

Proposed remedial treatment of the State Engineering Works site

North Fremantle

Landcorp

**Report and Recommendations
of the
Environmental Protection Authority**

Environmental Protection Authority
Perth Western Australia
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Summary and recommendations

Landcorp proposes to rehabilitate the land previously used by the State Engineering Works in North Fremantle (Figure 1). The proposal was described in a Notice of Intent which was released in June 1989 for public comment. Two public meetings were held by Landcorp to discuss the proposal and answer questions. The first was held at the North Fremantle community hall in July 1989 to inform local residents and interest groups of the proposal. The second at the South Coogee Agricultural Hall on 1 November 1989 was held to allow the residents and local interest groups in the City of Cockburn to ask questions about the relocation of the waste material to the Henderson landfill site in Cockburn (Figure 2).

The proposed clean up procedure included removal of waste material from the site, to a gazetted landfill at Henderson in the City of Cockburn, and relocation of leachate spoiled sand on site.

Sand whose metal ion content is higher than normal due to leaching of the ions from the waste material, will be relocated on-site above a 12 metre thick limestone base. The site will then be covered by 1.5 metres of clean fill.

Commitments by the proponent include measures to control the dust and noise during the operations. Should further development of the site be delayed, then paper mulch will be applied to the site to prevent dust movement.

Further development of the site is expected to be facilitated by the sale of the rehabilitated land to a developer for a mix of residential housing and public open space.

The Environmental Protection Authority considers that the removal of the State Engineering Works waste material to the Henderson landfill site should not cause unacceptable environmental impacts. The landfill site has been specifically designed to collect leachate from the site, and subject to testing, treat that leachate to remove any contaminants. This landfill site incorporates the most advanced specifications of any landfill in the State.

Recommendation 1

The Environmental Protection Authority concludes that the proposal as described in the Notice of Intent and responses to additional issues raised, is environmentally acceptable, and recommends that it could proceed subject to the Environmental Protection Authority's recommendations and commitments made by the proponent (see Consolidated Commitments, Appendix 2), including:

- removal of all waste material;

- relocation of leachate spoiled sands to an area on the site to be covered by a minimum of five metres of clean landfill;
- control of dust and noise from the site; and
- remedial treatment of the foreshore reserve (public open space).

In consideration of the low volume of fresh groundwater in the State Engineering Works area, which is completely underlain by salt water, and the Water Authority of Western Australia's intention to proclaim the area under the Rights in Water and Irrigation Act, which will allow for the control of groundwater extraction in the area, the Environmental Protection Authority recommends the following.

Recommendation 2

The Environmental Protection Authority recommends that groundwater from beneath the State Engineering Works site:

- a) Not be used for dust control, clean down, potable or irrigation purposes during site clean up or redevelopment;
- b) In addition the Environmental Protection Authority recommends that any groundwater use on the site be subject to approval of the Water Authority of Western Australia.

The effectiveness of the provisions made at the Henderson landfill site, by the City of Cockburn, to prevent any leaching to groundwater and the ultimate protection of the surrounding environment (which includes the Brownman Swamps of the Beelihar wetlands area) needs to be monitored. The Environmental Protection Authority considers that a monitoring programme should be prepared for the leachate and surrounding groundwater.

Recommendation 3

The Environmental Protection Authority recommends that a leachate monitoring programme and a monitoring programme for bores located near the landfill site be prepared and implemented, by the City of Cockburn, within six months of waste from the State Engineering Works being located to the Henderson landfill site, to the satisfaction of the Environmental Protection Authority.

The provision of drainage services that do not empty directly into the adjacent Swan River was addressed in the questions to the proponent. The proponent claimed to be unable to answer questions or take responsibility in relation to subsequent development because the present proposal only related to site clean up.

The Environmental Protection Authority's position is that the nominated proponent for a proposal has an ongoing responsibility for all aspects of that proposal and cannot choose to be divorced from issues in this manner.

Recommendation 4

The Environmental Protection Authority recommends that the proponent direct any stormwater discharge from any development on the site, into the North Fremantle drainage system and not directly into the adjacent Swan River, to the satisfaction of the Environmental Protection Authority.

In view of Landcorp's stated intention to sell the land after the clean up stage to a developer for further development of the site, the Environmental Protection Authority recommends that to ensure the continuity of environmental responsibility for the proposal a condition should be imposed outlining the appropriate procedure for a transfer of proponents.

Recommendation 5

No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

1. Introduction

Landcorp proposes to clean up the vacant State Engineering Works site located within the northern boundary of the City of Fremantle.

Landcorp, the proponent for the project, is a division of the Western Australian Development Corporation. Landcorp is a Government agency established to acquire, develop and market residential land in the Perth Metropolitan Area.

The State Engineering Works site is located adjacent to Thompson Road (Figure 1). The land is bounded by the Swan River to the east, vacated industrial land on McCabe Street to the north and a combination of light industrial and residential land to the west and the south.

Historically, the site was a limestone hill which was quarried in the late nineteenth century to obtain rock for the Fremantle Harbour. The State Engineering Works commenced operations on the site in 1908 and vacated the site in 1986. The State Engineering Works was involved with repairs of harvesters, ploughs, naval hardware and metal fabrication.

Waste occurs in a shallow layer over the whole site at depths ranging from a few centimetres to about a metre. It comprises burnt coal wastes, clinker slag and pyritic cinders, and contains elevated levels of lead, arsenic, zinc, copper, iron, mercury and cadmium. The underlying sand has levels of metal ions higher than normally found in soils, due to leaching of the ions from the waste into the sand layer.

