

**Remedial Action Plan and Remediation  
Dust Control and Monitoring for  
20 Adelaide Street, Hazelmere, WA**

**draft**

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Report written for Hazelland Pty Ltd  
January 2019

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**Stass Environmental**

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Figure 1 - Regional and local setting

Figure 2 - Proposed RAP remediation scheme

September 2018

# Remedial Action Plan and Remediation Dust Control and Monitoring for the 20 Adelaide Street Hazelmere, WA

## 1 INTRODUCTION

### 1.1 Documentation

Several reports and investigations have been undertaken on the subject Site from c.2005 to present. The information and results of these investigations are compiled in the following documents and should be read in conjunction with this Remediation Action Plan (RAP):

1. FOI 1233/05 by Department of Environment & Conservation (DEC) – Freedom of Information – Lot 20, Adelaide Street, Hazelmere (October 2005);
2. 2145245A:PR2\_16644.RevA by Parsons Brinckerhoff – Site Investigation (SI) – Hazelmere, WA (July 2006) (see figure 1);
3. V392/2007 grw4469 by Knight Frank – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
4. 476300-0kjc070709a by Burgess Rawson – Valuation Report – Lot 20 Adelaide Street, Hazelmere, WA (July 2007);
5. 60150301 by AECOM – District Storm Water Management Strategy – Hazelmere Enterprise Area (June 2010);

6. Drilling Logs by Banister Drilling & Irrigation for 20 Adelaide Street, WA. (May 2012);
7. E2012-031 (GME) – MDWES – Groundwater Monitoring Event #1 – Adelaide Street Hazelmere (May 2012);
8. NTEC Environmental Technology – Groundwater Modeling for the Wasterock Hazelland Landfill Site in Hazelland. (September 2012).
9. E2012-031 (GME) – MDWES – Groundwater Monitoring Event #2 – Adelaide Street Hazelmere (August 2012);
10. E2012-031 (GWAMP) – MDWES – Groundwater Abstraction for Dust Suppression & Surface Compaction v2 – Adelaide Street Hazelmere (October 2012);
11. E2012-031 (GME) – MDWES – Groundwater Monitoring Event #3 – Adelaide Street Hazelmere (January 2013);
12. E2013-031 – (SAMP) - MDWES – Soil Amendment Management Plan – Lot 20 Adelaide Street, Hazelmere (March 2013).
13. E2012-031 (GME) – MDWES – Groundwater Monitoring Event #4 – Adelaide Street Hazelmere (June 2013);
14. E2012-031 (AQMP) – MDWES – Air Quality Management Plan (AQMP) v2 – Adelaide Street Hazelmere, (October 2013).
15. Community Management Strategy (2013) Rowe Group. Rep Ref 7229. March 2013
16. Environmental Site Management Plan Lot 20, Adelaide street, Hazelmere, WA, 2014. Prepared by MWD Environmental Services, February 2014.

## 1.2 Background

Stage I, Preliminary Site Investigation (PSI) and Stage II, Detailed Site Investigation (DSI), were undertaken by Parson Brinkerhoff (2006) and the following sections summarise the investigation information.

The Site is located at Lot 20 Adelaide Street, Hazelmere, Perth (herein referred to as 'the Site'), within the City of Swan, approximately 14 km east north east of the Perth CBD, 6km east of the Swan River and 1 km west of the Darling Fault (Figure 1). It is currently vested with Wasterock Pty Ltd and has been since 2006. The Site historically operated as a licensed uncontrolled inert landfill from c.1987 to c.1997, after first being mined for building and construction sand. Current Site owners Hazelland Pty. Ltd (Owner) have subcontracted Wasterock Pty Ltd (WRK) to

undertake the required remediation work in order to make the Site developable for the future use (commercial / industrial).

The landfill covers the vast majority of the Site rising up to a maximum of eight metres above ground level in parts. Steep battered edges between 5m and 8m in height define the edge of the landfill. A shallow access ramp is located in the middle of the southern edge of the landfill which leads to the top of the landfill. The north western edge of the landfill has a slighter gradient than the other edges of the landfill.

A number of studies have taken place over the years upon the Site. These studies have identified varying levels of contamination primarily caused by Total Petroleum Hydrocarbon (TPH), Monocyclic Aromatic Hydrocarbons (MAH's), Heavy Metal impacts and potential Asbestos.

Based on the findings of the reports, the Department of Water and Environment Regulation (DWER) (formally DWER and DEC) classified the Site as 'Possibly contaminated – investigation required' on 27 April 2007 (VDM, 2008). In November 2010 the DWER revised this judgment and reclassified the Site to – 'Contaminated - remediation required'.

### 1.3 Site Identification

Site identification details are summarised below:

<b>Site Name:</b>	Adelaide Street Remediation (ASR).	
<b>Site Location:</b>	Lot 20 Adelaide Street, Hazelmere, Perth, WA.	
<b>Certificate of Title:</b>	Current Certificate of Title (CoT)	Vol: 2054 Folio: 299
<b>Site Area</b>	The Site dimensions measure approximately 565m (L) and 300m (W) Approximately area 169,500m <sup>2</sup> (16.9ha.).	
<b>Site Owner</b>	Hazelland Pty Ltd	
<b>Operations</b>	Closed landfill	
<b>Local Government</b>	City of Swan	
<b>DWER Classification</b>	Contaminated-Remediation Require	
<b>Proposed Zoning</b>	Commercial Industrial post remediation.	
<b>Locality Map</b>	See Figure 1	

### 1.4 Environmental Site Setting

The Site is an irregular shaped plot of land that has remained redundant and non-operational as a landfill since c.1997. The Site has been allowed to vegetate and stabilise from its closure to the present date. Much of the Site is overgrown with a variety of persistent introduced flora and some juvenile and semi-mature trees. The Site could be described currently as waste

land and undeveloped. The Site measures approximately 565m in length and 300m in width with a total combined area of approximately 16.9ha.

The Site is bound to the north by commercially developed land (LOGOS).

The east of the Site is bound by the Roe Highway (running north to south). In addition, on the south-east boundary of the Site, there is an operational sand quarry and landfilling operation (WAR Pty Ltd).

To the south, Adelaide Street runs south-east to north-west, bounding the High Wycombe residential estate. Future operations on the subject Site may have the potential to impact on neighboring residents.

Immediately to the west of the Site is an ice works and meat processing works. Furthermore, there are several undeveloped lots of land interspaced with small industrial/commercial premises surrounding the Site. At present it is perceived that these industrial/commercial operations have little impact or influence on the subject Site. However, future operations on the subject Site may have the potential to impact on those neighboring sites.

## 1.5 Site History

The Preliminary Site Investigation (PSI) reports state that the Site was primarily mined (open cut) for sand between c.1978 and c.1982. The sand was mined up to a reported 6mbgl. However, this may have been deeper in places. The mined area was then utilised as an inert landfill which was common practice for this time period.

Although primarily licensed for inert waste during its operational cycle, a number of potentially non-inert wastes may have been received at the landfill. The non-inert material was received with the knowledge and approval of the regulating authority, which at the time was the Shire of Swan. Records show that the received materials were described as inert building waste, car bodies and asbestos sheeting / pipes / tiles. In addition, it was reported that sludge's containing hydrocarbons, together with emulsified factory wastes, drums (unknown), drums of kerosene, bitumen, pesticide-contaminated soils and hospital wastes were also accepted. Based on the history of waste accepted on site it is possible the putrescible waste may have been accepted. However, this has not been confirmed and can only be identified during remediation of the Site.

