Maryland Development Corporation
Conceptual Remedial Strategy

Stages 3 to 5
Central precinct
Llandilo, NSW

FINAL
29 April 2015
50539-100238 (Rev 0)
JBS&G

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List of Abbreviations

A list of the common abbreviations used throughout this report is provided below. Additional development site specific terminology is discussed in **Section 1**.

ACM	Asbestos Containing Material
AHD	Australian Height Datum
As	Arsenic
Cd	Cadmium
Cr	Chromium
Cu	Copper
CSM	Conceptual site model
BTEX	Benzene, toluene, ethylbenzene and xylenes
B(a)P	Benzo(a)pyrene
DEC	NSW Department of Environment and Conservation
DECCW	NSW Department of Environment, Climate Change and Water
DQI	Data quality indicator
DQOs	Data Quality Objectives
DWE	NSW Department of Water and Energy
EPA	NSW Environment Protection Authority
ha	Hectare
Hg	Mercury
HIL	Health based investigation level
JBS&G	JBS&G Australia Pty Ltd
LOR	Limit of Reporting
Ni	Nickel
OCP	Organochlorine Pesticides
OEH	Office of Environment and Heritage
PAHs	Polycyclic aromatic hydrocarbons
Pb	Lead
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling, Analysis and Quality Plan
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compound
Zn	Zinc

1. Introduction and Background

1.1 Background

JBS&G Australia Pty Ltd (JBS&G) was engaged by Maryland Development Company Pty Ltd (the client, MDC) to prepare a Conceptual Remedial Strategy (CRS) across previously inaccessible areas (paved roads, building and stockpile footprints) of the Central Precinct Development Stages 3 to 5 and associated Regional Open Space, located at Llandilo, NSW. The Central Precinct is the third residential development area that is located within the former ADI St Marys property ('the property') (**Figure 1 and 2**).

The Central Precinct Development site is approximately 133.2 hectares (ha) and has been divided into a number of stages (**Figure 2**) and developed over the next several years. Due to the timeframes, the likely interactions between development stages including the remedial approaches and the requirement for remediation development approval, the preparation of a Conceptual Remedial Strategy is required.

For the purposes of this report, 'the site' (i.e. auditable areas) refers to the previously inaccessible areas (i.e. paved roads and building and stockpile footprints) within Stages 3, 4 and 5 of the Central Precinct (Stage 3 is approximately 12.7 ha, Stage 4 is approximately 52.1 ha and Stage 5 is approximately 9.6 ha). The surrounding Central Precinct Development is referred to as the 'development site' as shown on **Figures 3A**, **3B** and **3C**. The site is legally defined as Part Lot 1037 DP 1149525.

- Stage 3 auditable area (comprising paved road only) approximately 1000 m^2.
- Stage 4 auditable area (comprising paved road and stockpile footprints) approximately 8 ha.
    - Stockpile footprints approximately 7.6 ha.
    - Road approximately 4000 m^2.
- Stage 5 auditable area (comprising paved roads and building footprints) approximately 5000 m^2.
    - W Series building footprints approximately 4100 m^2.
    - Road approximately 900 m^2.

It is understood the site is to be developed together with the surrounding development site for residential land use including substantial vegetable gardens and poultry and associated Regional Open Space. It is noted some of the auditable area falls into the regional open space which surrounds the Central Precinct. All auditable areas within the Central Precinct will be assessed for suitability for a residential landuse use including substantial vegetable gardens and poultry in accordance with the SAQP (JBS&G 2015a[1]).

Stages 3, 4 and 5 Central Precinct Development has already been the subject of a number of environmental investigations as detailed in **Section 4** and is covered by the following Site Audit Statements (**Figure 4** and **Appendix A**):

- Site Audit Statement (SAS) CHK001/1 – the surrounding development site signed off as suitable for residential including substantial vegetable gardens and poultry (**Figure 1**);

[1] *Sampling Analysis and Quality Plan Central Precinct, Ropes Crossing NSW*, JBS&G Australia Pty Ltd, 24 March 2015 (JBS&G 2015a).

- SAR CHK001/6 – existing buildings, paved areas and stockpile footprints signed off as suitable for continued commercial/industrial use; and
- SAR CHK001/7 – concrete stockpile (**Figure 3b**). Signed off as suitable for continued use as a concrete stockpile only.

Based on CHK001/1 the current Stages 3, 4 and 5 development site (i.e. land surrounding the previously inaccessible sealed roads, building and stockpile footprints) is considered suitable for the proposed land use and therefore no further investigations, remediation or management are proposed.

Both CHK001/6 and CHK001/7 refers to the site and has conditions which has triggered the requirement for the Environmental Site Assessment (ESA) and remediation/management works. These conditions are discussed in **Section 4**.

Planned ESA works are yet to be completed in previously inaccessible areas (paved roads, building and stockpile footprints) based on development activities within Stages 3, 4 and 5 as per the Sampling Analysis and Quality Plan (SAQP) (JBS&G 2015a). Upon completion of the ESA works in each stage a Specific Remedial Action Plan (SRAP) will be developed in accordance with the Stages 3 to 5 CRS.

The Stages 3 to 5 CRS is designed to detail the potential future remedial and management strategies that could be implemented during the redevelopment in order for the site to be made suitable for the proposed use. The CRS will identify approaches and options to address potential environmental impact present on the previously inaccessible areas (the site) to render them suitable for the proposed development.

This Stages 3 to 5 CRS has been prepared with reference to relevant Australian Standards and guidelines made or approved by the NSW EPA.

1.2 Objective of the Stages 3 to 5 Conceptual Remedial Strategy

The objectives of the Stages 3 to 5 CRS are:

- Provide the framework for the remediation of the site that is consistent with the conceptual nature of the staged Development Application for the development site;
- Ensure a consistent decision making process and approach is applied to the remediation and management of the site;
- Define the remedial goals;
- Define the remediation strategy;
- Identify any regulatory approvals or licences required by the remediation works;
- Document the remediation and validation strategy and provide an outline of the potential remediation works required;
- Document the requirement for SRAPs for the site, if assessed as necessary; and
- Document the outline of the contingency, environmental management and occupational health and safety procedures to be implemented during any potential remedial works.

1.3 Scope of the Stages 3 to 5 Conceptual Remedial Strategy

As per the objectives above, the following scope of works will be undertaken:

- Summarise the historical use of the development site;
- Summarise the previous environmental investigations conducted on the development site;

- Identify the potential areas and contaminants of concern that may require remediation within the previously inaccessible areas of the development site (sealed roads and under buildings);
- Assessment of the potential Remedial Options;
- Detail the preferred remedial option/s;
- Detail the potential remediation approach and strategy;
- Detail the scope of the remediation works, including the requirement for SRAPs to be prepared at the relevant time;
- Define the validation sampling, analytical and quality plan to be developed and implemented by the Remediation Consultant to demonstrate the successful completion of the remediation works;
- Specify internal material tracking and stockpiling procedures for the handling of any materials generated as part of the management/remedial works; and
- Set out occupational health and safety and environmental management plans for the remediation and validation works so the appropriate plans can be developed and implemented by the Remediation Contractor during any remediation works.

1.4 Terminology and Roles and Responsibilities

Provided in the tables below are the terminology and roles and responsibilities relevant to the Central Precinct.

Table 1.1: Terminology

Abbreviation	Term	Definition
ACM Bonded	Asbestos Containing Materials Bonded	Bonded ACM comprises ACM which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. This term is restricted to material that cannot pass a 7 mm x 7mm sieve. Equivalent to "non-friable" asbestos in *How to Manage and control asbestos in the workplace Code of Practice* (Safe Work Australia 2011).
AF	Asbestos Fines	AF includes free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7mm sieve. Equivalent to "friable" asbestos in *How to Manage and control asbestos in the workplace Code of Practice* (Safe Work Australia 2011).
Ammunition	Ammunition	A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial or other non-operational purposes.
AMP	Asbestos Management Plan	See Section 3 of the Contamination Management Plan (CMP) (JBS&G 2015b[2])
AOC	Area of Concern	An area identified as containing potential contamination. Can also be referred to as Quarantined Area.
Category A	Category A ordnance Item	An item clearly of a military nature and which might readily be recognised by a member of the public as such (e.g. in effect complete in appearance as a projectile of 20 mm calibre or greater, hand grenade, mortar, bomb, etc.) and containing explosive filling, but excluding small arms ammunition.

[2] *Maryland Development Company Pty Ltd Contamination Management Plan Central Precinct, Llandilo, NSW*. JBS&G Australia Pty Ltd. 5 March 2015 (JBS&G 2015b).

Abbreviation	Term	Definition
Category B	Category B Ordnance Item	An item clearly of a military nature and which might readily be recognised by a member of the public as such (e.g. in effect complete in appearance as a projectile of 20 mm calibre or greater, hand grenade, mortar, bomb, etc.) and not containing explosive filling, but excluding small arms ammunition.
Central Precinct	Central Precinct	The development site as shown on **Figure 1 and 2.**
CMP	Contamination Management Plan	Describes the unexpected find protocol and asbestos management plan for the Central Precinct (JBS&G 2015b)
CRS Stages 3 to 5	Conceptual Remedial Strategy	This plan. For Stages 3, 4 and 5 of the Central Precinct
DUXOP	Defence Unexploded Ordnance Panel	The panel of contractors and consultants from whom the Department of Defence selects remembers for UXO related tasks.
ESA	Environmental Site Assessment	Environmental Site Assessments will be undertaken in each stage of the Central Precinct in accordance with the SAQP (JBS&G 2015a).
FA	Fibrous Asbestos	FA comprises friable asbestos material and includes severely weather cement sheet, insulation products and woven asbestos material. Defined as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Equivalent to “friable” asbestos in *How to Manage and control asbestos in the workplace Code of Practice* (Safe Work Australia 2011).
Induction	Site Specific Induction	The *Work Health and Safety Act 2011* (WHS Act) main objective is to secure the health and safety of workers and workplaces. A site specific induction is necessary for all workers on the Central Precinct to understand the site specific risks.
Metallic Debris	Metallic Debris	Debris comprising metal (ferrous) items. May include fragments of former ordnance items.
Ordnance	Ordnance	Any item of potential military origin. See Ammunition, Category A and B Ordnance Item and UXO
Property	Former St Marys ADI Property	The whole of the landholding formerly known as the ADI St Marys Property as shown on **Figure 1**.
Quarantined Area	Quarantined Area	Area removed from development activities due to potential contamination. Also see AOC.
SAQP	Sampling Analysis and Quality Plan	Describes how the ESAs will be undertaken across the Central Precinct (JBS&G 2015a).
Site	Site	The subject area, where potential contamination has been found.
SRAP	Specific Remediation Action Plan	A Specific Remediation Action Plan will need to be developed for each stage should impacts be identified which may pose a risk to human and/or ecological health during the Environmental Site Assessments (ESAs).
UXO	Unexploded Ordnance	Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting place for any reason, including souveniring.

Table 1.2: Roles and Responsibilities

Responsibility	Role and Company (where available)
Client	Maryland Development Company (MDC). The owner of the Central Precinct. Responsible for the overall management of the Central Precinct and the engagement of the Principal Contractor and Environmental Consultant.
Principal Contractor	Lend Lease Engineering (LLE) – Abbas Abbas 0418 727 179 ------- Means the contractor in primary control of the Central Precinct, or site. Responsible for notifying the client, appropriate consultant or contractor in relation to unexpected finds. Also responsible for quarantining AOC with suitable barricades and in forming other workers of its location in accordance with CMP (JBS&G 2015b).
Environmental Consultant	JBS&G – Katie Linz 02 8245 0300 -------- As defined under the NEPM (NEPC 2013) (Schedule B9) the environmental consultant responsible for the assessment of contaminated sites and preparation of assessment reports should be able to demonstrate relevant qualifications and experience to a level appropriate to the contamination issues relevant to the site under investigation. -------- Responsible for notifying the Client and Principal Contractor of any unexpected finds. Also responsible for undertaking the assessment, remediation and validation of any AOC in relation to chemical contamination. Additionally responsible for engaging the Ordnance contractor.
Ordnance Contractor	Persons and/or company appropriately qualified to undertake ordnance searches, clearances and prepare reports. Responsible for undertaking ordnance searches, removal of items and clearances.
Licenced Asbestos Assessor	JBS&G – Michael Samuel 02 8245 0300 ------ Means a person who holds an asbestos assessor licence. Responsible for final clearances after asbestos removal works are undertaken.
Licensed asbestos removalist (Asbestos Removal Contractor)	Means a person conducting a business or undertaking who is licensed under the WHS regulation to carry out Class A or Class B asbestos removal work. Responsible for the safe removal of asbestos of any AOC in accordance with the relevant legislation and codes of practice.
Asbestos Consultant / Competent Person	A person who has acquired through training or experience the knowledge and skills of relevant asbestos removal industry practice and holds a certification in relation to the specified VET course for asbestos assessor work or a tertiary qualification in occupational health and safety, occupational hygiene, science, building, construction or environmental health. For all other purposes, competent person means a person who has acquired through training, qualification or experience, the knowledge and skills to carry out the task.
Remediation Contractor	Persons and/or company appropriately qualified to undertake the required remediation works and has the appropriate insurances and licences. Responsible for undertaking remedial works in accordance with the CRS and SRAPs.
Worker	Any worker on the Central Precinct development site, including any contractor or sub-contractor. Responsible for undertaking their tasks in a safe manner and notifying the Principal Contractor if they see any items/conditions which may constitute and unexpected find.

2. Site Condition & Surrounding Environment

2.1 Site Identification and Condition

The location of the site is shown in **Figure 1**, and current layout is shown in **Figure 2, 3a, 3b and 3c**. The site details are summarised in **Table 2.1**.

Table 2.1 Summary Site Details

Lot Number	Part Lot 1037 DP 1149525.
Street Address	Stages 3 to 5 Central Precinct, Llandilo, NSW (See **Figure 3a, 3b and 3c**).
Local Government Authority	Penrith City Council
Geographic Coordinates (MGA 56)	33.7325 E 150.750 N
Site Area	Stage 3 area = approximately 12.7 ha Stage 4 area = approximately 52.1 ha Stage 5 area = approximately 9.6 ha Stage 3 – 0.1 ha subject to audit Stage 4 – 8 ha subject to audit Stage 5 – 0.5 ha subject to audit
Current Land-use	Open space with some commercial/industrial buildings
Proposed Land-use	Residential with substantial vegetable gardens and poultry and regional park

2.2 Site Description

2.2.1 Preliminary Site Inspection

A preliminary site inspection was completed on 11 March 2014 by JBS&G trained and experienced field scientists. At the time of the inspection, the buildings/warehouses and associated hard stands and road pavements were all still in place as shown on **Figure 2**.

Buildings and Warehouses and Associated Concrete Hardstand

A number of building structures, including 2 large warehouses and a number of smaller guard huts, storage sheds, weigh bridges and site offices, were located across the development site. Due to the presence of these structures and associated concrete hardstands, these areas of the development site have not been previously investigated as shown on **Figure 2**.

Paved Roadways

Roadways across the development site comprised a combination of bitumen paved and unsealed gravel as detailed on **Figure 2**.

Stockpiles

A number of stockpiles (SP30, SP31, SP32, SP33, SP34, SP35, SP36, SP37 and SP50) were located in the northern portion of the development site. The stockpiles were observed to be quite overgrown with grass and weeds. The stockpiled material was observed to comprise a combination of soil and asphalt, concrete and brick as shown on **Figure 3b**.

2.2.2 Detailed Site Inspection

A detailed site inspection and an interview with the development site caretaker (Kevin Sancroft) was undertaken on 9 February 2015 by trained and experienced field scientists.

At the time of the inspection, the development site area was fenced and the majority of the site was unsealed with the exception of the paved roads and the paved areas within the W building series compound, which was still in use. A photographic log is provided in the SAQP (JBS&G 2015a).

W Building Series

The W building series comprised a group of permanent and portable buildings currently used for storage and sterilisation of the on-site kangaroo population.

W01 (south) was a tall structure with steel frame and platforms on two levels with the first level housing a measuring device.

W01 (north) was a steel frame structure with a large deck on top.

One small portable storage shed was remaining from the cluster of small W01 buildings.

W02 (north) was a 3 storey structure once used as a radar room.

W02 (south) was a 2 storey structure with a deck on top that was also used as a radar room. The structure was made of concrete and galvanized steel with the room on lower level being used to store hay bales for recovering kangaroos. Steel steps and a ladder provided access to the rooftop deck. Suspected small ACM fragments were observed on the ground surface adjacent to the building.

W04 compound consisted of three portable structures which had been relocated adjacent to W01 cluster at the time of the inspection. One of these structures was being used as a recovery centre for kangaroos after sterilisation.

W05 area comprised the timber radar loop with steel cables (numbered as W04 on structure). Suspected highly weathered ACM fragments were observed on the paved area beside the radar loop.

At the time of the site inspection, both structures numbered W09 had been demolished and only the slabs remained.

W10 was an empty garage space that was re-covered to replace ACM cladding.

The toilet adjacent to W10 was made of ACM cladding that was damaged and suspected ACM fragments were observed on ground surface.

W11 was a large colour-bond steel warehouse which was on a slightly elevated surface with surrounding land sloping toward the east. The left portion housed Kangaroo Management Offices while the middle portion was used as a car storage/park. The right portion was being used as storage/workshop space. A 500 Litre diesel storage tank with no bund was identified and some staining on the ground surface was observed.

A caravan and portable building was located adjacent to the warehouse and another portable building was located opposite the warehouse all of which were not identified on plans provided.

Stormwater in the area of the W series buildings is anticipated to infiltrate at a rate reflective of the permeability of the surface soils and excess precipitation will migrate laterally across the ground surface to the east into the South Creek.

Paved Roadways

Bitumen paved road across Stage 3 gave access to the site offices that are part of X series building demolition area. The road was generally level with the surrounding area.

Two paved roads existed in the western portion of Stage 4. The roads were bitumen paved with no curbing and were generally level with the surrounding area. A small paved area was observed to the northeast of the first intersection, which contained an enclosure for holding kangaroos before sterilisation.

Stockpiles

Most of the stockpiles located in the northern portion of site were noted to be overgrown with vegetation. The following observations were made.

- Stockpile 39 consisted of large concrete sections and corroded steel reinforcement;

- Stockpile 34 consisted of large concrete fragments and steel reinforcement;
- Stockpile 36 consisted mostly of brick;
- Stockpile 50 consisted of concrete and steel reinforcement;
- Stockpile 37 consisted of road base and was overgrown with grass and minor trees;
- Stockpile 32 and 31 consisted of road base and were overgrown with vegetation; and
- Stockpile 30 comprised of soil and was overgrown with grass with characteristic green colour.

2.3 Surrounding Land use

The Stages 3 to 5 surrounding land use is as follows:

- North – Wianamatta Regional Park.
- East – Wianamatta Regional Park and The Ropes Crossing housing development.
- South –Stages 1 and 2 of the Central Precinct.
- West – Wianamatta Regional Park and The Jordan Springs residential development.

2.4 Topography and Hydrology

As reported in ADI (1996a[3]) the former ADI St Marys property (**Figure 1**) topographic relief is undulating to slightly hilly and ranges from RL 60m in the western and eastern sectors to RL 12m in the centre where South Creek and Ropes Creek flow northward. The creeks converge just north of Central Precinct and drain into the Hawkesbury River some 13km away. The alluvial floodplain of the combined creek system is approximately 1km in width.

Central Precinct is located on the plains to the east of the Nepean River. It has a flat to undulating surface that ranges from 20m to 30m above sea level. The highest points correspond to hills on the western side. South and Ropes Creeks are the two main waterways which flow north and have their confluence just north of the former ADI St Marys property boundary. Several open drainage channels drain the west of the property and flow into one channel which joins South Creek. Similarly two drainage channels drain the east of the property and flow into Ropes Creek. A majority of the catchment flows to South Creek. Both South Creek and Ropes Creek have sizeable catchments outside the Property area. Within the centre of the former ADI St Marys property, South Creek possesses a floodplain. The geology of the eastern and western sectors consists of the Bringelly Shale Unit, which is usually a sandstone and dark grey shale unit that is part of the Liverpool sub-group and the Wianamatta Group of the Triassic epoch.

