Sydney Environmental & Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessments

Specific Site Management Plan

for

West Circular Quay Public Domain Revitalisation Project

Prepared for:

Sydney Harbour Foreshore Authority
October 2010

(Report: C1602.Q2239.B15661FA)

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Executive Summary

Sydney Harbour Foreshore Authority (SHFA) is planning to undertake landscaping development works of West Circular Quay Public Domain (the site) as part of the public domain revitalisation program. Sydney Environmental and Soil Laboratory Pty Ltd (SESL) was engaged by SHFA to prepare this Specific Site Management Plan (SMP) for the ongoing operations of the Site, development works and proposed landuse. The Site is managed by SHFA and is currently used as public open space.

The requirement for an SMP arises from the impact of historical activities to the site, and addresses the need to ensure the protection of the general public, construction workers, maintenance workers visiting the site and the occupants of the neighbouring sites.

This SMP is designed to supplement the existing Environmental Management Plan for Sydney Harbour Foreshore Authority Public Domain (EMP) in specific regard to managing regions of known contamination during the proposed works.

This SMP manages SHFA staff, contractors and public risk associated with the identified contaminants at the assessment site under current landuse practices and throughout the construction program.

This SMP has been prepared to manage the potential risks to human health and the environment posed by subsurface levels of Benzo(a)pyrene (BaP) and total Polycyclic Aromatic Hydrocarbons (PAH) for the current and proposed uses of the site. BaP and PAHs were identified at two locations during the Detailed Site Investigation (DSI). This SMP relates to the public domain area in the West Circular Quay precinct, commonly known as First Fleet Park and the forecourt to the Museum of Contemporary Art.

Supplementary documents (such as work method statements, soil and water management plans, waste management plans and/or inspection and monitoring schedules) may be necessary to address risks associated with construction activities.

SYDNEY ENVIRONMENTAL & SOIL LABORATORY PTY LTD

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TABLE OF CONTENTS

LIST OF TABLES:

ATTACHMENTS:

ABBREVIATIONS

AST – Aboveground Storage Tank
ACM – Asbestos Containing Material
AHD – Australian Height Datum
BTEX – Benzene, Toluene, Ethyl benzene and Xylene's
B(a)P – Benzo(a)pyrene
COC – Chain of Custody
DEC – Department of Environment and Conservation NSW
DCA – Detailed Contamination Assessment
DP – Deposited Plan
DSI – Detailed site Investigation
DQO – Data Quality Objectives
EAC – Environmental Areas of Concern
EILs – Environmental Investigation Levels
EPA – Environmental Protection Agency
ESA – Environmental Site Assessment
GIS – Geographical Information System
NEPC – National Environment Protection Council
OCP – Organochlorine Pesticides
OPP – Organophosphorus Pesticides
PAH – Polycyclic Aromatic Hydrocarbons
PID – Photo Ionisation Detector
PQL – Practical Quantitation Limits
PSI – Preliminary Site Investigation
QA – Quality Assurance
QC – Quality Control
RAP – Remedial Action Plan
RPD – Relative Percent Difference
SAC – Soil Assessment Criteria
SESL – Sydney Environmental and Soil Laboratory
SILs – Soil investigation Levels
TPH – Total Petroleum Hydrocarbons
TRH – Total Recoverable Hydrocarbons
UCL – Upper Confidence Limit
UST – Underground Storage Tank
VOC – Volatile Organic Compounds

1 INTRODUCTION & OBJECTIVES

1.1 Introduction

Sydney Harbour Foreshore Authority (SHFA) is planning to undertake landscaping development works of West Circular Quay Public Domain (the site) as part of the public domain revitalisation program. Sydney Environmental and Soil Laboratory Pty Ltd (SESL) was engaged by SHFA to prepare this Specific Site Management Plan (SMP) for the ongoing operations of the Site, development works and proposed landuse. The Site is managed by SHFA and is currently used as public open space.

The requirement for an SMP arises from the impact of historical activities to the site, and addresses the need to ensure the protection of the general public, construction workers, maintenance workers visiting the site and the occupants of the neighbouring sites.

This SMP is designed to supplement the existing *Environmental Management Plan for Sydney Harbour Foreshore Authority Public Domain* (EMP) in specific regard to managing regions of known contamination during the proposed works.

This SMP manages SHFA staff, contractors and public risk (passive recreation) associated with the identified contaminants at the assessment site under current landuse practices and throughout the construction program.

This SMP has been prepared to manage the potential risks to human health and the environment posed by Benzo(a)pyrene (BaP) and total Polycyclic Aromatic Hydrocarbons (PAH) for the current and proposed uses of the site. BaP and PAHs were identified at two subsurface locations during the Detailed Site Investigation (DSI). This SMP relates to the public domain area in the West Circular Quay precinct, commonly known as First Fleet Park and the forecourt to the Museum of Contemporary Art.

Supplementary documents (such as work method statements, soil and water management plans, waste management plans and/or inspection and monitoring schedules) may be necessary to satisfactorily address risks associated with construction activities.

1.2 Objectives

In accordance with the project brief, the objectives of this SMP are to provide information on the identified soil contamination at the site and to provide guidance on the appropriate site management.

This SMP covers the routine non-intrusive current landuse and maintenance works, and development controls during construction.

This SMP documents the procedures required to ensure the protection of staff, contractors and visitors to the site under normal operating conditions (i.e. public open space) and to provide clear details of the location of contamination for appropriate management during development works.

This SMP will require revision at the conclusion of the revitalisation works to ensure this document is fit-for-purpose under the final landscape design.

1.3 Scope

This SMP describes the location and extent of known contamination identified to be impacted by the proposed revitalisation project. This SMP must be read in conjunction with the EMP for the site, and will form part of the project brief for request for tender.

This SMP does not remove the requirement of the project manager/contractor to prepare a Construction EMP as detailed in the EMP for the site (EMP Section 4.1).

2 ROLES & RESPONSIBILITIES

This SMP is design to be managed under the responsibilities outlined in the EMP. As such, the Authority's Regulatory Manager Property and Asset Management is responsible for the overall implementation and maintenance of the SMP and for ensuring that Authority staff and contractors working in the Authority's public domain have been informed of the requirements of the SMP prior to commencement of works.