The landfill recorded a finish level of approximately six to eight metres above surrounding surface levels (c.1990), which, by 2018, would have subsided significantly due to compaction.

## 2 SITE DESCRIPTION

Site descriptions/location and other pertinent information have been provided in earlier documents and only summaries are reprinted here. Please refer to the before mentioned documents for this or related information.

### 2.1 Geology

The underlying geology has been reported from the Geological Survey Western Australia (1986) 1:50,000 sheet number *2034 I and 2034 II* entitled "Perth" and Davidson (1995).

These sources indicate that the Site's underlying natural geology comprises Bassendean Sand, inter-fingered with Guildford Clay.

Bassendean Sand is present over most of the central Perth Region and lithologically, it is readily identifiable from drill cuttings. The unit varies in known thickness and can extend to a maximum of approximately 80 mbgl, depending mainly on the topography.

Bassendean Sand is pale grey to white and is fine to coarse but predominantly medium grained. It consists of moderately sorted, sub rounded to rounded quartz sand and commonly has an upward fining progression in grain size. Fine-grained, black, heavy minerals are commonly scattered throughout the formation but in places are more concentrated in thin layers or lenses probably indicating a shallow-marine origin. A layer of friable, limonite-cemented sand, colloquially called 'coffee rock', occurs throughout the strata. The coffee rock is usually encountered near the water table.

Bassendean Sand unconformably overlies the Cretaceous and Tertiary strata and interfingers to the east with Guildford Clay, and conformably overlies the Gnangara Sand. To the west, it is unconformably overlain by the Tamala Limestone. The stratigraphic relationships of the Bassendean Sand with the Guildford Clay and Gnangara Sand indicate that the formation was deposited under changing and conceivably alternating fluvial, estuarine, and shallow-marine pre-historic time periods.

Guildford Clay is predominantly of fluvial origin and is restricted mainly to the areas of its outcrop. However, it is also found locally in areas removed from present drainages such as Menora (north of Perth) and Fremantle (southwest of Perth). To the south of Perth, in the Ferndale-Lynwood area, widespread thick, black, silty clay is possible and could be of a lacustrine or fluvial origin. This outcrop of Guildford Clay exists over much of the eastern Perth Region and unconformably overlies the Jurassic and Cretaceous rocks, Kings Park Formation, Ascot Formation and Yoganup Formation.

The Guildford Clay consists of pale-grey, blue, but predominantly brown silty and slightly sandy clay, and interfingers to the west with the Gnangara Sand and Bassendean Sand. The geological unit can be observed up to 35 m thick. It commonly contains lenses of fine to coarse grained, very poorly sorted, conglomeratic and (in places) shelly sand at its base, particularly in the Swan Valley area. These basal lenses, which occur sporadically along the eastern margin of the coastal plain, are probably remnant deposits of the Ascot Formation or the Yoganup Formation which the Guildford Clay can overlay.

## 2.2 Hydrogeology

The uppermost aquifer underlying the region of the Site is the unconfined Superficial Aquifer (Water Register, 2012). Leederville and Yarragadee North aquifers underlie the Superficial. The base of the Superficial Swan Aquifer is mapped (DoE, 2004,) indicating a depth of 5–7m AHD at the Site, sloping upwards towards the Darling Fault in the east and downwards towards the Swan River in the west (NTEC, 2012 – Appendix H), with an estimated thickness of 10–25m (Davidson and Yu, 2006). The maximum thickness is around 26m at the Site.

Based on the groundwater levels, the hydraulic gradient of the Superficial Swan Aquifer at the Site is approximately 0.01 (NTEC, 2012 – Appendix H) sloping downwards along a transect that dips in the direction of the flux (to the north-west corner of the Site). Regional investigations (Davidson and Yu, 2006) indicate that groundwater flow rate (or transmissivity) travelling through the Superficial Swan Aquifer ranges from 50m/yr to over 1000m/yr. with Site conditions likely to comprise the lower end of this range. Salinity in the Cloverdale area of

the Superficial Aquifer beneath the surface, ranges from 500mg/L to 1000mg/L (DoW, 2004b) which classifies groundwater quality as being fresh to mildly acidic at the Site.

The underlying aquifer has a maximum saturated thickness of approximately 30 m (Davidson 1995). However, the Perth Groundwater Atlas (DoW 2004a) indicates that the aquifer depth may be approximately 22.0m to 31.0m beneath the Site. The upper portion of the aquifer is reported to be found at depths of between 12m to 21mbgl.

The Perth Groundwater Atlas (DoW 2004a) indicates that groundwater is encountered at approximately 4m to 5m (depending on topography) below the region of the Site, with levels potentially varying between 0.5m to 3.0m seasonally.

According to the online Perth Groundwater Atlas (Department of Water, 2009), the average groundwater table is at 15.0m AHD and flowing from south east to north-west.

Due to the unusual topography of the Site, the expected depth to groundwater ranges between 12mbgl in the west and 21mbgl in the east. Relative groundwater levels are 15m AHD over the majority of the Site. However, they may increase to 14m AHD in the north-west corner of the Site.

Groundwater levels were recorded as part of the monitoring events undertaken on site from 2012 through to 2013 by MDWES. In general, the groundwater levels recorded were between 3.60mbgl (23.2 m AHD) for MW1 (NW) and 11.72mbgl (22.39 m AHD) for MW3 (SE).

## 2.3 Hydrology

There are no surface water bodies on site or in close proximity to the Site. However, the Ollie Worrell Reserve is approximately 2.1km to the south-east and Kadina Brook is 2.2km to the east of the Site. Neither of these surface water features is likely to be affected by the groundwater flow, as they are considered to be up-gradient of the Site.

# 3 IDENTIFIED CONTAMINATION

## 3.1 DSI – Soil Results

As part of the Parsons Brinckerhoff (PB) report (2006), laboratory assessment of the soils was undertaken to determine the nature and extent of the fill currently present at the Site. Techniques used during their investigation included both a desktop study and the collection of limited soil samples through the excavation of fifteen (15) test pits to a depth of 5m below the surface of the landfill. The location of the test pits was based on systematic grid sampling over the landfill area, with a bias to position locations within the north eastern corner. Excavated material from each test pit was visually logged and soil samples were taken for laboratory analysis.

The PB report indicates that the majority of fill material **was inert construction and demolition waste within a sandy soil matrix**. Minor amounts of fragmented asbestos-containing materials (ACM) were identified in several test pit excavations within the superficial landfill horizons. It is possible that asbestos may be encountered within the deeper portions of the landfill this was not confirmed during the investigation. In addition, asbestos fragments are littered across the surface of the landfill area and ACM fragments appear to have been widely distributed across the site. However, the true extent of asbestos contamination will only be identified once the site remediation program begins.

The soil investigation criteria adopted for the investigation was based on the Western Australian Department of Environment (DoE) *Assessment Levels for Soil, Sediment and Water*, Draft for Public comment, Contaminated Site Management Series, November 2003 V3 - "Table 1 Assessment Levels for Soils". At the time of writing the DSI report, the future use of the Site was unknown. However, as the Site was a landfill, Health Investigation Levels (HIL-Fs) for commercial/industrial land use were considered the most appropriate. Reference has also been made to the Ecological Investigation Levels (EILs), as a conservative measure.