This is overlain by weathered shale and the Luddenham soils which are a clayey loam, which in are as contains manganese bands and ironstone fragments. The central portion of the site consists of fluvial soil types which are termed South Creek and Berkshire Park.

ADI (ADI 1996b[4]) reported South Creek and Ropes Creek are the two main waterways that flow northwards through the ADI St Marys Property and have their confluence just to the north of the former St Marys Property boundary. South Creek drains a very large catchment in western Sydney, originating at Narellan, over 30 km to the south. The catchment is a long narrow strip up to 8 km wide with an approximate area of 18,000 ha. The catchment includes residential, agricultural and industrial areas. The creek flows northwards from the development site through mainly agricultural areas before meeting the Hawkesbury River at Windsor, 12 km to the north.

[3] *ADI St Marys Property Historical Report,* ADI Limited, 1996 (ADI 1996a)
[4] *Volume 1 Validation Report for the Central Sector West of the ADI St Marys Facility*, ADI Limited, 1996 (ADI 1996b)

ADI (ADI 1996b) reported Ropes Creek drains a smaller catchment, originating at Cecil Park, 12 km to the south-west. This catchment is also a long narrow strip up to 4 km wide and with an approximate area of 2400 ha. The catchment also includes residential, agricultural and industrial areas. Part of the creek has been diverted along a concrete drainage channel for about 2 km through the former St Marys Property before flowing into South Creek at its new confluence just to the north of the former St Marys Property boundary.

The St Marys Sewage Treatment Plant (STP) is located south east of the Central Precinct boundary. ADI (1996b) reported effluent from the STP receives tertiary treatment before being discharged into the old Ropes Creek flow channel. This then flows into South Creek at its old confluence in the middle of the former St Marys Property.

ADI (1996b) reported three surface water sampling locations were located within the former central sector west, SW4, SW5 and SW6. Only one location (SW4) is located downgradient of the current development site and was located downstream of the confluences with the stormwater channels from the industrial and residential areas to the south of the former Central Sector West.

Results for SW4 as reported by ADI (1996b) indicated water was generally neutral, fresh and under oxidising conditions and no organic compounds such as phenols, explosives, BTEX, TPHs, VHCs or OCPs were detected in the Ropes Creek inflow.

2.5 Geology

Review of the regional geological map (DMR 1997) indicated the Central Precinct lies within Tertiary Londonderry Clay. The Londonderry Clay is characterised by clay, patches of ferruginised, consolidated sand.

Review of the regional soil map (DLWC 1972) indicated that Central Precinct lies within the Berkshire Park soil landscape group.

The typical Berkshire landscape is characterised by weakly pedal orange heavy clays and clayey sands, often mottled with inclusions of ironstone nodules. Large silcrete boulders (up to 20cm) occur in sand/clay matrix. Yellow podzolic soils where drainage conditions are poor, red podzolic soils and chocolate soils on flats and in small drainage lines. Kransnozems are present in unstructured plastic clays and in drainage lines or a crest.

Limitations of the Berkshire landscape group are very high wind erosion hazard if cleared. Gully, sheet and rill erosion on dissected areas. Waterlogging, impermeable subsoils, low fertility hazard.

This area is largely Quaternary age alluvium beds that consist of gravelly sand, sand, clayey sand silty clay, from 1 to 8m in depth. In the northeast, the soil type is the Berkshire Park soil, while the eastern area is the Blacktown soil type – both of these overlie the Bringelly Shale Unit. Noted in the western region were a number of paleochannels of unknown origin.

As reported in ADI (1996a) the former ADI St Marys Property is underlain by shales of Bringelly Shale Unit part of the Liverpool Sub-group and Wianamatta Group of the Triassic epoch. These are overlain by alluvium of Quaternary age. The Bringelly Shale unit consisting mainly of grey hard shales within intervening siltstone forms the bedrock. The top of the shale, up to 5m thick, is highly weathered and very friable in nature. The Quaternary alluvium comprises predominately buff coloured silt, silty/sandy clays which is often lateritic in nature and mottled with yellow/red ochres and iron nodules. Quaternary alluvium was deposited mainly in the central lowlands along the flood plains of South Creek and Ropes Creek. Thickness of the alluvium within the development site is likely to range in thickness from approximately 6m to 10m as these are the central lowlands.

2.6 Hydrogeology

A review of information obtained from the Natural Resource Atlas database (DECCW 2012[5]) indicated there are three registered groundwater monitoring wells located to the south east of the Central Precinct with no feature information available for any of the three wells. No registered groundwater wells are located within the development site.

As reported in ADI (1996a) groundwater was observed at the former ADI St Marys property in an upper unconfined aquifer and a lower regional semi-confined aquifer. The Quaternary alluvium and highly weather shale occurring at depths ranging from 2 to 10m below ground surface forms the shallow upper aquifer. The depth to the water table ranges from 2 to 7m below ground surface depending upon the surface topography. The water table occurs in the sandy to silty clay above the weathered shale and/or shale bed rock. The groundwater flow pattern on a regional scale follows the general topography of the area, however, variation in the flow direction can occur locally based on the ground slope. On a broad scale the groundwater flows across the eastern and western sectors in towards the central lowlands of the former ADI St Marys Property and then northwards.

ADI (1996a) reported the lower aquifer is comprised of fractured shales at the depth ranging 5 to 30m below ground level. The shale bedrock forms a valley type structure across the former ADI St Marys property and the groundwater flow pattern is governed by this structure. The hydraulic conductivity of the lower aquifer varies greatly depending upon the interception of fracture zones.

Additionally, ADI (1996a) reported the groundwater in the shallow upper aquifer is fresh to brackish as well as saline (electrical conductivity (EC) 300 to 40 000μS/cm). The groundwater from lower fractured shale aquifer is mainly saline (EC 6000 to 30 000 μS/cm). The groundwater pH ranges from 4.5 to 7 indicating slightly acidic conditions for both aquifers however at each sample point the shallow groundwater is consistently more acidic than deep groundwater. The dissolved oxygen concentrations are variable but generally less than 6mg/L indicating slightly reducing conditions in both aquifers.

Furthermore, ADI (1996a) reported the general groundwater from both aquifers has high total dissolved solids (TDS 150 to 20 000mg/L), slightly acidic pH and low dissolved oxygen concentration which makes it impractical for any domestic, agricultural or industrial use.

As detailed in the Stage 2 Decontamination Audit Report (Kidd 1999[6]), groundwater investigations were carried out from 1991, by Mackie Martin & Associates, who constructed and monitored 64 groundwater wells (later expanded to 154 by ADI) over the entire Property. The study identified two aquifers - one upper unconfined and one lower semi-confined. They proposed the lower, regional aquifer was in the fractured shale with the groundwater flow patterns reflecting the surface topography. The study surmised the upper, unconfined aquifer was composed of Quaternary alluvium and highly weathered shale at a depth of 2m to 10 m. Testing indicated the local permeability of the fractured shale aquifer is variable depending on the degree of fracturing but the average permeability was low (less than $1x10^{-6}$ m/sec). The permeability of the unconfined alluvial aquifer was also low due to the high clay and silt content of the alluvium.

The water table was typically 1.5 to 7m below the ground surface in the alluvium and from 3 to 30 m in in the shale. On a regional scale, the groundwater flow pattern followed the surface water drainage patterns - the general flow was from the east and west towards the central lowlands and then northwards. The groundwater movement was slow to very slow due to the low permeability and the gentle hydraulic gradients.

[5]NSW National Resource Atlas, http://nratlas.nsw.gov.au/wmc/custom/homepage/index.html, Department of Environment and Climate Change, accessed 6 April 2014 (DECCW 2014)

[6] *Stage 2 Decontamination Audit of ADI St Marys, Munitions Factory*, Department of Urban Affairs and Planning, Christopher H Kidd, HLA-Envirosciences Pty Ltd, June 1999 (Kidd 1999)

During the validation works undertaken by ADI (1996b) within the Central Sector West it was reported six monitoring wells (SM30, SM76, SM77, SM78, SM79, SM109 and SM110) were installed within the portion which currently forms part of the development site.

ADI (1996b) reported wells SM30, SM76 and SM110 are all shallow wells. The depth to water table measured in March 1996 ranged from 2.13m bgl (SM76) to 3.48m bgl (SM110). The water table elevation ranged from 15.05m AHD (SM110) to 15.41m AHD (SM76). Additionally, ADI (1996b) reported the depth to piezometric surface at well SM77 in March 1996 was 2.02m bgl, corresponding to 15.63m AHD. The groundwater in the lower fractured shale aquifer thus has higher head than the shallow aquifer and there is an overall upward movement of groundwater from the deeper aquifer to the shallow aquifer. Periodic water level monitoring at these wells did not show any significant changes in the water levels except for minor seasonal fluctuations.

Furthermore, ADI (1996b) reported the hydraulic conductivity of the upper aquifer was very low, ranging from 0.008 to 0.015 m/day. The hydraulic gradient in the upper shallow aquifer was also very low. Low hydraulic conductivity and low gradient combined with low effective porosity suggest extremely slow groundwater movement in both the horizontal and vertical directions.

ADI (1996b) reported sampling and analysing samples from these wells over a number of rounds. Samples were analysed for a range of inorganics and organics and demonstrated the groundwater had not been impacted by previous site activities.

During the validation works undertaken by ADI (Kidd 1999) within the Southern Sector West a total of 33 shallow and 10 deep groundwater monitoring bores were installed within the Sector. These bores were positioned based on topography and drainage, and were generally placed downgradient of areas where past activities impacted the soil (ie. where soil remediation was undertaken).

2.7 Acid Sulfate Soils

Review of the Natural Resource Atlas (DNR website[7]) indicated that there no known occurrence of acid sulfate soils in the vicinity of the site.

[7] Department of Natural Resources Atlas, www.nratlas.nsw.go.au accessed 7 April 2014

3. Summary Site History

The following is a summary of the former ADI St Marys property history as detailed in Kidd 1999.

Prior to WW2, the land consisted of farmland and natural bushland. The property was acquired by the Commonwealth Government in 1941, and in 1942 established an explosives factory for ordnance and ammunition filling, testing and related procedures. The entire property was known as the St Marys Munitions Filling Factory (MFF). In 1989, ownership was transferred to ADI Limited, and production officially ceased manufacturing on March 17th 1994, as part of a rationalisation process.

The ADI Munitions facility which covered an area of 1535 ha was established in 1942 and was part of a larger parcel of farmland resumed in 1941 by the Commonwealth for establishment of ammunitions factory to support the war effort (World War II). From 1955-57, a new munitions factory was constructed and a substantial part of the original factory was leased to private industry and became the present Dunheved Industrial Estate.

The St Marys Munitions factory was primarily a filling, or load and pack type, operation where explosives and propellant manufactured elsewhere, were loaded into shells, bomb and rocket casings and stored in magazines awaiting deployment. Small amounts of some initiator explosives for detonators and fuses were manufactured on the property because they were too sensitive to travel. Some test firing of detonators, fuses and smaller occurred at designated areas as part of the manufacturing quality assurance program. All larger munitions were test fired at Army ranges elsewhere.

The manufacturing, storage and handling of explosives and munitions at St Marys were carried out under strict safety and stock control procedures, and the area was a high security workplace. Off-specification or unserviceable munitions were destroyed by boiling out the explosive and propellant, recycling the scrap metal and burning the explosive and propellant in designated burning grounds. The residue ash was buried in on-site landfills along with general waste from the facility. It is understood a considerable surplus or unserviceable ordnance was brought to the site for disposal and demilitarisation after World War II (1946-1955).

The property had its own landfills for disposal of solid waste. Effluent from the various manufacturing operations was passed through settling ponds, referred to as labyrinths, to collect any residual explosives that might be present, before discharge to the sewer. Where necessary the wastewater was neutralised prior to discharge. The labyrinths were cleaned out periodically and the explosive material was taken to a burning ground for destruction.

In one location in the north eastern part of the property the wastewater was sprayed into earth lined evaporation ponds. In its review of the site history, ADI reports that several labyrinths occasionally overflowed into local watercourses, which led to complaints of "red water" (TNT residues). In 1980, an article in the media prompted an Inquiry into environmental and health issues including water quality issues in Ropes Creek. This led to various improvements in dust and effluent control. The reports detail the varying uses of the different regions of the sectors during the period of armaments production. Facilities and associated activities included hundreds of buildings for the assembly, production and storage of bombs (5001b, 10001b and 20001b), Quality Evaluation Laboratory (QEL), sampling laboratories, offices, ballistics testing tunnel, open-air pistol and rifle shooting range, workshops and boiler house, detonator and explosives testing, chemical storage, waste burning areas, waste trenches and tips, explosives trials areas, settling ponds for waste water, water evaporation ponds, underground fuel tanks, a water tower, amenities buildings, CSIRO yards for sheep dipping and storage of agricultural chemicals, borrow pits, farmlands, are as of natural bush land, and floodplains around the two creeks.

ADI conducted site contamination investigations in the early 1990's and developed and conducted remediation programmes to allow future development of the site for residential and other

development such as public open space. The various sectors were subject to contamination investigation, remediation and validation over the period from September 1990 to October 1996.

The former sector which currently falls within the Stages 3, 4 and 5 of the development site boundary is:

- North Western Sector;
- Central Sector West; and
- Southern Sector West.

3.1 North Western Sector

Only a small portion of the former North Western Sector falls within the Central Precinct. The portion which falls within the Central Precinct would have previously contained a small section of the former Site 5 (ADI 1995[8]).

As reported by ADI (1995) Site 5 was located in the southern portion of the Sector, with an area of 121 ha. Previously known as Bomb Filling. This site consisted of a production area which was commissioned in 1957 and used intermittently until early 1991. Site 5 contained 39 single or double storey buildings and connecting bitumen roads. Open grass areas and extensive bushlands surrounded these buildings. Of the 39 buildings, 10 were used as production areas and 29 for general storage. Some of the production buildings were surrounded by earth mounds to roof height. The mounds were built to dissipate any shock from accidental detonation of the contents housed within the building. Some production buildings also housed special settling tanks to collect contaminated process waste water.

The Proof Test Range (B56 and B57) were part of the Bomb Filling section constructed in 1978-1980 it comprised a storage building, control building and a 250 m long above ground tunnel to testing cannon ammunition.

Former Site 5 was reported as suitable for residential with substantial vegetable garden and poultry under site audit statement CHK001/1.

Since the completion of the ADI report (ADI 1995), the National Environment Protection (Assessment of Site Contamination) Measure has been updated (NEPC 2013). A comparison of historical data against the updated NEPC 2013 has therefore been undertaken to determine if there are any additional exceedances of the site criteria.

It is noted that the criteria for nickel, benzene, Aldrin+dieldrin, heptachlor, phenols and TPH C_6-C_9 and C_{10} –C_{40} have all been decreased (NEPC 2013). Based on a preliminary review of historical data, there were no additional exceedances of the newly adopted NEPC 2013 soil criteria identified.

For TPH C_6-C_9 and C_{10}-C_{40}, it is noted that the concentrations previously reported are only used for screening purposes as the F1 and F2 chain lengths detailed in NEPC 2013 are not directly comparable. It is noted that neither Site 5 nor the current site area are known to have contained above or below ground storage tanks (ASTs or ASTs) and therefore the potential presence of TPH contamination is considered to be low.

On review of the historical groundwater data from North Western Sector (ADI 1995), concentrations of COPC were all either within the adopted site criteria or below the laboratory limit of reporting (LOR). The LORs achieved in the 1995 report for OCPs were however higher than the current groundwater criteria. Based on the site history review however, it is known that OCPs were not manufactured at the Central Precinct development site. There still exists the potential that OCPs may have been sprayed under buildings prior to construction, however it is considered that this will be

[8] *Volume 1 Validation Report for the North Western Sector of the ADI St Marys Facility*, ADI Limited, 1995 (ADI 1995)

identified during the current site investigation works and the potential for groundwater impact from this type of activity is low.

3.2 Central Sector West

Approximately 50% of the former Central Sector West (western portion) falls within the Central Precinct boundary. The portion which falls within the development site would have previously contained the former Site 9, 24A, 24B and Building B45 (ADI 1996b).

As reported by ADI (1996b) Site 9 was approximately 1.552 ha, and was located west of South Creek. Site 9 was known as the Loud Proof Range, was used for the detonation of explosive devices such as grenades and smoke canisters. The explosive devices were detonated on the ground surface, and were usually surrounded by a square wood lined shield. This shield was used to collect information on the pattern of metal debris from the exploded devices. The detonation activities were conducted to test batches of explosive devices which were under development. Detonation activities ceased at Site 9 in 1991.

As reported by ADI (1996b) Site 24A was located to the east of Building B45. It was a low lying area that collected rain water run-off from the former Site 5.

As reported by ADI (1996b) Site 24B was 0.939 ha and comprised the CSIRO yards and shearing shed which were used for the storage of agricultural chemicals, and maintenance of sheep.

As reported by ADI (1996b) Building B45 was identified in the initial investigation as part of Site 5 into the North Western Sector. It was subsequently excised from Site 5 for inclusion in this Sector as the treatment plant was still in operation during the other remediation activities of the property. Building B45 was a structure which housed steam generation equipment to boil out explosive compounds from obsolete high energy projectiles. Building B45 was surrounded by a roof height earth wall mound. It also had a concrete labyrinth which was in use prior to 1986. The labyrinth collected the waste water steam.

Site 24K, tipsites 23- 25 and former farmland located within the Central Sector West not within the development site but adjacent the eastern boundary were used for the following:

- Site 24K – used for the disposal of sheep and kangaroo carcasses. General rubbish was also tipped.
- Tipsites 23-25 – approximate dimensions were 6 m x 6 m x 0.2 m waste comprised glass, scrap metal and plastic.
- Former farmland – used for farming and sheep grazing activities. The area was investigated prior to the stockpiling of Stockpile 30 (biosolids).

Former Site 9, Site 24A, Site 24B and Building B45 were reported as suitable for residential with substantial vegetable garden and poultry under site audit statement CHK001/1. Along with the adjacent Sites 24K, tipsites 23-25 and former farmland.

Since the completion of the ADI report (ADI 1996b), the National Environment Protection (Assessment of Site Contamination) Measure has been updated (NEPC 2013). A comparison of historical data against the updated NEPC 2013 has therefore been undertaken to determine if there are any additional exceedances of the site criteria.

As previously noted, the criteria for nickel, benzene, Aldrin+dieldrin, heptachlor, phenols and TPH C_6-C_9 and C_{10} –C_{40} have all been decreased (NEPC 2013). Based on a preliminary review of historical data, there were no additional exceedances of the newly adopted NEPC 2013 soil criteria identified.

For TPH C_6-C_9 and C_{10}-C_{40}, it is noted that the concentrations previously reported are only used for screening purposes as the F1 and F2 chain lengths detailed in NEPC 2013 are not directly comparable. It is noted that neither the Central Sector West nor the current site area are known to

have contained above or below ground storage tanks (ASTs or ASTs) and therefore the potential presence of TPH contamination is considered to be low.

On review of the historical groundwater data from Central Sector West (ADI 1996b), concentrations of COPC were all either within the adopted site criteria or below the laboratory limit of reporting (LOR). The LORs achieved in the 1996 report for OCPs and PAHs were however higher than the current groundwater criteria. Based on the site history review however, it is known that OCPs were not manufactured at the Central Precinct development site. There still exists the potential that OCPs may have been sprayed under buildings prior to construction, however it is considered that this will be identified during the current site investigation works, together with and potential PAH impact not previously identified, and the potential for groundwater impact from these types of contaminants is low.

3.3 Southern Sector West

Approximately 50% of the central portion of the former Southern Sector West is located within the Central Precinct. At the time of reporting the ADI Validation Report was not available for review. The following information was obtained from the site audit report prepared by Kidd (1999) and ADI (1996a).

