asbestos containing material - 180 000 m^3 within 600 000 m^3 of cement kiln dust, at undefined locations
asbestos content 0 - 0.5% w/w
form of asbestos - finely disseminated asbestos mixed with cement kiln dust invisible to the naked eye. 30% of samples taken from this area contained asbestos between 0.05% and 0.5%

In considering the appropriate methods for treating and managing the health risk from this asbestos contamination the Committee's task has been made more difficult by the lack of a development plan for the site. In the absence of knowledge of the land use (commercial, residential, recreational), the form of development (single residential, high density) and the likelihood of sub-surface disturbance by foundations, basements, car-parks and swimming pools, the advice of the committee can only be on broad-based general terms.

It is apparent that the co-ordination of remediation with development will be essential. All depths of cover referred to in this report relate to final ground levels. Therefore until the development plan has been finalised and ground levels determined, it is anticipated that the remediation methods indicated in this report will not be able to be applied, unless remediation involves the removal of all asbestos material. This report gives possible options for the treatment of asbestos contamination but the option proposed would need to be approved with the development proposal.

Current site condition

The Committee accepted that air monitoring by the proponents had shown no detectable levels of air-borne asbestos fibres and that therefore, in its current condition, the site does not pose a threat to public health, provided that the asbestos contamination remains undisturbed.

Demolition of buildings

The Committee considered that the issue of removal of asbestos from buildings on the site and demolition of buildings with asbestos building materials is adequately covered by existing WorkSafe legislation. The proponents have carried out a hazardous materials assessment of buildings and plant equipment which has identified asbestos materials.

Site Remediation

The Committee discussed at length at what level of asbestos content the soil may be considered to be uncontaminated or not posing a health risk. The proponents have proposed a figure of 1% asbestos content by weight based on the Victorian EPA's classification of waste material that any material containing more than 1% by volume is an asbestos containing material. WorkSafe WA legislation defines material containing more than 0.1% asbestos as a designated hazardous material. The Department of Environmental Protection (DEP) has previously required the removal of asbestos to 0.05% at the Humes factory site, based on the detection limit and the very fine size of the fibres and lack of "pacifying" matrix material. This was for contamination that occurred on the surface of the site. At the Swan Portland site it is intended that any remaining asbestos be covered with a depth of clean fill containing no asbestos. Concern was expressed defining "asbestos free" and at obtaining homogeneous samples and accurate, reproducible results for the determination of asbestos at low levels.

The Committee concluded that in the case of the Swan Portland site, it maybe of practical benefit to consider the site in zones as each of these zones was a distinguishable area containing different forms and levels of asbestos contamination. As the amount of respirable air-borne fibres will depend on such factors as the friability of the asbestos and proportion of respirable fibres generated, the nature of the soil, the moisture content of the soil and wind speed, it is not practical to define a scientifically valid health investigation level for asbestos in soil.

The Committee decided that the following remediation methods or combination of methods could be applied to all contaminated zones on the site:

1. Removal of any material containing asbestos.

   All material containing asbestos above the watertable could be removed from site to a suitable landfill or other dedicated asbestos disposal area. To remove material containing asbestos below the watertable may be feasible but would be impractical and present engineering difficulties. To determine that all asbestos had been removed, validation sampling would be undertaken and would need to show no detectable asbestos remaining (the definition of "no detectable asbestos" would be defined by the proponent and approved by an expert group). The committee recommends that the validation sampling, methods of sampling and analysis, and practical detection levels be approved by an expert group, including the Health Department, WorkSafe WA and the DEP. This validation sampling would also apply to proving areas assumed to be free of asbestos as uncontaminated;

2. Covering material containing greater than 1% asbestos with a warning layer/barrier and 2m of clean fill containing no asbestos.

   A warning layer or barrier will be placed over contaminated material. This barrier must be permeable, permanent and non-polluting. Possible barriers suggested were perforated PVC liner, sprayed bitumen or a form of geo-cloth; and

3. covering material containing up to 1% asbestos with a warning layer/barrier and 1m of clean fill containing no asbestos. Care should be taken were levels of fill differ to ensure that any slopes or steps in levels are adequately covered and will not be subject to erosion.

It is the Committee's preferred option that the areas of greatest asbestos contamination ie zone 1 areas of 68 000 m^3, are removed to a suitable site. Leaving greater than 1% asbestos contamination is acceptable where that contamination occurs at depth and is never likely to be disturb, namely in the zone 2 area where greater than 1% asbestos is know to be at depths up to 15 m below the current ground level and below natural ground level.

It should be noted that the 1% asbestos level for the different treatments is an arbitrary figure, not based on any scientific determination of health risk. It is adopted for ease of management, being the level at which asbestos is likely to be detected with the naked eye. It should not, therefore, be taken as a precedent for determining what level of asbestos is a health risk. Material containing less than 1% of finely disseminated asbestos may pose a greater health risk than material containing more than 1% of asbestos cement sheeting.

Short term risk management

The Committee has considered various mechanisms which may be initiated for notification and management of the asbestos hazard. These are:

- memorials or notifications on title;
- caveats on title;
- town planning scheme amendment;
- conditions at subdivision;
- strata titling;
- ministerial conditions on the proposal;
- regulations under the Environmental Protection Act, 1986;
- WorkSafe WA regulations; and
- the proposed contaminated sites legislation.

Installation of major services and remediation

It is not possible without a development plan to commence remediation, as the final ground levels and method of remediation may depend on the proposed development. For example if public open space is planned over areas containing greater than 1% asbestos, it may be appropriate to leave asbestos contamination in situ, rather than remove it. It is also unlikely that remediation will take place prior to the installation of major services, as it is possible that major services will need to be installed below the warning barrier and this would best be done before the barrier is installed.

It is also probable that major services will not be installed over the whole site at one time, that is, it is probable that development will be staged. It is also possible that parts of the site will be sold off to different developers as "super lots". It is therefore possible that parts of the site will be developed and occupied, while part of the site remains in its current, unremediated condition.

It is the opinion of the Committee that it is technically feasible to safely develop the site in stages as long as the appropriate precautions are taken to prevent respirable fibres of asbestos becoming air-borne. The Committee believes that a management plan should be drawn up by the developer or developers for the installation of major services and remediation and approved by the appropriate authorities.

For the ministerial conditions imposed on the proposal to become binding on all developers, should the site be sold as "super lots", it is necessary for all developers to become joint proponents for the proposal, and become jointly and severally liable for all ministerial conditions for the proposal.

Compliance with ministerial conditions will be audited by the DEP and by an independent auditor employed by the proponent to provide a performance review of conformance with the ministerial conditions of approval for the project.

Construction

The Committee recognises that it may be difficult to implement controls due to the mechanisms available under the current legislation as once the site is subdivided and sold to a number individual owners, there are deficiencies in the Environmental Protection Act for applying ministerial conditions. If it is a ministerial condition that any disturbance of asbestos on the site is managed in accordance with a management plan, the proponent/s would be held responsible for the management of any disturbance of asbestos on privately owned sub-divided land, and which may be caused by the owner of that land, or a builder or contractor. This may be difficult to achieve in practice.

There will be a requirement to monitor for air-borne asbestos fibres at the boundary or boundaries of any construction site where asbestos is being disturbed, to ensure that air-borne asbestos is not leaving the site. Should monitoring show asbestos levels above background levels, this would have to be reported to WorkSafe and the DEP to alert them to the problem.

It is the opinion of the Committee that construction can be allowed beneath the warning layer provided that appropriate precautions to reduce risk of air-borne asbestos fibres are taken. It is proposed that a management plan for constructions breaching the barrier be supplied by the proponents and that works be supervised by WorkSafe inspectors under their asbestos regulations.