A Notice of Intent was submitted by the proponent in June 1989 to the Environmental Protection Authority for assessment. A meeting to discuss the proposal was held at the North Fremantle Community Hall on 31 July 1989. The meeting was attended by approximately forty people and Landcorp explained the proposal and answered questions.

A second public meeting was held on 1 November 1989 at the South Coogee Agricultural Hall for residents and interested groups in the City of Cockburn. Landcorp presented its proposal to use the landfill site in Cockburn (Figures 2 and 3) to hold the waste from the State Engineering Works site. Landcorp explained the leachate collection system present at the site and the commitment by the City of Cockburn to establish a treatment system for the leachate if monitoring and testing showed it to be necessary.

The Environmental Protection Authority has received six submissions on this proposal which include submissions referring to the original Notice of Intent and the public meetings organised for local interest groups and residents of the City of Fremantle and the City of Cockburn.

2. Description of proposal and site evaluation

2.1 General

Landcorp proposes to rehabilitate and develop the site. To achieve this, site clean-up is required to ensure that the site is safe for the expected residential development. Site clean-up will involve removal of all waste materials from the site to the Henderson landfill in the City of Cockburn. Agreement has been reached between the Council, Health Department of Western Australia and the proponent to relocate up to 35,000 cubic metres of material to the landfill (appendices 3 and 4). The landfill site has recently been developed by the Council.

The extent of clean-up of contaminants on the site is dependent on three factors: (i) extent of contamination, (ii) potential threat to the environment by contaminants, and (iii) end use of the site. The volume of waste to be removed is expected to approximate 25,000 cubic metres although the proponent has reserved 35,000 cubic metres of space in the landfill.

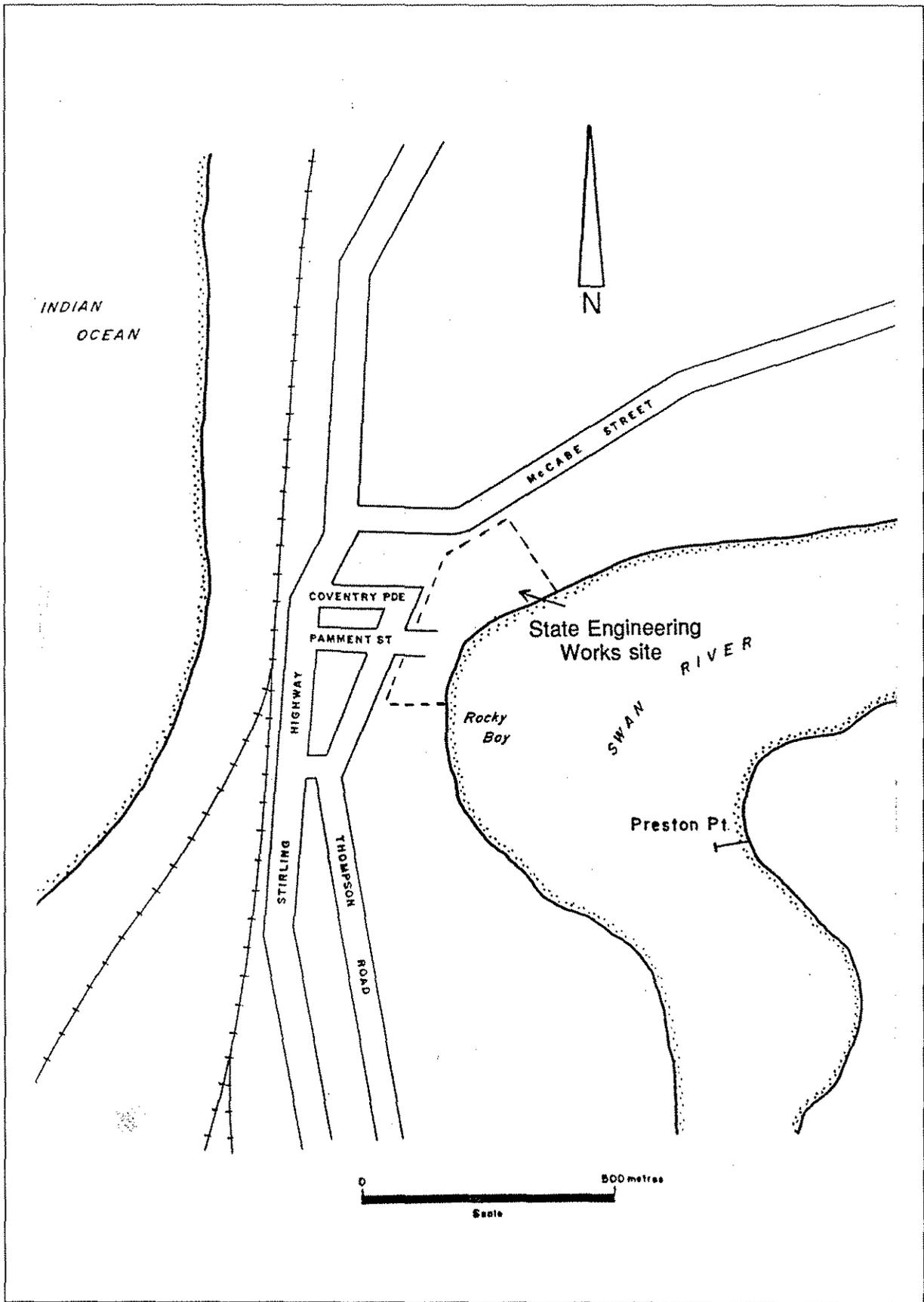
All waste material on the site will be removed to the Henderson landfill site. Leachate spoiled sands beneath the wastes have much lower levels of metal ions than the waste material and will be relocated on site.