The supervisor or person-in-charge of works in the public domain is responsible for implementing the requirements of the SMP during the course of works and at the completion of the works.

The following Table 1 outlines the main parties that have involvement in the SMP, and their respective roles and responsibilities. This table does not intend to list all responsibilities under relevant legislation, but is a brief clarification of the roles and responsibilities in implementing this SMP.

Table 1 – Roles and Responsibilities

Title	Name	Responsibilities
Sydney Harbour Foreshore Authority	TBA	• Appoint a Project Manager with the relevant experience and skills • Understanding the implementation of the SMP to auditing can be undertaken. • Conduct site inspections.
Project Manager	TBA	• Implementing the SMP. • Understanding and implementing the SMP in relation to any property management issues for the site. • All subcontractors are required to comply with the SMP and to comply with directions from SESL and / or SHFA in this respect.
Sydney Environmental & Soil Laboratory	Daniel Saunders Ryan Jacka	• Technical Support for SMP works.

2.1 Site Access

Vehicular access to the site is restricted to SHFA maintenance staff and contractors by permission only. Prior to the commencement of revitalisation works, the Project Manager will provide specific details regarding pedestrian and vehicular access to the site.

A perimeter fence must be erected around the entire works zone, with the contaminated regions further barricaded or identified. Signage should be erected at the two contaminated zones, identifying that the region is contaminated and work in the area is undertaken by permit and under supervision only.

3 SITE INFORMATION

3.1 Site Location and Ownership

The site is located at First Fleet Park, The Rocks NSW. It is described as Lot 7002 in Deposited Plan (DP) 1057990. The site is approximately 0.866 hectares (Ha) in area according to aerial photography.

3.2 Site Identification

The site is located between George St, Circular Quay West, Cahill Expressway and Sydney Harbour.

Table 2 details specific site information.

Table 2 – Site Identification Details

Site Owner	Sydney Harbour Foreshore Authority
Site Address	Corner Circular Quay West and George Street, Sydney
Lot and DP Number	Lot 7002 DP 10057990
Local Government Area	City of Sydney Council
Current Zoning	Public Open Space
Distance from Sydney CBD	900m north of Sydney CBD
Geographical Coordinates	Latitude: -33.513698 Longitude: 151.123302
Site Area	0.866 Ha (Total site)
Assessment Area	0.65 Ha (Exposed soil regions)
Site Elevation	5m AHD
Locality Map	Figure 1
Site Layout	Map 1

3.3 Site Characterisation

3.3.1 Site Drainage and Topography

The elevation across the survey area is approximately 5 metres (m) Australian Height Datum (AHD). It is assumed that the site surface water would discharge to Sydney Harbour to the East. The site is reclaimed land containing significant quantities of imported fill materials.

3.3.2 Proximity to Local Sensitive Environments

Sydney Harbour is situated approximately 13m to the east.

No remnant vegetation occurs within the assessment area.

3.3.3 Soil Contamination

The DSI undertaken by SESL on the site indicated that two (2) sub surface locations (A2/0.5 and B4/0.35) contained levels of benzo(a)pyrene and PAHs above the adopted HILs for the current landuse. Elevated levels of heavy metals were detected at two surface locations, BH7/0.1 (Mercury) and BH9/0.1 (Zinc), above the adopted phytotoxicity based investigation levels (PPBIL). See Map 1 for contaminant hotspot location.

No reports of groundwater investigations involving sampling and testing were available for the site. If future land uses propose the utilisation of groundwater, then a groundwater investigation should be undertaken to assess its suitability for the proposed use.

3.3.4 Surrounding Land Use

The site is located within a key public open space area for passive recreation, adjacent the ferry terminals of Circular Quay to the east, the museum of contemporary arts, visitor centre and George Street to the west. A ferry terminal and boardwalk are located north of the site and the southern boundary is bordered by a footpath located beneath the Cahill Expressway.

Surrounding sites are also controlled by SHFA.

3.4 Site History

3.4.1 Current Land Use

The Site is used as Public Open Space and is under the management of SHFA.

3.4.2 Summary of Site History

The greatest potential for contamination as described in this account is during the landfilling works to bring the site up out from “mudflats and marshes”.

The quality of the fill material varies as development of Sydney cove progressed. Original filling was undertaken with alluvial sands, however the historical account does not describe the quality of fill used thereafter. Fill material has been impacted by the industrial growth of Sydney is expected to be present at depth on the site, with the potential for heavy metals and hydrocarbons to be present as key contaminants of concern.

4 SITE CONTAMINATION ISSUES

4.1 Previous Site Assessment Reports

SESL cited the following report:

- *Detailed Site Investigation – First Fleet Park, The Rocks (SESL, 2010)*

4.2 Summary of Previous Assessment

A summary of the results, conclusions and recommendations of this previous investigation are outlined below. The location of the identified contaminants is shown on Map 1.

"The finding of the DSI indicated levels of heavy metal, Benzo(a)pyrene (BaP) and Polycyclic Aromatic Hydrocarbon (PAH) contaminants exceeded the adopted thresholds (HIL or EIL) at four locations on the site.

A summary of results exceeding the HILs:

- *A2/0.5m exceeds the HILs for BaP (6.3 mg/kg) and PAH (73.4 mg/kg); and*
- *B4/0.35m exceeds the HILs for BaP (8.4 mg/kg) and PAH (73.1 mg/kg).*

A summary of the results exceeding EILs:

- *B7/0.1m exceeds the EILs for Mercury (1.2 mg/kg); and*
- *B9/0.1m exceeds the EILs for Zinc (290 mg/kg).*

The results indicate that the surface topsoil materials at locations B7 and B9 and the subsurface soil materials at A2 and B4 contain elevated contaminants. See Appendix B for full results compared to the adopted Guidelines.

It is the recommendation of SESL that these isolated areas may be removed from site under the guidance of a site-specific Remedial Action Plan (RAP) or maintained on site under the guidance of a site specific Environmental Management Plan (EMP). Based on this Phase 2 DSI, SESL consider the site suitable for the current open space landuse, subject to the implementation of a Remedial Action Plan (RAP) or Environmental Management Plan (EMP). A Site Validation Report (SVR) shall be carried out to ensure success of the RAP if adopted." (DSI, SESL 2010).