Disturbance of areas of greater than 1% asbestos is not favoured by WorkSafe or the DEP as this would place an unnecessary call on their resources and lead to a recurring risk of disturbance for the long term future. Based on their past experience, WorkSafe would recommend the removal of all material consistently found to be contaminated with greater than 1% asbestos in the top 3m of the site. While it is the Committee's opinion that disturbance of asbestos can be managed safely, leaving near surface areas of greater than 1% asbestos on site is not the committee's preferred option.

Should a dust nuisance arise existing legislation can be used to require abatement. However this would only occur after a problem had arisen and after potential exposure of nearby residents to air-borne asbestos fibres. The long term problem is to ensure adherence to the approved management plan.

There is also the need to ensure that the warning layer and cover is reinstated after any breaches. All excavated material from below the cover would need to be removed promptly from the site in an approved manner to an approved asbestos disposal site. Clean soil would need to be separated from asbestos contaminated soil, if it is planned to replace the clean soil on site. Currently the only legislation which may be used to ensure that these occur, is WorkSafe WA regulations.

Minor works and swimming pools

As with construction, it is the Committee's opinion that minor works that breach the barrier can be managed to prevent health risk.

Any minor works or swimming pool applications approved by the local authority will be advised of the risk management requirements with the approvals and advised of the requirements of any relevant authority.

Long-term risk management

The Committee recommends point of sale disclosure of information for blocks affected by asbestos contamination at sale and resale. This disclosure should include notification that asbestos is present at a specified depth and covered with a warning layer which should not be breached without approval from WorkSafe and the DEP or a serious health risk may be incurred.

The Committee recommends that long-term risk is managed by recommending to the WA Planning Commission that memorials warning of the hazard of asbestos and directing owners to seek advice before undertaking work on the block, be placed on the titles of affected blocks. It is considered essential that memorials are placed on the titles of blocks that are affected by asbestos contamination.

Any blocks upon which asbestos remains would still be considered to be contaminated sites and as such would be listed upon the public register of contaminated sites to be established by the DEP when the contaminated site legislation comes into effect.

Public exposure to air-borne asbestos fibres

It is the opinion of the committee that no public exposure to air-borne asbestos fibres above the current background level of the Perth Metropolitan area should be permitted as a result of activities on the Swan Portland site.

The proponent has made the commitments that prior to occupation of the site, air monitoring of ambient levels of asbestos will take place at the boundaries of the site; once occupation has commenced, no air-borne asbestos must leave any site where asbestos is being disturbed and ambient air-monitors will be placed on its boundary or boundaries.

APPENDIX 1

REPORT OF THE EPA TECHNICAL COMMITTEE ON THE MANAGEMENT OF ASBESTOS ON THE SWAN PORTLAND SITE, BURSWOOD

Decisions in relation to terms of reference

1. *Review specific information supplied by the proponent on asbestos contamination on the site in the Public Environmental Review and in the reports "Assessment of Asbestos Contaminated Soils" (CMPS & F, April 1997) and "Rationale for a risk management approach to the remediation of asbestos contaminated soils" (CMPS & F, August 1997)*

The Committee has reviewed the above documents.

2. *Provide the EPA with advice on the following:*

   a) *the acceptability of leaving all asbestos on site under a layer of clean fill, giving a possible increase of long-term risk to public health, and/or the alternative of removing the worst of the near-surface contamination to a suitable landfill by approved means, with increase of short-term risk to public health;*

The Committee has found it acceptable to leave asbestos on site under a layer of clean fill or to remove the worst of the near-surface contamination to a suitable landfill. Removal of areas of contamination is the preferred option for zone 1.

   b) *the conditions which should apply if asbestos is left on site;*

The Committee has recommended that material containing greater than 1% asbestos be covered with a warning layer/barrier and 2m of clean fill, and that material containing up to 1% asbestos be covered with a warning layer/barrier and 1m of clean fill. The barrier may be breached provided it is done in accordance with an approved management plan which must be provided by the developer or developers. The Committee recognises that the current legislation may be insufficient for policing and enforcement of the management plans.

   c) *the depth of cover that should be applied over asbestos contaminated areas to reduce the pathways for air-borne fibres to minimum practical levels, given that it will be impracticable to remove all asbestos from the site and some level of contamination will remain. The depth of cover should be suitable to prevent exposure of asbestos by erosion or migration, and prevent/minimise disturbance of asbestos in the future during installation of services, construction, use by future residents, future maintenance/installation of services and possible future redevelopment. Identify if the depth of cover should be related to amount of asbestos contamination and use of the site;*

See above.

   d) *appropriate criteria for public exposure to airborne asbestos fibres, and whether these criteria should be related to length of exposure;*

It is the opinion of the committee that no public exposure to air-borne asbestos fibres above the current background level of the Perth Metropolitan area should be permitted as a result of activities on the Swan Portland site.

   e) *the requirements and responsibility for monitoring of airborne asbestos fibres during all stages of development and use of the site;*

The proponent has made the commitments that prior to occupation of the site, air monitoring of ambient levels of asbestos will take place at the boundaries of the site. Once occupation has commenced, no air-borne asbestos must leave any site where asbestos is being disturbed and ambient air-monitors will be placed on the boundary or boundaries of the site.

f) the management measures proposed for various stages of remediation, service installation, construction, occupation and future development in the proponent's document "Rationale for a risk management approach to the remediation of asbestos contaminated soils". Recommend measures for short and long term management of the site to minimise risk related to asbestos;

The Committee found that the management measures acceptable subject to the views expressed in this report.

g) any mechanisms, such as regulations under the EP Act, strata titling/titling or information disclosure, that should be implemented, to minimise both short and long term risk related to asbestos;

The Committee recommended that disclosure should be made that blocks are affected by asbestos contamination at sale or resale and that long-term risk is managed by recommending to the WA Planning Commission that memorials warning of the hazard of asbestos and directing owners to seek advice before undertaking work on the block, be placed on the titles of affected blocks. It is considered essential that this occur;

h) management of asbestos risk through land use. This could take the form of restricting the type of development (for example high or low rise buildings, basements and swimming pools) in certain areas of the site or restricting areas to non-residential use

The Committee found that this was unnecessary if the other recommendations in its report were carried out.

i) other relevant matters.

The Committee recommended the formation of an expert committee to approve the proponent's sampling programmes and methods, and analytical methods for asbestos. The expert committee will also approve the definition of "no detectable asbestos".

3. Provide a final written report to the EPA by the end of September 1997, noting that the Committee's report is likely to be published with the EPA's advice to the Minister for the Environment.

This report is provided to the EPA.

APPENDIX 2

REPORT OF THE EPA TECHNICAL COMMITTEE ON THE MANAGEMENT OF ASBESTOS ON THE SWAN PORTLAND SITE, BURSWOOD

MINORITY VIEW

WorkSafe Western Australia

Government of Western Australia

7 October 1997

File: 033422V07

Dr Jim McNulty
Chairman
EPA Technical Committee- Asbestos (Swan Portland Cement Site)
18 Kenmore Crescent
FLOREAT WA 6014

Dear Dr McNulty

RE: EPA TECHNICAL COMMITTEE ON ASBESTOS MANAGEMENT FOR SWAN PORTLAND CEMENT SITE

As stated in the terms of reference dated 14th August 1997 for the Environmental Protection Authority Technical Committee reviewing Asbestos Management at the above site, this Department would like to express concerns about certain items in the technical report dated 30 September1997. These are as follows:

1. **Pages i and ii, items 9, 10 & 11:**

   WorkSafe Western Australia would discourage any work to be done at the above site beneath the warning layer where asbestos is present in concentrations greater than 1% w/w and as a result believe that the three paragraphs mentioned above should be deleted.

   The contaminated areas are waste containment cells that are similar to other waste disposal areas governed by EPA's Waste Management Section. These cells should not be disturbed because cross contamination could occur, potentially exposing members of the public to airborne asbestos.