Kidd (1999) reported historically, the sector had a variety of uses including ammunition testing, landfills and covered waste trenches, CSIRO yards used for sheepdipping and storage of agricultural chemicals, buildings used for the storage of chemicals, and an area formerly containing 4 underground fuel storage tanks. ADI nominated 15 sites that were targeted for site investigation purposes. The portion of the former southern sector west which falls within or proximal to the Central Precinct would have previously contained Site 3 and 4A-D.

As reported by ADI (1996a) Site 3, located adjacent the current Jordon Springs Connector Road, was approximately 2 ha and contained 10 single storey igloo type Nissen huts of galvanised iron with concrete floors. It was a fenced, cleared area, with patchy grass cover, divided by a small gravel internal road. The site was surrounded by light natural bush and small trees. There was no documented or visual evidence of any buried waste or fill. The processes conducted in this area included delivery and temporary storage of chemicals in sealed containers. Chemicals were then despatched to process areas as required. A range of chemicals cleaning agents, sulphuric acids, lead acetate, sodium sulphate, nitric acid, hydrochloric acid, potassium hydroxide, potassium chlorate and accelerator.

As reported by ADI (1996a) Site 4 was approximately 28 ha and was sub-divided into four separate sub-sites - 4A, 4B, 4C and 4D. The site was divided by an access road and cleared fire track with 4A and 4B on the south east side and 4C and 4D on the north-west side. There were several documented or known disposal locations within the site. There were no underground storage tanks on the site. Discharges to land included solid waste buried in a series of trenches and air emissions from burning activities.

Site 4A was a small fenced area containing nine, filled and covered waste trenches. The dimensions varied, but they were generally 10m x 2m x 1m. The trenches were used for disposal of solid waste. The waste included empty drums, asbestos lagging, pipes, wooden pallets, building rubble, fibro cement, paint scrapings, paint thinner, tins sealed drums containing paint scrapings and ammunition boxes (ADI 1996a).

Site 4B was originally a soil borrow area which was subsequently used for open air burning of explosives. A drainage channel was cut down the middle of the area to permit run-off. The area was used for open air trial and burning of explosives and for the shallow burial of empty ammunition boxes after its initial use as a barren site for clean fill. The majority of the activities were conducted in the 1960's. Activities included the testing of 3.5 inch rockets and burning of shields in explosions. In the 1970's CIG performed tests on gas bottles in fires.

Site 4C was approximately 0.2 ha and consisted of two waste water settling ponds used for waste water disposal from explosive processing. Waste water which collected in labyrinths was periodically collected and placed in the ponds. This practise ceased in the late 1980's but the ponds still contained some water which was mainly rain water and run-off from the surrounding areas.

Site 4D was largely open forest with a slope of 3%. Under the tree canopy, the ground cover is scattered leaf litter and tussock grass. Site 4D was a test site for the open air detonation of grenades.

Site 11 is located to the east of the W series buildings and was formerly a soil and gravel quarry area and a tip site for rubble and general factory waste.

Former Site 3, 4A, 4B, 4C and 4D and Site 11 were reported as suitable for residential with substantial vegetable garden and poultry under site audit statement CHK001/1.

3.4 Recent Site History of Remaining Buildings

3.4.1 W-Series Buildings

At the completion the site audit in 1999 a number of buildings located in the south eastern portion of the current development site remained. Currently referred to as the W-Series buildings.

They were used as a test antenna range for a few years after the site audit statements were issued, and in more recent times for internal site management processes and maintenance.

Currently all structures still remain onsite.

3.4.2 Stockpiles

Stockpile 30

This stockpile is located in the north east of the development site (**Figure 3b**) and is reported to comprise approximately 74,780 m^3 of biosolids originating from the St Marys Sewage Treatment Plant (STP) in the 1980s. A letter from the NSW EPA (ADI 1996[9] and EPA 1996[10], discussed below) indicates the material within the stockpile can be investigated as if it were contaminated soil.

Site 24F reported in ADI (1996c[11]) was a treated sewage sludge settling area. In the mid 1980s the St Marys Sewage Treatment Plant received approval from the St Marys Munitions Filling Factory to pump treated sludge from its plant onto ADI land. In the initial investigation Site 24F was identified as a disused sewage effluent dumping area boarded by 0.5-1 m high earth mounds. The estimated area was 5 hectares with five distinct ponds separated by 0.5 m high earthen mounds.

ADI (1996c) reported 148 samples were collected to characterise and delineate the dried sludge. Samples were analysed for a range of heavy metals, pH, OCPs, PCBs, TKN, NH_4, NO_3, NO_2, total P and PAH. Impacts above the then site criteria were reported for Cr, Cu, Zn, OCPs, PCBs and PAHs.

Areas of OCP, PCB and PAH impacts reported in the sludge materials were excavated and disposed to landfill with validation samples collected from these excavations ADI (1996c).

ADI (1996c) reported the dried sludge material was excavated and stockpiled within the St Marys Property the total volume was estimated at 75 000 m^3. Historical analytical results for the sludge moved are provided in the SAQP (JBS&G 2015a).

Compared to current site criteria (NEPM 2013) the data provided for the biosolids stockpile in general meets todays residential human health investigation levels. There were several exceedances for total PAHs above the BaP TEQ (3 mg/kg). Analytical results could not be located and reviewed to calculate the BaP TEQ, therefore PAHs and BaP remain a contaminant of concern for the biosolids.

[9] *Sewage Sludge on ADI Property*, ADI Limited, April 1996 (ADI 1996)
[10] *Re: Sludge Stored in Southern Sector*, EPA, May 1996 (EPA 1996)
[11] *Volume 1 Validation report for the Southern Sector East of the ADI St Marys Property*, ADI limited, July 1996 (ADI 1996c).

The biosolids have been in the stockpile since the mid-late 1990s (>15 years) which would suggest the survival of any bacteria, viruses or helminth ova is unlikely.

Stockpile 31, 32 and 37

These stockpiles are located in the north of the development site (**Figure 3b**) and are reported to comprise soil and asphalt and are approximately, 45,060 m^3, 8750 m^3 and 174,170m^3, respectively. Materials are reported to have originated from demolition activities in the 1990s.

Stockpile 32 was sampled in accordance with the Protection of the Environment Operations (Waste) Regulation 2005- General Exemption Under Part 6, Clause 51 and 51A, "The recovered aggregate exemption 2010", and was classified as recovered aggregate suitable for reuse as fill under roadways (Geotech 2013[12]).

Stockpile 33, 34, 35 and 50

These stockpiles are located in the north of the development site (**Figure 3b**) and are reported to comprise concrete and are approximately, 1000 m^3, 136,760 m^3, 1800 m^3 and unknown, respectively. Materials are reported to have originated from demolition activities in the 1990s.

Stockpile 36

This stockpile is located in the north of the development site (**Figure 3b**) and is reported to comprise brick and is approximately, 19,310 m^3. Materials are reported to have originated from demolition activities in the 1990s.

3.5 Integrity Assessment

The information obtained from the historical sources reviewed has been found to be in general agreement.

[12] *Jordan Springs Development Project, Central Precinct, Jordan Springs, Assessment of Asphaltic Concrete Stockpile for Potential Re-Use*, Maryland Development Company Pty Ltd, Geotech Testing Pty Ltd, June 2013 (Geotech 2013).

4. Previous Investigations

The following environmental report has been prepared for the site however was not available for review:

- Validation Report for the Southern Sector West of the ADI St Marys Property, Report No. 498810, ADI Limited 1996.

A number of Site Audit Statements and additional environmental advice were available for review and have been summarised below.

4.1 Validation Report for North Western Sector (ADI 1995)

ADI (1995) reported the North Western Sector of the ADI St Marys Facility was investigated, remediated and validated over the period of September 1990 to August 1995. The procedures used in the assessment and remediation of this land were those contained in the recommended approach in the Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites, ANZECC and NH&MRC, January 1992.

Within the 191 ha Sector ordnance and ammunition filling, testing and related procedures were intermittently conducted between 1942 and 1991 at identified sites. A detailed historical survey was conducted which identified raw materials, products, manufacturing locations, site usage, waste disposal and factory procedures which may have impacted on certain areas within the Sector (ADI 1995).

ADI (1995) reported to assess, remediate and validate the North Western Sector, Safe Environmental Acceptance Criteria were drawn from accredited sources and subsequently approved by the EPA NSW as the criteria governing the assessment and validation for the North Western Sector.

Additionally ADI (1995) reported a total of 671 soil samples, collected within the Sector boundaries from sites 5, 6, 7 and 8, form the validation data. These samples were analysed for the full range of chemicals, and include the results of systematic grid sampling and judgemental sampling arising from specific areas which were considered to be potentially contaminated. Any identified contamination was duly remediated or removed and disposed of off-site. To confirm the complete removal of contamination, validation sampling was performed, the results of which, combined with background grid sampling, provided statistical probabilities. Results show that statistical analysis of the validation data met the statistical criteria and the probability of other random samples exceeding criteria is low.

Furthermore, ADI (1995) reported the entire North Western Sector was also subjected to intensive sub surface investigation technologies to locate metallic buried waste or debris. The application of advanced sub surface investigation technologies was based on the historical information available to ADI. The metallic items detected, including ordnance related, were duly removed and safely and responsibly disposed. The sub surface investigations also contribute to the overall validation results.

Additionally, ADI (1995) reported there was no contamination in the underlying groundwater system.

Resulting from the extensive, thorough and systematic assessment, remediation and validation undertaken, ADI was confident the validation results will allow future development within the North Western Sector which is not hindered by any past onsite, or adjacent production activities.

4.2 Sewage Sludge on ADI Property (ADI 1996)

A letter was prepared by Mr David Aynsley in April 1996 detailing the proposed use of a sludge stockpile to the EPA. The sludge stockpile was located in the southern sector of the ADI property and it was proposed to use the material as compost in accordance with the Guidelines for the use and Disposal of Biosolids Products EPA NSW Oct 1995.

4.3 Re: Sludge Stored in Southern Sector (EPA 1996)

Helen Davies of the EPA replied to the above mentioned letter in May 1996. The letter detailed that the EPA agreed with the ADI proposal to move the above mentioned material from the present location with the following comments:

- The material is not regarded as bio-solids but should instead be treated as soil which is possibly contaminated;
- The area under the current stockpile in the southern sector east should be validated following removal of the soil;
- A sampling programme should be developed for the material before the material is re-used for any beneficial use; and
- The EPA should be notified in writing of your revised proposal.

4.4 Historical Report ADI St Marys Property (ADI 1996a)

This report was compiled by ADI to document the general history of each of the sites the remediation and investigation works were to target during the late 1990s. The sites relevant to the current development site have been discussed in **Section 3**.

4.5 Validation Report for the Central Sector West of the ADI St Marys Property (ADI 1996b)

ADI (1996b) reported the Central Sector West of the ADI St Marys Property has been investigated, remediated and validated over the period of September 1990 to October 1996. The procedures used in the assessment and remediation of this land were those recommended in the Australian and New Zealand Guidelines for the Assessment and Management of Contaminated Sites, ANZECC and NH&MRC, January 1992.

ADI (1996b) reported activities conducted within the 102.1 ha Central Sector West included tipping of non-explosive waste and burning of explosive related materials. Boil out of ammunition, ammunition testing and related procedures were also conducted intermittently. These activities were conducted between 1957 and 1996. Portions of the Sector were also used for farming activities. A detailed historical survey was conducted which identified materials, site usage, waste disposal and factory procedures which may have impacted on certain areas within the Sector.

ADI (1996b) reported to assess, remediate and validate the Central Sector West, Safe Environmental Acceptance Criteria were drawn from accredited sources and approved by the Environment Protection Authority of NSW (EPA NSW) as the criteria governing the assessment and validation for the Central Sector West.

Additionally, ADI (1996b) reported a total of 525 soil samples, collected within the Sector boundaries, form the validation data. These samples were analysed for a range of chemicals, and include the results of systematic grid sampling and judgemental sampling arising from specific areas which were considered to be potentially contaminated. Any identified contamination was duly remediated or removed and disposed of off-site.

ADI (1996b) reported to confirm the complete removal of contamination, validation sampling was performed. The results of this validation sampling, combined with background grid sampling, were evaluated statistically. Results show that the mean and 95% upper confidence limit of the data were found to be comfortably within the Safe Environmental Acceptance Criteria. Additionally there is a low probability that other random samples will exceed the Safe Environmental Acceptance Criteria.

Furthermore, (ADI 1996b) reported the entire Central Sector West was also subjected to intensive sub surface investigation technologies to locate metallic buried waste or other debris. The application of advanced sub surface investigation technologies was based on the historical information available to ADI. The metallic items detected, including ordnance related materials, were

duly removed and safely and responsibly disposed. The sub surface investigations also contribute to the overall validation of the Sector.

ADI (1996b) reported no analyte was found in the groundwater at concentrations outside the Safe Environmental Acceptance Criteria with the exception of a very low sporadic concentration of RDX at one well. However, this was expected to decrease naturally with time due to dispersion, adsorption and degradation, and fall within the Safe Environmental Acceptance Criteria. Additionally there was no migration of contaminants outside the Sector through the groundwater.

Surface water investigations in South Creek and Ropes Creek identified elevated concentrations of zinc, nitrate and phosphate. These were attributed to discharge from the St Marys Sewage Treatment Plant, and not onsite activities. The impacts which were outside the Safe Environmental Acceptance Criteria for surface water were due to nutrients, bacteria and temperature caused by sources outside the St Marys Property (ADI 1996b).

Resulting from the extensive, thorough and systematic assessment, remediation and validation undertaken, ADI was confident the validation results will allow future development within the Central Sector West which is not hindered by any past on-site, or adjacent production or associated activities.

4.6 Site Audit Statement – Stage 2 Decontamination Audit Report for ADI Site, St Marys, CHK001/01 (Kidd 1999a[13])

A Site Audit Statement (SAS) was completed in 1999 by Christopher Kidd of HLA-Envirosciences of the ADI St. Marys Property – Excluding Eastern Sector, QEL, Site 6 and Site 23, buildings and Concrete Stockpile. As part of the Site Audit Statement the following reports were reviewed:

- Historical Reports – St Marys Property, ADI Limited, 1996;
- Validation Report for the western Sector, ADI St Marys Facility, ADI Limited November 1994;
- Validation Report for the North Western Sector of the ADI St Marys Facility, Report No. 498800, ADI Limited 1995;
- Validation Report for the Southern Sector West of the ADI St Marys Property, Report No. 498810, ADI Limited 1996;
- Validation Report for the Southern Sector East of the ADI St Marys Property, Report No. 498810, ADI Limited 1996;
- Validation Report for the Northern Sector West of the ADI St Marys Property, Report No. 498820, ADI Limited 1996;
- Validation Report for the Central Sector East of the ADI St Marys Property, Report No. 498840, ADI Limited 1997;
- Validation Report for the Central Sector West of the ADI St Marys Property, Report No. 498840, ADI Limited 1996;
- Validation Report for the North Eastern Sector of the ADI St Marys Property, Report No. 498850, ADI Limited 1996;
- QA/Verification Survey Results, ADI St Marys Property, Report No. PG980323da ADI Limited. 1999;

[13] *Site Audit Statement, ADI St. Marys Property* – Excluding Eastern Sector, QEL, Site 6 and Site 23, buildings and Concrete Stockpile, Christopher H Kidd, HLA-Envirosciences Pty Ltd, 1999 (Kidd 1999a)

On review of the above mentioned reports, the auditor concluded the site was suitable for residential, including substantial vegetable gardens and poultry subject to the following conditions:

- Excludes Eastern Sector, QEL, Site 6 and Site 23 which are covered by separate site audit statements, namely CHK001/2, CHK001/4 and CHK001/5.
- Excludes areas not yet investigated including the footprint of original buildings, car parks and roads, mainly around former Administration Centre Buildings (CHK001/6) and the concrete stockpile in the Central Sector West. (Stockpile CHK001/7).
- An appropriate management plan, including procedures for the safe handling and disposal of any items of ordinance that may be found during earthworks, should be lodged prior to the commencement of development earthworks. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI.

4.7 Site Audit Statement – Stage 2 Decontamination Audit Report for ADI Site, St Marys, CHK001/06 (Kidd 1999d[14])

A Site Audit Statement (SAS) was completed in 1999 by Christopher Kidd of HLA-Envirosciences of existing buildings and paved areas scattered about the site. As part of the Site Audit Statement the following reports were reviewed:

- Historical Reports – St Marys Property, ADI Limited, 1996;
- Validation Report for the Western Sector, ADI St Marys Facility, ADI Limited November 1994;
- Validation Report for the North Western Sector of the ADI St Marys Facility, Report No. 498800, ADI Limited 1995;
- Validation Report for the Southern Sector West of the ADI St Marys Property, Report No. 498810, ADI Limited 1996;
- Validation Report for the Southern Sector East of the ADI St Marys Property, Report No. 498810, ADI Limited 1996;
- Validation Report for the Northern Sector West of the ADI St Marys Property, Report No. 498820, ADI Limited 1996;
- Validation Report for the Central Sector East of the ADI St Marys Property, Report No. 498840, ADI Limited 1997;
- Validation Report for the Central Sector West of the ADI St Marys Property, Report No. 498840, ADI Limited 1996;
- Validation Report for the North Eastern Sector of the ADI St Marys Property, Report No. 498850, ADI Limited 1996;
- QA/Verification Survey Results, ADI St Marys Property, Report No. PG980323da ADI Limited. 1999;

The Site Audit concluded the site was suitable for commercial/industrial use and may continue to be used for existing commercial use and carparks, but underlying soils need to be tested for chemical and ordnance contamination after demolition. The following conditions were also listed:

- Soils under existing buildings, car parks, roads and the concrete stockpile shall be tested for ordnance and/or chemical contamination when these facilities are removed, site audit statements for these areas will be required.

[14] *Site Audit Statement, ADI St. Marys Property* – Existing buildings and paved areas scattered about the site, Christopher H Kidd, HLA-Envirosciences Pty Ltd, 1999 (Kidd 1999d)

- An appropriate management plan, including procedures for the safe handling and disposal of any items of ordinance that may be found during earthworks, should be lodged prior to the commencement of development earthworks. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI.

4.8 Site Audit Statement – Stage 2 Decontamination Audit Report for ADI Site, St Marys, CHK001/07 (Kidd 1999e[15])

A Site Audit Statement (SAS) was completed in 1999 by Christopher Kidd of HLA-Envirosciences of the Concrete Stockpile at the ADI St Marys Property. As part of the Site Audit Statement the following reports were reviewed:

- Historical Reports – St Marys Property, ADI Limited, 1996;
- Validation Report for the Central Sector East of the ADI St Marys Property, Report No. 498840, ADI Limited 1997;
- QA/Verification Survey Results, ADI St Marys Property, Report No. PG980323da ADI Limited. 1999;

The Site Audit concluded the site was suitable for continued use as a stockpile for crushed concrete, but underlying soils need to be tested for chemical and ordnance contamination after stockpile removal. The following conditions were also listed:

- On removal of all or part of the stockpile the underlying ground should be tested for both chemical and ordnance contamination. The testing should follow similar methods and levels of quality assurance as other parts of the ADI St. Marys site. Appropriate remediation and validation should be performed (if necessary) the work reviewed by a site auditor.
- Appropriate management plan, including procedures for the safe handling and disposal of any items of explosive ordinance, shall be in place before development earthworks commences and shall remain in place to cover any excavation on the site during its ongoing use. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI.
- The final surface of any earthworks in areas which are to be used for active recreational land uses, e.g. sports grounds, school grounds and picnic areas, or low density residential use, should, on completion of the earthworks, be surveyed with a metal detector by appropriately qualified and experienced personnel and the work reviewed by an independent site auditor.

4.9 Contamination Management Plan (CMP) (URS 2008)

This CMP was prepared to support the lodgement of the Central Precinct Plan and takes into account the then current site knowledge including EPA guidance relating to the reliance on specialist consultants for use in the development phase prior to sub-division.