5 HAZARD ASSESSMENT

5.1 Site Specific Hazards

The particular hazards addresses by this SMP are those arising from contaminants present in soil dust and potentially groundwater. Site soils are known to have been contaminated with organic contaminants (i.e. PAHs, Benzo(a)pyrene), however there is significant anecdotal evidence that further contamination is present at depth on the site.

The initial assessment of off-site impacts involves assessing potential transport media and receptors. Additional review of available geological, topographical and hydrogeological information, regional information typically available from water resource management authorities, together with an on-site reconnaissance, is required to establish whether off-site impacts are significant.

5.1.1 Risk to the Environment

Environmental impacts are likely to be limited to migration of contaminated dusts from the site and removal of soils from the site. Environmental impacts are possible due to the location, topography and use of the site.

5.1.2 Odours

Heavy metal and PAH contaminants are not considered volatile, and so odour emissions are not expected. However there is a possibility of buried organic materials, industrial waste and natural marine sediments that may cause an odour issue. These sources of odour were not identified in the surface 500mm of the site.

5.1.3 Dust Generation

Disturbance and subsequent generation of dust, noted to be impacted with elevated Benzo(a)pyrene exceeding the adopted guideline thresholds (Column E – Parks, recreational open space. NEPM, 1999) represent the most significant risk during general maintenance works carried out on site.

5.1.4 Soil Excavations

Disturbance of the site could result in more significant impacts from exposure and/or discharge of contaminated soils and groundwater. These issues should be specifically addressed during preparation of the Construction EMP, Site Safety Management Plan (SSMP) and the Safe Work Method Statements (SWMS) for any particular activity. Disturbance of the site such that groundwater is discharged is considered unlikely due to the limited excavation depth required for the proposed development.

5.2 Health Risk

5.2.1 Exposure Pathway

For a hazard to present a risk, there must be a potential for exposure to that hazard. A number of contaminant exposure pathways exist, comprising:

- Inhalation of contaminants in the form of dust;
- Ingestion of contaminated soil, dust or water; and
- Dermal adsorption of contaminants through skin contact.

The major hazardous properties of the contaminants of concern for First Fleet Park are summarised in Appendix B.

5.2.2 Health Risk for Non-intrusive Site Use

SESL have adopted the NEPM (1999) Guideline: *Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater* to apply the relevant health risk criteria for the site. For general site use (i.e. Public Open Space) involving non-intrusive activities, human exposure to contaminated soils is a moderate risk. The potential risk arises from the elevated lead and BaPs identified within the subsoil in the investigation area.

5.2.3 Risk From Disturbance of Soils

Given the presence of the identified contaminants (i.e. PAHs and BaP) within the soil in the investigation area the potential for inhalation of dust by site maintenance workers and dermal contact is considered the principal health risk to be managed in the area controlled by the SMP.

Dust migrating from the site is also considered likely and therefore dust suppression controls must be employed during site works.

Heavy metals were not identified at levels that exceed health guidelines, however due to the historical landuse, it should be expected that heavy metals are present.

5.2.4 Measures to Minimise Exposure to Workers

As human health risks associated with the site in its current condition is confined to the potential exposure of the public and maintenance workers to soil and dust, by ingestion and inhalation, management of the risk is largely limited to minimising contact with soil and minimising dust generation.

Measures to minimise exposure to workers from ingestion and inhalation include:

- Avoid contact with soils and dust;
- Do not eat, drink or smoke when undertaking activities which involve disturbance of the contaminated soils or dust;
- Avoid contact with impacted soils;
- Minimise disturbance of dust;
- Removal of soil, using appropriate supervised techniques, is to be controlled to minimise dust generation;
- Observe good hygiene such as washing the face and hands before eating, drinking or smoking; and
- Wearing of appropriate PPE (long trousers, gloves, eye protection and dust mask).

Examples of measures are detailed in Table 3.

Table 3 – Exposure Pathways and Control Measures for Contaminants of Concern

Contaminant of Concern	Exposure Pathways	Control Measures
BaP	○ Dermal contact with soil contaminated soils. ○ Inhalation of dusts generated.	○ Wear long sleeve shirts, long trousers, coveralls, safety boots, gloves, safety glasses. ○ Keep dust generation to a minimum. Wet dusty surfaces prior to works. ○ Do not work in windy conditions (to be determined by Site Manager). ○ Remain up wind of any dusts generated. Use a mask to minimise dust exposure. ○ Do not eat, drink or smoke in the vicinity of impacted areas. ○ Observe general hygiene, wash hands and face before eating/drinking.
Heavy metals		

5.2.5 Management of Exposure to Dust

Prior to any works or other activities carried out in investigation area (ESA; SESL, 2009) consideration must be given to how the work or activity can be undertaken with minimal dust generation. The dust control or avoidance measures should be documented in a SWMS prepared for the proposed works. Secondary controls, such as the wearing of dust masks should also be considered. Further details of OH&S management requirements are provided in Appendix C.

Should any unexpected hazards arise, the Project Manager should be contacted immediately so that the risks (health or safety) can be re-evaluated and the appropriate level of management and/or protection can be implemented prior to the recommencement of any works.

5.3 Emergency Response

During any activities involving disturbance of the site, a copy of the emergency response information is to be posted on site showing the emergency meeting point, contact details and the location and route to the nearest hospital with emergency facilities. Emergency Contact details are shown in Table 4.

Table 4 – Emergency Response Contact Details

Resource	Contact Name	Phone
Ambulance	Ambulance Service of NSW	000
Hospital	St Vincent's Hospital, Darlinghurst, the emergency entry is on Victoria Street.	(02) 8382 1111
Police	NSW Police Service	000
Fire Department	NSW Fire Brigade	000
Poison Information Centre		131 126
SESL	Daniel Saunders Ryan Jacka	0417 011 305 0433 245 221
SHFA	TBA	(02) 9240 8500
Project Manager	TBA	TBA

6 SOIL MANAGEMENT OPTIONS

SESL recommends two possible approaches for dealing with the identified contaminated soil. These are onsite containment and management or offsite removal of soil determined to be located within hot spots. Generally, retaining soil on-site for remediation is the preferred method of soil management where appropriate, pending on planning volume of the identified contaminants, and cost involved in capping the material, off site disposal must considered to address the identified contamination control.