   In addition, if the Town of Victoria Park is not willing to prevent, through the planning approval process, building or construction below the warning layer then the barrier may be broken. If the integrity of the >1% asbestos warning layer cannot be guaranteed by the Town of Victoria Park, then the asbestos in Zone 1 should be removed.

Westcentre 1260 Hay Street West Perth.
Postal Address: P.O. Box 294 West Perth Western Australia 6872. **Telephone:** (08) 9327 8777. **Facsimile:** (08) 9321 8973.
Internet Address: http://www.wt.com.au/safetyline **Email Adress:** safety@worksafe.wa.gov.au **TTY:** (08) 9327 8838

2. Page i. Item 6 c:

A 1 metre layer of clean fill is not sufficient in depth for some areas which contain less than 1% asbestos w/w (Zones 2 & 3) to ensure that the warning layer is not disturbed when installing major services.

WorkSafe W A recommends that a warning layer and 2-3 metres of clean fill be put in areas where services are to be installed such as roads/drainage and at a greater depth for major construction work such as a hotel or 3 storey apartments. Where major construction work is not anticipated, such as building a single storey house, 1 metre of clean fill is acceptable. A caveat should be placed on Titles for Zones 2 & 3 to prevent work in areas below the warning layer.

Thank you for your assistance in this matter.

Yours sincerely

Peter Shaw
Executive Director

Luciano Muriale
Committee Member

c.c. **Ann Barter**
Department of Environmental Protection

Appendix 4

List of recommended Ministerial Conditions and proponent's consolidated commitments

Statement No.

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

Title: Site remediation and redevelopment of the Swan Portland Cement site, Burswood

Proposal: The demolition of buildings on the Swan Portland Cement site [being Part lot 66 (6.9609 hectare), lot 10604 (1.5989 hectare), part lot 35 (1.3264 hectare), part lot 35 (8.9953 hectare), part lot 1 (0.0486 hectare)], remediation of the site to a residential standard and redevelopment of the site for uses including residential R80 and R160, tourism/recreation, office/residential and special commercial.

Proponent: Swan Portland Cement Limited

Proponent Address: 175 Burswood Road, BURSWOOD WA 6100

Assessment Number: 1036

Report of the Environmental Protection Authority: Bulletin 879

This proposal as defined in the Public Environmental Review and subsequently modified during the environmental assessment process conducted by the Environmental Protection Authority, may be implemented subject to the following conditions and procedures:

1 Implementation

1-1 Subject to these conditions and procedures, the proponent shall implement the proposal as modified during the environmental impact assessment process conducted by the Environmental Protection Authority and documented in Schedule 1 of this statement.

2 Proponent Commitments

2-1 The proponent shall implement the consolidated environmental management commitments documented in Schedule 2 of this statement.

2-2 The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in this statement.

3 Asbestos Contamination

3-1 Prior to construction beyond remediation, the proponent shall remediate (see note 1 following Condition 17) areas of the site contaminated by asbestos.

3-2 The proponent shall either remove asbestos contamination at concentration greater than one per cent by volume of asbestos from the site to an approved disposal site, or cover this contamination with a physical warning barrier and two metres of clean fill material (certified as not containing contaminants above soil criteria for residential use) to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Health Department of Western Australia, WorkSafe Western Australia, the Department of Environmental Protection, Department of Minerals and Energy and the Town of Victoria Park, as appropriate. The warning barrier shall be permeable to water and long-lasting and also resistant to alkaline attack, if being used in areas contaminated with cement kiln dust.

3-3 In areas where greater than one per cent by volume of asbestos has been covered with a warning barrier and two metres of clean fill (see condition 3-2), the proponent shall only construct hardstand areas, plant shallow-rooted vegetation or establish other uses acceptable to the Minister for the Environment, acting on advice of the Health Department of Western Australia, WorkSafe Western Australia and the Department of Environmental Protection.

3-4 The proponent shall either remove asbestos contamination at concentration less than one per cent by volume of asbestos from the site to an approved disposal site, or cover this contamination with a physical warning barrier and a depth of clean fill material (certified as not containing contaminants above soil criteria for residential use) to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Health Department of Western Australia, WorkSafe Western Australia, the Department of Environmental Protection, the Department of Minerals and Energy and the Town of Victoria Park, as appropriate. The warning barrier shall be permeable to water and long-lasting and also resistant to alkaline attack, if being used in areas contaminated with cement kiln dust.

In order to reduce to a minimum the post-remediation disturbance of asbestos contamination, the proponent shall determine the depth of clean fill required by this condition according to the use proposed for each area, on advice of the Department of Environmental Protection and any other relevant government agency.

The proponent may determine which use of the site will cause disturbance at the greatest depth, and apply a depth of cover in excess of this depth to areas of less than one percent by volume of asbestos contamination.

3-5 After remediation, the proponent shall provide details of any residual (see note 2, following Condition 17) asbestos contamination, including concentrations and depths, that will remain on site to all service providers, as well as the Town of Victoria Park, the Western Australian Planning Commission, WorkSafe Western Australia, the Health Department of Western Australia and the Department of Environmental Protection.

3-6 The proponent shall neither subdivide nor commence construction beyond remediation without the placement of memorials by the appropriate authority on the titles of asbestos-contaminated lots advising of the presence and depth of asbestos. Such memorials shall be to the requirements of the Minister of the Environment.

4 Cement Kiln Dust Contamination

4-1 Prior to construction beyond remediation, the proponent shall cover areas of cement kiln dust not contaminated with asbestos with a warning barrier and a minimum of one metre of clean fill, to the requirements of the Environmental Protection Authority on advice of

the Health Department of Western Australia, WorkSafe Western Australia and the Department of Environmental Protection. The warning barrier shall be permeable to water, long-lasting and resistant to alkaline attack.

4-2 After remediation, the proponent shall provide details to all service providers, as well as the Town of Victoria Park, the Western Australian Planning Commission, WorkSafe Western Australia, the Health Department of Western Australia and the Department of Environmental Protection of any residual (see note 2, following Condition 17) cement kiln dust contamination, including concentrations and depths, that will remain on site.

4-3 The proponent shall neither subdivide nor commence construction beyond remediation without the placement of memorials by the appropriate authority on the titles of cement kiln dust contaminated lots advising of the presence and depth of cement kiln dust. Such memorials shall be to the requirements of the Minister for the Environment.

5 Development Plan for Areas with Residual Asbestos Contamination

5-1 Prior to ground-disturbing activities (see note 3, following Condition 17), the proponent shall prepare a Development Plan to the requirements of the Minister for the Environment, on advice of the Ministers responsible for Health, WorkSafe and Planning as well as the Environmental Protection Authority. This plan shall show the uses of the site and positions of services and relate the depth of fill covering asbestos contamination to specific uses of the site. The plan shall include the depths and locations of any construction below final ground level, such as:

1. services, including roads, gas, electricity, water, sewerage and communications;
2. foundations;
3. basements, parking garages and undercroft areas; and
4. swimming pools, spa pools or ornamental pools.

5-2 The proponent shall only develop the site in accordance with the Development Plan required by condition 5-1.

6 Environmental Management System

6-1 In order to manage the environmental impacts of the project, and to fulfil the requirements of the conditions and procedures in this statement, prior to ground-disturbing activities, the proponent shall prepare Environmental Management System documentation with components such as those adopted in Australian Standards AS/NZS ISO 14000 series, to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

6-2 The proponent shall implement the Environmental Management System referred to in condition 6-1.