## 4 PROPOSED REMEDIATION OPTIONS

A number of remediation options have been considered over the years, but these have been opted out for numerous reasons by the DWER. Finally a remediation option, originally proposed by DWER in 2017 has gained traction and is described in this RAP. This option is the recontouring of the Site and capping with clean fill to provide a land that can be zoned industrial commercial and developed to its full potential. The recontouring, making safe and capping will be done sequentially in areas as shown in Figure 2 The following main items are identified:

Under this option the following actions are proposed:

1. All vegetation is stripped sequentially from the area/section under remediation/recontouring (see Figure 2).
2. Install a vibration arrest barrier along the South and West border of the site. The barrier to be designed to the required engineering standard and effectiveness. It is envisaged that such a barrier will be at least 6m deep and 3 m wide, filled with roadbase manufactured on site. Virgin sand recovered during excavation to be stockpiled for future use.
3. Recontour each area being worked to achieve required RL by pushing excess material to pre determined material stockpile areas (see Figure 2).
4. Compact the area being remediated to required standard.
5. Any visible ACM fragments are removed from the surface of area being remediated, prior to compaction.
6. A 10m x 10m grid be established in area being remediated, at compaction of finished levels and soil samples taken to 0.1m depth and submitted to NATA approved laboratory for asbestos analyses.
7. On receipt of laboratory results, a report should be generated to show if the land surface of the area under remediation complies with DoH guidelines for Industrial/Commercial land with respect to asbestos. Compaction to required level to be finalised and capping with approximately 500mm of crushed brick and concrete prior layer prior to final capping with clean sand fill.
8. Cover the recontoured land, prior to capping, either with a layer of mulch or papier-mâché or dust suppressant binders or woven materials to prevent dust lift off while other areas are being recontoured.
9. Proceed to other areas as per civil engineering construction and management plan (to be provided).

10. Once the Site has been recontoured and compacted, a 500mm capping layer of crushed concrete and masonry to be installed over all disturbed land.
11. All services to the Site to be installed according to a prepared industrial redevelopment plan at a future date.

## 5 INTRODUCTION TO RAP

### 5.1 Purpose

This report describes the details of the Remediation Action Plan (RAP) for the remediation of Lot 20 Adelaide Street, Hazelmere which is land described in previously mentioned reports. Preparation of the RAP was commissioned by the Hazelland Pty Ltd (Hazelland). It is understood that the site is to be developed for industrial and commercial purposes. An independent Site Auditor, Mr Charlie Barber of Australian Environmental Auditors Pty Ltd, has been appointed by the Hazelland to review the RAP. The Auditor will issue a site audit report and site audit statement upon the completion of the assessment, remediation and validation works, indicating which land uses (if any) the site is suitable for from a contamination perspective.

### 5.2 Objective

The objective of the proposed remediation program is to remediate the identified contamination present in the fill across the subject site to a condition where the land is considered suitable for the proposed uses.

### 5.3 Scope of Works

The scope of the RAP has been established on the basis of the findings of the previous investigations, with the RAP aimed at providing:

- An appropriate remedial strategy, which comprises localised remedial actions so as to render the site suitable for the proposed commercial use;
- Appropriate requirements for the validation and verification of the successful implementation of the remediation strategy and the remediation acceptance criteria to be adopted;
- Appropriate environmental safeguards required to conduct the remediation works in an environmentally acceptable manner;
- OH&S procedures required to conduct the remediation works in a manner that will not pose a threat to the health of site workers or users.

### 5.4 Site Accessibility

It is the remediation contractor's responsibility to securely fence the site to prevent unauthorized entry to the site and in particular the remediation areas during any excavation works.

Access to the treed areas and/or removal of trees is also to be provided and managed by the Project Manager / Developer, who will obtain the approval from the relevant authorities. There should be no access to these areas until the approval has been obtained.

## 5.5 Site History

The site history has been provided in previous reports (PSI, DSI and Reports 1 to 15 of this series).

## 5.6 Site Condition

The site condition has been provided in previous reports (PSI, DSI and Reports 1 to 15 of this series).

## 5.7 Area Remediation Goals

The main objectives of the remediation programme will be to:

- Remove all affected soil and vegetation as identified in the contamination assessments (either due to exceedance of the adopted site assessment criteria, presence of bonded asbestos or on aesthetic grounds). Refer to Fig 1 for site boundary.
- Remove any asbestos fragments to a minimum 0.1 m depth
- Remove all impacted (bonded asbestos) topsoil from the areas of the site identified in the contamination assessments (including DSI).
- Undertake validation sampling and analysis to confirm that all contaminated or aesthetically unsuitable material has been removed and remaining soils are suitable for the proposed reuse.
- Ground gases will be assessed upon completion of each area and post-remediation of the Site. As each of the remediated areas is completed, ground gas monitoring wells will be established and screened.
- Compact the remediated soils and confirm area has been recontoured to required RL.
- Make safe from potential dust liftoff by using mulch or spray on papier-mâché.
- Cap with acceptable materials at completion of all works at the Site.

## 5.8 Extent of Remediation

The Areas of Environmental Concern (AEC) identified in DSI and following reports is essentially the whole site as shown in Figure 1.

Mature trees and heavy grass cover limited the ability to assess the site for signs contamination and, in particular, fragments of ACM on or near the ground surface across the site. As such, the whole site is considered as AEC and will require recontouring and capping.

## 6 REMEDIATION METHODOLOGY

### 6.1 General Remediation Sequence

The detailed remedial works procedures and works sequence undertaken during the remediation process will be developed by the remediation contractor, who would also be responsible for the appropriate execution of the works plan and procedures.

It is the contractor's responsibility to devise a safe work method statement and to implement proper controls that enable the personnel undertaking the remediation to work in a safe environment.

It is also the contractor's responsibility to securely fence the site to prevent unauthorised entry to the site and in particular the remediation areas during the excavation works. Approval for the contractor to enter of the site will need to be granted by the Project Manager / Developer.

This RAP does not relieve the contractor(s) of their ultimate responsibility for occupational health and safety of their workforce and to prevent contamination of areas outside the immediate workspace. This RAP sets out the minimum standards and guidelines for remediation that will need to be used in preparing individual method statements for each remediation location.

The remediation works proposed will need to comprise the following steps depending on the contamination characteristics and the waste disposal approval.

### 6.2 Strip Vegetation and Confirm Land Complies with DoH Guidelines for Industrial/Commercial Land

The Department of Health have generated asbestos land use guidelines in 2009 (Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia, May 2009 WA Department of Health) which provide for a certain amount of ACM to be present within the soils of subject land.

For Industrial/Commercial land that guideline is 0.05% ACM to soil, weight by weight. The remedial works for the removal and validation of the site shall follow the following procedure:

### 6.3 Site Establishment

The following actions are to be taken:

- a) The immediate asbestos removal/remediation work area is to be known as the "Asbestos Work Area". Access to the Asbestos Work Area should remain restricted until the asbestos removal/ remediation works are complete. Temporary fencing barriers shall be erected around the Asbestos Work Area to restrict entry.
- b) The fence is to be covered in shade cloth or similar material. Signs are to be placed in appropriate locations around the Asbestos Work Area by the Principal Contractor with the words "Asbestos Work Area, Do Not Enter" or similar approved signage. This signage is only to be displayed for the duration of the ACM remediation work at the Site. It is to be placed at the Asbestos Work Area boundaries and at the entry to the decontamination area. The region surrounding and adjacent to the Asbestos Work Area is to be known as the "Asbestos Work Site".
- c) The perimeter of the site shall be securely fenced with warning placards

- d) Signs should be located at all main entrances to the workplace or all entrances to the areas where ACM is present.
- e) All warning signs shall comply with Australian Standard AS 1319:1994 Safety Signs for the Occupational Environment.
- f) Air monitoring should be undertaken whenever asbestos removal work is in progress. All air monitoring and clearance inspections will be carried out by the Consultant Occupational Hygienist to NATA Standards and in accordance with the Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC: 2002 (2009)].