Currently onsite containment and management is the preferred method to address the identified contamination. In all cases, environmental issues must be managed by the Project Manager or civil contractor in accordance with the best environmental management practices. The purpose of these measures is to prevent public and environmental exposure to the contaminated fill.

These management principles are relevant to each of the SMP procedures:

1. The disturbance of contaminated subsoil should be avoided wherever possible;
2. Where disturbance of contaminated material is unavoidable, preferred management strategies are:
    a. Minimisation of disturbance;
    b. Dig and dump to licensed offsite facility;
    c. Strategic reburial

    Other management measures may be considered but must not pose unacceptably high risks;
3. Works should only be performed when it has been demonstrated that the potential impacts of works involving contaminated soil are manageable to ensure that the potential short and long term environmental impacts are minimised;
4. The material being disturbed and any other unknown contaminated soil and waters associated with works, must be considered in developing a Remedial Action Plan complying with general environmental due diligence;
5. Receiving environment either on site or offsite must have necessary receiving criteria satisfied; and
6. Management of disturbed contaminated soil is to occur if the SMP landuse criteria is exceeded or compromised.

6.1 Capping – Barrier Layer

Currently, the identified contamination is present at a depth of 0.35m and 0.5m. The overlying 350mm+ of recently imported soils provide an adequate capping barrier, allowing the site to be used as public open space without a risk of encountering contaminated soil.

During the proposed works, there is a potential for the soil in the contaminated regions to be disturbed.

Contaminated soil can be capped in order to provide a protective layer between the contaminated fill, the public park user and the environment. A suitable liner and capping layer will be determined between suitably qualified environmental engineers, civil contractors and the NSW DECCW.

Typical capping systems of non-leachable contaminants include covering with a geofabric warning layer for future management and maintenance. Once covered with this warning fabric, clean fill is then placed on top of the contaminant layer and compacted to grade.

Mechanical protection of geofabric with the unconsolidated fill material underneath requires the barrier layer to be increased to 0.5m (500mm) in the region of B4. This is the minimum depth recommended to ensure necessary protection of the geofabric barrier layer from damage from vehicular traffic and other post construction surface loads.

In the event that the capping layer within site is unlikely to experience vehicular traffic during construction and operational phases, then a reduced capping layer depth may be considered. The SMP must control the risk of penetration through effective institutional management of the site. The selection and placement of capping material must ensure that the geofabric layer must is protected from mechanical abrasion and other potentially compromising loads. A reduced capping layer under this control program may be reduced to 0.15m (150mm) compacted and boundary areas controlled by effective containment.

Accurate construction plans and surface materials are required before a method suitable for capping is determined. A health risk assessment may be required to quantitatively assess site-specific exposure risks to users of the park.

It is important to note that the current level of soil cover provides and adequate barrier layer above the contamination. The above capping methods will only be required if this upper layer is to be removed. It is the first preference to leave the contaminated soil undisturbed, to prevent uncontrolled migration of contaminants from the location of known contamination. If it is necessary to disturb these soils, then they should be placed in a controlled contamination cell as described above.

6.1.1 Imported Fill Sampling

Soils materials to the site for capping and backfilling purposes should be analysed according to Appendix E, at the recommended rate of 1 sample per 500m^3 with a minimum of 3 samples per source site. If Virgin Excavated Natural Material (VENM) certified material is available, then sampling requirement may be revised. The number of representative samples can only be reduced in consultation with the Project Manager for the site. All stockpile of imported material are to be placed away from region of contamination.

6.1.2 Record Keeping

If soil is capped and left on site, documentation and construction drawings of the location and design of the capping cell must be kept. If ongoing maintenance of the cell is required, a covenant must be place on the title of the land.

6.2 Off-Site Disposal

Soil sampling to data is limited to works completed in report *Detailed Site Investigation – First Fleet Park* (SESL, 2010). The report identified significant PAH and BaP levels. No leachability assessments were undertaken to provide a waste classification for the contaminated material.

If any materials are identified for offsite disposal, they must be further assessed in accordance with the NSW DECC (2009) *Waste Classification Guidelines Part 1: Classifying Waste*.

SESL also recommends that before any soil leaves site that the following additional investigation are addressed:

- The preparation of a Remedial Action Plan (RAP) providing details for the remediation of contaminated soils identified on across the whole parkland Site; and
- The preparation of a Site Validation Report (SVR) should be prepared following the remediation of contaminated soils identified on Site to ensure success of the RAP.

6.3 Onsite Treatment

SESL considers that the impacted fill material will not be suitable for onsite treatment such as bioremediation as the primary contaminants of concern are PAH and heavy materials, which do not normally degrade quickly.

6.4 Stockpiling Contaminated Materials

Exposed or excavated fill materials or soils containing or suspected of containing significantly contaminated materials and/or potentially asbestos materials must not be left unattended. If it is necessary to leave the site unattended, the fill materials or soils must be dampened to prevent generation of dust, and placed back in the excavation and the surface cover reinstated so that exposure to these materials cannot be prevented to users of the public domain.

7 MONITORING AND REVIEW

7.1 Inspection and Maintenance Schedule

An inspection and monitoring schedule describing a control and monitoring program for minimising the environmental and occupation health and safety impacts associated with the works is provided in Appendix D.

Then monitoring plan sets out the roles and responsibilities and detail of the programs and reporting requirements associated with the environmental and OH&S controls outlined in this SMP.

7.2 Complaint and Incident Management

In compliance with the EMP, the following procedures must be followed to if a complaint or incident occurs.

If a complaint is made by a member of the public or by any other person with respect to and environmental management or control issue either during “minor works” or during “major works” or at any other time, appropriate corrective action is required to be undertaken as soon as practicable.

Similarly, if an or an environmental incident occurs that has given or may give rise to pollution of soil, air or waters, appropriate corrective action is required to be undertaken as soon as practicable.

In addition to the above, complaints and environmental incidents are required to be notified to the Authority’s Regulatory Manager Property and Asset Management as soon as practicable after a complaint has been made or an environmental incident has occurred.

Records of complaints and incidents are required to be entered into the Register contained in Appendix D of the EMP, but only after corrective action has been taken and the Authority’s Regulatory Manager Property and Asset Management has been notified.