Additionally, this CMP satisfies one of the SAS conditions (reiterated on all the SAS's), *Appropriate management plan, including procedures for the safe handling and disposal of any items of explosive ordinance, shall be in place before development earthworks commences and shall remain in place to cover any excavation on the site during its ongoing use. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI.*

The objective of the CMP is to provide a framework for identifying and addressing any discovery of chemical contamination or potentially explosive ordnance to ensure a safe working environment for workers during development and to avoid unacceptable impact on the natural environment.

[15] Site Audit Statement, Concrete Stockpile at the ADI St Marys Property, Christopher H Kidd, HLA-Envirosciences Pty Ltd, 1999 (Kidd 1999e).

The CMP provides a plan site workers can be inducted into and a flow chart illustrating lines of action and responsibility should any unexpected finds occur.

The approaches in the CMP are intended for use only during the site preparation phase of development, during which structures may be demolished and disposed of, land levels may be altered and redundant infrastructure is removed and new infrastructure is installed.

4.10 Assessment of Asphaltic Concrete Stockpile for Potential Re-Use (Geotech 2013)

An assessment of Stockpile 32 was conducted by Geotech in June 2013. The stockpile was generated during striping of roads at the Jordan Springs residential subdivision and was proposed for possible re-use. Stockpile 32 comprised mostly asphaltic concrete fragments and sandy gravel and was approximately 60 m by 30 m and 5 m in height. The volume of the stockpile was estimated to be approximately 9000 m^3 and 18000 tonnes based on the assumption that the density of the material was approximately 2 tonnes / m^3.

It was concluded that the material contained within stockpile 32 complied with the recovered aggregate exemption and could therefore be applied to land for road building purposes subject to geotechnical requirements for re-use.

4.11 Sampling Analysis and Quality Plan (SAQP) (JBS&G 2015a)

The SAQP was developed to document the methods which will be employed to complete the Environmental Site Assessments (ESAs) across the Central Precinct.

The ESAs are required across previously inaccessible areas (paved roads, building and stockpile footprints) of the Central Precinct Development and associated Regional Open Space.

It is understood the inaccessible areas requiring ESA are to be developed together with the surrounding development site for residential land use including substantial vegetable gardens and poultry and associated Regional Open Space. It was noted some of the auditable areas fall into the regional open space which surrounds the Central Precinct. All auditable areas within the Central Precinct will be assessed for suitability for a residential landuse use including substantial vegetable gardens and poultry.

4.12 Contamination Management Plan (CMP) (JBS&G 2015b)

This Contamination Management Plan (CMP) is a revision and update of previous CMP (URS 2008). This CMP now supersedes URS 2008.

The CMP is a condition of all site audit statements (SASs_ requiring an appropriate management plan including procedures for the safe handling and disposal of any items of explosive ordnance, shall be in place before development earthworks commences and shall remain in place to cover any excavation on within Central Precinct during its ongoing use.

The objectives of this CMP is to provide an Unexpected Finds Protocol (UFP) with an appropriate framework for identifying and addressing any discovery of chemical contamination, potentially explosive ordnance or any other form of hazard during development prior to subdivision so as to ensure a safe working environment for workers and to avoid unacceptable impact on the natural environment.

Unexpected finds may occur in areas which, although searched extensively, contain remnant materials which were obscured by the local topography, the type of surface cover (e.g. building) or at a depth preventing detection. The Site Auditor[16] considered that, while explosive ordnance may be uncovered during earthworks, it is unlikely that these will present an unacceptable risk provided appropriate procedures for the safe handling and disposal of such material are adopted.

[16] *Stage 2 Decontamination Audit of ADI St Marys Munitions Factory* (HLA, 1999)

Furthermore the CMP provides an appropriate framework for an Asbestos Management Plan (AMP) including procedures required for handling and disposing of any identified asbestos containing materials and asbestos impacted soils during the development of the Central Precinct.

The successful implementation of the CMP requires the appropriate briefing and Specific OHS Induction of site workers who may uncover potential chemical contamination (including potential asbestos containing materials) and/or explosive ordnance. It is proposed this briefing will include the review of the CMP and the associated flow chart (**Appendix D**).

This CMP describes reporting procedures and lines of responsibility, including the contact numbers for relevant experts at the commencement of the development works.

The Property has been remediated, audited and declared suitable for its intended land uses, and remnant contamination, if present, is most likely to be discovered during the development earthworks which occur prior to subdivision. The approaches included in the CMP are intended for use only during the Central Precinct preparation phase of development, during which structures are demolished and disposed of, land levels are altered and redundant infrastructure is removed and new infrastructure is installed. Post-subdivision management plans, if required, would be administered through the relevant local government authority.

4.13 Reliability of Previous Data

The data provided in the previous reports has been reported as reliable by the previous consultants and was reviewed as being of an acceptable quality in the issue of previous site audit advices and statements.

5. Conceptual Site Model

5.1 Potential Areas and Substances of Environmental Concern

While investigations, remediation and validation have been conducted within the Stages 3 to 5 development site, no investigations have been conducted on the previously inaccessible areas of the former ADI St Marys Property (CHK001/6 and CHK001/7) (i.e. the site). And due to the staging of the current development works and the usage of some of the sealed roads, detailed assessments are not able to be conducted as yet.

Notwithstanding the above, based on the current site information, site historical review and former development site uses, general areas of environmental concern have been categorised and are presented in (**Table 5.1**).

Table 5.1 Areas of Environmental Concern and Associated Contaminants of Potential Concern

Area of Environmental Concern (AEC)	Contaminants of Potential Concern (COPC)
Stockpiled Material (Stockpiles 30, 31 and 37)	Heavy metals*, Ba, PAHs, TPH/BTEX, OCPs, OPPs, PCBs, asbestos and explosives**. Additionally, Selenium and Phenols for Stockpile 30.
Stockpiled Materials (Stockpiles 32, 33, 34, 35, 36 and 50)	Asbestos and metallic Debris – may contain explosive ordnance waste
Stockpile Footprints (all stockpiles)	Heavy metals*, Ba, PAHs, TPH/BTEX, OCPs, OPPs, PCBs, asbestos and explosives** Metallic Debris – may contain explosive ordnance waste
Building Footprints and Associated Hardstand	Heavy metals*, Ba, PAHs, TPH/BTEX, OCPs, OPPs, PCBs, asbestos and explosives** Metallic Debris – may contain explosive ordnance waste
Paved Roads	Heavy metals*, Ba, PAHs, TPH/BTEX, OCPs, OPPs, PCBs, asbestos and explosives** Metallic Debris – may contain explosive ordnance waste

* Heavy metals include As (Asenic), Cu (Copper), Cr (Chromium), Cd (Cadmimum), Ni (Nickel), Pb (Lead), Zn (Zinc) and Hg (Mercury).

** Explosives will include, but not limited to, RDX (research department explosive), TNT (trinitrotoluene), 2,4-DNT (2,4-Dinitrotoluene) and 2,6-DNT (2,6-dinitrotoluene).

Stockpile 32 has been previously investigated and is considered suitable to use underneath roadways (Geotech 2013).

Concrete stockpiles 33, 34, 35 and 50 and brick stockpile 36 cannot be sampled due the volume of the stockpiles and the size of the materials. Instead they will be managed under the remedial strategy for the development site discussed in **Section 7.3.6 and 10.2.6**. In general, these stockpiles will be processed prior to crushing. Processing will incorporate a checking/inspection step prior to placement to ensure the materials do not contain asbestos or any other potentially hazardous material. And re-use within the development site will be at depths of greater than 3 m below the final ground surface or underneath roadways.

While metallic debris has been identified as a contaminant of concern to be assessed during the detailed investigation of the site, the metallic debris will also be removed (remediated) and validated during these works, as documented in the SAQP (JSB&G 2015a). Therefore, the Stages 3 to 5 CRS will only provide remedial strategies for the potential chemical contaminants of concern which may be identified. Where Category A unexploded ordnance (UXO) is identified and removed during the ordnance clearances soils and/or groundwater, where required, within these areas will be tested for explosives as part of the ESAs as per the SAQP (JBS&G 2015a).

The exception to the above is Stockpiles 33, 34, 35, 36 and 50. While there is a low risk of ordnance items being present within these stockpiles, the materials will be checked/inspected prior to crushing during the processing stage discussed in **Section 7.3.6 and 10.2.6**.

Groundwater has been previously investigated and signed off as part of the historical remediation and validation works conducted across the former ADI St Marys Property therefore significant groundwater impacts are not anticipated and the CSR will primarily deal with soil impacts. However additional groundwater investigations are to be conducted within the site located in Stages 3 to 5 of the development site as per the SAQP (JBS&G 2015a). Should groundwater impacts be identified that require remediation these will be discussed in the specific RAP (SRAP) for Stages 3, 4 and 5.

5.2 Potentially Contaminated Media

Potentially contaminated media present at the site include:

- Fill material (including stockpiles); and
- Natural soils; and
- Groundwater.

The source of the fill material across building and road footprints is unknown. Fill material across the site must therefore be considered a potentially contaminated medium.

Based on the known former site use for munitions testing and the unknown source of fill materials, vertical migration of contamination from the fill and surface soils into the underlying natural soils may have occurred. Consequently, natural soils across the site are considered to be potentially contaminated media.

Based on the depth to groundwater (1.5 to 7 m bgs) and the non-porous nature of the natural silty clays and the previous remedial and validation works conducted on the development site, it is considered unlikely that groundwater is a contaminated media. However due to the previous site history and the length of time since the previous works were conducted additional groundwater investigations will be conducted as part of the ESA works (SAQP JBS&G 2015a).

5.3 Potential Exposure Pathways

Contaminants generally migrate from site via a combination of windblown dusts, rainwater infiltration, groundwater migration and surface water runoff. The potential for contaminants to migrate is a combination of:

- The nature of the contaminants (solid/liquid and mobility characteristics);
- The extent of the contaminants (isolated or widespread);
- The location of the contaminants (surface soils or at depth); and
- The site topography, geology, hydrology and hydrogeology.

The potential contaminants identified as part of the site history review and review of previous investigations are generally in a solid form (e.g. heavy metals, asbestos, explosives etc). As the site is currently paved or vegetated, there is a low potential for contaminates to have migrated via either windblown dust or surface water.

The potential for contaminants to migrate via groundwater is moderate to low, given the absence of any significant sources of contamination at the site. However, in the event that significant soil contamination is identified, the potential groundwater contamination will need to be assessed and remediated.

It should be noted the Central Precinct part of the redevelopment works is proposed to be cut in some places but predominately filled with clean fill between 1 - 8 m above the current ground levels (**Appendix B**).

Based on the contaminants of concern identified in various media as discussed above and proposed site development activities, the exposure pathways considered to be potentially complete for the site during and following development works include:

- Potential dermal and oral contact to impacted soils as present at shallow depths and/or accessible by earthworks contractors and future residential site occupiers across the extent of the site; and/or
- Potential oral and dermal contact to shallow groundwater as accessible by earthworks contractors and future residential site occupiers across the extent of the site.

At this stage, it is not anticipated that any groundwater extraction will occur over the area of the site in the future as prior to housing construction the Central Precinct will be predominately filled to raise the ground levels (i.e. no large excavations are anticipated).

5.4 Receptors

Potential receptors of environmental impact present within the site which will require to be addressed with the site remediation / management include:

- Future residential / recreational users of the open space areas of the site restricted to non-paved areas who may potentially be exposed to COPCs through direct contact with impacted soils and/or ingestion and/or inhalation of dusts / fibres associated with impacted soils; and/or
- Excavation / construction / maintenance workers conducting activities at or in the vicinity of the site, who may potentially be exposed to COPCs through direct contact with impacted soils present within excavations and/or inhalation of dusts / fibres associated with impacted soils.

5.5 Preferential Pathways

For the purpose of this assessment, preferential pathways have been identified as natural and/or man-made pathways that result in the preferential migration of COPCs as either liquids or gasses.

Man-made preferential pathways are may be present throughout the site, generally associated with fill materials at near surface depths. Fill materials are anticipated to have a higher permeability than the underlying natural soil and/or bedrock.

5.6 Data Gaps

Given the uncertainty associated with the extent of contamination as a result of these data gaps, conservative assumptions with respect to the extent of impacted soil conditions have been made. Appropriate characterisation of site conditions prior to, or during site remediation activities will provide suitable data such that appropriate remedial measures can be implemented for the site to be considered suitable at the completion of remediation works for the proposed site use.

6. Conceptual Remedial Strategy

6.1 Remediation Objectives

The objective of any remediation activities will be to ensure the site is suitable for the proposed land use.

6.2 Regulatory and Planning Requirements

6.2.1 Environment Planning and Assessment Act 1979 / SEPP55

The remediation works are classified as Category 1 Remediation Works as per the meaning provided in *Statement Environmental Planning Policy 55 – Remediation of Land* (SEPP 55) and will require development consent under the *Environmental Planning and Assessment Act 1997.*

The nature of remediation works is relatively straightforward and it is considered most appropriate that development applications for remediation works are included with development application documentation for the associated earthworks as ancillary to other development.

6.2.2 Protection of the Environment Operations Act 1997 (POEO Act)

The proposed remediation/validation activities are not required to be licensed under the *Protection of the Environment Operation Act 1997*. None of the individual work stages are found to be greater than 3 hectares in area and hence do not trigger the licensing requirements.

6.2.3 Water Management Act 2000

A dewatering and re-injection approval is unlikely to be required from the NSW Office of Water (NOW) for any proposed site remediation works. If dewatering is required as part of remediation works approval will need to be obtained prior to undertaking any works.

6.2.4 Protection of the Environment Operations (Waste) Regulation 2014

The regulations make requirements relating to non-licensed waste activities and waste transporting. The proposed works on the site are unlikely to be required to be licensed.

Part 7 Section 78 of the Regulation stipulates special transportation, re-use or recycling requirements relating to asbestos waste and must be complied with regardless whether the activity is licensed.

The requirements for the transportation of asbestos waste include:

- Bonded asbestos material must be securely packaged at all times,
- Friable asbestos material must be kept in a sealed container,
- Asbestos-contaminated soils must be wetted down,
- All asbestos waste must be transported in a covered, leak-proof vehicle.

Part 7 Section 79 of the regulation stipulates reporting on transportation of asbestos waste solely in NSW and applies to the transportation of asbestos waste as defined in Schedule 1 Part 3 of the POEO Act. The transporter of a load of asbestos waste must cause the following information to be given to the EPA (in the prescribed form and manner) before the transportation of the load commences:

- The address of the site at which the asbestos waste has been generated (by its removal from the site), if known to the transporter;
- The name, address and contact details of the premises from which the load is proposed to be transported;
- The date on which it is proposed that the transportation commence;

- The name, address and contact details of the premises to which the waste is proposed to be transported;
- The approximate weight (in kilograms) of each class of asbestos waste in the load (rounded to the nearest kilogram and, if the amount to be rounded is 0.5 kilogram, rounded up); and
- Any other information specified in the Asbestos and Waste Tyres Guidelines.

Additionally, Section 79 stipulates the transporter of a load of asbestos waste must ensure that the occupier of any premises to which the transporter causes the load to be delivered is given the following information (in the prescribed form and manner) no later than on delivery:

- The unique consignment code issued by the EPA in relation to that load,
- Any other information specified in the *Asbestos and Waste Tyres Guidelines* issued by the NSW EPA.

Section 80 of the regulations relates to the disposal of asbestos waste and indicates the following:

- A person disposing of asbestos waste off the site at which it is generated must do so at a landfill site that can lawfully receive the waste.
- When a person delivers asbestos waste to a landfill site, the person must inform the occupier of the landfill site that the waste contains asbestos.
- When a person unloads or disposes of asbestos waste at a landfill site, the person must prevent:
    - any dust being generated from the waste, and
    - any dust in the waste from being stirred up.

Moreover, Section 81 of the regulations stipulates a person must not cause or permit asbestos waste in any form to be re-used or recycled.

Provision is provided in the Regulation and recent EPA (2014) guidelines for the NSW EPA to approve the immobilisation of contaminants in waste (if required with unexpected finds).

6.3 Waste Classification Guidelines (EPA 2014)

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with this guideline. Where wastes require immobilisation prior to off-site disposal (to reduce waste classifications) an immobilisation approval shall be sought in accordance with Part 2 of this guideline. Immobilisations are only anticipated to be required with unexpected finds.

6.4 Sydney Regional Environmental Plan (SREP) No 30-St Marys

The Central Precinct is covered by this planning instrument which aims to

- Support the *St Marys Environmental Planning Strategy, 2000* of the Department of Urban Affairs and Planning by providing a framework for the sustainable development and management of the land to which this plan applies, and
- Rezone certain land for urban and employment-generating development, and
- Rezone land for conservation purposes and conserve the significant heritage values of the land to which this plan applies, and
- Ensure that urban development on the land achieves desirable environmental, social and economic outcomes, and
- Provide opportunities for recreation facilities that meet the needs of the regional and local community, and

- Ensure that development of the land to which this plan applies is integrated with established surrounding areas.

In relation to contaminated land and remediation the SREP 30 simply states in Section 29 the development is to have regard to soil constraints to ensure that the risk of adverse environmental and economic impacts is minimised.

6.5 St Marys Environmental Planning Strategy (EPS) 2000

This document describes the approach to be taken in managing development and conservation on the former ADI St Marys property. The EPS identifies the following:

- The aims for the future use and management of the property;
- Specific performance objectives;
- Actions to be undertaken by local and state governments;
- Development controls; and
- The obligations of developers.

The EPS stipulates a development application must be lodged with the relevant council (Penrith City Council) for all development which requires consent except when exempt and complying provisions apply.

Section 12 details the requirements in managing any remaining contamination on the site as follows:

- The existence of a Site Audit Statement must be noted on any planning certificates issued by a council under section 149(2) of the Environmental Planning and Assessment Act 1979. The vendor of a property must give a planning certificate to any potential purchaser.
- The SREP requires that precinct plans include proposals for, and information on, management of remnant contamination risk.
- The plan of management will include a contamination management plan to identify procedures for the safe handling and disposal of any items of ordnance that may be found during earthworks.
- Each precinct plan will include a contamination management plan to identify procedures for the safe handling and disposal of any items of ordnance that may be found during earthworks.
- Soils under existing buildings, car parks, and roads shall be tested for ordnance or chemical contamination when these facilities are removed; site audits for these areas will also be required.
- On removal of all or part of the existing stockpiles, soils under existing stockpiles will be tested for ordnance and chemical contamination. The testing should follow similar methods and levels of quality assurance as other parts of the site. Appropriate remediation and validation should be performed and the work reviewed by an independent auditor.
- In granting approval for any development involving excavation, the council will advise the applicant of the appropriate contact within the Commonwealth Government for identification and disposal of any ordnance-related items which are uncovered during the development.

6.6 Penrith City Council Requirements

The council will use both the SREP 30 and St Marys EPS to guide their development consents. However the requirements of Penrith's development control plan (2006)-contaminated land, have

been considered in the development of this CRS. It is noted Council consent is required for all remediation of all contaminated land within the Penrith Local Government Area. This requirement is prescribed by Sydney Regional Environmental Plan No 20 Hawkesbury-Nepean River (No 2 – 1997) Part 3 Clause 11, subclause (4).

6.7 Asbestos Removal Regulations and Code of Practice

The removal and disposal of asbestos will be managed in accordance with the Work Health and Safety Act (2011) and Work Health and Safety Regulation (2011), "*How to Safely Remove Asbestos: Code of Practice* (WorkCover 2012a), *How to Management and Control Asbestos in the Workplace: Code of Practice* (WorkCover 2012b), *Managing Asbestos in or on Soil* (WorkCover 2014), the NSW WorkCover Guidelines and the NSW EPA Waste Classification Guidelines.

Excavation and removal of asbestos fibre contaminated soils are required to be conducted by a Class A licensed contractor. Excavation, onsite remediation and offsite removal of ACM contaminated soils are required to be conducted by at least a Class B licensed contractor.