## 7 SITE SAFETY

All categories of personnel employed at the Site and visitors to the Site will be given appropriate Asbestos Awareness Training to ensure adequate awareness of the health risks of asbestos, methods of prevention and control, proper work practices, emergencies and use of personal protective equipment.

Site specific induction procedures will include where necessary, asbestos management and personal protective requirements, with emphasis placed on the workers responsibility in relation to asbestos matters, and the health hazards that may result if these responsibilities are neglected.

A number of control procedures are to be put in place when working with asbestos to ensure that the generation of asbestos fibre does not occur during asbestos related activities.

Personnel involved in the removal of the asbestos will wear, as a minimum, approved full-face cartridge type respirators fitted with Class P3 particulate filters, disposable overalls, boot covers and gloves. All PPE is compulsory and must be worn by all personnel undertaking asbestos removal.

Any other personnel entering the Asbestos Work Area must also be trained in the use of and wear the compulsory PPE.

A visual inspection will be undertaken by the Consultant Occupational Hygienist to assess the completion of the establishment of the Asbestos Work Area and decontamination facilities prior to commencement of the ACM removal work. Access to the Asbestos Work Area will only be permitted following satisfactory completion of the visual inspection.

### 7.1 Site Stripping

- g) Activities carried out at the Site will be such as to ensure that all equipment used and all facilities erected and procedures used are designed and operated to eliminate the emission of asbestos fibre into the atmosphere.
- h) To ensure that dust generation is minimised the ground surfaces in the Asbestos Work Area and all other sources of dust are to be suppressed by the use of water sprays. The sprays and micro misting will provide minimal amounts of water to the Asbestos Work Area in a mist form to minimise water run-off and with consideration given to slips and falls. Spraying must also be undertaken when removing the soil and debris from within the Asbestos Work Area. A mobile water cart will be available full time on site during the remedial works. Care should be undertaken to ensure the soil is not over-wetted. If unacceptable level of dust is generated, works will be halted and additional dust suppression techniques will be employed;
- i) Operators of mobile plant and equipment required to operate within the Asbestos Work Area must wear the appropriate PPE and the operators' cabin must be completely closed and the air conditioning system must only be operated on a recirculating air function.
- j) All vegetation is stripped from the subject land, with the waste material to be disposed of to a suitably licenced landfill facility, as required.
- k) All suitable measures shall be taken to prevent the dust generation and migration from the site.

## 7.2 Asbestos Picking

DoH (2009) guideline documentation for asbestos site remediation advises on certain procedures during site remediation. These are incorporated below together with additional procedures considered to be applicable to this case:

- a) The whole of the site is to be carefully raked utilising a tined implement being careful not to generate dust or damage the asbestos fragments.
- b) All visible ACM fragments are removed from the surface.
- c) Any Identified Hot Spots are to be managed on site.
- d) The Asbestos Work Area will be inspected to ensure visible debris have been removed at the completion of works in each Asbestos Work Area.
- e) All equipment and machinery used within the Asbestos Work Area shall only be used in that area and when removed from the Asbestos Work Area shall be thoroughly decontaminated. Tools used in the Asbestos Work Area must be thoroughly cleaned and decontaminated before being taken from the Asbestos Work Area.
- f) Where "Asbestos Bags" are used for waste, they are to be sealed, placed into a second bag and sealed again and thoroughly washed clean of dust as they are passed through the decontamination unit. Bags are to be filled to no more than 1/2 full, or so that the weight is manageable and does not result in manual handling injury or bag rupture. The bagged material is to be placed into trucks or bins that are double lined with 0.2mm impervious plastic.
- g) All soiled PPE, and other asbestos contaminated debris shall be placed into "Asbestos Bags" Bags are to be filled to no more than 1/2 full or so that the weight is manageable and does not result in manual handling injury or bag rupture. The asbestos bags are to be sealed, placed into a second bag and sealed for appropriate disposal.
- h) Transport and final disposal of asbestos waste material shall be carried out in a manner which will prevent the liberation of asbestos dust into the atmosphere.

## 8 POTENTIAL ENVIRONMENTAL IMPACTS OF THE PROJECT

Consideration has been given to dust from all operational aspects of the project. The potential for unacceptable off-site impacts from dust is most affected by the prevailing wind direction during dry summer conditions when east to south easterly winds prevail. These wind direction, however, are away from any residential/sensitive areas. The north and north easterly winds are of concern with respect to nearby residential areas.

### 8.1 Principal Environmental Objectives

#### 8.1.1 DoH/DWER objectives for dust management

The objective of the programme is to minimise and manage dust emissions emanating from and leaving the proposal site associated with all operations including land clearing, excavations, stockpiles and general operational activities such as loading and transport.

When personnel are required to work within the remediation areas where potential contact with contaminated soil, other materials or water, the following, additional Modified Level D Protection will be required:

- Disposable coveralls (if necessary) ;
- Respiratory protection meeting AS1715-2009 requirements;
- Nitrile work gloves meeting AS2161-2008 requirements or heavy duty gauntlet gloves;
- Personal air quality monitoring filters are to be placed and collected by the suitably qualified sampler at the beginning and end of the sampling period (beginning and end of the work shift). Pre and post calibration checks of the air sampling pump flow rate will be required to ensure valid samples are taken.
- Any additional protection identified by the Consultant.

Earthwork machinery operators should stay in the air-conditioned cab of their vehicle while in the area where remedial works are being undertaken. Workers not in air-conditioned vehicles or while out of their vehicles should wear a P2 respirator while they within the area of remedial works. The remediation areas shall be demarcated.

All contractors are required to show compliance with relevant Occupational Health and Safety Regulations, including the preparation of a Site Safety Management Plan and Safe Work Method Statements.

#### 8.1.2 Proponent commitments

The proponent provided the following objectives for the dust management plan. The objectives are to ensure that:

- Nuisance dust levels are not experienced by neighbours and do not cause any health problems;
- Dust generated during the developmental and recontouring phases of the site infill do not significantly impact on amenity;

- The operational/construction layout for the proposed site will minimise dust and particulate emissions from the site.

### 8.1.3 Implementation Strategy

#### 8.1.3.1 Dust control strategies implemented to date

The site operator will have had considerable experience over more than 20 years in managing dust issues in the this kind of sites; this experience has been applied and improvements made, where required. Consequently, this previous experience is outlined below.

## 8.2 Potential dust sources from the remediation operations

The following site operations have the potential to cause dust emissions:

- Loading, hauling, compacting;
- Trucking haul to site operations;
- Laying down reprocessed soils in infill areas;
- Shaping infill areas;
- Compacting infill areas.
- Vehicle movement over unsealed ground;

### Dust control measures

Table 1 below includes those dust control measures to be implemented.