7.3 Review of SMP

This SMP should be reviewed prior to any changes to the current or proposed landuse scenario. Any changes to this scenario are considered to include any issues relating to access control, increased access to the property subsoil, changes of use, change of ownership, remediation of works etc. Any works undertaken and changes to site conditions will be documented.

8 LIMITATIONS

This report only covers the site conditions at the time of the site inspection and sampling (DSI, 06/01/09). Should there be any variation in the site conditions beyond this date, such as imported fill, chemical spillage, illegal dumping, further assessment will be required. Any imported fill should be tested, or appropriate validation certificates should be provided by a suitably qualified consultant in order to ensure suitability for the proposed development. In addition, the imported fill material must be free from asbestos, ash and odour, not be discoloured and not be an acid sulfate soil.

SESL's assessment is necessarily based on the result of limited site investigations and upon the restricted program of visual assessment of the surface and consultation of available records. Neither SESL, nor any other reputable consultant, can provide unqualified warranties nor does SESL assume any liabilities for site conditions not observed, or accessible during the time of investigations.

No site investigations can be thorough enough to provide absolute confirmation of the presence or absence of substances, which may be considered contaminating, hazardous or polluting. Similarly, the level of testing undertaken cannot be considered to unequivocally characterise the degree or extent of contamination on site. In addition, regulatory or guideline criteria for the evaluation of environmental soil and groundwater quality are frequently being reviewed and concentrations of contaminants which are considered acceptable at present may in the future be considered to exceed acceptance criteria. Similar conditions may prevail in regard to site remediation standards as different regulatory mechanisms are developed and implemented.

9 REFERENCES

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Map 1 - Site Layout and Hotspot Locations

First Fleet Park, The Rocks NSW

KEY: Bore Hole

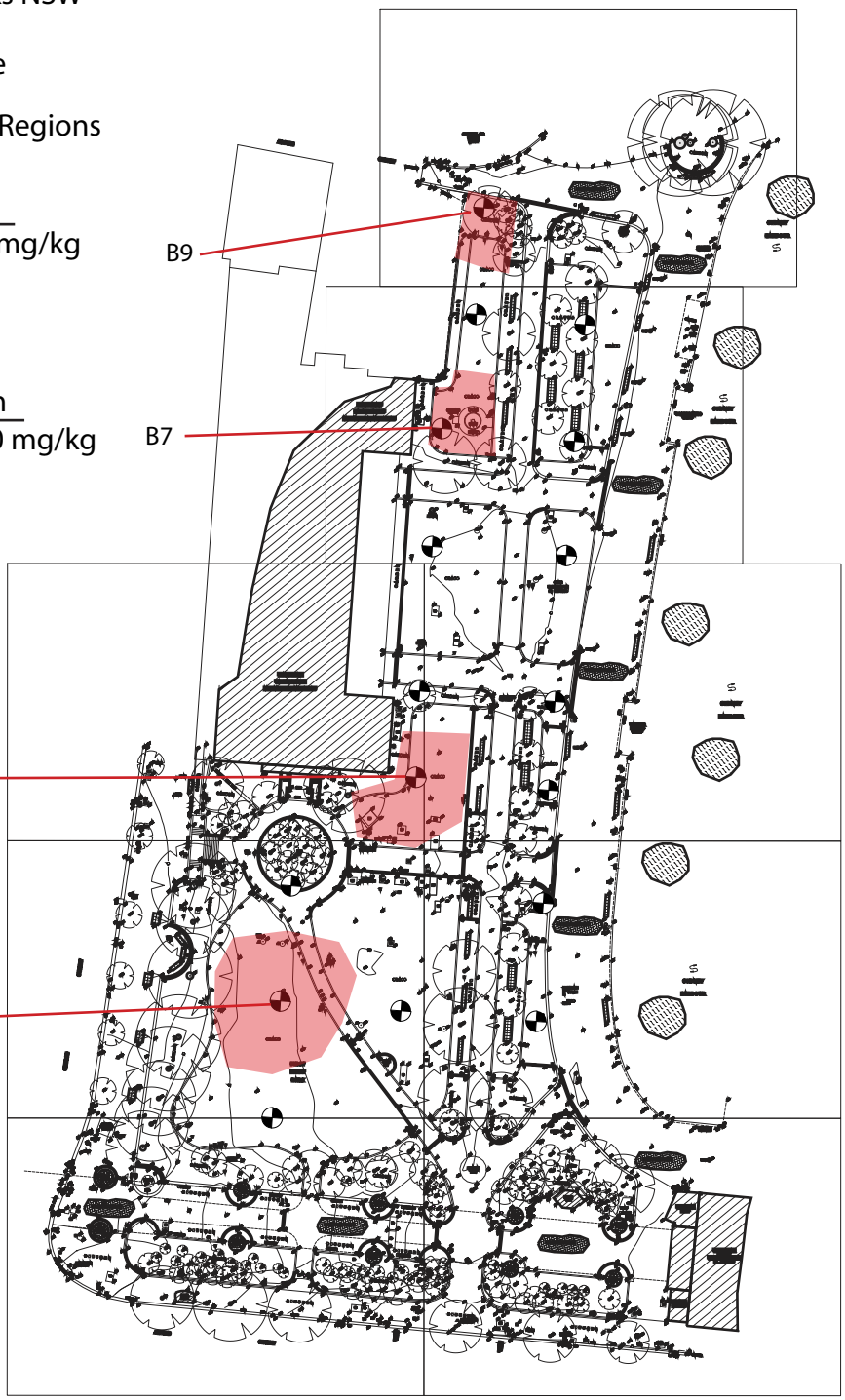
Affected Regions

B9/0.1m
Hg - 1.2 mg/kg

B7/0.1m
Zn - 290 mg/kg

B4/0.35m
BaP - 8.4 mg/kg
PAH - 73.1 mg/kg

A2/0.5m
BaP - 6.3 mg/kg
PAH - 73.4 mg/kg



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APPENDIX - A

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Appendix A – Legislative and Policy Obligations

1.1 A Compliance with Regulatory Requirements

Environmental Planning and Assessment Act and Regulations

Remedial works at the Site are not considered to present a designated development under Schedule 3 of the EP&A Act. Furthermore, the program of rehabilitation works described in this RAP has been designed so that works should not adversely affect the environment and should be an improvement to the environment. For these reasons the remediation works will not require the preparation of an Environmental Impact Statement (EIS).