Before starting any affected works, the appointed contractor is required to obtain a site-specific permit approving the asbestos works from NSW WorkCover. A permit will not be granted without a current licence and the permit application must be made at least seven days before the work is due to commence.

6.8 Extent of Remediation and Management Required

The extent of remediation works is limited to the remediation of identified contamination in soils and stockpiled materials across the site. At the time of preparation of the CRS, asbestos was the only contaminant of concern observed as part of the metallic debris investigations on site. The results of the detailed assessments to be conducted in accordance with the SAQP (JBS&G 2015a) will likely also identify the presence of asbestos (at a minimum) that will require remediation. Regardless, the CRS provides a remediation approach which can also address any additional identified chemical contamination should others be detected.

Remediation and/or site management is required to:

- Prevent direct human contact to potentially impacted soils located across the Site. Without pre-empting the findings of the additional assessments required to address data gaps, potentially impacted materials are considered to be restricted to the fill materials across the site;
- Remove potential ongoing sources of environmental impact;
- Validate the remedial works in accordance with the relevant NSW EPA guidelines and with reference to the site specific criteria; and
- Document the validation process.

The CRS has been prepared with reference to the following guidelines and legislation:

- Managing Land Contamination, Planning Guidelines, SEPP 55 – Remediation of Land; (DUAP 1998).
- National Environment Protection (Assessment of Site Contamination Measure) measure 1999, as amended 2013, National Environment Protection council (NEPC 2013).
- Contaminated Sites: Sampling Design Guidelines, September 1995 (EPA 1995).
- Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, August 2011 (OEH 2011).
- Contaminated Sites: Guidelines for NSW Site Auditor Scheme, April 2006 (DEC 2006).

- Contaminated Sites: Guidelines for the Assessment and Management of Water, March 2007 (DEC 2007).
- Work Health and Safety Act 2011.
- How to Safely Remove Asbestos: Code of Practice. WorkCover 2012.
- How to Manage and Control Asbestos in the Workplace: Code of Practice. WorkCover 2012.
- Managing Asbestos in or on soil. WorkCover 2014.
- Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia. Environmental Health Directorate, May 2009 (EHD 2009).
- Waste Classification Guidelines, Part 1: Classifying Waste NSW DECCW (2014).

6.9 Hierarchy of Remedial Options

The *Contaminated Sites Guidelines for the NSW Auditor Scheme* (DEC 2006) lists the following order of preference for soil remediation and management:

- On-site treatment of the soil so that the contaminant is either destroyed or the associated hazard is reduced to an acceptable level;
- Off-site 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;
- Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill; and
- Consolidation and isolation of the soil on-site by containment within a properly designed barrier.

In addition, it is also a requirement that remediation should not proceed in the event that it is likely to cause a greater adverse effect than leaving the site undisturbed. And, where there are large quantities of soil with low levels of contamination, alternative strategies are required to be considered or developed (DEC 2006).

6.10 Options Assessment

Each of the potential remedial options have been assessed in **Table 6.1** following.

Table 6.1 Remedial Options Screening Matrix

Option	Discussion	Conclusion
Option 1 On-site treatment of the soil so the contaminants are either destroyed or the associated hazards are reduced to an acceptable level.	**Soil** Metals Although there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified inorganic contaminants of concern (e.g. cement stabilisation) Metals are unable to be destroyed. On site treatment is therefore not an option which is able to be considered. Explosives, pesticides and PCBs Explosives, Polycyclic aromatic hydrocarbons, pesticides and PCBs if present in site soils could be remediated by thermal processes. However this requires substantial investment in plant and equipment and substantial energy use. Similarly for heavy metals, there are a number of microencapsulation treatment technologies which can reduce the mobility of the identified organic contaminants of concern (e.g., cement stabilisation). TPH and PAH TPH and PAH impacted soils could be bioremediated via landfarming. However this requires space to create landfarms, and time for bioremediation to occur. Due to the limited extent and low volume of material anticipated to require remediation, implementation of bioremediation is considered not to be cost or time effective. Asbestos Fibres This option is not suitable for asbestos fibre contaminated soil given there is no available technology to economically remove or destroy asbestos fibres in soil. Similarly, while the small fragments of ACM identified in soil samples by the laboratory may be visible, there is no available technology to economically remove or destroy the small ACM fragments in soil. Bonded ACM Hand picking of ACM within fill material is labour intensive and can be costly and time consuming. The success of the remediation method is highly dependent upon the soil type and the amount of other building rubble present, and also on the adopted validation criteria. The more clayey the soil, or the more building rubble present, the harder it is to identify and remove all ACM. For soils being retained onsite, validation is easier to achieve as the criteria allows for some ACM to remain in the soils. This is the preferred option for retaining soils containing ACM. Should the material be particularly high in ACM content, or prove difficult to achieve validation, consideration should be given to offsite disposal (**Option 3**).	Not a viable option for metals, explosives, PAHs, pesticides, TPH, PCBs and asbestos fibres. Preferred option for Bonded asbestos.

Option	Discussion	Conclusion
<u>Option 2</u> Off-site treatment of the soil so the contaminants are either destroyed or the associated hazards are reduced to an acceptable level, after which the soil is returned to the site.	**Soil** As above (**Option 1**), however, there as reductions in noise and dust emissions on site in comparison to onsite treatment, which are offset by increased truck movements. Typically, the costs associated with returning the treated materials to the site often result in them being disposed to landfill. This strategy will incur additional costs, such as transport and approval from consent authorities and would require licenced offsite treatment facilities, which are limited in availability, not necessarily proximal to the site and do not enable treatment of some contaminants.	Not a viable option.

Option	Discussion	Conclusion
Option 3 Excavation and offsite removal of the contaminated material.	**Soil** Based on the previous remediation and validation works being conducted across the main operational areas of the former ADI St Marys property it is anticipated should any residual impacts of the following COPC remain they would be minimal and likely to be able to be disposed to landfill. With the exception of bonded ACM which has the potential to be managed on site. Metals, TPH, PAH There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting metals, TPH and PAH impacted soils, dependent on waste classification in accordance with EPA 2014. These are located close to the site. Explosives, pesticides and PCBs There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting explosive, pesticide and PCB impacted soils, dependent on waste classification in accordance with EPA 2014, and whether any chemical control order comes into play. Asbestos Fibres There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting friable asbestos wastes including fibre and AF/FA (asbestos fines/ friable asbestos) contaminated soils. Given the relatively minor amount of asbestos fibre contaminated soils anticipated, this option is likely the fastest and most cost effective method of remediating the asbestos fibre contaminated material. Bonded ACM There are currently suitably licensed waste facilities in the Sydney Metropolitan region capable of accepting ACM contaminated soils. Offsite disposal of ACM contaminated material is likely the fastest method of remediating the site fit for the agreed residential land use. This option generates the highest quantity of waste, since the materials are disposed to landfill rather than treated and reused (ie. **Options 1 & 2**) or retained on site (**Option 4**). This option also generates additional truck movements and associated fuel/emissions over **Option 1 and Option 4**, but less than **Option 2**, since materials are not returned to site. Given the likely success of remediation via hand picking, and the application of risk-based validation criteria, offsite disposal is not the preferred remedial Option. However, should validation prove hard to achieve because of the nature of fill or the ACM contamination, this option may be reconsidered.	Viable option for metals, TPH, PAH, explosives, pesticides and PCBs A feasible option for Bonded ACM, dependant on the success of remediation via **option 1**.

Option	Discussion	Conclusion
Option 4 Consolidation and isolation of the soil by on-site containment within a properly designed barrier and ongoing management.	**Soil and Groundwater** Containment of the contaminated soil and groundwater would require the potential exposure to contamination be managed by the implementation of an ongoing Environmental Management Plan. It is noted that there must be acceptance by the ultimate custodian of the land that future controls will be implemented, and that a notation will be made on the Title of the land. Although feasible, this option is not being considered given the requirement for no ongoing management, public notification and associated restrictions on future land use.	Not a suitable option.

6.11 Preferred Remediation Strategy

In consideration of the hierarchy for remediation options, the COPC, the environmental setting, the sensitivity of the proposed land use and the commercial constraints, the preferred remedial strategy is as follows:

- excavation and offsite disposal of any identified asbestos fibre contaminated material;
- excavation and offsite disposal of any identified metals, explosives, pesticides, PCBs, TPH and PAH contaminated material; and
- excavate and hand pick the bonded ACM contaminated soils for reuse in subsurface areas (under roads and/or open space) following validation. Bonded ACM fragments removed during the hand picking process will be disposed offsite to a suitable licensed facility.

There are no 'cap and containment' measures being proposed to remediate the site. Any material placed at depth will be validated as suitable to remain onsite in accordance with **Section 10**. Therefore there will be no requirement for long term management of material, no requirement for an Environmental Management Plan, and no notation on Title/s.

7. Remedial Plan

The remediation strategy for the site has been prepared as an overarching strategy that can be applied to the site located within Stages 3, 4 and 5 of the Central Precinct.

7.1 Specific Remedial Action Plans (SRAP)

In order for this remediation strategy to be appropriately implemented, upon completion of the detailed ESA for the site located in Stages 3, 4 and 5 (**Figures 3a, 3b and 3c**) in accordance with SAQP (JBS&G 2015a), an SRAP will be required consistent with the CRS but will provide a detailed description of the remediation works required for the specific site. The SRAP is required to be developed in accordance with the requirements set out in NSW OEH (2011).

Stages 3, 4 and 5 SRAPs will be reviewed by a NSW EPA accredited Site Auditor and an Interim Audit Advise issued stating that if the SRAP is implemented, the site is capable of being made suitable for the proposed land use.

7.2 Preliminary Works

7.2.1 Approvals, licenses and notifications

This Stage 3 to 5 CRS is for the submission of the remediation development application for Stages 3, 4 and 5. Once approved the Council will require a SRAP be submitted with an Auditor advice prior to the specific remediation works commencing.

Any excavation and removal of asbestos fibre contaminated soils are required to be conducted by a Class A licensed contractor. Excavation, remediation and offsite removal of bonded ACM contaminated soils are required to be conducted by a contractor holding at least a Class B licence.

Before starting the works, the appointed contractor is required to obtain a site-specific permit approving the asbestos works from NSW WorkCover. A permit will not be granted without a current licence and the permit application must be made at least seven days before the work is due to commence.

7.2.2 Site establishment

All safety and environmental controls are to be implemented as the first stage of remediation works. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works;
- Assess need for traffic controls;
- Work area security fencing;
- Site signage and contact numbers;
- Stabilised site entry gate;
- Sediment fencing (attached to security fencing); and
- Stormwater runoff sediment controls.

All environmental controls are specified in **Section 11**.

7.3 Remedial Works

The remediation and validation works will be supervised by an appropriately qualified and experienced environmental consultant and, where required, undertaken by an appropriately licensed remediation contractor.

7.3.1 Air Monitoring

Where remedial works are required for the management of asbestos impacted soils, perimeter air monitoring will be conducted on each of the site boundaries. Additional downwind monitoring locations will be included in the air monitoring program as required.

Air monitoring will be conducted in accordance with the requirements of the National Occupational Health and Safety Commission (NOHSC) *Asbestos Code of Practice and Guidance Notes*, in particular the Guidance note for the estimation of airborne asbestos dust [NOHSC 3002:2005] as detailed in **Section 11 and 12**.

7.3.2 Metals, TPH, PAH, Pesticide, PCB and Explosive Contaminated Soils

If impacts of metals, TPH, PAH, pesticide, PCB and/or explosives are identified as requiring remediation in soils the following remediation works shall be undertaken:

- Where required, excavate and stockpile separately any 'clean' overburden fill to provide access to the contaminated material;
- Excavation of the contaminated material to the extent indicated in the SRAP;
- The impacted area will be excavated based on visual observations of contamination (odours and staining and/or any other signs of contamination). A PID will also be used to assist visual aid and olfactory indicators in determining the excavation extent. Materials containing these visual signs of contamination will be separated in an attempt to minimise the volume of any heavily impacted materials requiring offsite disposal;
- Disposal of the material to an appropriately licensed waste facility:
    - Prior to off-site disposal excavated contaminated materials may be stockpiled within a stockpiling area/s and managed in accordance with **Section 8 and 11**; or
    - Excavated contaminated materials may be loaded directly onto trucks and disposed at a licensed waste facility in accordance with requirements detailed in **Section 8**.
- Excavations are to be validated as per **Section 10.** Should validation fail the failed wall/s or base of the excavation will be excavated further in the direction of the failure and the validation process repeated until validation is achieved. Should the failed wall/s of the excavation require overburden to be excavated and stockpiled this will be undertaken first in accordance with the SRAP, REMP and the site health and safety plan; and
- Following validation of the excavation as outlined in **Section 10,** backfill the excavation with stockpiled overburden, validated material or clean fill sourced from elsewhere on the development site.

7.3.3 Asbestos Fibre (AF/FA) Contaminated Soils

If impacts of asbestos fibres are identified as requiring remediation in site soils the following remediation works shall be undertaken:

- Where required, excavate and stockpile separately any 'clean' overburden fill to provide access to the contaminated material;
- Excavation of the contaminated material to the extent indicated in the SRAP;
- Disposal of the material to an appropriately licensed waste facility:
    - Prior to off-site disposal excavated contaminated materials may be stockpiled within a stockpiling area/s and managed in accordance with **Section 8 and 11**; or
    - Excavated contaminated materials may be loaded directly onto trucks and disposed at a licensed waste facility in accordance with requirements detailed in **Section 8**.

- Excavations are to be validated as per **Section 10.** Should validation fail the failed wall/s or base of the excavation will be further excavated in the direction of the failure and the validation process repeated until validation is achieved. Should the failed wall/s of the excavation require overburden to be excavated and stockpiled this will be undertaken first in accordance with the SRAP, REMP and the site health and safety plan; and
- Following validation of the excavation as outlined in **Section 10,** backfill the excavation with stockpiled overburden, validated material or clean fill sourced from elsewhere on the development site.

Environmental health and safety management requirements for the handling of all materials disturbed during site remediation activities will be based on the requirements provided for asbestos-related works in SWA 2011/NSW WorkCover 2011 and as per **Section 11 and 12**.

7.3.4 Bonded ACM Contaminated Soils

If impacts of bonded ACM are identified as requiring remediation in site soils the following remediation works shall be undertaken:

- Excavate and stockpile separately 'clean' overburden fill to provide access to the contaminated material;
- Excavation of the contaminated material to the extent indicated and stockpiling prior to spreading within a pad sorting area and managed in accordance to **Section 8 and 11**;
- Spreading of the contaminated material to form pad/s not more than 0.1 m thick, within the designated pad sorting area (more than one pad may be used). All pads will be managed as a stockpile in accordance with **Section 8 and 11**;
- The pad will be walked, raked and picked (rake teeth spaced less than 7 mm apart and teeth greater than 10 mm in length) for bonded ACM (at least 2 passes with 90^{o} direction changes) by a Class B licenced asbestos contractor in accordance with NEPC 2013;
- Collection of ACM fragments by raking and hand picking of the spread material;
- Offsite disposal of the collected ACM fragments to an appropriately licensed waste facility;
- Pads will be validated as per **Section 10.** Should validation fail the pad will be subjected to an additional rake, walk/pick and re-validated until such time as validation is achieved;
- Excavations are to be validated as per **Section 10.** Should validation fail the failed wall/s or base of the excavation will be further excavated in the direction of the failure and the validation process repeated until validation is achieved. Should the failed wall/s of the excavation require overburden to be excavated and stockpiled this will be undertaken first in accordance with the SRAP, REMP and the site health and safety plan; and
- Reinstatement of the validated pad materials into validated excavations, or stockpiling of the validated pad material within a stockpiling area/s and managed in accordance with **Section 8 and 11**.

Environmental health and safety management requirements for the handling of all materials disturbed during site remediation activities will be based on the requirements provided for asbestos-related works in SWA 2011/NSW WorkCover 2011.

7.3.5 Stockpiles 30, 31 and 37

Where the ESA in accordance with the SAQP (JBS&G 2015a) identifies impacts (chemical and/or asbestos) within these stockpiles any impact will be remediated in accordance with **Sections 7.3.2, 7.3.3 and 7.3.4** and the SRAP for Stage 4.

7.3.6 Stockpiles 33, 34, 35, 36 and 50

Stockpiles 33, 34, 35, 36 and 50 comprise concrete and brick. These stockpiles are proposed to be reused onsite after crushing. However, prior to crushing the materials need to be processed to ensure no asbestos and /or other hazardous materials. The following processing works will be undertaken prior to crushing:

- Excavate materials from stockpile;
- Spread materials approximately 20 m x 20 m and 300 mm thick;
- Trained Environmental Consultant (Asbestos Consultant / Competent Person) to inspect as per **Section 10.2.6**. The Environmental Consultant will additionally be trained by the Ordnance Contractor to identify potential ordnance items of interest;
- Where suspect materials are identified these will be removed by either the Principal Contractor or their representative/sub-contractor. Where potential ordnance items are identified the Ordnance Contractor will be contacted to confirm and remove, if required;
- Offsite disposal of picked suspect materials to an appropriately licensed waste facility;
- Once these materials are removed the spread materials will be validated as per **Section 10.2.6**. Should validation fail the spread materials will be subjected to an additional pick and re-validated until such time as validation is achieved; and
- Once validation is achieved materials will be sent to the crusher or stockpiled prior to crushing.

Environmental health and safety management requirements for the handling of all materials disturbed during site remediation activities will be based on the requirements provided for asbestos-related works in SWA 2011/NSW WorkCover 2011.

7.3.7 Waste/Burial Pits

If impacts of waste/burial pits are identified as requiring remediation in site soils the following remediation works shall be undertaken:

- Where required, excavate and stockpile separately any ‘clean’ overburden fill to provide access to the contaminated material;
- Excavation of the contaminated material to the extent indicated in the SRAP;
- The impacted area will be excavated based on visual observations of contamination (odours and staining and/or any other signs of contamination). A PID will also be used to assist visual aid and olfactory indicators in determining the excavation extent. Materials containing these visual signs of contamination will be separated in an attempt to minimise the volume of any heavily impacted materials requiring offsite disposal;
- Disposal of the material to an appropriately licensed waste facility:
    - Prior to off-site disposal excavated contaminated materials may be stockpiled within a stockpiling area/s and managed in accordance with **Section 8 and 11**; or
    - Excavated contaminated materials may be loaded directly onto trucks and disposed at a licensed waste facility in accordance with requirements detailed in **Section 8**.
- Excavations are to be validated as per **Section 10.** Should validation fail the failed wall/s or base of the excavation will be excavated further in the direction of the failure and the validation process repeated until validation is achieved. Should the failed wall/s of the excavation require overburden to be excavated and stockpiled this will be undertaken first in accordance with the SRAP, REMP and the site health and safety plan; and

- Following validation of the excavation as outlined in **Section 10,** backfill the excavation with stockpiled overburden, validated material or clean fill sourced from elsewhere on the development site.

7.3.8 Underground Storage Tanks

If impacts of an Underground Storage Tank(s) (USTs) or other waste tank are identified as requiring remediation in site soils the following remediation works shall be undertaken:

- A licensed contractor is required to remove and dispose of any residual liquid contents of the tank for licensed off-site disposal.
- Removal of the tank for appropriate off-site destruction. The contractor must keep destruction documentation for validation purposes.
- Provision of all disposal documentation.
- Excavation and stockpiling of any surrounding impacted soils. Prior to off-site disposal the environmental consultant shall undertake sampling for waste classification purposes in accordance with *Waste Classification Guidelines Part 1: Classifying Waste* EPA 2014.
- Validation of the tank pit excavation as per the sampling and analytical protocols provided in EPA 2014[17] and **Section 10**.
- The environmental consultant shall make an assessment based on the condition of the tank, nature and extent of any soil impacts to determine the need for groundwater validation via the installation and sampling of groundwater monitoring wells. Groundwater wells will be required if:
    - The tank is greater than 20 years old; or
    - On removal it appears to contain holes; or
    - On removal a sheen is observed on seepage water; or
    - Natural soil samples in the base and/or walls of the tank pit are impacted above the site criteria (**Section 10**).