In the programme for remedial treatment of these sands the proponent will use criteria for clean-up of soils (Appendix 6) which have been employed in previous proposals of a similar nature. These criteria are considered by the Environmental Protection Authority to be acceptable for the remedial clean up of the State Engineering Works site.

Leachate spoiled sand that exceeds the criteria will be relocated on-site on top of a 12 metre thick limestone base and covered by at least five metres of clean fill. Further residential development and associated roadworks will provide an effective seal over the sands. Landcorp intends to conduct a sampling programme over the entire site after the removal of waste material, but prior to the relocation on-site of any of the spoiled sands, and the results will be made available to the Environmental Protection Authority. Results will be used to identify the sand that exceeds the selected clean-up criteria for lead, arsenic, zinc, copper, mercury or cadmium and requires relocation on-site. Further sampling will be carried out after relocation of the identified spoiled sand, to ensure all sands exceeding the criteria have been moved.

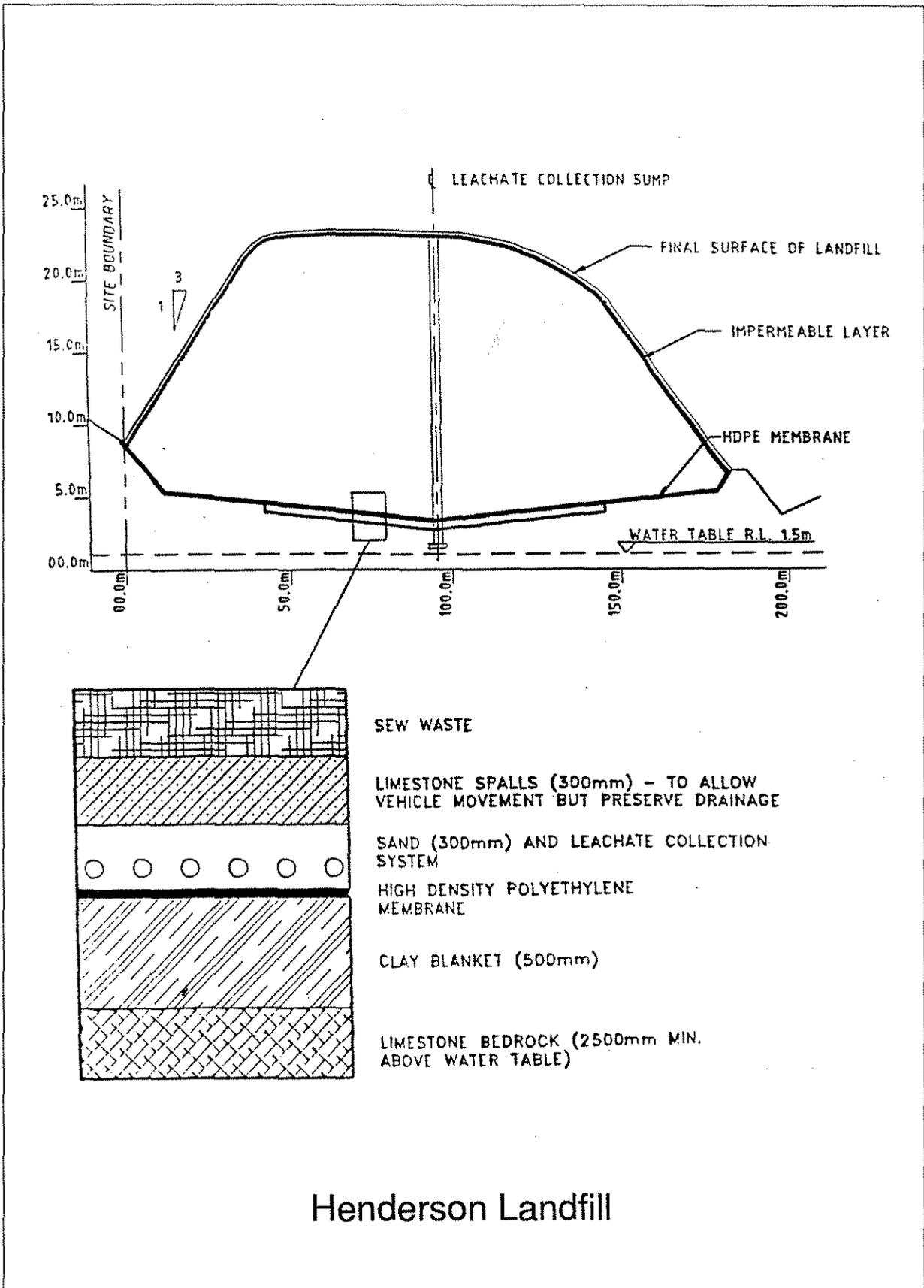
Finally, the site will be covered by additional clean fill to a depth of at least 1.5 metres. Many areas will be covered with significantly more fill because of the site contouring that is planned as part of the housing development. Landcorp considers that this will further ensure the long-term integrity of the site.

The Henderson landfill site incorporates technically advanced features to ensure protection of the surrounding environment by incorporating a fully lined high



Source : Landcorp

Figure 1: Location map for State Engineering Works site



Source : Halpern Glick Maunsell Pty Ltd

Figure 3: Cross section through the Henderson landfill

density polyethylene impermeable membrane to protect the water table.

The landfill site includes a leachate collection system consisting of a network of slotted irrigation pipes set in porous sands and a leachate pumping system designed to conduct leachate to treatment ponds or to be recirculated through the landfill. Currently the landfill contains the leachate collection and recirculating systems, should testing of the leachate show leachate treatment to be necessary, the City of Cockburn is committed to install a treatment process.