7 Asbestos Environmental Management Plan

7-1 Prior to ground-disturbing activities, the proponent shall prepare the Environmental Management Plan referred to in Commitment 2 of Schedule 2 to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, WorkSafe Western Australia and the Health Department of Western Australia which in addition to actions 2.1 to 2.7 shall include the following:

1. a sampling and analysis plan, including definition of "no detectable levels of asbestos", with provision of the advice of an expert panel convened by the Minister

for the Environment (including the Health Department of Western Australia, WorkSafe Western Australia and the Department of Environmental Protection);

2. a plan for management of any future disturbance of residual asbestos contamination. This management plan shall include:
    1. the management of asbestos disturbance;
    2. provision for ambient air monitoring at the boundary or boundaries of any lot where asbestos contamination is being disturbed, including the identification of the organisation or agency responsible for that monitoring;
    3. the trigger mechanism for the plan;
    4. responsibility for implementing the plan;
    5. how the implementation will be reported or audited; and
    6. contingency plans in the event of asbestos fibres being detected above the background level of 0.0002 fibres per millilitre.

7-2 The proponent shall implement the Environmental Management Plan required by condition 7-1.

8 Cement Kiln Dust Environmental Management Plan

8-1 Prior to any ground-disturbing activities, the proponent shall prepare the Environmental Management Plan referred to in Commitment 3 of Schedule 2 to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection and the Health Department of Western Australia which in addition to actions 3.1 to 3.6 shall include a plan for the management of future disturbances of residual cement kiln dust. This plan shall include, but not be limited to:

1. management of cement kiln dust disturbance;
2. provision for contaminated groundwater disturbance and dewatering;
3. the trigger mechanism for the plan; and
4. contingency plans in the event that cement kiln dust poses or has the potential to pose a health or environmental hazard.

8-2 The proponent shall implement the Environmental Management Plan referred to in condition 8-1.

9 Public Availability of Environmental Management Plans

9-1 The proponent shall make the Plans referred to in commitments 1-9, inclusive, in Schedule 2 of this Statement available to the public to the requirements of the Environmental Protection Authority.

10 Water Quality

10-1 Prior to ground-disturbing activities, the proponent shall make provision for the long term maintenance of the surface water drainage system, the pollutant traps and the sedimentation basin by entering into an agreement with an appropriate body acceptable to the Minister for the Environment on advice of the Environmental Protection Authority, the Water and Rivers Commission, the Swan River Trust and the Town of Victoria Park.

10-2 The proponent shall neither subdivide nor commence construction beyond remediation without the placement of memorials or restrictive caveats by the appropriate authority on the titles of lots with contaminated groundwater to prevent the installation of shallow

groundwater extraction bores. Such memorials or restrictive caveats shall be to the requirements of the Minister for the Environment.

10-3 Prior to construction beyond remediation or subdivision, the proponent shall make provision for long term access to groundwater monitoring bores, for monitoring purposes, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Water and Rivers Commission and the Swan River Trust.

10-4 Prior to construction beyond remediation or subdivision, the proponent shall prepare contingency plans in the event that groundwater monitoring shows unacceptable groundwater levels or contamination, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Water and Rivers Commission and the Swan River Trust.

10-5 Prior to construction beyond remediation or subdivision, the proponent shall prepare contingency plans in the event that surface water monitoring shows unacceptable surface water contamination, to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Water and Rivers Commission and the Swan River Trust.

10-6 Prior to construction beyond remediation, the proponent shall ensure that a mechanism exists to require all buildings and hardstand areas to be connected to the sealed drainage system for the collection of storm waters and that no soakwells are permitted.

10-7 During remediation, the proponent shall remediate or remove for treatment and disposal any hydrocarbon-contaminated groundwater to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Water and Rivers Commission and the Swan River Trust.

11 Duty of Disclosure

11-1 Prior to sale (of all or part of the site), the proponent shall make full disclosure of residual contamination and other environmental considerations constraining development and/or use of the site to prospective purchasers, to the requirements of the Environmental Protection Authority on advice of the Department of Land Administration and the Department of Environmental Protection.

12 Noise Limits

12-1 The proponent shall conduct operations so that noise emissions do not unreasonably impact on people in the vicinity, including residents.

12-2 The proponent shall ensure that noise emissions meet the requirements of the Environmental Protection Act and the Environmental Protection (Noise) Regulations 1997.

12-3 During remediation and development, the proponent shall manage traffic noise to protect the amenity of people in the vicinity, including residents, by ensuring that commercial vehicle movements and heavy traffic are limited to between 0700 hours and 1800 hours on Monday to Saturday inclusive.

12-4 Within two months of the formal authority issued to decision-making authorities under Section 45(7) of the Environmental Protection Act 1986, the proponent shall provide a report to the Department of Environmental Protection, as required by Regulation 13(4) of

the Environmental Protection (Noise) Regulations 1997, detailing how compliance with condition 12-2 will be achieved at potential noise-sensitive sites.

12-5 The proponent shall subsequently conduct operations in a manner consistent with the report required by condition 12-4.

13 Performance Review

13-1 Each year during remediation and redevelopment, for at least three years following remediation of the site, and thereafter as determined by the Minister for the Environment on advice of the Health Department of Western Australia, the Water and Rivers Commission, the Swan River Trust and the Department of Environmental Protection, the proponent shall prepare and submit a performance review to evaluate the environmental performance, which shall include, but not be limited to:

1. environmental objectives reported on in Environmental Protection Authority Bulletin 879;
2. proponent's consolidated environmental management commitments documented in Schedule 2 and those arising from the fulfilment of conditions and procedures in this statement;
3. Environmental Management System environmental management targets;
4. Environmental Management Plans; and
5. environmental criteria,

to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection.

Note: The Environmental Protection Authority may recommend changes and where significant, recommend actions, to the Minister for the Environment following consideration of the performance review.

14 Changes to Implementation

14-1 Where, in the course of implementing the proposal, the proponent seeks to change any aspect of the proposal as documented in Schedule 1 of this statement in any way that the Minister for the Environment determines, on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

15 Proponent

15-1 The proponent for the time being nominated by the Minister for the Environment under section 38(6) or (7) of the Environmental Protection Act is responsible for the implementation of the proposal until such time as the Minister for the Environment has exercised the Minister's power under section 38(7) of the Act to revoke the nomination of that proponent and nominate another person in respect of the proposal.

15-2 Any request for the exercise of that power of the Minister referred to in condition 15-1 shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the proposal in accordance with the conditions and procedures set out in the statement.

15-3 The proponent shall notify the Minister for the Environment of any change of proponent contact name and address within 30 days of such change.

16 Commencement

16-1 The proponent shall provide evidence to the Minister for the Environment within five years of the date of this statement that the proposal has been substantially commenced.

16-2 Where the proposal has not been substantially commenced within five years of the date of this statement, the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment will determine any question as to whether the proposal has been substantially commenced.

16-3 The proponent shall make application to the Minister for the Environment for any extension of approval for the substantial commencement of the proposal beyond five years from the date of this statement.

16-4 Where the proponent demonstrates to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority that the environmental parameters of the proposal have not changed significantly, then the Minister may grant an extension not exceeding five years for the substantial commencement of the proposal.

17 Compliance Auditing

17-1 The proponent shall submit periodic Performance and Compliance Reports, in accordance with an audit programme prepared in consultation between the proponent and the Department of Environmental Protection.

17-2 Unless otherwise specified, the Department of Environmental Protection is responsible for assessing compliance with the conditions contained in this statement and for issuing formal clearance of conditions.

17-3 Where compliance with any condition is in dispute, the matter will be determined by the Minister for the Environment.

Note

1. "Remediation" is this statement means removal or rendering safe contaminants so that they no longer pose or have the potential to pose an unacceptable risk to human health or the environment. Areas remediated, must be validated as such in accordance with a validation program approved by the Contaminated Sites Branch of the Department of Environmental Protection.

2. "Residual" in this statement means remaining on the site after remediation has been completed and validated.

3. Ground-disturbing activities excludes sampling and monitoring to determine the extent and nature of contamination.

Schedule 1

The proposal as modified during the environmental impact assessment process

The proposal area is the Swan Portland site, Burswood, which comprises of Part lot 66 (6.9609 hectare), lot 10604 (1.5989 hectare),part lot 35 (1.3264 hectare), part lot 35 (8.9953 hectare), part lot 1 (0.0486 hectare). The current zoning of the site is Urban (Metropolitan Regional Scheme) Residential R60 (Town Planning Scheme), with non-conforming useright. The proposed zoning is Special use, including residential R80 and R160, tourism/recreation, office/residential and special commercial.