7.3.9 Validation

Validation of the remedial works will be conducted to demonstrate the remediation objectives have been achieved. Details of the validation program are provided in **Section 10**.

7.3.10 Backfilling of excavations and Imported Fill Materials

Following validation of the excavations as outlined in **Section 10,** the excavations will be backfilled with either stockpiled overburden, remediated and validated material, clean fill sourced from elsewhere on the development site and/or validated imported fill material where required.

Materials proposed to be imported to the site will be assessed in accordance with **Section 8**.

7.3.11 Offsite Disposal of Material

Contaminated soils to be disposed off-site shall be assessed in accordance with **Section 8.**

7.3.12 Site Dis-establishment

On completion of the remediation works all plant/equipment and safety/environmental controls shall be removed from the site. Details are provided in **Section 11.**

[17] Technical Note: Investigation of Service Station Sites, Environmental Protection Authority, April 2014 (EPA 2014)

8. Materials Management and Tracking Plan

It is likely that fill material/soils will require to be removed between the development stages. Material will be required to be environmentally characterised prior to movement. This will particularly relate to the potential classification of the material as “asbestos contaminated soil”. Material shall be moved as per a material tracking plan (MTP).

The movement of all earth based materials on the site during any remedial activities is required to be subject to a material tracking system. The material tracking system shall be administered by the environmental consultant with the provision of all required information by the remediation contractor.

Material tracking shall be required for all materials that are moved / excavated from a location on the site and not wholly replaced in the same locations within the same day of material movement (i.e. soils excavated for testpitting / assessment do not require material tracking, however all other material will require tracking).

8.1 Material Tracking Data

To this extent, all excavation and filling works as undertaken for the purposes of site remediation shall require the following information to be recorded by the consultant based only on information provided by the contractor and verified by the consultant, with respect to material placement activities:

- Date;
- Estimated volume (cubic metres);
- Type of material (refer to classification scheme in **Section 8.3**);
- Depth of placement (RL);
- Source (from) information in terms of MGA56 co-ordinates as established by site GPS and/or survey and/or the site specific grid location (grid system to be supplied in SRAP);
- Placement (to) information in terms of MGA56 co-ordinates as established by site GPS and/or survey and/or the site specific grid location;
- Reference document (where necessary, i.e. ESA report, SRAP and/or validation report or virgin excavated natural material / excavated natural material classification);
- Purpose of placement (i.e. asbestos picking, surplus to site requirements etc); and
- Comments (when required).

Any material proposed to be moved for environmental remediation will have been cleared of metallic debris and ordnance prior to movement. Either as part of the historical ordnance clearances undertaken on the property or the clearances undertaken as part of the ESAs as detailed in the SAQP (JBS&G 2015a).

Additionally, as noted in **Section 5.1**, where Category A UXO is identified during the ordnance clearances soils will be analysed for explosives during the ESA as per the SAQP (JBS&G 2015a), prior to determining remedial options.

To ensure the materials are suitable for the final placement location proposed land use, material which has been removed for the purposes of environmental remediation, and is proposed to be moved again subsequent to the completion / validation of environmental remediation works:

- Material tracking forms for the replacement of the material shall make reference to the initial material tracking forms generated by the excavation of the materials for remediation; and
- Reference all associated environmental data.

As part of the validation of the material tracking forms, mass / material balances shall be assessed at each stage where additional material tracking forms are generated for particular site material.

It is the responsibility of the Remediation Contractor to ensure the material tracking record sheet(s) are completed and submitted to the Environmental Consultant at the end of each day's work. The Environmental Consultant has ownership of the material tracking system on receipt of all the necessary information from the contractor.

The Environmental Consultant is required to review the submitted material tracking record sheet(s) and to investigate/resolve any discrepancies. Following this review, a copy of the material tracking record sheet(s) is to be forwarded to the Principal Contractor. Ideally this would occur within two days of the Environmental Consultant verifying the material tracking record sheet(s) from the contractor.

8.2 Stockpiles

All materials stockpiled onsite will be managed via the remediation contractor. Unique numbers will be provided for each stockpile, the source of the stockpile, its estimated volume and its location onsite (via GPS) will also be recorded consistent with the material tracking system provided above.

Additionally, stockpiles will be managed in accordance with **Section 11** and **EMP16** (**Appendix C**).

Any contaminated soils disposed off-site will need to be controlled as per the EPA requirements of waste tracking and acceptance by the contractor, where classified as a waste that must be tracked. Additionally, for validation purposes all disposal dockets must be collected by the contractor and provided to the consultant.

Trucks will be loaded in a designated area away from the contaminated material excavations by the contractor. The transporting contractor shall ensure that there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.

The contractor shall also log truck movements and approximate volume, via registration number, into and out of the site.

All appropriate road rules shall be observed and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.

8.3 Material Tracking Characterisation Protocol

Should the Principal Contractor identify materials that require characterisation, MDC (or their nominated representative) and the environmental consultant will be notified of the details of the material requiring characterisation and the purpose of the characterisation (e.g. materials requiring to be disposed off-site, materials requiring to be imported to the Central Precinct, or characterisation of potentially contaminated soils etc.). The environmental consultant will be responsible for undertaking the required characterisation sampling based on either the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014) or one of NSW EPA's general exemptions[18]. Upon receipt of the analytical results the environmental consultant is responsible for providing appropriate

[18] NSW EPA List of General Orders and Exemptions: http://www.epa.nsw.gov.au/wasteregulation/recovery-exemptions.htm accessed on 24/02/2015

documentation (e.g. material characterisation report, waste classification etc.) to the remediation or and/or principal contractor.

The proposed sampling frequency and analytical schedule is presented in **Table 8.1**.

Table 8.1: Material Characterisation – Analytical Schedule

Validation Area	Sampling Frequency	Analytes
Characterisation of material for beneficial reuse (VENM, ENM or any other suitable material granted an applicable EPA Resource Recovery Order under the Protection of the Environment Operations (Waste) Regulation 2014)	VENM - minimum 1 per 1000 m^3 minimum 3 per source site up to a maximum of 10. ENM – see *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 The excavated natural material order 2014* http://www.epa.nsw.gov.au/resources/waste/rro14-excavated-natural-material.pdf	Analytes dependent upon EPA exemption or source site characteristic. As a minimum: Heavy metals TPH/BTEX PAHs OCPs/PCBs Asbestos EC (ENM) pH (ENM) RTA T276 (276 (rubber plastic, bitumen, paper, cloth, paint and wood) (ENM)
Contaminated material requiring disposal offsite (waste classification)	Minimum of 1 sample per 25 m^3 of material for any chemical contaminated area. Minimum of 1 per 250 m^3 of materials for the asbestos fibre impacted areas.	TPH/BTEX, PAHs, heavy metals, OCP/PCBs, asbestos and TCLP (if required). Where Explosives are a contaminant of concern within a Remediation Area these will also be analysed.
Imported fill material (VENM or ENM only)	VENM - minimum 1 per 1000 m^3 minimum 3 per source site up to a maximum of 10. ENM – see *Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 The excavated natural material order 2014* http://www.epa.nsw.gov.au/resources/waste/rro14-excavated-natural-material.pdf	Analytes dependent upon EPA exemption or source site characteristic. As a minimum: Heavy metals TPH/BTEX PAHs OCPs/PCBs Asbestos EC (ENM) pH (ENM) RTA T276 (276 (rubber plastic, bitumen, paper, cloth, paint and wood) (ENM)
Reuse on the Central Precinct AND/OR Characterisation of Potentially Contaminated Soils	1 sample per 25 m^3 up to 200 m^3. Lower sample rates can be derived for soil quantities >200 m^3 by apply statistical analysis reference EPA Victoria (2010)[19] ---------- If an area requires assessing sampling will be conducted in accordance with EPA 1995[20] and NEPC (2013)[21]	TPH/BTEX, PAHs, heavy metals, OCP/PCBs and asbestos. And explosives[1] where an identified contaminant of concern. ---------- Results will be assessed against the Assessment Criteria in the SAQP (JBS&G 2015a)

[1] Explosives will include, but not limited to, RDX (research department explosive), TNT (trinitrotoluene), 2,4-DNT (2,4-Dinitrotoluene) and 2,6-DNT (2,6-dinitrotoluene).

[19] *Industrial Waste Resource Guidelines Soil Sampling*. Victoria EPA. 2010 (Vic EPA 2010).

[20] *Contaminated Sites: Sampling Design Guidelines*, NSW EPA. September 1995 (EPA 1995)

[21] *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)*, National Environment Protection Council, 2013 (NEPC 2013).

Material to be moved on the site shall be tracked as per one of the following classifications:

- Contaminated material for off-site treatment and disposal / management as Hazardous Waste (if required);
- Contaminated material for off-site disposal as Restricted Waste (if required);
- Contaminated material for off-site disposal as Special Waste, co classified as Restricted Waste (if required);
- Contaminated material for off-site disposal as Special Waste, co classified as General Solid Waste;
- Contaminated material for off-site disposal as General Solid Waste;
- Contaminated material for asbestos picking / remediation;
- Remediated and validated material for site re-use;
- Surplus soils as excavated natural material; and/or
- Surplus soils as virgin excavated natural material.

8.4 Material for Importation

Where material is required to be imported onto the Central Precinct, the imported fill material must comprise virgin excavated natural material (VENM[22]), or excavated natural material (ENM[23]) and have been sampled in accordance with **Table 8.1**.

Prior to importation of material onto the Central Precinct, the contractor/supplier shall provide, at a minimum, the following information to the Central Precinct for prior evaluation in order to obtain an approval on the potential acceptability of the material for use at the Central Precinct:

- Details of the source site history, source site address, and characteristics of the material (such as colour, soil type, odours); and
- Details of any sampling performed for purposes of certification.

Prior to and during the importation of VENM or ENM, visual inspection must be undertaken to verify the appearance of the material is consistent with the source material description. The material must be accompanied by a summary report which includes laboratory report(s) from a NATA accredited laboratory and chain of custody documentation, in additional to other QA/QC documentation to demonstrate the samples were obtained in accordance with the applicable recycled material exemption. In addition to the above information from the supplier, following the importation of the material a visual inspection is need to confirm there is no visible asbestos, staining or odours and that the material delivered meets, in general, the description of the source material.

8.5 Materials Requiring Offsite Disposal

Contaminated soils and ACM to be disposed off-site require a waste classification in accordance with EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste*. The presence of asbestos in fill materials must be noted in the preparation of the waste classification (**Table 8.1**).

Should a remediation area contain explosives as a contaminant of concern, materials will still be classified as per EPA 2014. Reference will be given to the *Transport of Dangerous Goods Code* to determine if the waste exhibits any explosive properties. Should the waste be classified as a

[22] As defined in *Waste Classification Guidelines Part 1: Classifying Waste*, EPA, November 2014 (EPA 2014)

[23] Protection of the Environment Operations (waste) Regulation 2005 – General Exemption Order Under Part 6, Clause 51 and 51A. *The excavated natural material exemption 2014* (EPA 2014)

hazardous waste an immobilisation approval may need to be obtained from the EPA in accordance with *Waste Classification Guidelines Part 2: Immobilisation of Waste* (EPA 2014b).

8.6 Reuse on the Central Precinct

Where materials are proposed to remain on the Central Precinct these need to have either been remediated and validated in accordance with **Section 10** or assessed as per **Table 8.1** as suitable to remain onsite and suitable for the proposed locations final land use.

9. Contingency Plan

A review of the potential remediation works has been undertaken to identify potential risks to meeting the site validation criteria. A number of potential risks have been identified. These are listed following with contingencies that will be implemented to ensure that validation criteria are met.

Additionally, the associated remedial works health and environmental risks/hazards and their minimisation/mitigation are further discussed in **Sections 11 and 12.**

9.1 Unexpected Finds Protocol

It is acknowledged that previous investigations of the development site have been undertaken to assess contaminants of potential concern other than asbestos. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during remediation. The nature of any residual hazards which may be present at the site are generally detectable through visual or olfactory means, for example:

- >10 m^2 of ACM fragments encountered in one location (visible);
- Fibrous asbestos material;
- Metallic debris, potential UXO (visible);
- Drums / bottles / containers of chemicals (visible);
- Construction / demolition waste (visible);
- Ash and/or slag contaminated soils / fill materials (visible);
- Petroleum contaminated soils (staining / discolouration visible); and
- Volatile organic compound contaminated soils (odorous).

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure detailed in the CMP (JBS&G 2015b) and summarised in **Appendix D** is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use on site, should be posted in the Site Office and referred to during the Site Specific Induction by the Remediation Contractor.

9.2 Contingency Scenarios

9.2.1 Remedial Strategy Failure

In the event the proposed remediation works do not meet the validation criteria, or if the selected remedial strategy is not able to proceed, the following actions will be considered to ensure firstly the safety and health of people and the environment and secondly that the overall project objectives are achieved.

1. Continued controlled excavation until validation is achieved.
2. Reassessment of remedial and validation options for ACM, asbestos fibres, chemical contaminated soils.

Auditor to be notified and provided with details of any proposed contingency actions prior to implementation.

9.2.2 Material Storage Breach

In the event any stockpiled materials escape (or have the potential to escape), then the management controls shall be rectified and investigations undertaken to review the adequacy of the controls and any improvements implemented (**Section 11**).

9.2.3 Complaints

Due to the nature of the activities and type of contaminants potentially at the site there is a potential for complaints to be received from members of the public relating to environmental emissions including:

- Noise and vibration arising from excavation; and
- Dust emissions arising from excavation, material handling and placement.

Monitoring of all environmental emissions shall be undertaken during the works as detailed in the **Section 11 and 12** and appropriate actions taken to further control emissions following receipt of a complaint. Such additional controls may include the following actions:

- Disturbance of soils during meteorologically favourable periods only; and/or
- Covering or wetting down soils which are generating dust.

9.2.4 Observation of Potential for Groundwater Contamination

Based on the previous remediation and validation works conducted across the former ADI St Marys Property, it is considered unlikely groundwater has been impacted. However should other indicators of potential groundwater contamination be noted during remedial works, then the installation and sampling of groundwater wells will be recommended. Groundwater assessment, if required, should consider DEC (2007) guidance, including adoption of appropriate groundwater investigation levels protective of relevant environmental values.

Auditor to be notified and provided with details of any proposed groundwater assessment prior to implementation.

9.2.5 Severe Weather

Weather will be monitored on a daily basis via checking an internet based weather service provider. Should severe weather be forecast works will stop until safe to re-commence. All site management controls will be implemented to the extent practicable as outlined in **Section 11** prior to any severe weather events.

9.2.6 Odours from Works

The potential for odour complaints is considered low however, where odour complaints occur the following will be undertaken:

- Installation of an odour screening / masking system at the remediation area boundaries;
- Disturbance of soils during meteorologically favourable periods only; and/or
- Covering of impacted soils.

10. Validation Plan

10.1 Overview

From review of the proposed remediation strategy for the site, validation activities may be required for:

- Excavations formed by the removal of chemical (metals, TPH, PAH, pesticides, PCBs or explosives) contaminated area;
- Excavations formed by the removal of asbestos fibre contaminated areas;
- Excavations formed by the removal of bonded ACM contaminated material;
- ACM contaminated material which has undergone hand picking;
- Waste materials requiring offsite disposal;
- Residual soils underneath stockpiles or sorting pads where contaminated material has been stored;
- Any fill materials imported to the site; and
- Reuse of Stockpiled materials 33, 34, 35, 36 and 50.

10.2 Validation Inspection, Sampling and Analyses

Validation sampling is required to be undertaken to demonstrate the site has been remediated to a standard suitable for the agreed land use.

It is noted based on the results of the ESAs to be undertaken in accordance with the SAQP (JBS&G 2015a) a site specific human health risk assessment (HHRA) may be required. The HHRA would indicate, where required, site specific criteria for the contaminants of concern under a residential land use with substantial vegetable garden and poultry.

All samples collected from any chemical contaminated area will be analysed for the specific contaminant of concern as identified in the SRAP.

All samples collected to be analysed for asbestos will be 500 mL in size, in accordance with NEPC (2013) and WA DOH (2009) guidelines. Samples will be analysed in accordance with Australian Standard *'Method for the Qualitative Identification of asbestos in bulk samples'* (AS4964-2004) by NATA accredited laboratories.

All samples collected for waste classification purposes will be analysed for TPH/BTEX, PAHs, heavy metals (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn), OCPs/PCBs, asbestos and TCLP (metals/PAHs) where required. Samples will be analysed in accordance with the analytical schedule (**Table 10.1**) by NATA accredited laboratories.

Should a remediation area contain explosives as a contaminant of concern (**Section 5.1**), materials will still be classified as per EPA 2014. Reference will be given to the *Transport of Dangerous Goods Code* to determine if the waste exhibits any explosive properties. Should the waste be classified as a *hazardous waste* an immobilisation approval may need to be obtained from the EPA in accordance with *Waste Classification Guidelines Part 2: Immobilisation of Waste* (EPA 2014b).

All samples collected for imported soils will be analysed in accordance with **Section 8** and meet the definition of either VENM or ENM in accordance with EPA 2014.

A suitably qualified person, trained and experienced in the identification of asbestos, will be required to undertake the validation inspections and sampling. All inspections of remedial pads will be undertaken walking two sets of 1 m spaced transects, the second set being perpendicular to the first.

ACM identified shall be collected and placed in a bag to be weighed prior to being stored for offsite disposal.

10.2.1 Quantification and Analytical Schedule for Validation Samples

The proposed soil validation sampling, quantification and analytical program is outlined in **Table 10.1**.

Table 10.1 Quantification and Analytical Schedule

Validation Area	Sampling Frequency	Analytes[1]
Excavations formed by the removal of asbestos fibre contaminated areas	1 validation sample per 5 m linear of wall and 1 m depth, 1 Validation sample per 25 m^2 area for the base.	Asbestos[2]
Excavations formed by the removal of bonded ACM contaminated soil	1 validation and quantification sample per 10 m linear of wall and 1 m depth, 1 validation and quantification sample per 100 m^2 area for the base.	Asbestos[2]
Excavation formed by the removal of chemical contaminated soil	1 validation sample per 10 m linear of wall and 1 m depth, 1 validation sample per 100 m^2 area for the base.	Identified contaminants of concern as per the SRAP
Remediated bonded ACM contaminated material	1 quantification sample comprising the entire pad of remediated material	NA
	1 sample per 20 x 20 x 0.1 m pad (or 1 sample per 40 m^3)	Asbestos[2]
Contaminated Material requiring disposal offsite	Minimum of 1 sample per 25 m^3 of material for any chemical contaminated area. Minimum of 1 per 250 m^3 of materials for the asbestos fibre impacted areas.	TPH/BTEX, PAHs, heavy metals, OCP/PCBs, asbestos and TCLP (if required). Where Explosives are a contaminant of concern within a Remediation Area these will also be analysed.
Stockpiles 33, 34, 35, 36 and 50	Excavated materials will be visually inspected by a Trained Environmental Consultant (Asbestos Consultant / Competent Person) per 20 m x 20 m x 300 mm pad.	None. Visual clearance only.
Residual soils underneath stockpiles where contaminated material has been stored	1 sample per 10 m grid	Identified contaminants of concern as per the SRAP
Imported fill material	As per **Section 8**	As per **Section 8**

Note: [1] Laboratory analysis is proposed for validation samples only, and is not required for quantification samples.
[2] All samples analysed for asbestos will be 500 mL samples in accordance with NEPC (2013 and WA DOH (2009) guidelines, and analysed in accordance with AS 4964-2004.

10.2.2 Chemical Contaminated Soils

The validation program for excavations to remove any chemical contaminated fill is:

- Inspection of representative samples of the excavation base and walls, obtained by an excavator bucket, by a suitably trained and experienced person. If any odours or staining are observed, the excavation will be extended and the affected excavation surface re-inspected until such time as visual validation is obtained.
- The chemical impacted area will be excavated based on visual observations of contamination (odours and staining etc). Materials containing these visual signs of contamination will be separated in an attempt to minimise the volume of impacted materials requiring offsite disposal.
- Following visual validation, soil samples will be collected as per **Table 10.1**.