**Table 1. Dust control measures**

Improvement	Details of Improvement	Location of Implementation
	<p>A wind sector sprinkler system will be installed. The sprinkler system is more efficient as it waters areas and stockpiles when wind direction and speed are at a set level; to reduce wastage and runoff from product stockpiles.</p> <p>There will also be use of water truck equipped with cannon and dribble bars as well as turbo micro misters.</p>	Stockpile areas

### **8.3 Dust control strategies to be employed at the site**

#### **8.3.1 Strategies required**

There are two separate operations to be considered when planning dust management strategies. These are

- Site preparation: These are carried out at the surface wind conditions; special precautions and are required for these operations.
- Infill operations that include those activities for which dust management strategies are required for each type of operation. However, the risk of dust emissions crossing the proponent's boundaries are less likely due to operations being well below ambient wind conditions.

The above are further detailed in the sections below.

## **9 SITE PREPARATION**

### **9.1 Proponent commitments**

The following commitments are provided by the proponent in regard to dust management during site preparation.

- Develop the site in a staged process so that possible impacts from surface preparation are limited.
- Undertake surface preparation only under favourable weather conditions – principally during calm weather conditions.
- Establish a phone link to the site manager for nearby residents.
- Keep residents informed of when activities are likely to occur.
- Ensure that dust control mechanisms (sprays) are implemented where and when required.
- Undertake visual monitoring of dust at the boundary during these activities and stop work if unfavourable wind conditions cause dust to lift-off in the direction of residences.

Action to be taken for the above commitments and additional dust control and management measures are outlined in Tables 2.

**Table 2. Strategies and control measures to minimise dust emissions during vegetation & overburden removal phase**

<b>Activity</b>	<b>Strategy or Control Measure</b>	<b>How</b>
Surface preparation	Favourable weather conditions	Should be undertaken immediately after vegetation removal to prevent leaving an open, cleared area.
Monitoring: surface preparation	Conduct continual visual monitoring for dust lift off.	If dust emissions threaten to cross the boundary stop work immediately and do not resume until optimum weather conditions return or until water sprays have been applied.
	Maintain dust monitoring equipment at boundary depending on prevailing wind conditions and weather station (DustTrak 8530 )	As required

## 10 SITE REMEDIATION

### 10.1 Proponent commitments

The following actions have been implemented by the proponent in regard to dust management for remediation operations.

- Watering the access roads.
- Watering of active infill benches and forward earthworks
- Using water sprays throughout the plant and at transfer points.
- Implementing speed restrictions for site construction vehicles.
- Wind sector wet down controls.
- The proponent will not deviate from any proposed method in the RAP unless it is done with prior written approval of the CEO of DWER.
- The proponent will ensure that the environmental consultants supervising the remediation works and air quality monitoring are to be onsite at all times while the work is being undertaken.
- The proponent shall suspend work if there is any evidence of dust emissions which are not able to be managed using the dust control methods detailed in this RAP.

Table 3 below includes those strategies required to ensure that dust emissions are minimised during remediation activities.

**Table 3. Strategies and control measures to minimise dust emissions during site construction phase**

Activity	Strategy or Control Measure	When	How
Materials Movement	<ul style="list-style-type: none"> <li>• Use water sprays for loading and unloading of contaminated materials and product as required.</li> <li>• Water sprays to transfer points.</li> </ul>	All actions to be carried out for the life of the remediation works	use sprinkler systems at short regular intervals to maximise dust control and efficient water use.
Soils Processing	Water spray to hoppers		
Fugitive dust	Sprinkler systems to be installed for dust control. A water truck to be available if required.	Sprinkler system will be installed	As required – sprinklers and water truck.
Trucking	<ul style="list-style-type: none"> <li>• Trucks to depart in clean condition.</li> <li>• Truck to obey speed restrictions on site approach; road and obey speed limits within the site as required by safety considerations.</li> </ul>	All actions to be carried out for the life of the site remediation.	

## Notifications

- The proponent will notify DWER by email, at least 72 hours prior to commencing any remediation works, at: [admince@dwer.wa.gov.au](mailto:admince@dwer.wa.gov.au)

The email will have the subject line: 20 Adelaide Street and be made out for the attention of CEO, DWER

- The proponent will notify local residents by letter drop, prior to commencing remediation works.

## 10.2 Weather information required

Information required to ensure the best possible outcomes for dust management includes:

- Maintaining an automatic weather station (or a wind sock) for monitoring wind data;
- Visual monitoring of dust emissions.

## 10.3 Weather monitoring requirements

Where there is the potential for dust lift-off, in order of importance, dust impacts on amenity are primarily influenced by:

- wind strength;
- wind direction; and
- ground level moisture.

As ground-level moisture is to be artificially controlled by spraying, the key parameters for managing the effectiveness of dust suppression and management are wind strength and wind direction.

For site planning purposes long-range weather forecasts can be obtained on a weekly basis to ensure that adequate planning is in place for conditions likely to cause dust emissions. This information is followed up on daily basis by monitoring real-time data available from the dedicated weather station.

The Site Operator should be aware when hot, dry and windy conditions are likely to occur and appropriate action should be taken in deploying water sprays on the day, before such conditions arise so as to prevent dust emissions or to avoid operations that would be most likely to cause excessive dust emissions.

## 10.4 Wind Direction and Strength

The nearest weather station to the Site is Perth Airport, approximately 5 km to the west of the Site. Perth Airport has a mean annual rainfall of 824 mm with the vast majority (79%) of the

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rain falling between May and September each year. The period October to April is the main period when dust management strategies will need to be actively implemented; however, there will still be occasional dust management activities required during the winter months.

During October to April the typical average monthly wind pattern is for easterly winds to blow in the morning and south-westerly winds in the afternoon. The maximum morning wind speed is in the order of 20 km/hr to 30 km/hr for <10% of the time and 30 km to 35 km/hr for <1% of the time. Afternoons tend to have the longer windy periods and at higher wind speeds, in the order of 20 km/hr to 30 km/hr for <22% of the time and 30 km/hr to 35 km/hr for <4% of the time. Detailed weather data is available on the Bureau of Meteorology website:

([http://www.bom.gov.au/climate/averages/tables/cw\\_009172.shtml](http://www.bom.gov.au/climate/averages/tables/cw_009172.shtml)).

## 11 PERFORMANCE INDICATORS

### 11.1 Relevant standards

#### 11.1.1 National Standards

National standards that apply to the measurement of atmospheric particulates are summarised in Table 4 below. It is, however, not envisaged that continuous air monitoring will be required for this project.

**Table 4: Relevant standards applying to measurement of atmospheric particulates**

Standard	Application
AS 3580.9.8-2001 AS 3580.9.11-2008	Method for sampling and analysis of ambient air - Determination of suspended particulate matter - PM(sub)10(/sub) continuous direct mass method using a tapered element oscillating microbalance analyser
AS 3580.1.1-2007	Ambient air – guide for the sighting of sampling units

### 11.2 Performance criteria

The following are indicators for tracking the progress in managing and controlling dust emissions.

#### 11.2.1 Visual monitoring

Visual monitoring of dust emissions will be the first line of action for dust management, particularly during overburden removal. Actions may be instigated without delay at the observed source of dust emission. In the case of overburden removal this would include ceasing the offending operation, application of water sprays and only restarting operation at a low intensity and slowly increased to ensure dust emissions are minimised. In the case of site construction, the application of corrective water sprays at the offending operation would be appropriate.