The proposal incorporates the remediation of the site to residential standards and the redevelopment of the site.

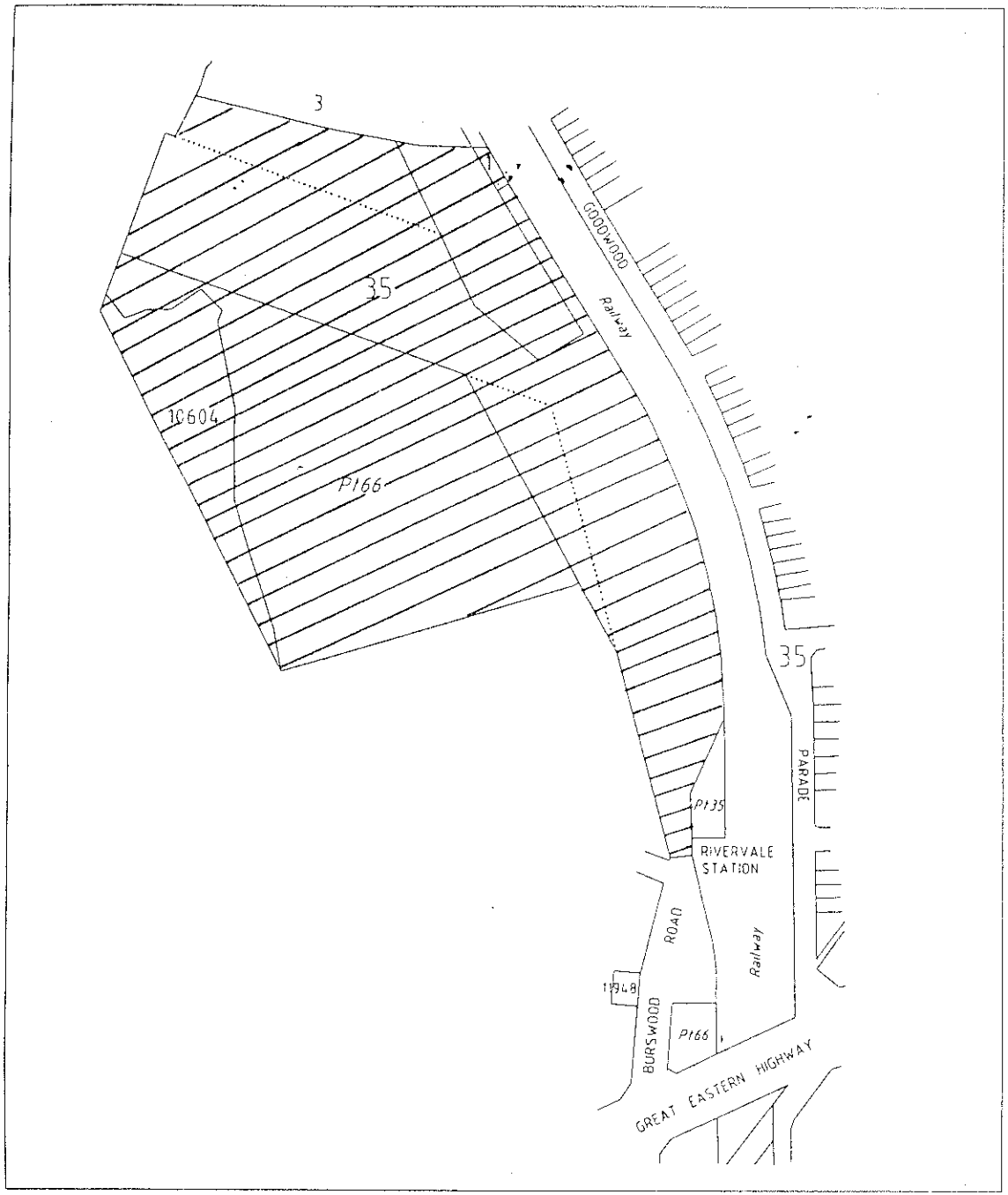
Key Proposal Characteristics of modified proposal

Element	Description
SITE IDENTIFICATION	Part lot 66 (6.9609 ha), lot 10604 (1.5989 ha), part lot 35 (1.3264 ha), part lot 35 (8.9953 ha), part lot 1 (0.0486 ha).
CURRENT ZONING	Urban (Metropolitan Regional Scheme) Residential R60 (Town Planning Scheme), with non-conforming use right.
PROPOSED ZONING	Special use, including residential R80 and R160, tourism/recreation, office/residential and special commercial.
DEMOLITION	Hazardous materials assessment of buildings and plant equipment; site occupational health and safety plan approved by WorkSafe, provide environmental management plan for off-site dust, wind-blown debris and noise.
REMEDIATION	
asbestos	remediate prior to construction. remove material containing greater than 1% asbestos by weight, estimated volume 67 000 cubic metres, and/or cover material containing greater than 1% with barrier and 2 metres of clean fill and do not disturb area (containment cell). remove and/or cover material containing less than 1% with a depth of clean fill suitable to prevent disturbance of asbestos contamination by future activities on the site, but not less than 1 metre.
cement kiln dust	cover with a barrier and at least 1 metre of clean fill.
kiln bricks and associated contamination	remove and dispose to a suitable landfill, estimated volume 19 000 cubic metres.
hydrocarbons	excavate and bioremediate hydrocarbon-contaminated soil, return remediated soil or dispose to landfill, remediate or remove for treatment and disposal any hydrocarbon-contaminated groundwater.

MANAGEMENT	
asbestos	validate uncontaminated areas; provide environmental management plan for remediation; provide details of contamination remaining; attach memorials to sites with contamination.
cement kiln dust	provide environmental management plan for remediation; provide details of contamination remaining; attach memorials to sites with contamination.
kiln bricks and associated contamination	provide environmental management plan for remediation; validate remediation.
hydrocarbons	provide environmental management plan for remediation; validate remediation.
groundwater	limit alkaline recharge and lower artificial mounding by management of surface water, maintain monitoring bores and monitoring.
surface water	provide environmental management plan for remediation.
dust	provide and implement environmental management plan for remediation, maintain dust levels within criteria established for residential areas by the Kwinana Environmental Protection Regulations (EPA 1992).
noise and vibration	provide and implement environmental management plan for remediation, maintain noise within limits specified by the Noise Regulations (1997), restrict traffic noise to permitted hours, and vibration levels within limits specified by Australian Standard 2670.2 "Evaluation of human exposure to whole-body vibration. Part 2".
public safety	provide and implement site safety plan.
REDEVELOPMENT	development shall be in accordance with development plan (to be submitted).
asbestos	install services in clean fill; provide management plan for future disturbances, ensure disturbances are identified and managed in accordance with plan.
cement kiln dust	install all services in clean fill channels or conduits; provide management plan for future disturbances.
groundwater	monitor levels and quality and implement contingency plans if not satisfactory.
surface water	provide sealed drainage system with pollutant traps and treatment basin to collect storm water from roofs and hardstand areas in cement kiln dust contaminated area; ensure long term maintenance of storm water system; monitor discharge from treatment basin and implement contingency plans if not satisfactory.
dust	provide and implement environmental management plan for redevelopment, maintain dust levels within criteria established for residential areas by the Kwinana Environmental Protection Regulations (EPA 1992).
noise and vibration	provide and implement environmental management plan for redevelopment, maintain noise within limits specified by the Noise Regulations (1997), restrict traffic noise to permitted hours and vibration levels within limits specified by Australian Standard 2670.2 "Evaluation of human exposure to whole-body vibration. Part 2".
public safety	provide and implement site safety plan.