State Environmental Planning Policy (SEPP No.55 – Remediation of Land)

The objective of this planning policy is to provide a statewide planning approach to the remediation of contaminated land. In particular the policy aims to promote the remediation of contaminated land for the purpose of reducing risk of harm to human health or any other aspect of the environment. The planning policy applies to this site because the site is categorised as Category 2 remediation work.

The Site is considered not to be Category 1 site because the remediation will not be carried out in an area under an environmental planning instrument and the remediation is not required by a remediation order.

Under Category 2 the remediation work does not require consent under SEPP 55.

1.2 A Assessment Criteria

1.2.1 Soil Investigation Levels (SILs)

The NSW DEC has endorsed the use of the Soil Investigation Levels (SILs) given in the *Schedule B(1) Guideline in the Investigation Levels for Soil and Groundwater* (NEPM, 1999). The guidelines provide both Health Based Investigation Levels (HILs) and Ecologically Based Investigation Levels (EILs).

HILs are given in the NEPM for 4 types of land uses:

A Standard residential with garden/accessible soil (home grown produce contributing less than 10% of vegetable and fruit intake; no poultry) this category includes children's day-care centres, kindergartens, preschools and primary schools.

D Residential with minimal opportunities for soil access, including dwellings with fully and permanently paved yard space such as high-rise apartments and flats.

E Parks, recreational open space and playing fields, includes secondary schools.

F Commercial/industrial includes premises such as shops and offices as well as factories and industrial sites.

The HILs that are appropriate for the Development Site correspond to the NEPM E criteria

for parks and recreational open space, together with the EILs. A summary of the HILs and EILs that have been adopted for assessing the investigation and remediation of the site are provided in Appendix A Table 2.

Appendix A - Table 2. Soil investigation levels for urban development.

Health-based investigation levels (mg/kg)					*Provisional Phytotoxicity Based Investigation Levels ** for sandy loams of pH 6-8 (PPBIL)*
	Column 1	**Column 2**	***Column 3***	**Column 4**	
	Residential with gardens/accessible soil including children's day care centres, preschools, primary schools, townhouses and villas (NEHF A)	Residential with minimal access to soil including high rise apartments and flats (NEHF D)	Parks, recreational open space playing fields including secondary schools (NEHF E)	Commercial or Industrial (NEHF F)	
Metals/Metalloids					
Arsenic (total)	*100*	400	**200**	500	***20***
Beryllium	*20*	80	**40**	100	**-**
Boron	*3000*	12000	**6000**	15000	**-**
Cadmium	*20*	80	**40**	100	***3***
Chromium (111)**	*12%*	48%	**24%**	60%	***400***
Chromium (VI)	*100*	400	**200**	500	***1***
Cobalt	*100*	400	**200**	500	**-**
Copper	*1000*	4000	**2000**	5000	***100***
Lead	*300*	1200	**600**	1500	***600***
Manganese	*1500*	6000	**3000**	7500	**-**
Methyl Mercury	*10*	40	**20**	50	**-**
Mercury (Inorganic)	*15*	60	**30**	75	***1*****
Nickel	*600*	2400	**600**	3000	***60***
Zinc	*7000*	28000	**14000**	35000	***200***
Organics					
Aldin + dieldrin	*10*	40	**20**	50	**-**
Chlordane	*50*	200	**100**	250	**-**
DDD+DDE+DDT	*200*	800	**400**	1000	**-**
Heptachlor	*10*	40	**20**	50	**-**
Polycyclic Aromatic Hydrocarbons (PAH)	*20*	80	**40**	100	**-**
Benzo(a)pyrene	*1*	4	**2**	5	**-**
Phenol ***	*8500*	34000	**17000**	42500	***70***
PCB (total)	*10*	40	**20**	50	**-**
Other					
Cyanides (complex)	*500*	2000	**1000**	2500	**-**
Cyanides (free)	*250*	1000	**500**	1250	

Aesthetic Guidelines

The 1999 NEPM '*Schedule B(1) Guidelines on the Investigation Levels for Soil and Groundwater*, advise that:

> *"there are no numeric Aesthetic Guidelines but the fundamental principle is that the soils should not be discoloured, malodorous (including when dug over or wet) nor of abnormal consistency. The state of the natural soil should be considered".*

ANZECC/NHMRC Site Remediation Policy

The preferred order of options for Site remediation and management is given by the ANZECC/NHMRC (1992) guidelines as:

- On site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
- Offsite treatment of excavated soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level, after which the soil is returned to the site.

If these options can not be implemented other options should be considered including:

- Removal of contaminated soil to an approved site or facility, followed where necessary by replacement of clean fill;
- Consolidation and isolation of the soil on site by containment within a properly designed barrier.

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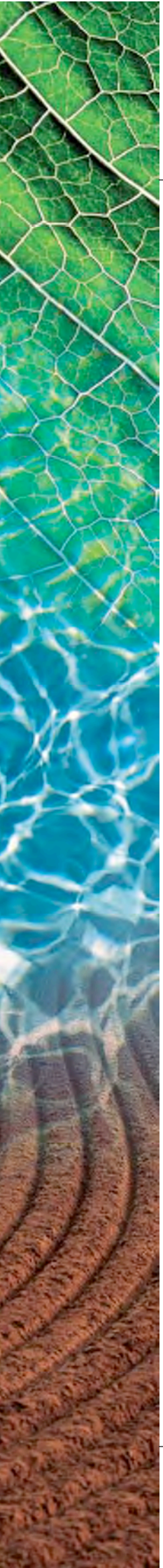
Appendix B – Properties of Known Soil Contaminants

Table 1. Known soil contaminants.

Name	NEPM Exposure Limit (Column A)	Physical description	Acute Health Effects	Chronic Health Effects	First Aid
PAHs (benzo(a)pyrene)	1 mg/kg	May be present in ash material (grey solids), tars(black viscous liquid – solid, with hydrocarbon odour).	Toxic: irritant. All chemicals should be considered hazardous. Direct physical contact should be avoided. Chlorocarbon materials have produced sensitisation of the myocardium to epinephrine in lab animals and could have a similar effect in humans.	Inhalation of vapours may contribute to cancer hazard. May contain benzo(a)pyrene amongst others. These are listed as human blood and animal lung, skin and kidney carcinogens.	In all cases consult a physician. Eye: Irrigate immediately. Skin: Remove contaminated clothes. Breat: Fresh air, respiratory support. Ingest: Seek medical attention immediately.