2.2 Character of waste on site

Most of the surface waste material comprises:

- i black coal wastes composed of burnt coal, coke and clinker,
- ii clinker slag composed of glassy clinker, and refractory brick; and
- iii pyritic cinders composed of iron sulphides and iron-rich clay minerals.

Generally these three wastes are found mixed together, however, distinct layers of each waste type can be seen in places. In many trenches the wastes were observed to contain metal turnings and filings, minor amounts of building rubble, metal pieces and oil wastes.

2.3 Soil and trench surveys

A comprehensive surface and trench soil sampling programme covering the whole site was undertaken to determine levels of lead, arsenic, zinc, copper, iron, mercury and cadmium. Selected samples were tested also for cyanide, polychlorinated biphenyls and pesticides. Samples were taken for polychlorinated biphenyls analysis near an electrical substation where capacitors were known to be kept.

Results show the distribution of various contaminants occurs superficially over the whole site. No dumps of significant volume were located and there is no apparent pattern to the waste distribution. Wastes have been used to level the site for building and road construction. The industrial waste varies from a few centimetres to over a metre in depth and is sometimes overlain by up to 0.5 metre of sand. Metal ion levels in the waste material are much greater than recommended concentrations in soils set by Australian authorities for various land uses.

Visual inspection suggested that the sand beneath the waste was clean. Testing, however, indicated concentrations of some elements did exceed the selected criteria provided in the Notice of Intent (see Appendix 6). Neither cyanide nor polychlorinated biphenyls were found in the sand samples. Remnant pesticides of low concentrations were found beneath one of the newer concrete slabs on the site and probably originated from termite treatment of the building pad. Lubricating oil contamination was noted at the trench inspection time and is most likely sourced from the lubricant once used in the casting operation.

2.4 Groundwater contamination

Testing indicates that there is currently minimal contamination of the groundwater and removal of the waste material will effectively prevent further contamination. Samples taken over a continuous 24 hour period, using a 16.4 metre deep bore intersecting the freshwater/saltwater interface, showed that the water contained arsenic and cyanide levels either equal to or slightly above recommended levels for drinking water quality in Australia.

The proposed relocation of leachate spoiled sand on-site, on top of a platform of limestone (with a thickness of 12 metres above the groundwater table) is proposed to secure further leachates and ensure groundwater integrity. Limestone has a significant buffering potential and will react with metal ion complexes in the leachate and render them immobile.

3. Summary of public and government agencies submissions

3.1 Introduction

A total of six public and Government submissions on this proposal have been received by the Environmental Protection Authority. Contributors are listed in Appendix 5. No submission indicated clean up to be undesirable. The Environmental Protection Authority appreciates the time and effort required to make a submission and commends those that participated in providing valuable input to the assessment of this proposal.

3.2 Specific issues raised from the public meeting and submissions by the public and government agencies

Comments from submissions may be broadly classified as follows:

- dust control during clean-up and development;
- source and disposal of water used on site for dust control and machinery clean down;
- adequate supervision during rehabilitation;
- transport route for trucks entering and leaving the site;
- restriction of working hours and days;
- groundwater protection and use;
- health considerations for workers;
- access, use and commitments related to the foreshore reserve (public open space);
- retention of the cycleway;
- existing noise and odour sources not emanating from the site;

- plans for the offices still on site;
- suitability and acceptability of the proposed Henderson landfill in Cockburn for disposal of the waste material.

The major environmental issues raised in submissions included control of dust and noise and the treatment of the industrial waste. Several complaints were received by the Environmental Protection Authority regarding dust control problems when buildings were removed from the site in a previous operation.

Appendix 1 contains a summary of questions asked in the public and government agencies submissions and the proponent's responses.

3.3 Summary of proponent's response to issues raised

The proponent believes that the issues raised including waste disposal, noise and dust control, entry and exit from the site, responsibility and action to be taken for the foreshore reserve and the suitability of the proposed landfill site for the industrial waste are answered in the Notice of Intent, written responses (Appendix 1) and commitments listed in Appendix 2.

The proponent is committed to the minimisation of dust generated as a consequence of the proposal, and has given it the highest priority for control during the clean-up operation. For this reason the proponent had intended to carry out the work during wet weather months to maximise the natural dust suppression effects of elevated soil moisture levels and prior to the development of strong winds associated with the drier months. Should the work be carried out in the drier months, suppression of dust will be augmented by water supplies available close to the site.

All working areas will be watered down during excavation activities. Sprinklers will be set out on areas that may generate dust and may be run overnight where necessary. All loads of material leaving the site will be dampened down to ensure dust is not generated during transport and unloading of the materials. These loads will also be covered by heavy tarpaulins.

If for some reason there is significant delay during phases of site clean-up and redevelopment, the proponent advises that areas which have the potential to generate dust will have paper mulch applied to minimise dust generation.

The proponent has made commitments regarding noise and dust generation and has also committed to the clean up of the foreshore reserve (public open space) in a manner that will maintain the stability and vegetation of the cliff as well as provide for the safety of those using the area. The existing cycle path will be temporarily closed during the clean up stage and replaced on completion of the clean up. All details for the cycle path closure and reconstruction will be discussed with the City of Fremantle.

The proposed use of the Henderson landfill in the City of Cockburn was the subject of the public meeting in

Cockburn on 1 November. The meeting was called by the proponent at the request of the Environmental Protection Authority. The issues raised were answered at the meeting and included concerns about groundwater contamination and the long-term responsibility for the waste material once deposited at the landfill site.

The proponent explained that the City of Cockburn accepted responsibility as it does with all material disposed of at the site, and noted that the landfill site was specifically designed to ensure the protection of the groundwater with a leachate collection and recovery system that will be integrated with a treatment system if testing proves it to be necessary.