Plans

Figure 1 shows the location of the Swan Portland site. Figures 2, 3, 4 and 5 show the approximate extent of asbestos, cement kiln dust, kiln brick and hydrocarbon contamination..



CMPS&F
ENVIRONMENTAL

SWAN PORTLAND CEMENT

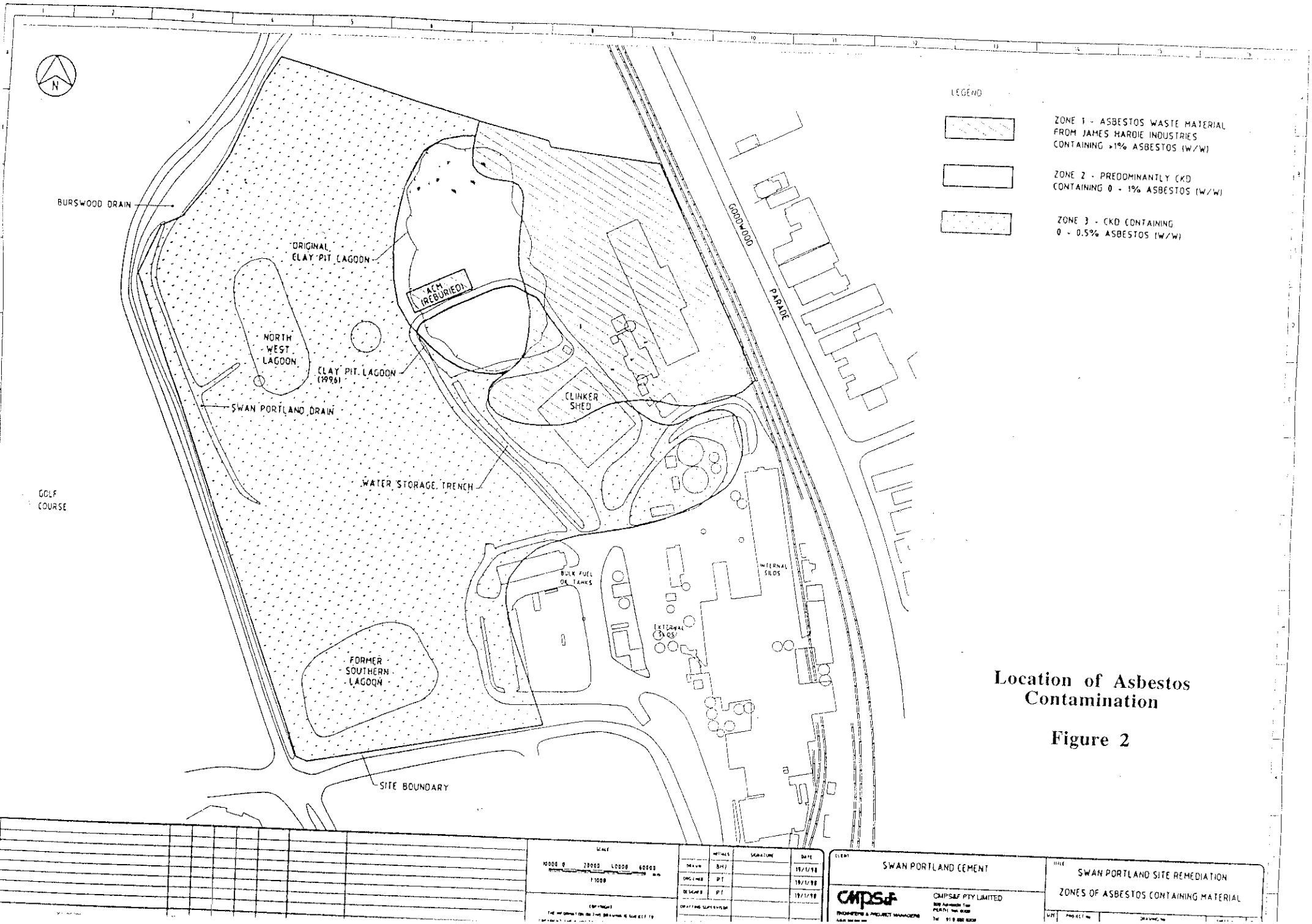
SITE LOCATION

FIGURE 1

Proposal Area

0 50 100 200 300

SCALE
(METRES)