- If chemical concentrations exceed the site criteria in any validation sample, the excavation will be extended in the direction relating to the failed sample, and the validation inspection and sampling process repeated. Alternatively, where chemical concentrations are all below the site criteria, the excavation will be deemed to have been successfully remediated and validated.

10.2.3 Asbestos fibre (AF/FA) contaminated fill material

The validation program for excavations to remove any asbestos fibre contaminated fill is:

- Inspection of the excavation base and walls (where excavations are no deeper than 1 mbgs) by a suitably trained and experienced person. If additional asbestos fibres or bundles are identified, the excavation will be extended and the affected excavation surface re-inspected until such time as visual validation is obtained.
- Following visual validation, soil samples will be collected as per **Table 10.1**. Soil samples will be collected using an excavator bucket where the excavation is greater than 1 m deep.
- If asbestos fibres are identified in any validation sample (laboratory), the excavation will be further extended in the direction relating to the failed sample, and the validation inspection and sampling process repeated until asbestos fibres are not identified by the laboratory. Alternatively, where asbestos fibres are not identified by the laboratory, the excavation will be deemed to have been successfully remediated and validated.

10.2.4 Bonded ACM contaminated fill material

The validation program for bonded ACM contaminated fill excavations is:

- Asbestos quantification (AQ) samples will be collected as per **Table 10.1**.
- The AQ samples will comprise a volume of fill material no less than 10 L. The sampled material shall be spread on plastic and raked. All ACM within the AQ sample shall be recovered, bagged and weighed. The volume of the fill material within the AQ sample shall be calculated based on the dimensions of the sampled area within the excavation wall. The mass of fill will be calculated using a conservative soil density of 1.63 g/cm^3 (from US EPA 2003[24]).
- The mass of recovered ACM and the mass of fill material within the sample will be used to calculate the concentration of ACM within the AQ sample which is representative of that wall or base.
- A soil sample will be collected for laboratory analysis from within the AQ sample to confirm that no asbestos fibres are present. The sample will be analysed in accordance with the validation program summarised in **Table 10.1**.
- If the concentration of ACM within an AQ sample is calculated to be above the adopted criterion, or if asbestos fibres are identified in the soil sample, the excavation will be extended in the direction of the failed wall or base, and the validation process repeated.
- Alternatively, where the concentration of ACM is calculated below the adopted criterion for all walls and the base, and asbestos fibres are not identified by the laboratory, the excavation will be deemed to have been successfully validated.

10.2.5 Validation of Remediated ACM Contaminated Material

The validation program to remove ACM is:

[24] *User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings.* US EPA Office of Emergency and Remedial Response, June 19 2003 (US EPA 2003)

- Each uniquely identified pad of spread and picked material will be inspected by the environmental consultant by walking two sets of 1 m spaced transects set at right angles, to observe the presence of remaining ACM fragments. Remaining fragments will be collected and weighed. If the visual inspection does not identify residual ACM fragments above the adopted criteria, then soil samples will be collected and analysed in accordance with **Table 10.1**.
- Until such time as both the inspection and laboratory analyses are able to validate the material, the material will be quarantined. Once the results are obtained, each pad will either be validated as suitable for reuse on site, or otherwise deemed to have failed validation and will require further remedial works or offsite disposal.

10.2.6 Stockpiles 33, 34, 35, 36 and 50

The validation program to for materials from Stockpiles 33, 34, 35, 36 and 50:

- Each uniquely identified pad of spread and picked material will be inspected by the environmental consultant by walking two sets of 1 m spaced transects set at right angles, to observe the presence of remaining suspected hazardous materials.
- Until such time as the inspection is able to validate the material each pad will either be validated as suitable for crushing and subsequent reuse onsite, or otherwise deemed to have failed validation and will require further remedial works or offsite disposal.

10.2.7 Contaminated Materials Requiring Offsite Disposal

Contaminated soils and ACM to be disposed off-site require a waste classification in accordance with **Section 8.5**.

Should a remediation area contain explosives as a contaminant of concern, materials will still be classified as per EPA 2014. Reference will be given to the *Transport of Dangerous Goods Code* to determine if the waste exhibits any explosive properties. Should the waste be classified as a *hazardous waste* an immobilisation approval may need to be obtained from the EPA in accordance with *Waste Classification Guidelines Part 2: Immobilisation of Waste* (EPA 2014b).

10.2.8 Footprint of Contaminated Stockpiles

The validation program for the footprint of any fibre and bonded ACM contaminated stockpiles is:

- Inspection of the stockpile footprint by a suitably trained and experienced person. If bonded ACM are identified, surface soils are required to be walked and picked, and the footprint re-inspected until such time as visual validation is obtained;
- Following visual validation, soil samples will be collected from the footprint on a 10 m grid, and analysed in accordance with **Table 10.1**;
- If asbestos is identified in a validation sample, the soil represented by the failed validation sample will be scraped and disposed offsite, and the validation inspection and sampling process repeated for the failed area. Alternatively, where asbestos is not identified by the laboratory, the footprint will be deemed to have been successfully validated.

The validation program for the footprint of any chemical contaminated stockpile is:

- Inspection of the stockpile footprint by a suitably trained and experienced person. If any signs of contamination is observed (staining and/or odours), surface soils are required to be removed via a surface scrape, and the footprint re-inspected until such time as a visual validation is obtained;
- The material removed via the surface scrape is required to be disposed offsite;

- Following visual validation, soil samples will be collected from the footprint on a 10 m grid, and analysed in accordance with **Table 10.1**;
- If the contaminants of concern are reported above the validation criteria (**Section 10.3**) in a validation sample, the soil represented by the failed validation sample will be scraped, and the validation inspection and sampling process repeated for the failed area. Alternatively, where the contaminants are not identified above the validation criteria by the laboratory, the footprint will be deemed to have been successfully validated.

10.2.9 Imported Materials

Fill materials imported on to the Central Precinct development site are required to be either Virgin Excavated Natural Materials (VENM) or Excavated Natural Materials (ENM) as per **Section 8**.

10.3 Soil Validation Criteria

10.3.1 Soil Retained Onsite

Based on the proposed use of the site as Standard Residential and Recreational, concentrations of contaminants in the soil will be compared against published levels as presented in **Table 10.2 and 10.3**, sourced from the following:

- Health based Investigation Levels (HILs) for Residential– NEPC 2013, HIL-A;
- Generic ecological investigation levels (EILs) based on NEPC (2013); and
- Ecological Screening Levels (ESLs) for TPH fractions, BTEX and benzo(a)pyrene in fine grained soil for either urban residential and public open space land use or areas of ecological significance within the Regional Open Space areas (NEPC 2013).

Additionally, a site specific Human Health and Ecological Risk Assessment (HHERA) will be completed for the Central Precinct on receipt of site analytical data. This will be updated during the staged development works as additional analytical data is collected. Should the HHERA specify site specific criteria these will be incorporated into the SRAPs.

Works will be completed in accordance with the decision process for assessment of urban redevelopment sites (DEC 2006).

The results of asbestos observations and analysis will be assessed in general accordance with NEPC (2013) and WA DOH (2009) guidance.

No HILs are available for various explosives compounds. In assessing the concentrations of explosives, the “US Army Medical Bioengineering Research and Development Laboratory for the Corn Husker Army Ammunition Plan, Rosenblah, 1986” acceptable levels for urban development were adopted, as these levels have been adopted in previous environmental assessments on the former ADI property as detailed in **Table 10.2 and 10.3** below.

Table 10.2 Health Based Soil Investigation Criteria and Hydrocarbon Management Limits (all units in mg/kg)

	Limit of Reporting	Laboratory Method	Health Investigation/ Screening Levels Residential A
METALS			
Arsenic	2.0	ICP-AES (USEPA 200.7)	100
Boron	10.0	ICP-AES (USEPA 200.7)	4500
Cadmium	0.4	ICP-AES (USEPA 200.7)	20
Chromium	5.0	ICP-AES (USEPA 200.7)	100[1]
Chromium (VI)	1.0	Alkali leach colorimetric (APHA3500-Cr/USEAP3060A)	100
Copper	5	ICP-AES (USEPA 200.7)	6,000
Nickel	5.0	ICP-AES (USEPA 200.7)	400
Lead	5.0	ICP-AES (USEPA 200.7)	300
Zinc	5.0	ICP-AES (USEPA 200.7)	7,400
Mercury (inorganic)	0.05	Cold Vapour ASS (USEPA 7471A)	40[2]
POLYCYCLIC AROMATIC HYDROCARBONS			
Carcinogenic PAHs (as B(a)P TPE)[3]	0.028	GCMS (USEPA8270)	3
Naphthalene	0.1	GCMS (USEPA8270)	56
Total PAHs[4]	0.4	GCMS (USEPA8270)	300
BTEX			
Benzene	1.0	Purge Trap-GCMS (USEPA8260)	0.7[6]
Toluene	1.0	Purge Trap-GCMS (USEPA8260)	480[6]
Ethylbenzene	1.0	Purge Trap-GCMS (USEPA8260)	NL[6]
Total Xylenes	3.0	Purge Trap-GCMS (USEPA8260)	110[6]
TOTAL RECOVERABLE HYDROCARBONS			
F1 C_6-C_{10}	10	TPH Purge Trap-GCMS (USEPA8260)	50[6,]
F2 >C_{10}-C_{16}	50	TPH Purge Trap-GCMS (USEPA8260)	280[6]
F3 >C_{16}-C_{34}	100	Purge Trap-GCFID (USEPA8000)	-
F4 >C_{34}-C_{40}	100	Purge Trap-GCFID (USEPA8000)	-
ORGANOCHLORINE PESTICIDES			
DDT + DDD + DDE	0.3	GCECD (USEPA8140,8080)	240
Aldrin + Dieldrin	0.2	GCECD (USEPA8140,8080)	6
Chlordane	0.1	GCECD (USEPA8140,8080)	50
Endosulfan	0.3	GCECD (USEPA8140,8080)	270
Endrin	0.1	GCECD (USEPA8140,8080)	10
Heptachlor	0.1	GCECD (USEPA8140,8080)	6
HCB	0.1	GCECD (USEPA8140,8080)	10
Methoxychlor	0.1	GCECD (USEPA8140,8080)	300
PHENOLS			
Phenol	5	Distillation-Colorimetric (APHA 5530)	3000
PCBs			
Total PCBs	0.7	GCECD (USEPA8140,8080)	1
Asbestos			
Asbestos (<0.1 m bgs)	0.1 g/kg	PLM / Dispersion Staining	No asbestos capable of being detected via the investigation, which comprises both visual identification and sample analysis by a NATA accredited laboratory
Asbestos FA/AF (>0.1 m bgs)	0.1 g/kg	PLM / Dispersion Staining	0.001%

	Limit of Reporting	Laboratory Method	Health Investigation/ Screening Levels Residential A
Bonded ACM (>0.1 m)	0.1 g/kg	PLM / Dispersion Staining	0.01%
Asbestos Fibres	0.1 g/kg	PLM / Dispersion Staining	No respirable asbestos fibres of being detected via sample analysis by a NATA accredited laboratory
Explosives			
RDX	0.5	HPLC (USEPA 8332)	10[7]
TNT	0.5	HPLC (USEPA 8332)	15[7]
2,4 – DNT and 2,6 - DNT	0.5	HPLC (USEPA 8332)	1.5[7]

Notes:
1. Guideline values presented are for Chromium (VI) in absence of total Chromium values. Where total Chromium results are elevated, samples will be analysed for Chromium (VI).
2. Guideline values are for inorganic mercury. Where elevated mercury concentrations are encountered and/or site information suggests the potential presence of elemental mercury and/or methyl mercury, consideration of applicability would be needed.
3. Carcinogenic PAHs calculated as per Benzo(a)pyrene Toxicity Equivalent Factor requirements presented in NEPC 2013
4. Total PAHs calculated as per requirements presented in NEPC 2013.
6. Soil Health Screening Levels for Vapour Intrusion: Clay Soils. Values presented are those for 0 to <1 m bgs for residential land use. Reference should be made to results tables for further detail of levels at greater depths.
7. US Army Medical Bioengineering Research and Development Laboratory for the Corn Husker Army Ammunition Plan, Rosenblah, 1986.
NL: Non-limiting.

Table 10.3 Ecological Screening Levels and Soil Quality Guideline Values (all units in mg/kg)

	Limit of Reporting	Laboratory Method	ESLs Urban Residential and public open space	ESLs Areas of Ecological Significance	SQGs (Aged)[3] Urban Residential and public open space	SQGs (Aged)[3] Areas of Ecological Significance
METALS						
Arsenic	4.0	ICP-AES (USEPA 200.7)	-	-	100	40
Cadmium	0.4	ICP-AES (USEPA 200.7)	-	-	-	-
Chromium	1.0	ICP-AES (USEPA 200.7)	-	-	410	140
Chromium (VI)	1.0	Alkali leach colorimetric (APHA3500-Cr/USEAP3060A)	-	-	-	-
Copper	1.0	ICP-AES (USEPA 200.7)	-	-	230	85
Nickel	1.0	ICP-AES (USEPA 200.7)	-	-	270	50
Lead	1.0	ICP-AES (USEPA 200.7)	-	-	1100	470
Zinc	1.0	ICP-AES (USEPA 200.7)	-	-	770	230
Mercury (inorganic)	0.1	Cold Vapour ASS (USEPA 7471A)	-	-	-	-
POLYCYCLIC AROMATIC HYDROCARBONS						
Benzo(a)pyrene	0.5	GCMS (USEPA8270)	0.7	0.7	-	-
Naphthalene	0.1	GCMS (USEPA8270)	-		170	10
BTEX						
Benzene	1.0	Purge Trap-GCMS (USEPA8260)	50	10	-	-
Toluene	1.0	Purge Trap-GCMS (USEPA8260)	85	10	-	-
Ethylbenzene	1.0	Purge Trap-GCMS (USEPA8260)	70	1.5	-	-
Total Xylenes	3.0	Purge Trap-GCMS (USEPA8260)	105	10	-	-
TOTAL RECOVERABLE HYDROCARBONS						
F1 C_6-C_{10}	10	TPH Purge Trap-GCMS (USEPA8260)	180[1]	125[1]	-	-
F2 >C_{10}-C_{16}	50	TPH Purge Trap-GCMS (USEPA8260)	120[2]	25[2]	-	-
F3 >C_{16}-C_{34}	100	Purge Trap-GCFID (USEPA8000)	300	Insufficient data to derive value	-	-
F4 >C_{34}-C_{40}	100	Purge Trap-GCFID (USEPA8000)	2800	Insufficient data to derive value	-	-
ORGANOCHLORINE PESTICIDES						
DDT	0.1	GCECD (USEPA8140,8080)	-	-	180	3

Notes:

1. Values for F1 C_6-C_9 are obtained by subtracting BTEX (Sum) from laboratory result for C_6-C_9 TRH.
2. Values for F2 >C_{10}-C_{16} are obtained by subtracting naphthalene from laboratory result for >C_{10}-C_{16} TRH.
3. SQG derived using assumed data using NEPC 2013 methodology, using the EIL calculator. Estimated CEC at 20 cmol/kg, pH at 7 and percentage clay content >10%.

10.3.2 Offsite Disposal Criteria

Contaminated soils requiring disposal off-site shall be assessed in accordance with EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste* (**Section 8**).

10.3.3 Imported Soil Criteria

In accordance with current EPA policy, only material that does not represent an environmental or health risk at the receiving site may be considered for resource recovery. In accordance with this, only Virgin Excavated Natural Material (VENM) as defined in the *Protection of the Environment Operations Act* (1997) Schedule 1 or ENM (excavated natural material) as defined under *Protection of the Environment Operations (Waste) Regulation 2014* may be imported to reinstate the excavations (**Section 8**).

10.4 Quality Assurance / Quality Control

The objective of the strategy is to remediate the site to a standard suitable for the proposed use. To demonstrate the effectiveness of the remedial works, validation sampling and analyses will be conducted. The quality of the validation data must be sufficient to draw conclusions regarding the suitability of the site. Hence, the quality assurance / quality control (QA/QC) program employed as part of remediation works will involve pre-determined data quality indicators (DQIs).

The DQIs are summarised following and in **Table 10.4**:

- **Precision** - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is normally assessed by calculating the Relative Percent Difference (RPD)[25] of duplicate samples. However, this calculation is not applicable due to the presence/ absence nature of asbestos, and as such, the agreement between the sample pairs will be assessed instead.
- **Accuracy** - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- **Representativeness** –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by using an adequate number of sample locations to characterise the site to the required accuracy.
- **Comparability** - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples, ensuring analysing laboratories use consistent analysis techniques and reporting methods.
- **Completeness** – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.

[25] $$RPD(\%) = \frac{|C_o - C_d|}{C_o + C_d} \times 200$$

Where C_0 is the analyte concentration of the original sample
C_d is the analyte concentration of the duplicate sample

Table 10.4 Summary of Quality Assurance / Quality Control Program

Data Quality Objective	Frequency	Data Quality Indicator
Precision		
Blind duplicates (intra laboratory)	1 / 20 samples	<50% RPD1 (for asbestos primary and duplicate samples agreement)
Blind duplicates (inter laboratory)	1 / 20 samples	<50% RPD1 (for asbestos primary and duplicate samples agreement)
Accuracy		
Surrogate spikes	All organic samples	70-130%
Laboratory control samples	1 per lab batch	70-130%
Matrix spikes	1 per lab batch	70-130%
Representativeness		
Sampling appropriate for media and analytes		-
Samples extracted and analysed within holding times.	-	organics (14 days), inorganics (6 months)
Trip spike (for volatiles)	1 per sampling event when sampling for volatile or semi-volatile COPC	70-130% recovery
Trip blank	1 per sampling event when sampling for volatile or semi-volatile COPC	<LOR
Rinsate	1 per sampling event where reusable sampling equipment used	<LOR
Comparability		
Standard operating procedures for sample collection & handling	All Samples	All samples
Standard analytical methods used for all analyses	All Samples	All samples
Consistent field conditions, sampling staff and laboratory analysis	All Samples	All samples
Limits of reporting appropriate and consistent	All Samples	All samples
Completeness		
Sample description and COCs completed and appropriate	All Samples	All samples
Appropriate documentation	All Samples	All samples
Satisfactory frequency and result for QC samples	All QA/QC samples	-
Data from critical samples is considered valid	-	Critical samples valid

1. Relative per cent difference

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include requesting further information from samplers and/ or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

10.5 Validation Reporting

The validation report will be prepared in general accordance with OEH (2011), documenting the works as completed. This report will contain:

- Details of the remediation works conducted;
- Information demonstrating that the objectives of the SRAP have been achieved, in particular the validation sample results and assessment of the data against both the pre-defined data quality objectives and the remediation acceptance (validation) criteria;
- Information demonstrating compliance with appropriate regulations and guidelines;
- Any variations to the strategy undertaken during the implementation of the remedial works;
- Results of all environmental monitoring undertaken during the course of the remedial works; and

- Details of any environmental incidents occurring during the course of the remedial works and the actions undertaken in response to these incidents.

The report will serve to document the remediation works for future reference.

11. Remediation Environmental Management Plan (REMP)

This section contains procedures and requirements that are to be implemented as a minimum requirement during any remediation works.

11.1 Purpose

This Remediation Environmental Management Plan (REMP) has been designed to ensure the risk to the remediation workforce at the site, adjoining properties, and the surrounding environment is acceptable. Risks will be managed through the implementation of a number of ongoing monitoring and management measures pertaining to the proposed remedial works. The remedial works are being undertaken to make the site suitable for the proposed land use.

11.2 Responsibilities

Remediation Contractor

The remediation supervisor is responsible for ensuring the work is carried out in accordance with the REMP. This will include:

- Ensuring a copy of the SRAP is available at the site during the remediation/validation activities;
- Confirming individuals are competent in performing allotted tasks;
- Liaison with the contractor representatives, as appropriate, regarding REMP matters; and
- Investigation and reporting of incidents and accidents.