These issues have been covered by Landcorp in commitments (Appendix 2) or in its responses to issues raised in Appendix 1.

4. Environmental impacts and management

4.1 General introduction

The Environmental Protection Authority has identified the major potential environmental impacts to be dust and noise control and the management of the industrial waste at the landfill site. The Environmental Protection Authority considers that these issues can be managed with the commitments given by the proponent, responses by the proponent to further issues raised and the Environmental Protection Authority's recommendations in this report.

Recommendation 1

The Environmental Protection Authority concludes that the proposal as described in the Notice of Intent and responses to additional issues raised, is environmentally acceptable, and recommends that it could proceed subject to the Environmental Protection Authority's recommendations and commitments made by the proponent (see Consolidated Commitments, Appendix 2), including:

- removal of all waste material;
- relocation of leachate spoiled sands to an area on the site to be covered by a minimum of five metres of clean landfill;
- control of dust and noise from the site; and
- remedial treatment of the foreshore reserve (public open space).

4.2 Dust and noise

The Environmental Protection Authority is aware of local concern in relation to the amount of dust and noise expected from the site clean up and redevelopment stages of the proposal. The proponent has assured the

Environmental Protection Authority that strict controls over both dust and noise emanating from the site will be provided.

The proponent has made commitments in the original Notice of Intent relating to dust and noise issues. Another commitment to dust control was also made after consultation with the Environmental Protection Authority during the public submissions stage of the assessment, (see Appendix 2).

The Environmental Protection Authority considers that these commitments tabled in Appendix 2, numbers 5, 6, 15 and the proponent's response to issues summarised in section 3.3 of this Report, are adequate for the control of both dust and noise problems and do not require the Environmental Protection Authority to make further recommendations.

4.3 Groundwater Contamination

The Environmental Protection Authority has considered groundwater contamination at both the State Engineering Works site and landfill site. The landfill site has adequate protection as indicated in Section 4.4 which includes a clay and synthetic membrane lined site augmented by a leachate collection and recirculating system.

Protection of the groundwater located under the State Engineering Works site will be effectively managed by removal of the waste material. After removal of the waste material the groundwater will no longer be subject to contamination from metal ions in the waste. It is expected that over a short period of time the groundwater will have recovered and meet the recommended levels for drinking water quality in Australia.

Leachate spoiled sand beneath the waste material will be tested to determine if the criteria (Appendix 6) as tabled in the original Notice of Intent are met. Any sand exceeding the criteria will be relocated on site and covered by a minimum of five metres of clean fill.

The Environmental Protection Authority considers the measures proposed by the proponent for treatment of leachate spoiled sands adequate to prevent potential groundwater contamination. The acceptance of the on site management of the sand is due to the significantly lower levels of metal ions measured in the sand when compared to the waste material.

Further to this management the Water Authority of Western Australia intends to proclaim this area under the Rights in Water and Irrigation Act. This will enable the Water Authority of Western Australia to institute a system of licensing of wells and bores in the area.

The Water Authority of Western Australia's proposal is principally based on findings of the "Perth Urban Water Balance Study" which indicated that in this area the thin lens of fresh groundwater is completely underlain by salt water. Accordingly, management strategies to reduce local abstraction, prevent salt-water intrusion and maximise local recharge are essential.

Recommendation 2

The Environmental Protection Authority recommends that groundwater from beneath the State Engineering Works site:

- a **Not be used for dust control, clean down, potable or irrigation purposes during site clean up or redevelopment;**
- b **In addition the Environmental Protection Authority recommends that any groundwater use on the site be subject to approval of the Water Authority of Western Australia.**

4.4 Waste removal and management at the Henderson landfill site in the City of Cockburn

The Environmental Protection Authority has considered the disposal of contaminated waste material in the Henderson landfill site as proposed in the proponent's Notice of Intent. The Environmental Protection Authority considers that removal of the waste material from the State Engineering Works site to this landfill should not cause an environmental impact due to the design specifications of the landfill, which include collection of leachate from the site, and testing, and if necessary treatment of that leachate to remove any contaminants. As with all municipal landfill sites in the future, the Henderson landfill will be capped with clay to prevent the infiltration of water once filled.

The Environmental Protection Authority considers that the landfill has adequate environmental safeguards including:

- a natural limestone base;
- a half metre thick clay blanket at the collection centre of the landfill;
- a high density polyethylene membrane over the entire floor of the landfill;
- a three hundred millimetre thick porous sand layer above the membrane containing the pipe-works for the leachate collection systems; and
- a three hundred millimetre thick limestone cover above the sand layer to allow vehicle movement but preserve drainage conditions.

Figure 3 contains a diagram in cross-section of the landfill site.

The effectiveness of the provisions made at the landfill site to prevent any leaching to groundwater and the ultimate protection of the surrounding environment (which includes the Brownman Swamps of the Beelihar wetlands area) needs to be monitored. The Environmental Protection Authority considers that a monitoring programme should be prepared and implemented for the leachate and surrounding groundwater condition.

This programme should be available for implementation no later than six months from the relocation of the State Engineering Works waste to the Henderson

landfill. The time difference in this recommendation between relocation of the waste and availability of the monitoring programme is in recognition of the absorptive capacity of material within landfill sites. It is calculated that very little leachate will form in the first two to three years but the Environmental Protection Authority considers that there needs to be a sampling period that will provide baseline data. ie. between the start of the programme and the formation of leachate.

Recommendation 3

The Environmental Protection Authority recommends that a leachate monitoring programme and a monitoring programme for bores located near the landfill site be prepared and implemented, by the City of Cockburn, within six months of waste from the State Engineering Works being located to the Henderson landfill site, to the satisfaction of the Environmental Protection Authority.