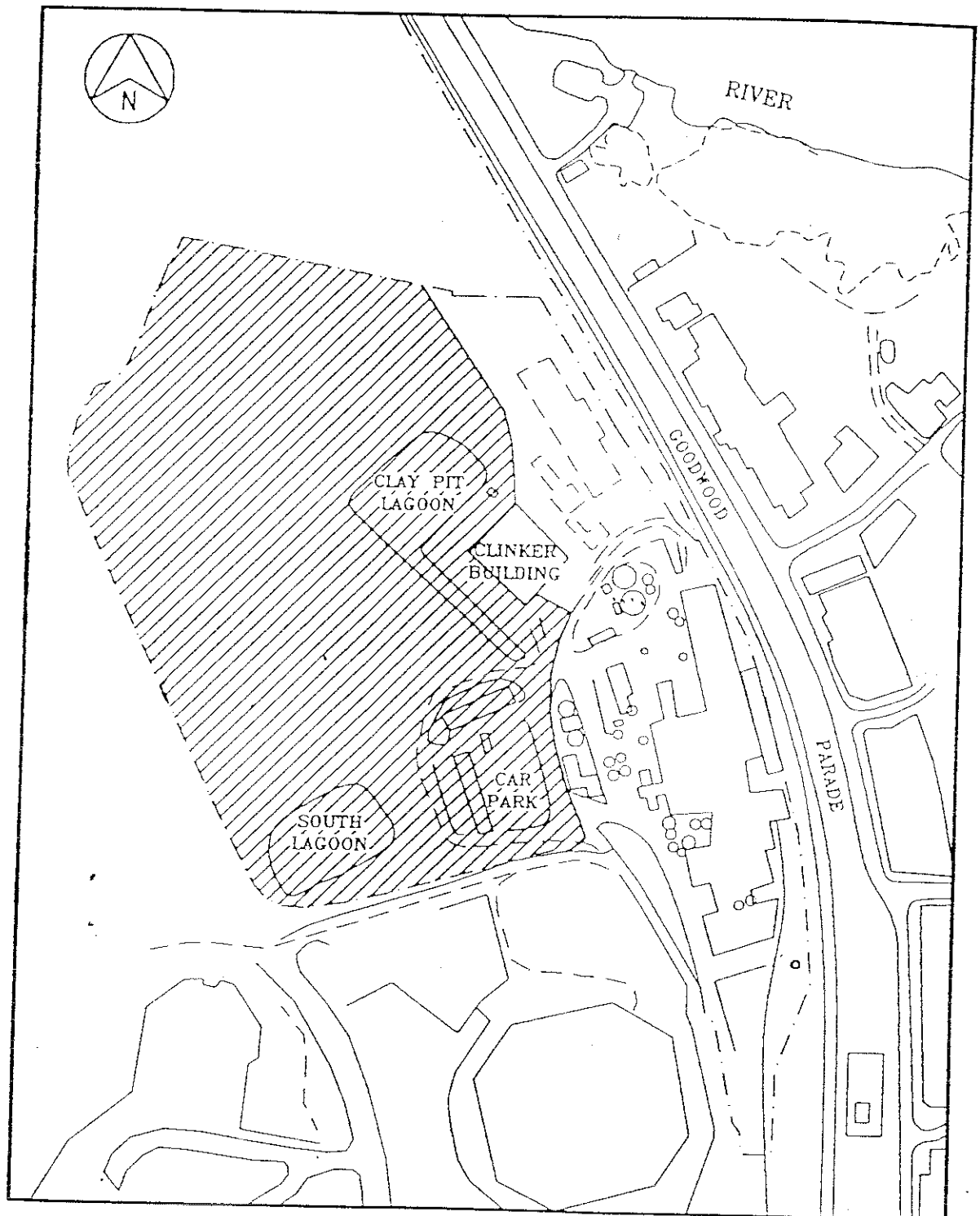
Location of Asbestos Contamination

Figure 2

ENVIRONMENTAL

FIGURE 3

SWAN PORTLAND
LOCATION OF CEMENT KILN DUST



LEGEND

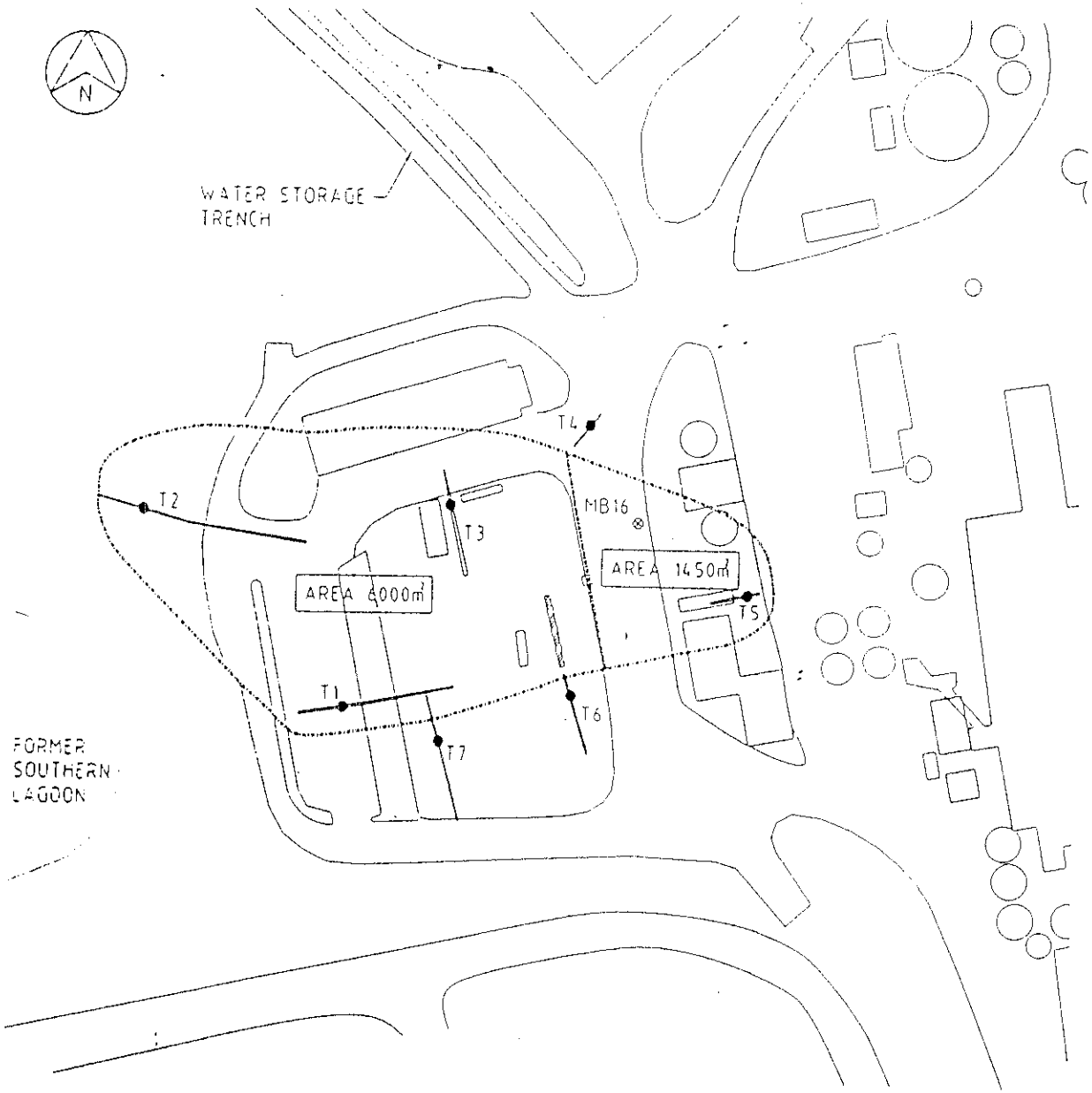
Site Boundary

Cement kiln dust

0 100m

SCALE

DATE OF LAST EDIT: 03/07/1996-08.49 CAD FILE: J:\PROJECTS\WE8367\FIG12



CMPS&F ENVIRONMENTAL

SWAN PORTLAND CEMENT

LOCATION OF RUBBISH DUMP CONTAINING BURIED KILN BRICKS

FIGURE 4

LEGEND

- INVESTIGATION TRENCH
- GOLDER ASSOC. TRENCH
- MONITOR BORE
- ESTIMATED EXTENT OF RUBBISH
- SAMPLING POINT

30 20 10 0 30

METRES

1:1000

Schedule 2

Proponent's Consolidated Environmental Management Commitments

5 January 1997

SITE REMEDIATION AND REDEVELOPMENT OF THE SWAN PORTLAND CEMENT SITE, BURSWOOD (1036)

SWAN PORTLAND - TABLE OF ENVIRONMENTAL COMMITMENTS (6 JANUARY 1998)

Commitment	Objective	Action	Timing	Whose advice	Measurement/ Compliance criteria
1. Prepare and implement a Demolition Environmental Management Plan for off-site environmental effects	To protect the amenity and safety of the public, nearby landusers.	Plan to include:	Pre-demolition	DEP, WorkSafe	Approval by DEP and WorkSafe.
		1.1 Hazardous materials assessment of buildings and plant equipment.	Pre-demolition.	WorkSafe, DEP	Approval of assessment by WorkSafe W A and DEP.
		1.2 Management measure for off-site effects of noise, dust and wind-blown debris.	Pre-demolition.	DEP (Pollution Prevention Division)	Approval of plan by DEP.
		1.3 Demolition dust monitoring program for dust and air-borne asbestos fibres.	During demolition of major structures.	DEP (Pollution Prevention Division)	Monitoring of nuisance dust levels and compliance with DEP guidelines for "Land development sites and impacts on air quality", 1996 and the WA Environmental Protection Policy (Atmospheric Wastes) Kwinana. Action level of 0.0002 f/ml for asbestos.
		1.4 Site occupational health and safety management plan.	Pre-demolition.	WorkSafe	Approval of plan by WorkSafe.

2. Prepare and implement an Asbestos Environmental Management Plan	To protect the public, nearby landusers and future occupiers of the site from adverse effects of asbestos fibres.	Plan to include:	Prior to ground disturbing activities.	Health Dept, DEP, WorkSafe WA	Plan to be approved by DEP, Health Dept and WorkSafe.
		2.1 Environmental monitoring of airborne asbestos fibres on site boundaries.	During any works on site where asbestos contamination is being disturbed and after completion of works for time to be decided by relevant authorities.	Health Dept	Action level for change of work practice to be 0.0002 fibres/ml of air at site boundary. Monthly reports of monitoring to be submitted to Health Dept. and DEP
		2.2. Removal of asbestos material in accordance with NOHSC Code of Practice and Health Regulations.	During remediation.	WorkSafe WA, Health Dept	Performance and Compliance report and report of independent auditor.
		2.3. Design and implementation of validation program.	Prior to, during and post remediation.	Expert panel#, DEP (Contaminated Sites Branch)	Approval of the plan by authorities. Validation report to be submitted to DEP.
		2.4. Waste transport.	During remediation.	WorkSafe WA, DME Town of Victoria Park	Approval of methods by WorkSafe WA Performance and Compliance Report.
		2.5. Disposal of asbestos.	During remediation.	DEP(Waste Management Division)	Approval of plan by DEP. Performance and Compliance report.
		2.6. Audit of the above actions.	Post remediation.	DEP (Audit Branch)	Approval of audit reports by DEP.
		2.7. Public relations, liaison with neighbours	Prior to, during and post remediation.		Complaints register, detailing resolution of complaints.