#### 11.2.2 Short-term corrective monitoring

A short-term “corrective action” dust concentration target is recommended to assist in maintaining ambient standards.

The dust concentration target is not to exceed PM<sub>10</sub> of 50µg/m<sup>3</sup> as a maximum concentration over a 24hr period, consistent with the document "*A guideline for managing of the impacts of dust and associated contaminants from land development sites, contaminated sites, remediation and other related activities*" (DEC March 2011).

Should the target concentration of PM<sub>10</sub> particulates be exceeded, this would initiate management procedures to ensure that ambient dust standards are met.

### 11.2.3 Complaints register

A complaints register will be maintained to verify that operating parameters are effective.

The complaints register will track any problems that are likely to occur in regard to visual amenity.

## 12 MONITORING

### 12.1 Ongoing monitoring

Table 5 below provides all dust monitoring activities required to minimise the risk of dust emissions crossing the boundaries of the site

**Table 5. Ongoing dust monitoring activities**

<b>Monitoring</b>	<b>Location</b>	<b>Parameter/Frequency</b>
Visual dust monitoring.	All site locations.	Opportunistic observation of visual dust lift-off or emission.
DustTrak 8530 boundary dust monitoring	Maintain dust monitoring equipment at boundary depending on prevailing wind conditions and a weather station/wind sock (DustTrak 8530 )	Throughout remediation works.
Wind direction and strength.	Locate weather station in accordance with appropriate standards/guidelines	Wind strength and Direction.
Complaints Register.	All site operations.	Log complaint as required by register.

Note:

Cartridges from the monitoring equipment for both PM<sub>10</sub> and lead concentration will be provided to laboratories within a 7 day return period.

## 13 CONTINGENCIES AND REMEDIAL ACTION

Table 6 below provides actions to be taken in the event that certain contingencies arise which are likely to cause dust emissions beyond the boundaries of the site.

**Table 6. Monitoring contingencies and management actions**

<b>Monitoring</b>	<b>Trigger</b>	<b>Management Action</b>
Visual dust monitoring.	Observations of dust lift off or dust emission.	Operational personnel to report observation to EO/QM who will log report and require remedial action to be taken: either to cease the reported activity or immediately apply water sprays.  Activity should only be restarted at low intensity and gradually increased to observe if dust suppression measure has been successful.
Short-term Dust monitoring	Assigned target level	Notify operations personnel to take corrective action as for visual dust monitoring.
Complaints Register.	Dust Complaint.	Compare Dust and Wind data for the day from official Bureau of Metrology (BOM) website to verify complaint. If complaint verified, take remedial action and notify complainant of outcome.

### 13.1 Roles and Responsibilities

In order to achieve the goals of the remediation programme, the following roles have been identified for the developer, contractor, environmental consultant and site auditor.

Prior to the commencement of remediation works a site meeting between the Project Manager for Development/Developer, Contractor, Environmental Consultant and Site Auditor is recommended to confirm responsibilities and procedures in accordance with the RAP.

#### 13.1.1 Project Manager for Development / Developer

The Project Manager/Developer would be responsible for the implementation of this RAP. In this regard, the Project Manager or his nominee would have the following particular responsibilities:

- 1 Engage an Accredited Site Auditor;
- 2 Engage a remediation contractor(s) holding Class A Asbestos Removal License;
- 3 Distribution of information to all relevant parties on the requirements of this RAP;
- 4 Analysis of non-conformance and oversight of corrective action taken; and
- 5 Taking appropriate action in response to any complaints or expressions of concern.

#### 13.1.2 Class A Licensed Asbestos Contractor

The Contractor is responsible for on-site operations including:

- engage Environmental Consultant;

- compliance with all aspects of this RAP;
- co-ordinating and managing remediation activities;
- handling of contaminated materials including excavations, stockpiles, and disposal;
- maintaining site records including excavations, stockpiling and disposal of contaminated materials and importation (if required) and placement of clean fill materials;
- provision of all necessary training and occupation health and safety of all personnel and subcontractors into the requirements of this RAP;
- safety of all personnel on site;
- preparation and implementation of site specific OH&S plan to ensure adequate compliance measures are incorporated into work processes;
- constantly monitor work practices to ensure full compliance with this RAP and all statutory licensing and approval conditions;
- engage an occupation hygienist for the set-up and maintenance, inspections, analysis and reporting of air monitoring for air-borne asbestos fibres during remediation;
- measures to minimise environmental effects;
- record compliance with the RAP and measures carried out under the RAP;
- act promptly to implement and record corrective actions for non-conformances; and
- assist the Environmental Consultant by supplying earthmoving equipment (excavator) during validation and delineation works required during and to finalise remediation works.

### 13.1.3 Environmental Consultant

A suitably qualified Environmental Consultant should undertake inspections, sampling and validation reporting during remediation consistent with WA DWER requirements including:

- review contractor's procedures and compliance to the RAP;
- set out of AEC;
- undertake full time surveillance of the removal of topsoil and surface fill from site to be stockpiled for reuse onsite;
- agree appropriate procedure for visual screening of contaminated material with contractors;
- assess any material from an "unexpected find" for contamination and waste classification;
- inspect and sample the base and walls to validate the remediation of each AEC;
- confirm the extent of remediation undertaken;
- provide final validation report(s) on the completion of remediation including any further recommendations; and
- provide site specific environmental management plan(s).

### 13.1.4 Site Auditor

The Site Auditor would be responsible for the review of remediation and that the validation findings by the environmental consultant are consistent with WA DWER requirements including:

- review and approve RAP;
- review Environmental Consultant's validation report(s);
- issue a site audit report(s); and
- issue a site audit statement(s).

### 13.2 Contingencies for Unexpected Finds

Should unexpected contamination or other unexpected find (tanks, drums etc) be identified during the remediation or construction phases of the redevelopment, the following general approach will be adopted:

- Stop all works at the location of the unexpected finds.
- Notify the Remediation Contractor's Site Supervisor of the find;
- At the instruction of the Remediation Contractor's Site Supervisor, place barricades around the affected area and cease work in that area; and
- Notify the Environmental Consultant for an assessment of the find in terms of the potential impact to human health and the environment.

Further remediation may be required following the assessment by the Environmental Consultant; however, this will be dependent upon the type of the find and the severity of the potential impact.

If during remedial works, further suspected asbestos containing material is observed within parts of the site where it has not yet been identified then the remedial works should cease immediately and an appropriately qualified consultant should review and assess the material and/or the site condition.

### 13.3 Minimisation of Cross Contamination

Given the work area and nature of the site, measures should be enforced to eliminate the potential for cross contamination.

- Areas that are to be remediated, should be delineated and isolated. Plant and vehicle movements from these areas should be restricted to a defined path. Plant and vehicles will pass over a wheel shaker bay before exiting the site onto the public road system;
- Plant/truck movements within areas of active remediation should also be restricted and monitored to ensure vehicles do not pass over previously excavated and/or validated areas.

### **13.4 Waste Disposal**

All material to be disposed of offsite, that is not pre-approved to be disposed of, must undergo appropriate sampling and analysis at a minimum frequency of 1 sample per 25m<sup>3</sup> to provide a classification of the materials for waste disposal in accordance with appropriate regulatory guidelines. No material is to be removed off site without contractor approval. If the material contains asbestos it will automatically classify as asbestos contaminated soils and be classified accordingly under the above guidelines.