4.5 Subsequent site development

The provision of drainage services that do not empty directly into the adjacent Swan River was addressed in the questions to the proponent. The proponent claimed to be unable to answer questions or take responsibility in relation to subsequent development because the present proposal only related to site clean up.

The Environmental Protection Authority's position is that the nominated proponent for a proposal has an ongoing responsibility for all aspects of that proposal and cannot choose to be divorced from issues in this manner.

Recommendation 4

The Environmental Protection Authority recommends that the proponent direct any stormwater discharge from any development on the site, into the North Fremantle drainage system and not directly into the adjacent Swan River, to the satisfaction of the Environmental Protection Authority.

The Environmental Protection Authority has included the following recommendation to ensure continuity of environmental responsibility for the proposal. Through this recommendation the current proponent is made aware of its responsibilities and should the land be sold to another party, it provides a mechanism for the transfer to that party of the environmental responsibilities. The Environmental Protection Authority also retains the option to assess any new proposal for use of the State Engineering Works site, if it has significant environmental impacts.

Recommendation 5

No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister has advised the proponent that ap-

proval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

5. Conclusion

Landcorp proposes to clean up the old State Engineering Works site (Figure 1), with the waste material being removed from the site to the Henderson landfill (Figure 2). Leachate spoiled sand will be relocated on site above a limestone base and covered by a minimum of five metres of clean landfill. The site will then have one and a half metres of clean fill placed on it at the development stage. The major concerns are the control of dust and noise and the management of the waste material in the landfill site.

Based on the information supplied in the Notice of Intent and the additional information and commitments given in response to questions raised by the Environmental Protection Authority and in submissions, the Environmental Protection Authority concludes that the project is environmentally acceptable and recommends that it could proceed subject to the commitments given in the Notice of Intent and in the proponent's response to issues raised during the assessment, and the recommendations made in this report.

Appendix 1

**Issues raised in submissions and the
proponents responses numbered 1 to 13**

Question 1: Outline who is responsible for the foreshore reserve (public open space) including the cycle path area, cliff face and beach area to the river's low tide mark. Outline the proposed monitoring and treatment programmes for this area?

Response: The foreshore reserve is part of an A Class Reserve which is vested with the Fremantle City Council. This Reserve includes the cycle path and the cliff face down to the low tide mark.

Sampling of soils on the cliff face has detected the presence of similar contaminants as on the State Engineering Works site. Inspection has shown that there is an amount of scattered contaminant material over the surface of soils. It was these suspect materials that was sampled in the survey.

It is assumed that contaminants are present both beneath the cycle path and adjacent to it based on the distribution of contaminants on the State Engineering Works site and the actual cliff face. A layer of soils with contaminant material can be seen at the very top of the cliff face. This no doubt extends beneath the cycle path. As a result sampling to detect contaminants beneath the cycleway was not performed.

Landcorp has committed itself to clearing the A Class Reserve up to the edge of the cliff face of contaminants. The area immediately surrounding the monument, located above the sheer limestone cliff face, has been excluded from this treatment after consultation with the City of Fremantle

In view of the above and the Fremantle City Council's concern over the matter, Landcorp has also committed to cleaning the cliff face of waste material which could come in contact with the general public. This includes waste at points of access to the water and any waste on the actual foreshore.

Landcorp considers it would be impractical to clear the entire face in a similar manner to the land above the cliff as this would remove well established vegetation and may destabilise the actual cliff face. As it is recognised that some wastes could remain on more inaccessible areas of the cliff face, Landcorp has committed to constructing a sturdy fence designed to discourage people coming in contact with this material.

Question 2: Does the foreshore reserve (public open space) constitute a health hazard to users of the reserve?

Response: Levels of heavy metals both on the State Engineering Works site and the adjacent foreshore reserve exceed guidelines set by the State Pollution Control Commission of New South Wales for formal playing fields. These guidelines were drafted with public health in mind given regular use of the area by the general public.

Landcorp in agreement with the City of Fremantle proposes to clear the contaminants from the foreshore reserve as it is regularly used by the general public. (See Question 1 and response).

Question 3: If the cycle path is disturbed who will replace it and when. What interim arrangements will be made for users of the path?

Response: The cycle path would need to be disturbed during the clean up operation and thus will be closed to the public for the duration of the clean up stage.

Landcorp has committed to replacing the cycle path with a bituminous seal similar to that which currently exists after works associated with the site clean up have been completed. This will be done to the satisfaction of the City of Fremantle.

Interim arrangements will be made so that users can bypass the works. This will involve signing the bicycle path so that users are aware they cannot pass by the State Engineering Works site. An alternative route will be established in consultation with the Fremantle City Council.

Question 4: What are the proposed entry and exit points for the site during the remedial clean up and development stages. Will they avoid residential housing. How long will the stages take to complete?

Response: Landcorp has committed to using entry and exit points which open from the south-west section of the site onto Thompson Street. Trucks would then turn into Craig Street which opens onto Stirling Highway. This has been chosen as the best point to enter and exit since it avoids residential housing and allows easy access to Stirling Highway.

It is expected that the entire site clean up will take eight weeks.

Question 5: Where will the landfill come from for the development stage?

Response: Landcorp will source material for the covering of the site after the removal of contaminated waste. At this stage it is not possible to state exactly from where the fill will be sourced, however it will not be taken from around the State Engineering Works site. As Landcorp is not responsible for development of the site it cannot pass comment on fill for the development.

Question 6: What actions will be taken to control the noise, dust and vibration associated with the remedial clean up and subsequent development stage?