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Appendix C – Health and Safety Management Procedures

The information below is designed to be incorporated into the official procedures for site management. This information is not intended to be used 'as is' and only provides general advice. It is the responsibility of the Project Manager to prescribe the appropriate OH&S strategy for the proposed works.

The purpose of this Occupational Health and Safety Plan is to establish standard health and safety procedures for the personnel involved in the remedial works at the site.

The levels of protection and the procedures specified in this plan are based on the available information and represent the minimum health and safety requirements to be observed by all personnel involved in excavation and on site activities during the excavation works with respect to contamination. Higher levels may be necessary due to unforeseeable site conditions or personal preferences. Employees and their subcontractors must read this document carefully and complete a sign off sheet prior to site activity.

The ultimate responsibility and authority for the health and safety of the individual rests with the individual themselves and their colleagues. Each employee is responsible for existing utmost care and good judgment in protecting his/her own health and safety and that of other fellow employees. It is the responsibility pf the employer to bring any observed potentially unsafe condition or situations to the attention of the designated Site Health and Safety Officer. The designated Site Health and Safety Officer should be appointed and act in consultation with the environmental officer.

Should personnel find themselves in a potentially hazardous situation, the employee shall immediately discontinue the hazardous procedure and take effective correction or preventative action.

1.1C Potential Hazards

Potential hazards include:

- Exposure and possible absorption through skin of contaminants;
- Inhalation of volatile contaminant vapours;
- Slips, trips, bumps falls, falling objects, crushing injuries typical of every construction related job site;
- Fire or explosion; and
- Physical hazards noise and hot weather.

Exposure through the ingestion route can be controlled effectively by the use of gloves, good personal hygiene and the restrictions on smoking, eating and drinking in contaminated areas. The use of appropriate personal protective clothing and conscientious personal decontamination procedures can eliminate the risk of skin exposure. All soil and water should be treated as if it were contaminated.

1.2C General Procedures

The following personal hygiene and work practice guidelines are intended to prevent injuries and adverse health effects. These guidelines represent the minimum standard procedures for reducing potential risks associated with this project and are to be followed by the contractor, general personnel and subcontractors on site during excavation works;

- A fire extinguisher, a complete field first aid kit and a bottle of emergency eyewash solution will be maintained on site;
- Eating, drinking, smoking, taking of medicine, chewing of gum is prohibited in the immediate vicinity of the excavation activities;
- Neoprene rubber gloves as a minimum will be worn when soil, water or any other potentially hazardous substance is handled;
- Hands and if necessary, face will be thoroughly washed before eating or putting anything in your mouth;
- Always be alert to potential changes in exposure conditions such as strong odours, unusual appearance in soil, oily sheen on water etc.;
- Use of appropriate level of personal protective. Lesser levels of protection can result in preventable exposure; excessive levels of protective equipment can impair efficiency and increase potential for accidents to occur;
- Site-specific overalls are recommended for use on site. Site clothing is to be laundered separately; and
- The site induction should increase decontamination procedures and OH&S procedures for all staff involved with contaminated material.

1.3C Personal Protective Equipment

The level of personal protective clothing required at the site during the excavation will consist of the following:

- Steel toed boots;
- Hard hat;
- Gloves
- Hearing protection if required;
- Safety glasses if required;
- Safety vest;
- Long sleeved, long pants overalls (disposable if required); and
- Half faced respirator fitted with organic compound and asbestos fibre filter is to be available on site for each personnel.

Site personnel and subcontractors are expected to provide their own personal protective clothing and equipment equivalent to those recommended above.

1.4C Contaminant Vapour

The soil gases are to be minimised through the wetting of the excavation areas and if required the use of organic compounds absorbent solutions. Initially a PID will be used on site at all times to determine the concentrations of volatile organic. Both ambient air and breathing space readings will be taken throughout the course of the works.

Preliminary exposure setting for various substance s have been outlined in the *Exposure Standards for Atmospheric Contaminations in the Occupational Environment, Worksafe*

Australia (May 1995). The trigger level based on these values is set to 50ppm of volatile organic compounds within the breathing space of workers. If greater concentrations are observed, work practices will be reviewed in an effort to reduce gas emissions. Half face respirators will also be available for field personnel if required.

1.5C Decontamination

All personnel and subcontractors should familiarise themselves with the nearest medical facility, for the site locality is Royal North Shore Hospital, St Leonards, the emergency entry on Reserve Road.

In the event of an emergency, the procedures specified below will be followed. If an unanticipated potentially hazardous situation arises as indicated by instrument readings, visible contamination, unusual or excessive odours etc. Site and subcontractors shall temporarily cease operations, move away to a safe area and assess the situation. In the event of an emergency, employees shall contact the local fire brigade or paramedics as appropriate by calling 000.

1.6C Fire and Explosion

In the event of fire or explosion:

- If the situation is readily controllable with available resources, take immediate action to do so. This may include:
  - Assessment to determine whether the situation is controllable.
  - If the situation is controllable, dispatch fire fighting equipment to the site of the fire and take immediate action.
  - Attempting to put out the fire using methods compatible with the burning materials
  - Isolate the fire to prevent spreading, if possible.
- If the situation is not immediately controllable, notify the local fire department (000) and evacuate all non-essential personnel from the site.

1.7C Community Consultation and Liaison

The Council will decide on the most appropriate community liaison strategy. As the Council should be informed of the remediation project and the condition of the site, it is imperative that an effective consultation process be developed.

1.8C Unforseen Circumstances

The health and safety procedures specified in this plan are based on available data, which suggest minimal potential for worker exposure to significant levels of hazardous substances. Should substantially higher levels of contamination be encountered in the soil or groundwater, or should situations arise which are obviously beyond the scope of the decontamination procedures specified herein, work activities will be modified or if necessary halted pending discussion with the site representative and Council.

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Appendix D – Site Environmental Controls and Maintenance Schedule

The information below is designed to be incorporated into the official procedures for site management. This information is not intended to be used 'as is' and only provides general advice. It is the responsibility of the Project Manager to prescribe the appropriate Construction EMP for the proposed works.