## 14 ENVIRONMENTAL MANAGEMENT PLAN

### 14.1 General

The work shall be undertaken with all due regard to the minimisation of environmental effects and to meet all statutory requirements. The contractor shall have in place an Environmental Management Plan (EMP) such that work on the site complies with the requirements of relevant occupational and environmental legislation.

In particular, the EMP will provide documented procedures for control of asbestos management, water run-off including control of fugitive dust emissions.

The contractor shall also be responsible to ensure that the site works comply with the following conditions:

- Fugitive dust leaving the confines of the remediation areas is minimised;
- No water containing any suspended matter or contaminants leaves the site in a manner which could pollute the environment;
- Stockpiles (where required) must be suitably managed with bunding or silt fencing to prevent contaminated sediments from leaving the vicinity of the stockpile and adequate dust suppression must be applied to the surface of the stockpile;
- Vehicles shall be cleaned and secured so that no mud, soil or water are deposited on any public roadways or adjacent areas;
- Noise and vibration levels at the site boundaries comply with the legislative requirements; and
- Contingency measures for the management of the site during periods of heavy rainfall, water within excavation areas, handling and management of saturated soils and equipment failures and spills.

The successful contractor should develop a site emergency response plan (ERP) and occupational health and safety plan (OHSP). These will maintain the safety of the personnel working on the site, given any likely emergency situation that may occur. The OHSP and ERP should include emergency phone numbers and details of local emergency facilities.

### 14.2 Noise Control

The site is located in a residential and commercial/industrial area. The nearest receptors are residential and commercial properties adjacent to the area of remediation. No excessively noisy operations (e.g. rock hammering, piling) will be required for the remedial work. Noise and vibration will be restricted to reasonable levels. Remedial works will be undertaken between the hours of 7 a.m. and 6 p.m. Monday to Saturday in accordance with the WA regulations unless otherwise stated in relevant conditions of the development approval. It is not proposed to employ any specific noise mitigation measures.

### 14.3 Odour Control

Given the nature of the identified contaminants and the observations made during the contamination assessment, no odour issues are envisaged as a result of the remediation of this site. However, in the event that unexpected odorous material is encountered or odour

complaints are received from the surrounding community then the protocols outlined in Section for 'unexpected finds' will need to be followed.

#### **14.4 Traffic Control/Management**

These measures will depend on how access arrangements are designed for the site. Local residents should be advised of the potential for traffic disruptions. All on-site vehicular traffic shall use only demarcated internal routes and approved public highway routes to and from the selected landfill.

All loads shall be covered and lightly wetted to ensure that no materials or dust are dropped or deposited outside or within the site. Each truck, prior to exiting the site, shall proceed through an appropriate shaker bar and lead-in and lead-out crushed rock/ concrete located near the designated exit point. Adelaide Street near the exit point must be cleaned at the end of each day by a mechanical sweeper or be hand swept depending on the extent of deposited material on the street. Each truck exiting the site shall be inspected by the contractor or remediation consultant prior to despatch and either logged out as clean wheels and chassis or hosed down into the wheel wash or wash down bay until deemed clean by the remediation consultant or contractor.

#### **14.5 Public Complaints System**

Any complaints received during the works shall be noted and the Developer/Project Manager will take all necessary actions to address the cause of complaint.

#### **14.6 Dust Management Program**

The site is located in a commercial area with potential exposure to residential areas to the south of the Site. The potential for substantial dust generation during the recontouring and scraping process or during stockpile formation is elevated. To control the generation of dust from the site during remedial works it is proposed to implement a dust management program consisting of:

- In a worked area, where the contamination is ACM in topsoil, water spraying the remediation area should be undertaken prior to commencement of the remediation works (i.e. the day before) to appropriately "condition" (dampen) the soil to the depth of scraping. This could also be undertaken at the end of each day in deeper excavation areas to "condition" the fill for the next day's remedial works;
- If during excavation, appreciable volumes of dust are produced (this will be determined by a visual inspection), dust control measures will be intensified and the works area will be watered down with light water spray to "condition" the material;
- The application of water to any excavated or scraped material being stockpiled for waste classification purposes and during the loading of trucks (if dust is being generated);
- Vehicle access will be limited to those vehicles required within the area of remediation;
- Temporary haul roads should be created using cones/witches hats;

- Previously remediated areas will be off limits to vehicular traffic (with the exception of the water cart (properly washed down and decontaminated) if dust suppression is required after barrier capping layer (crushed concrete and masonry) has been applied;
- Trucks will be loaded on site and not on the street;
- Drop height will be minimised when loading ACM impacted soil onto trucks; and
- Haul routes, if created will be wetted as required and scraped at the completion of works.

The implementation of the above dust management methods will be refined with input from the appointed earthwork contractor.

### **14.7 Decontamination Procedures**

The Contractor shall reduce, as far as is practicable, the potential for soil to be tracked off the site through adherence on the tyres of vehicles. This could include a restriction on off-site vehicle movement during wet conditions, the manual cleaning of vehicle wheels prior to vehicles leaving the site, the use of a shaker bar and lead-in and lead-out crushed rock/concrete.

### **14.8 Occupational Health and Safety**

The contractor will prepare a Safe Work Method Statement (SWMS) to be reviewed by an Occupational Hygienist to ensure suitable OH&S measures for working with asbestos are adopted. All personnel on site should be required to wear the following protection at all times:

- Steel-capped boots;
- Safety glasses or safety goggles with side shields meeting AS1337-1992 requirements (as necessary, particularly during demolition);
- Hard hat meeting AS1801-1997 requirements; and
- Hearing protection meeting AS1270-2002 requirements when working around machinery or plant equipment if noise levels exceed exposure standards.

When personnel are required to work within the asbestos remediation areas where potential contact with contaminated soil, other materials or water, the following, additional Modified Level D Protection will be required:

- Disposable coveralls (if necessary) to prevent contact with asbestos, splashed soil, materials or water;
- Respiratory protection meeting AS1715-2009 requirements;
- Nitrile work gloves meeting AS2161-2008 requirements or heavy duty gauntlet gloves;
- Any additional protection identified by the Occupation Hygienist.

Earthwork machinery operators should stay in the air-conditioned cab of their vehicle while in the area where remedial works are being undertaken. Workers not in air-conditioned vehicles or while out of their vehicles should wear a dust mask while within the area of remedial works. The remediation areas shall be demarcated.

All contractors are required to show compliance with relevant Occupational Health and Safety Regulations, including the preparation of a Site Safety Management Plan and Safe Work Method Statements.

## 15 OCCUPATIONAL MONITORING

An Occupational Monitoring Plan must be developed by the Class A licensed asbestos removal contractor and approved by a suitably qualified Occupational Hygienist. Monitoring will use the “Membrane Filter Method” with monitoring locations situated both inside and outside the works area. Sampling will be undertaken over each day of remedial works. The monitoring locations will need to be placed based on wind direction (to be determined on the day) and located at sensitive receptors (i.e. surrounding residential development and site office located outside the remediation areas). The Plan should be detailed and indicate monitoring locations, number, methods and turnaround time for reporting in case of positive detections. The Plan should be provided as part of the contractors’ tender. Personal monitoring will also be covered in this Plan.