Response: Noise: Hours of activity on site will be restricted to normal working hours to minimise the impact of noise. These hours correspond to the hours during which background noise levels are generally highest and the Neighbourhood Annoyance Regulations permit the highest noise level emissions.

Landcorp has already committed to minimising the noise from the site to the satisfaction of the Environmental Protection Authority (see Section 6 of the Notice of Intent) or the consolidated set of commitments in this Report (Appendix 2).

Vibration: No problems relating to vibration are expected to arise from clean up of the site. If this does

pose a problem Landcorp commits itself to taking appropriate action to control the vibration.

Dust: The control of dust will be of primary concern during clean up of the State Engineering Works site and as such Landcorp has committed itself to dust control measures in the Notice of Intent prepared for the proposal. All earthmoving operations will be professionally supervised to ensure that the following dust abatement techniques are carried out:

- a) watering down by tankers and hoses of all areas where soils are being disturbed;
- b) sprinklers will be used to water down areas that may generate dust while work is not in progress;
- c) as a result of the above all loads will be dampened down to minimise dust generation during transport;
- d) If for any reason work is interrupted for a significant period, areas that have the potential to generate dust will have paper mulch applied to them.

It is proposed to conduct a programme of sampling for dust throughout the clearance of the site. Results of this programme will, if necessary, be used to further refine dust management techniques.

The following commitment has been made after consultation with the Environmental Protection Authority:

The proponent commits itself to controlling the concentration of airborne dust generated from the State Engineering Works site so that it will not exceed 1000 micrograms per cubic metre of air when measured in accordance with the following:

- a) the concentration of airborne dust to be determined as the difference in the concentration of dust in air between two samples of fifteen minutes duration within a sixty minute period;
- b) the samples shall be taken at locations within five metres of the premises boundary on opposite sides of the premises;
- c) one sampling location shall be generally located upwind of the other sampling location;
- d) the air shall be sampled at a rate of not less than one hundred litres per minute.

Question 7: What hours and days of the week are proposed for site work?

Response: Site works will occur between the hours of 7.00am and 5.00pm Monday to Friday, and from 8.00am to 12.00pm on Saturdays. No activities will be performed on Sundays or public holidays unless required to suppress dust problems.

Question 8: Will the remedial clean up and subsequent development be performed in stages over the site or all at once?

Response: Remedial clean up will be performed over the entire site on a staged basis. This will allow testing of soils to confirm success of removal immediately after each stage is completed. Staging allows operations to

continue on the site while soil samples are being analysed. This can take a number of days. A staged approach also allows stabilisation to avoid dust generation, which will be put in place as soon as possible after works have finished.

Question 9: What plans are proposed for the existing State Engineering Works offices and the surrounding land. Will the land beneath the buildings be treated in the same manner as the rest of the waste in the event of the buildings being removed?

Response: It is now proposed to demolish the State Engineering Works offices. If the buildings are to be demolished Landcorp commits itself to treating the land beneath the buildings in the same manner as the rest of the land.

Question 10: Will signs be erected on site to inform people of the nature of the waste material and for them to keep off the land during site works?

Response: Landcorp commits to erecting signs prior to the beginning of site works to inform people of the nature of the clean up and to inform them that they should keep off the land during the works.

Question 11: Will residents of the completed development be able to put bores down for groundwater extraction. Does the proponent intend to use groundwater during site works and after development?

Response: Landcorp is committed to not using groundwater during the clean up of the site and has no intention of putting down bores on the site. Sampling of bore waters has shown the fresh/salt water interface to be close to the surface, thus pumping of fresh water would further promote the intrusion of salt water. It is for this reason that Landcorp makes the above commitment.

Question 12: How will the wastewater from the truck clean down area be contained?

Response: Landcorp commits itself to conducting waters from the washdown to a depression on site where no waste materials exist. Waters will then be allowed to soak into the ground. The proponent will ensure wash down waters do not exit the site. The top 0.5 metres of soil in the depression will be removed after washing down has ceased and will be disposed of in the Henderson landfill.

Question 13: What drainage services are proposed for the final development stage?

Response: Landcorp is only responsible for the cleanup of the site and not its development.

Appendix 2

**Consolidated list of commitments made by the Proponent
numbered 1 to 19 for the remedial treatment of the State
Engineering Works site, North Fremantle**

The proponent is committed to:

- 1 removing all industrial waste materials from the State Engineering Works site and relocating it to the Henderson landfill as soon as it is possible, to the satisfaction of the Environmental Protection Authority.
- 2 relocating all contaminated sands which exceed the selected criteria (detailed in Appendix 6 of the Environmental Protection Authority Report), to a location on site where it will be covered by at least five metres of clean fill, to the satisfaction of the Environmental Protection Authority.
- 3 conducting a sampling programme to ensure that all contaminated sands which exceed the selected clean-up criteria (detailed in Appendix 6 of the Environmental Protection Authority Report) will be relocated on site, to the satisfaction of the Environmental Protection Authority.
- 4 ensuring that all areas on the site are covered with at least 1.5 metres of clean fill unless testing shows that this will not be necessary. This will be done as soon as development on the land begins, to the satisfaction of the Environmental Protection Authority.
- 5 minimising the dust generated by earthworks on site by the use of water sprays, hoses or whatever other technique is required. Further, areas that have the potential to generate dust will be sprayed with mulch or some other suitable method if they are to be left unwatered for an extended period. This will be done to the satisfaction of the Health Department of Western Australia, the Department of Occupational Health, Safety and Welfare and the Environmental Protection Authority.
- 6 minimising noise levels during the remedial treatment work and site redevelopment to the satisfaction of the Environmental Protection Authority.
- 7 ensuring that workers on the site are not put at any undue risk during remedial treatment. Precautions will be taken under instruction and to the satisfaction of the Department of Occupational Health, Safety and Welfare.
- 8 ensuring that all remedial work will be supervised by professionals in the engineering and environmental fields. This will ensure that the work is carried out to the standards required by the Environmental Protection Authority and other Government Authorities.
- 9 clearing the A Class Reserve (up to the edge of the cliff face) of contaminants, to the satisfaction of the City of Fremantle, Swan River Trust and the Environmental Protection Authority.
- 10 removing from the cliff face, waste material which could come into contact with the public. This includes wastes at points of access to the water and any wastes on the actual foreshore along the river boundary of the proponent's land, to the satisfaction of the City of Fremantle, Swan River Trust and the Environmental Protection Authority.
- 11 constructing a sturdy fence, designed to discourage people coming in contact with the waste material remaining on the cliff face, to the satisfaction of the City of Fremantle.
- 12 replacing the cycleway with a bituminous seal, similar to that which currently exists, after works associated with the site clean up have been completed, to the satisfaction of the City of Fremantle.
- 13 using entry and exit points from the south-west section of the site onto Thompson Street to avoid residential housing in the area.
- 14 taking appropriate action to control vibration, to the satisfaction of the Environmental Protection Authority.
- 15 limiting the concentration of airborne dust generated from the State Engineering Works site to not exceed 1000 micrograms per cubic metre of air when measured in accordance with the following:
 - a the concentration of airborne dust to be determined as the difference in the concentration of dust in air between two samples of fifteen minutes duration within a sixty minute period;
 - b the samples to be taken at locations within five metres of the premises boundary on opposite sides of the premises;
 - c one sampling location to be generally located upwind of the other sampling location;
 - d the air to be sampled at a rate of not less than one hundred litres per minute.
- 16 treating the land beneath the buildings currently on site, in the same manner as the rest of the land in the event that the buildings are demolished, to the satisfaction of the Environmental Protection Authority.
- 17 erecting signs prior to the commencement of the site works to inform people of the nature of the clean up and to keep off the land during the operation.
- 18 not using groundwater during the clean up of the site.
- 19 conducting waters from the washdown area to a depression on-site where no waste materials exist. Waters will then be allowed to soak into the ground. The top 0.5 metres of soil in the depression will be removed at the end of the clean up stage and will be disposed of in the Henderson landfill site.

Appendix 3

**City of Cockburn approval for use
of the Henderson landfill courtesy of Landcorp's notice of intent**



City of Cockburn

P O BOX 21, HAMILTON HILL, WESTERN AUSTRALIA 6163
9 COLEVILLE CRESCENT, SPEARWOOD 6163

ALL WRITTEN COMMUNICATIONS TO BE ADDRESSED TO CITY MANAGER

PROCESSED
DATE REC
VALUE REC

Mrs. A. Moss
65/0032

SAB:mb:15689/03

3rd May 1989

Maunsell & Partners Pty Ltd
PO Box 7190
Cloisters Square
PERTH WA 6000

ATTENTION: MR. S. A. BIRD
SENIOR ENVIRONMENTAL SCIENTIST

OFFICE HOURS

8.30 AM - 4.30 PM
MONDAY TO FRIDAY

TELEPHONE

ADMINISTRATIVE
CENTRE (09) 418 0444
WORKS
DEPT (09) 418 0450
FAX (09) 418 0416

Dear Sirs,

WASTES FROM STATE ENGINEERING WORKS

In reply to your letter of 23rd March 1989, council at its meeting held on 2nd May 1989, resolved that it will accept waste from the State Engineering Works site in East Fremantle to Henderson Landfill Site subject to a satisfactory fee being negotiated.

Yours faithfully,

A. J. ARMAREGO
CITY MANAGER/TOWN CLERK

AM:bp

Appendix 4

**Health Department approval for use of the
Henderson landfill courtesy of Landcorp's notice of intent**



Western Australia

Health Department of Western Australia

Your ref
Our ref 147/84 SBH:GS
Enquiries Mr Sven Hansen

Maunsell & Partners Pty Ltd
PO Box 7190
Cloister Square
PERTH 6000

Dear Sir

STATE ENGINEERING WORKS

I refer to your letter of 13 March and the enclosed report regarding the disposal of contaminated soil from the State Energy Works at East Fremantle.

The results of testing does not indicate the formation of hazardous leachates which in any event would be collected and treated as required. Therefore there appears to be no reasons why the material cannot be disposed of at the Cockburn City Council landfill site in Henderson.

Yours faithfully

Sven B Hansen
ENGINEER-WASTE MANAGEMENT

20 March 1989
(90317SH2)

189 Royal St East Perth WA 6004 Tel (09) 222 4222 Telex AA93111 Fax (09) 227 9813
Telegrams WAHEALTH Letters PO Box 8172 Stirling St Perth 6000
The Health Department of Western Australia - promoting a smoke free environment

Appendix 5

List of organisations and individuals that made submissions

North Fremantle Community Association
Wetlands Conservation Society
Water Authority of Western Australia
Pollution Action Network
City of Fremantle
Mr R Gate

Appendix 6

**Proponent's selected soil relocation criteria courtesy of
Landcorp's notice of intent**

**RECOMMENDED HEAVY METAL CONCENTRATIONS
IN SOIL BY LAND USE (ppm)**

Source	Fe	Cu	Zn	As	Cd	Hg	Pb
Recommended soil levels from NSW State Pollution Control Commission							
(A) Public open space Formal playing fields	-	1000	-	40	15	20	2000
(B) Amenities playing fields, park, playgrounds, small children - adopted for use in NSW	-	1000	130	40	12	4	1500