3. Prepare and implement a Cement Kiln Dust (CKD) Environmental Management Plan.	To protect the public from adverse effects of the CKD.		Prior to ground disturbing activities	DEP, Health Dept.	Plan to be approved by DEP on advice of Health Dept.
		Plan to include: 3.1 Dust management during excavation, grading and stockpiling.	During remediation and redevelopment.	DEP (Pollution Prevention Environmental Systems Divisions), Health Dept	Monitoring of nuisance dust levels and compliance with DEP guidelines for "Land development sites and impacts on air quality", 1996 and the WA Environmental Protection Policy (Atmospheric Wastes) Kwinana.
		3.2 Validation of clean-up of remediated area.	Post remediation.	DEP (Contaminated Sites Branch)	Approval of validation program and validation reports by DEP.
		3.3 Waste transport.	During remediation and redevelopment.	DEP (Pollution Prevention Division)	Approval of method by DEP.
		3.4 Waste disposal.	During remediation and redevelopment.	DEP (Waste Management Division)	Approval by DEP.
		3.5 Installation of services in clean fill trenches or conduits	Post remediation		Report of auditor .
		3.6 Audit of the above actions.	Post remediation	DEP (Audit Branch)	Approval of audit reports by DEP.

4. Prepare and implement a Kiln Brick Waste (including associated contaminated soil) Environmental Management Plan	To protect the public from adverse effects of the Kiln Brick Waste.		Prior to ground disturbing activities.	DEP, Health Dept.	Plan to be approved by DEP on advice of Health Dept.
		Plan to include: 4.1 Dust management during excavation, grading and stockpiling.	During remediation.	DEP (Pollution Prevention Division), Health Dept.	Monitoring of nuisance dust levels and compliance with DEP guidelines for "Land development sites and impacts on air quality", 1996 and the WA Environmental Protection Policy (Atmospheric Wastes) Kwinana
		4.2 Validation of of clean-up of remediated area.	Post remediation.	DEP (Contaminated Sites Branch)	Approval of validation program and validation reports by DEP
		4.3 Waste transport.	During remediation.	DEP (Pollution Prevention Division)	Approval of method by DEP.
		4.4 Waste disposal.	During remediation.	DEP (Waste Management Division)	Approval by DEP.
		4.5 Contingency plans for undetected hazardous waste.	During remediation.	DEP (Contaminated Sites Branch)	Approval by DEP.
		4.6 Audit of the above actions.	Post remediation.	DEP (Audit Branch)	Approval of audit reports by DEP.

5. Prepare and implement a Oil Waste (including underground fuel storage tanks) Environmental Management Plan	To protect the public from adverse effects of the Oil Waste.		Prior to ground disturbing activities.	DEP, Health Dept.	Plan to be approved by DEP on advice of Health Dept.
		Plan to include: 5.1 Investigate extent & severity of contamination at drum disposal site and fuel tank sites.	Pre remediation.	DEP (Contaminated Sites Branch), Health Dept	Program to be based on ANZECC/NHMRC "Guidelines for the Assessment of Contaminated Sites" 1992, EPA (NSW) "Sampling Design Guidelines" 1995.
		5.2 Validation of clean-up of remediated area.	Post remediation.	DEP (Contaminated Sites Branch)	Approval of validation program and validation reports by DEP.
		5.3 Waste transport.	During remediation.	DEP (Pollution Prevention Division)	Approval of method by DEP.
		5.4 Waste disposal.	During remediation.	DEP(Waste Management Division)	Approval by DEP.
		5.5 Audit of the above actions.	Post remediation.	DEP(Audit Branch)	Approval of audit reports by DEP.

6. Prepare and implement a Surface and Groundwater Quality Environmental Management Plan	To protect the aquatic environment and local groundwater quality.	Actions according to management plan agreed by WRC and SRT to include:	Prior to ground disturbing activities	DEP, SRT, WRC	Plan to be approved by DEP on advice of SRT and WRC.
		6.1. Surface water management • collection and management during remediation works; • installation of surface water drainage system, pollutant traps and treatment basin; • monitoring of discharge of Burswood Drain to river; and • all ornamental water features to be sealed.	During and after remediation.	DEP (Pollution Prevention Division), SRT	Measure and report water quality to a schedule and ensure quality compliance to "Guidelines for the protection of aquatic ecosystems" (ANZECC, 1992) for discharge of water to Swan river.
		6.2. Groundwater management • monitor groundwater levels and quality at on-site and off-site bores	During and after remediation.	DEP (Contaminated Sites Branch), WRC	Measure and report watertable elevation and quality. Ensure long term decrease in watertable beneath cement kiln dust fill on-site. Ensure off-site compliance with "Guidelines for recreational water quality" (ANZECC, 1992).
		6.3. Audit of the above actions.	Post remediation.	DEP (Audit Branch)	Approval of audit reports by DEP.

7. Prepare and implement a Dust and Windblown Debris Environmental Management Plan	To maintain the amenity of the local area during implementation of the remediation.		Prior to ground-disturbing activities.	DEP	Plan to be approved by DEP.
		Plan to include: 7.1 Management of dust.	During remediation and redevelopment.	DEP(Pollution Prevention Division)	In accordance with DEP guidelines for "Land development sites and impacts on air quality", 1996. Approval by DEP of management plan.
		7.2 Dust monitoring programme.	During remediation and redevelopment.	DEP(Pollution Prevention, Environmental Systems Divisions)	Monitoring of nuisance dust levels in accordance with DEP guidelines for "Land development sites and impacts on air quality", 1996 and the WA Environmental Protection Policy (Atmospheric Wastes) Kwinana.
		7.3 Complaints register	During remediation and redevelopment.		Resolution of complaints.
		7.4 Audit of the above actions.	Post remediation.	DEP (Audit Branch)	Approval of audit reports by DEP.

8. Prepare and implement a Noise and Vibration Environmental Management Plan	To maintain the amenity of the local area during implementation of the remediation.		Prior to ground disturbing activities.	DEP	Plan to be approved by DEP.
		Plan to include: 8.1 Management of noise and vibration	During remediation and redevelopment.	DEP(Pollution Prevention Division)	Noise emissions to meet the requirements of Environmental Protection (Noise) Regulations 1997. Vibration to meet AS 2670.2 - 1990 requirements.
		8.2 Noise monitoring program and provision for vibration monitoring if necessary	During remediation and redevelopment.	DEP(Pollution Prevention Division)	Approval of monitoring program(s) by DEP.
		8.3 Complaints register	During remediation and redevelopment.		Resolution of complaints.
		8.4 Audit of the above actions.	Post remediation.	DEP (Audit Branch)	Approval of audit reports by DEP.
9. Prepare and implement a Public Safety and Traffic Management Plan.	To maintain the amenity of the local area during implementation of the remediation.		Prior to ground disturbing activities.	DEP, MRD	
		Plan to include: 9.1 Management of traffic and actions affecting public safety.	During remediation and redevelopment.	MRD, Town of Victoria Park	Approval of plan by DEP on advice of MRD.
		9.2 Site safety plan for off-site impact.	During remediation and redevelopment.	DEP	Approval of plan by DEP.
		9.3 Liaise with neighbours.	During remediation and redevelopment.		Complaints register showing resolution of complaints.
		9.4 Audit of the above actions.	Post remediation.	DEP (Audit Branch)	Approval of audit reports by DEP.

Where:

Expert Panel refers to panel to be established by the EPA to approve methods of sampling and analysis and detection levels for asbestos.
DEP - Department of Environmental Protection
DME - Department of Minerals and Energy
WRC - Water and Rivers Commission
SRT - Swan River Trust
MRD - Main Roads Department