Para-occupational samples will be submitted to a NATA accredited lab for analysis. It should be noted that the analytical method does not differentiate between the types of fibres and reported fibres may not be asbestos.

## 16 VALIDATION PLAN

### 16.1 Validation Sample Collection and Analysis

#### Stockpiled Topsoil and General Fill

Any uncontaminated topsoil and general fill, that has been stockpiled, must be assessed and validated to confirm the suitability of the soil to remain on site for reuse.

Test pits must be excavated within the stockpile(s) to the full depth, with samples collected and analyses based on 14 samples per 1000 m<sup>3</sup> of stockpiled soil. The sample will be at least 1000ml. screened through 7mm sieve with a 500ml sub-sample for laboratory analyses. The minimum number of sampling sites will be governed by the number of samples required with one sample analysed from each chosen location on the stockpile, all samples must be analysed for the presence of asbestos.

If results of the assessment indicate that the stockpile(s) do not comply with the RAP then further separation, assessment and removal of contaminated soil will be required. All material requiring off-site disposal will require waste classification all final disposal dockets to the approved waste facility will need to be forwarded to the Environmental Consultant for reporting.

### 16.2 Asbestos Validation

Validation for ACM would be undertaken by visually assessing the remediated areas. Visual assessment will be undertaken by a walkover of the delineated AEC and raking of the surface to assess the upper 10cm of the remediated soil surface. For AEC that are delineated to an area less than 100m<sup>2</sup> the entire wetted natural soil surface should be raked. For delineated AEC greater than 100m<sup>2</sup> a 500ml sample for laboratory assessment for asbestos fines (AF) and fibrous asbestos (FA) will also be collected at each assessment point, based on the Western Australia (WA) Department of Health (DoH) Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia (WA DoH, 2009).

Based on the WA DoH, 2009 – Table 1, once remediation has been undertaken the likelihood of ACM within an AEC would be considered as “Likely” before being validated.

Given the WA DoH 2009 guidelines, a validation regime would include a site walkover conducted in a grid pattern at two times the minimum sampling grid given for the area of each delineated AEC and sampling (raking points) also based on two times the minimum sampling grid given in the NSW Sampling Design Guidelines, 1995 for the area of each AEC.

### **16.3 Sample Collection and Handling**

Sampling must be undertaken directly from the exposed surface of excavations or stripped areas. Sampling data shall be recorded to comply with routine Chain of Custody requirements.

The general sampling, handling, transport and tracking procedures comprises:

- The use of stainless steel sampling equipment;
- Labelling of the sample containers with individual and unique identification including project and sample number;
- Placement of the containers into an enclosed and secure container for transport to the laboratory; and
- Use of Chain of Custody documentation to ensure that sample tracking and custody can be cross-checked at any point in the transfer of samples from the field to hand-over to the laboratory.

### **16.4 Quality Assurance Plan**

#### **16.4.1 Field Quality Assurance and Quality Control**

Quality Assurance (QA) and Quality Control (QC) procedures will be adopted throughout the field sampling programme to ensure sampling precision and accuracy and prevent cross contamination. Appropriate sampling procedures will be undertaken to ensure that cross contamination does not occur. It should be specified that:

- Standard operating procedures are followed;
- Site safety plans are developed prior to commencement of works;
- Replicate field samples are collected and analysed;
- Samples are stored under secure, temperature controlled conditions;
- Chain of custody documentation is employed for the handling, transport and delivery of samples to the selected laboratory; and that

Proper disposal of contaminated soil originating from the site area is completed

### 16.4.2 Laboratory Quality Assurance and Quality Control

The laboratory will undertake in-house QA/QC procedures involving the routine testing of:

- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data including control standards and recovery plots.

In addition, the analytical laboratory will be required to provide evidence that their analytical results are correct, through analysis of certified reference material and/or reanalysis of extracts by another NATA accredited laboratory.

The laboratory in-house QA/QC testing procedures for asbestos testing are not possible as the results are a 'detected' or 'not detected' answer involving observations of samples by qualified personal from a NATA accredited laboratory.

### 16.4.3 Achievement of Data Quality Indicators

Based on a fulfilment of the data quality objectives an assessment of the overall data quality will be presented in the final validation report. Based on a fulfilment of the data quality objectives an assessment of the overall data quality will be presented in the final validation report.

### 16.4.4 Evaluation of Validation Sampling Results

The information obtained through the validation assessment to be undertaken will be used to characterise the subject site in terms of contamination issues and risk to human health and/or environment. To characterise the AEC as successfully remediated, the following will need to be satisfied:

The Asbestos Work Area will be inspected by the Consultant to ensure that all visible ACM debris within the Asbestos Work Area has been removed from the Asbestos Work Area. The Consultant is to be accompanied by the Principal Contractor at all times during clearance inspections.

- a) The site shall be surveyed and pegged in a 10m x 10m grid
- b) Soil samples taken at each location to a depth of 0.1m and submitted to NATA approved laboratory for asbestos analyses.
- c) On receipt of laboratory results, a report should be generated to show if the land complies with DoH guidelines for Industrial/Commercial land.
- d) If the 0.05% guideline is achieved, the land should be provided with clearance/validation report for asbestos for submission to the site Auditor.
- e) Any Identified Hot Spots are to be managed on site and resampled
- f) Clearance inspections and Certification are to be provided by the Consultant Occupational Hygienist.

## 17 VALIDATION REPORTING

A validation assessment report will be prepared by the Environmental Consultant. The validation report shall confirm that the given area of contamination has been remediated to a suitable standard for the proposed redevelopment and occupation and that no related adverse human health and environmental effects have occurred as a result of the temporary works. The validation report shall also include a summary of the information from previous investigations.

The validation report shall include:

- Scope of work
- Site identification
- A summary of the site history, site condition and the surrounding environment, geology and hydrogeology;
- Details of the total volume of contaminated materials removed from the site;
- Drawings showing contamination assessment sample locations and validation sample locations as well as any pertinent features;
- Sampling plan and methodology
- Quality Assurance/ Quality Control data evaluation
- Detailed analytical results were obtained;
- Confirmation that placed fill is appropriately certified;
- The final disposal destination of the materials removed from site and
- Conclusions and recommendations.

The objective of the final validation report will be to confirm the site has been appropriately remediated and is therefore suitable for the intended development. Construction must not commence until the findings of the report are reviewed and endorsed by the Site Auditor and/or Environment Protection Authority. A clear statement must be made in the conclusion of the report that the site is suitable (or not) for the proposed and permitted uses.

## 18 REFERENCES

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## 19 LIMITATIONS

This report is restricted to the agreed-upon Scope of Services. No representations or warranties are made concerning the nature of any other substance on the Property, other than the visual observations and analytical data as stated in this report.

In preparing this report, Stass Environmental has relied upon certain verbal information and documentation provided by the Client and/or third parties. Except as discussed, Stass Environmental did not attempt to independently verify the accuracy or completeness of that information.

The total professional liability of Stass Environmental will not exceed twice the amount of professional fees charged for the project, excluding reimbursements and expenses, or any other agreed amount between Stass Environmental and the Client. If the Client wishes to obtain additional professional indemnity for the particular project, then Stass Environmental shall co-operate with the Client to obtain such increased or special coverage at the Clients cost.

# FIGURES



**Fig 1- Site and Regional View, Lot 20 Adelaide Street, Hazelmere**



**Fig 2- Proposed RAP Remediation Scheme**