Best practice procedures will be followed throughout the rehabilitation project to protect the environment within and around the site. These procedures will involve:

- Surface water management;
- Control of fugitive emissions;
- Dust control measures;
- Groundwater control measures;
- Noise and vibration measures; and
- Equipment cleaning and operation.

1.1 D Erosion, Sediment and Surface Water Management

1.1.1 Approach

An important part of the remedial works will be the management of erosion, sediment and surface water. The strategy to be adopted will aim to:

- Prevent soil erosion at the site;
- Protect off site waters and sediment from being polluted by onsite sources;
- Minimise impacts to on site-surface waters from remedial works during the project; and facilitate the implementation of the remedial works program.

The strategy will involve the instillation and operation of a number of environmental control measures that will be progressively implemented as work proceeds across the site. The design approach adopted will satisfy the follow principles:

- Minimise the are of disturbed soil exposure wherever possible by staging the works;
- Control water flow from the top of the site, through the works and out the bottom of the site;
- Runoff from clean or remediated areas will be diverted away from unremediated areas of the site;
- Runoff will not be allowed to enter or overflow the unremediated area;
- In the case of an extreme rainfall event, overflow water from unremediated areas will be filtered through straw bales and silt fences prior to discharging from the site. Given the short duration of the rehabilitation program, the probability of an extreme event occurring is considered be very low; and
- Rehabilitated disturbed lands as quickly as possible.

Regular maintenance of all erosion, sedimentation and pollution control devices would be undertaken to ensure their continuing effective and efficient operation.

1.1.2 Protection of Excavation

Surface waters will be prevented from entering excavations by the construction of bunds and diversion drains around the perimeter of excavation areas. Water excluded from entering the excavation will be directed to individual retention basins if required.

Rainfall entering excavations will be allowed to evaporate / dissipate naturally or be pumped out of the excavation and either sent to the temporary water retention basins, used for dust irrigation/dust suppression purposes. The end use will depend on the quality of the ponded water.

1.1.3 Stormwater Control in Remediated Areas

Erosion protection in disturbed areas of the site will be provided by:

- Grassing and the establishment of other vegetation;
- Grading and sealing of areas proposed for future development by compaction of the upper soil layers; and
- The construction and maintenance of or erosion and sediment control measures such as contour drains, straw bales and silt fences.

1.2 D Control of Fugitive Emissions

Odour generation and air quality will controlled throughout the program of remedial works by the following procedures and techniques:

- The remediation contractor to use treatment methods and equipment having emissions which comply with NSW EPA requirements;
- All loads of contaminated material leaving the site will securely covered; and
- The prevailing weather conditions will be considered in the manner in which work is undertaken.

All practicable measures will be taken to ensure that fugitive emissions emanating from within the site are minimised such that nuisance odours cannot be detected outside the site boundaries and the ambient air quality is not adversely impacted.

The ambient air monitoring program and the on-site monitoring program will monitor odour levels at the site boundary and within the property throughout the project. As discussed a PID will be used to monitor volatile organic vapours in the breathing space of the site workers and at the site boundaries as required. A breathing space and site boundary trigger value of 50ppm is set for additional vapour monitoring.

1.3 D Dust Control Measures

The following procedures and techniques will control dust generation:

- A tarpaulin will securely cover all loads of soil contaminated material entering or leaving the site;
- Water sprays will be used across the site over unsealed or bare surfaces;
- Plastic sheeting will be used by the remediation contractor to cover excavation faces and stockpiles where necessary;
- Materials at the site will be processed, handled, moved and stored in a proper and efficient manner in order to minimise exposure; and
- No material processing shall be undertaken on site.

1.4 D Groundwater Control Measures

If groundwater is encountered during remediation works, then groundwater would be pumped into holding containers to be analysed for contaminants prior to being disposed off site by an approved EPA licensed contractor.

1.5 D Noise and Vibration Control Measures

Noise and vibration levels will be controlled throughout the project. Special precautions will be taken to avoid nuisance in neighbouring areas, particularly from machinery, vehicles and waring sirens. The control measures to be implemented will include the following:

- All construction vehicles involved in the rehabilitation project will generally enter and leave the site in accordance with specified site entry controls;
- Use of suitable construction techniques and methodologies;
- Selection of quieter equipment, use acoustic enclosures, construction of suitably placed acoustic barriers or earth mounds and the fitting or 'residential class' mufflers and noise reduction kits to earthmoving and excavation equipment will be fitted;
- All material processing equipment will have noise attenuation measures that make the equipment suitable for use in urban areas and by which comply with regulatory requirements. The protection measures where necessary will include:
    - The encapsulation of engine chambers;
    - Fitting NSW EPA approved silencers to all powered operated plant.
- The use of reversing alarms will be adjusted according to the prevailing ambient noise level.

All practical measures will be taken during the remediation works to minimise the generation of noise and vibration from within site so that it remains within acceptable levels. In the event that short term noise operations are necessary, and where these are likely to affected residences, notification will be provided to residents, specifying the expected duration of the noisy work.

1.6 D Equipment Cleaning and Operation

Throughout the site rehabilitation project, controls will be placed on the operation and movement of equipment. General procedures that will be implemented include the following:

- Equipment working within an excavation will be washed inside the area so that any wash water will run into the excavation. Wash waters will be allowed to naturally evaporate or be removed from the excavation along with ponded surface water;
- Equipment washing facilities will be provided for the effective cleaning of equipment after they have been loaded with contaminated fill, and prior to their leaving the site. The facilities will also be used to clean other earthmoving plant and equipment used on site;
- All trucks transporting material off site shall be securely covered immediately after loading the fill to prevent wind blown emissions and spillage;
- All truck tailgates shall be securely fixed prior to loading and immediately after unloading fill material;
- No trucks or equipment carrying contaminated materials shall be allowed to move across remediated areas except across designated transportation corridors;
- All vehicles transporting materials on site shall be operated in a manner so as to prevent any loss of materials during loading, transport and unloading activities; and

- Any storage tanks or drums used for fuels or liquids shall be bunded and bund shall contain at least 110% of the largest tank contained or 25% or the total volume of all drums, whichever is the grater, and the bund shall not be penetrated by any services.