The remediation Contractor contact details will be provided in the SRAP.

Other Members of the Site Workforce

Every individual worker is responsible for conducting their allocated tasks in an environmentally friendly manner and in accordance with their training and experience. They must give due consideration to the environment of all others in their proximity and cooperate in matters of environmental management. All workers must leave their work areas in such a condition that the location will not be hazardous at any time.

11.3 Hours of Operation

Remediation works shall only be permitted during the following hours:

Monday to Friday: 7:00 am to 5:00 pm

Saturdays: 8:00 am to 4:00 pm

Sundays and Public Holidays: No work permitted.

Emergency work is permitted to be completed outside of these hours.

11.4 Excavation

Excavation works shall be undertaken as per relevant statutes and Australian and International Standards.

It is anticipated the majority of excavated materials will remain on site with the exception of any identified impacts in the SRAP which shall be transported to a facility lawfully able to accept them.

11.5 Identification of Environmental Procedures

As discussed in the sections above remediation works are proposed to be undertaken within the site located in Stages 3 to 5 of the Central Precinct development. These have been summarised in **Table 11.1** with the potential environmental emissions (including emissions to soil, air and water)

associated with each identified activity. Procedures required to control potential environmental emissions to acceptable levels have been identified, and are noted in the table for each proposed activity. Should any additional potential environmental impacts require management beyond what is listed below these will be specified in the SRAP.

Table 11.1 Review of Potential Environmental Impacts

Activity	Potential Emissions	Management Procedure
Excavation of Soils	Noise generation Dust generation Sediment migration Odour generation Disturbance to existing flora / fauna Contamination of heavy equipment	01 Dust and Airborne Hazard Control 02 Odour Prevention and Control 03 Material Tracking and Transporting 04 Handling of Environmentally Impacted Material 08 Air Monitoring – Asbestos 09 Flora & Fauna 10 Heritage / Archaeological 11 Visual Impacts 12 Emergency Response 13 Noise and Vibration Control 17 Sediment Control 19 Decontamination of Heavy Equipment 20 Environmental Monitoring
Handling of Soils	Noise generation Dust generation Air Emissions Odour Generation Sediment migration Contamination of heavy equipment	01 Dust and Airborne Hazard Control 02 Odour Prevention and Control 03 Material Tracking and Transporting 04 Handling of Environmentally Impacted Material 08 Air Monitoring – Asbestos 12 Emergency Response 13 Noise and Vibration Control 16 Soil Storage Area 17 Sediment Control 19 Decontamination of Heavy Equipment 20 Environmental Monitoring 23 Imported Fill Protocol
Soil Sampling	Noise generation Dust generation Sediment migration Contamination of heavy equipment	01 Dust and Airborne Hazard Control 02 Odour Prevention and Control 04 Handling of Environmentally Impacted Material 08 Air Monitoring – Asbestos 09 Flora & Fauna 10 Heritage / Archaeological 12 Emergency Response 13 Noise and Vibration Control 17 Sediment Control 19 Decontamination of Heavy Equipment 20 Environmental Monitoring 23 Imported Fill Protocol
Stockpiling of Soils	Noise generation Dust generation Odour generation Sediment migration Contamination of heavy equipment Release of contaminants to sub-surface soils and groundwater	01 Dust and Airborne Hazard Control 02 Odour Prevention and Control 03 Material Tracking and Transporting 04 Handling of Environmentally Impacted Material 08 Air Monitoring – Asbestos 12 Emergency Response 13 Noise and Vibration Control 16 Soil Storage Area (Stockpile Management) 17 Sediment Control 19 Decontamination of Heavy Equipment 20 Environmental Monitoring

Activity	Potential Emissions	Management Procedure
Off-Site Disposal of Wastes	Noise generation Dust generation Sediment migration Traffic impacts	01 Dust and Airborne Hazard Control 02 Odour Prevention and Control 03 Material Tracking and Transporting 04 Handling of Environmentally Impacted Material 08 Air Monitoring – Asbestos 12 Emergency Response 13 Noise and Vibration Control 14 Traffic 19 Decontamination of Heavy Equipment 20 Environmental Monitoring 21 Waste Classification

A number of environmental procedures have been identified in **Table 11.1** to control the potential emissions identified. Procedures are provided in **Appendix C**. To allow the implementation of each procedure, nominated organisations need to be charged with the responsibility of implementation. To this effect, the most likely responsible party(s) to each procedure and responsibilities are shown against the list of procedures in **Table 11.2** following. Each organisation will need to be familiar with the requirements of each of the relevant procedures.

Table 11.2 Summary of Responsibilities for Environmental Procedures

Procedure	Remediation Contractor	Remediation Consultant	MDC
01. Dust and Airborne Hazard Control	X		
02. Odour Prevention and Control	X	X	
03. Material Tracking and Transporting	X	X	
04. Handling of Environmentally Impacted Material	X		
08. Air Monitoring – Asbestos	X	X	
09. Flora and Fauna	X	X	
10. Heritage / Archaeological	X	X	
11. Visual Impacts	X		
12. Emergency Response	X	X	
13. Noise and Vibration Control	X	X	
14. Traffic	X	X	
16. Soil Storage Area (Stockpile Management)	X	X	
17. Sediment Control	X		
18. Operation of Site Office	X		
19. Decontamination of Heavy Equipment	X		
20. Environmental Monitoring	X	X	
21. Waste Classification	X	X	
22. Excavation Water and Impacted Surface Water Treatment	X	X	
23. Imported Fill Protocol	X	X	
24. Community Consultation	X	X	
25. Incident Reporting	X	X	
26. REMP Review	X	X	X
27. Training	X	X	

12. Health and Safety Plan

A detailed Health and Safety Plan (HSP) is required to be developed prior to commencement of remediation works. The objectives of the HSP are:

- To apply standard procedures that minimises risks resulting from the works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.

This health and safety plan contains procedures and requirements that are to be implemented as a minimum during the remediation works.

The objectives of the health and safety plan are:

- To apply standard procedures that reduce risks resulting from the above works;
- To ensure all employees are provided with appropriate training, equipment and support to consistently perform their duties in a safe manner; and
- To have procedures to protect other site workers and the general public.
- These objectives will be achieved by:
- Assignment of responsibilities;
- An evaluation of hazards;
- Establishment of personal protection standards and mandatory safety practices and procedures; and
- Provision for contingencies that may arise while operations are being conducted at the site.

This health and safety plan does not provide safety information specific to construction or excavation activities carried out by contractors, such as the safe operation, maintenance and inspection of plant, etc. Contractors will be required to prepare their own Safe Work Method Statements for their work activities. All parties working on the site shall comply with all applicable Health and Safety legislation, regulations, codes and guidelines. All contractors shall comply with Lend Lease (2012) '*EHS Requirements for Contractors*'.

In addition to general assessment of the potential for exposure to chemical contaminants the HSP should also include specific consideration of the identified contaminants of concern present within in-situ materials on the site as specified in the SRAP.

As a precautionary measure, the HSP shall include the requirement for the plan to be revised in the event of an unexpected find of contaminated material during remediation construction.

12.1 Responsibilities

Remediation Supervisor

The remediation supervisor is responsible for ensuring the work is carried out in accordance with the health and safety plan. This will include:

- Ensuring a copy of the health and safety plan is available at the site during the remediation/validation activities;
- Confirming individuals are competent in performing allotted tasks;
- Liaison with the contractor representatives, as appropriate, regarding safety matters; and

- Investigation and reporting of incidents and accidents.

The remediation supervisor contact details will be provided in the SRAP.

Other Members of the Site Workforce

Every individual worker is responsible for conducting their allocated tasks in a safe manner and in accordance with their training and experience. They must give due consideration to the safety of all others in their proximity and cooperate in matters of health and safety. All workers must leave their work areas in such a condition that the location will not be hazardous to others at any time.

12.2 Hazards

Job Risk Assessments (JRAs) and Safe Work Method Statements (SWMS) will need to be supplied by the Remediation Contractor and incorporated into the Health and Safety plan detailing all the known or potential hazards associated with the work activities some are listed below.

The known or potential hazards associated with the work activities described above are listed below:

- Inhalation hazards associated with the presence of chemicals, asbestos fibres and ACM contaminated soil.
- Physical hazards, including:
- work in or near excavations;
- operating machinery;
- heat stress and UV exposure;
- underground or overhead services;
- manual handling; and
- noise.

In the event of the discovery of any condition that would suggest the existence of a situation more hazardous than anticipated, or of any new hazard that could potentially cause serious harm to personnel or the environment, work will be suspended until the Project Manager has been notified and appropriate instructions have been provided to field personnel.

12.2.1 Inhalation Hazards

The main inhalation hazards from the remediation/validation works are consequent of the potential presence of asbestos.

Measures require to be put in place to prevent/ minimise the generation of airborne fibres. These have been described in the environmental controls for the works. Where airborne emissions are generated, PPE shall be required to be worn to prevent potential exposure, as described in **Section 12.3**.

12.2.2 Chemical Hazards

When working with contaminated materials in general, care must be taken to ensure that the contamination is not introduced to the worker via ingestion, inhalation or absorption. PPE and decontamination requirements related to the remedial works are summarised in **Sections 12.3 and 12.5**.

12.2.3 Physical Hazards

Operating Machinery

Heavy plant and equipment operating in the vicinity of field personnel presents a risk of physical injury. Personnel should be cognisant of their position in relation to operating machinery at all times.

Never walk behind or to the side of any operating equipment without the operator's knowledge. Do not assume that the operator knows your position. Personnel should stay at least 1 m from the operational area of heavy equipment and should not stand directly below any load or piece of equipment (*e.g.* backhoes).

Work In or Near Excavations

All excavations shall be shored, sloped or otherwise constructed so as to minimise the potential for collapse. Appropriate physical barriers should be erected during and on completion of excavations to prevent any personal entering the excavation area.

Cuts and Abrasions

The manual work associated with the remediation works may give rise to the risk of cuts and abrasions to personnel working in the area. As well as the direct consequences of any cut or abrasion, such injuries can lead to the possibility of exposure to contaminants through the wound as well as diseases such as tetanus. To minimise the risk of direct or indirect injury, personnel will wear the personal protective equipment described in **Section 12.3**.

Heat Stress and UV Exposure

Site personnel may experience heat stress due to a combination of elevated ambient temperatures and the concurrent use of personal protection equipment; this depends in part on the type of work and the time of year.

In addition to heat stress, overexposure to UV radiation in sunlight can result in sunburn to exposed skin. The use of a high protection sunscreen (SPF15 or greater) on all exposed skin is recommended. Hats (including hard hats in specified areas) will also provide additional sun protection during the peak (*i.e.* 10:00 am to 3:00 pm) sun period. Sunglasses should be worn (where appropriate) to protect eyes from effects of UV exposure.

Underground Services

There is the potential for underground services (electricity, natural gas lines, water, telephone, sewer, and stormwater) to be present beneath the work area. The remediation contractor shall ensure that appropriate procedures will be taken to minimise the risk associated with excavation near services.

Aboveground Electrical Hazards

All electrical plant and equipment must comply with the requirements of Australian Standard AS 3000. Hand held portable tools shall comply with AS/NZS 3160 "hand-held portable electric tools" and shall be double insulated. Cord connected portable hand lamps shall comply with AS/NZS 3118. A Residual Current Device (RCD) shall protect plug-in portable equipment, which is connected to a supply above Extra Low Voltage - 12-24volts (including equipment supplied from a generator or welding set). RCD protection shall be provided during maintenance of portable electrical equipment at all times while the equipment is connected to a power supply above Extra Low Voltage, irrespective of whether power is switched ON or OFF. RCD's shall comply with AS 3190 and shall be type II units, rated to trip at or below 30 milliamps within 40 milliseconds.

No excavator, drill rig or crane may work within 6 m of overhead distribution power lines.

Manual Handling

When lifting or handling heavy objects, use correct lifting techniques, bending the knees not the back. If the item to be lifted is too heavy or awkward for one person to lift, seek assistance from other company employees or use mechanical help.

Noise

Long-term exposure to high levels of noise is unlikely. However, operating machinery may cause significant noise exposures for short periods. Earplugs or earmuffs should be worn in any situation where noise levels make normal conversation difficult.

12.3 Personal Protective Equipment

All workers who may come into direct contact with contaminated soil will wear the following personal protective equipment:

- Overalls or long sleeved collared shirt;
- Heavy duty outer gloves (eg. leather) where there is a risk of cuts or abrasions, otherwise PVC outer gloves if in direct contact with contaminated soil;
- Steel capped boots;
- Safety glasses;
- High visibility vest or jacket; and
- Hard hat.

In addition to the above, the following personal protective equipment will be worn by the licensed personnel responsible for removing the asbestos contaminated soils, or potentially exposed to airborne emissions:

- During any work in the asbestos contaminated area prior to final clearance, overalls worn should be made from either 100% synthetic material or a mixed natural/synthetic fabric capable of providing adequate protection against fibre penetration. Gloves, rubber soled work shoes or gum boots should be provided for personnel involved in wet work. These shoes will remain inside the work area for the duration of the work.
- Approved respirators shall be worn in the asbestos contaminated area at all times to provide respiratory protection. The minimum protection is an approved properly fitting disposable respirator or half faced respirator fitted with a particulate cartridge. However it is expected that the contractor will conduct a risk assessment in relation to the works and should consider the requirement for positive pressure, hood or full-face powered air-purifying respirator fitted with an approved Class M filter.
- The contractor shall supply and keep in good order, two complete sets of protective clothing and respirators for authorised inspection personnel. These will remain the property of the contractor at the end of the contract.
- Respirators should be issued for personal use only and shall be kept in a clean condition. Alcohol based antiseptic swabs should be made available for the cleaning of respirators.
- Any respirator defects should be reported for subsequent repair. They should be maintained in a clean and safe working condition.
- Employees must receive instruction in the correct method of using the respirator and on the importance of correct facial fit and maintenance. No person with a beard shall be allowed within the asbestos work area except using an approved positive pressure continuous airflow hood.

It is further noted that, as part of the WorkCover permitting process, additional PPE may be required. If this occurs, then the above PPE requirements will be upgraded to reflect WorkCover's requirements.

In the event that workers will be exposed to highly odorous soil conditions during remediation works, the following additional PPE should be adopted:

- Impermeable disposable overalls; and
- Half or full face respirator with organic vapour cartridge (as per action levels identified in **Table 12.1**).

A PID shall be used to monitor the concentrations of VOCs within the workspace, with the following action levels at which the additional PPE mentioned above is required.

Table 12.1 Action Levels for Respirator Use

Instrument	Airborne Levels (as measured with a PID)	Level of Protection
PID	<80 ppm	No additional protection required
	>80 ppm	Half or full faced respirator

12.4 Monitoring procedures

It is prudent practice to conduct monitoring for airborne asbestos fibres during asbestos works. The results of air monitoring can be used:

- To identify failures in containment;
- To identify poor work practices; and
- To provide proof of containment for occupiers and regulatory authorities and to provide evidence of good work practices for both present and future needs.

Monitoring will be conducted in accordance with the National Occupational Health & Safety Commission (NOHSC) membrane filter method as approved by the National Association of Testing Authorities (NATA). The procedure is detailed in **Appendix C and E.**

The appropriate TWA (NOHSC) levels are:

- Amosite - 0.1 fibre/mL;
- Chrysotile – 0.1 fibre/mL;
- Crocidolite - 0.1 fibre/mL;
- Other forms of asbestos - 0.1 fibre/mL; and
- Any mixture of these, or where the composition is unknown - 0.1 fibre/mL.
- With consideration to these levels the following trigger levels have been developed:
- If airborne fibre levels reach 0.01 fibres/mL the source of fibre release is to be found and rectified. Work in the affected area does not have to stop; and
- If airborne fibre levels reach 0.02 fibres/mL work in the work area should stop and additional controls measures employed. This will involve additional water spraying during excavations.

Air monitoring results will be obtained within 24 hours of sample collection. While this precludes “real time” monitoring, inspections will be made during excavation works and, if there is any visible dusts, light water spays will be used to wet the excavation and prevent the release of any airborne asbestos fibres.

In accordance with the Work Health and Safety Act 2011 (WHS 2011), an airborne asbestos monitoring action flowchart has been developed for the site in the event of an exceedance of asbestos fibres at a site boundary. The procedure is detailed in **Appendix C and E.**

12.5 Decontamination Procedures

The decontamination procedures specified below will be followed whenever personnel, plant or equipment leave the site.

Personnel

All personnel shall enter and exit the contaminated work areas through a designated decontamination unit/area to be specified in the SRAP.

The following steps should be taken to ensure personnel do not leave the site with potentially contaminated clothing:

1. Wash boots in clean water
2. Remove outer gloves and store for reuse
3. Remove overalls and store for reuse (during the day) or place in the skip for the asbestos wastes for disposal.
4. Remove respirator and goggles (if used) and store clean for reuse or decontamination, as appropriate.
5. Thoroughly wash hands and face.

If any part of a worker's body comes into direct contact with any potentially contaminated material, the affected part(s) should be immediately washed with clean water.

Vehicle, Plant and Equipment

All equipment, including personal protective equipment, will be washed or otherwise cleaned to ensure that contaminated soil, water or dust is removed before it leaves the Site. All plant and equipment will have their outer bodies thoroughly cleaned of soil and sediment before moving off the site.

12.6 Emergency Response

The remediation contractor will be responsible for preparing an emergency response plan, which will provide details on appropriate action and evacuation procedures in the event of an emergency.

In the event of an emergency arising on the site, appropriate action should be taken. Site evacuation procedures should be followed, as necessary.

In the event of an accident: evaluate the seriousness of the injury, and contact emergency services, if necessary; provide first aid, as appropriate, and if safe to do so evacuate the injured person via the Decontamination Zone; make the area as safe as possible without jeopardising safety.

If a serious accident occurs, do not disturb the scene, except to make safe and prevent further injury or damage, and keep all unauthorised people out, and report all accidents to the Project Manager.

13. Community Consultation

Consequent of the social and potential environmental profile of the site, a community consultation / communication plan shall be required to notify all stakeholders (including occupiers of neighbouring properties and other contractors performing works in remediated areas of the site) of the proposed remedial works. This plan should be integrated with existing community consultation / communication planning.

14. Conclusion

14.1 Conclusions

Overall, it is considered that the proposed actions outlined in this CRS conform to the requirements of the *Contaminated Sites Guidelines for the NSW Site Auditor Scheme (2nd Edition)* (DEC 2006) because they are: technically feasible; environmentally justifiable; and consistent with relevant laws policies and guidelines endorsed by NSW EPA.

Subject to the successful implementation of the measures described in this CRS and the recommendations below, it is concluded the site (auditable areas within Stages 3 to 5) can be made suitable for the intended land uses and that the risks posed by contamination can be managed in such a way as to be adequately protective of human health and the environment.

14.2 Recommendations

It is recommended the processes outlined in this CRS be implemented and the following documentation be developed and implemented in addition to a SRAP to ensure the risks and impacts during remediation works are controlled in an appropriate manner:

- A Remediation Environmental Management Plan (REMP), to document the monitoring and management measures required to control the environmental impacts of the works and ensure the validation protocols are being addressed; and
- A Health and Safety Management Plan (HSP) to document the procedures to be followed to manage the risks posed to the health of the remediation workforce.

The REMP and HSP will require to be cognisant of the potential occurrence and storage / handling of asbestos contaminated soils on the site.

Upon completion of the works on the site a validation report is required to be submitted by the Remediation Consultant to the Site Auditor for certification that site is suitable for the proposed uses.

15. Limitations

This report has been prepared for use by the client who commissioned the works in accordance with the project brief only and has been based in part on information obtained from other parties. The advice herein relates only to this project and all results conclusions and recommendations made should be reviewed by a competent person with experience in environmental investigations, before being used for any other purpose.

JBS&G accepts no liability for use or interpretation by any person or body other than the client. This report should not be reproduced without prior approval by the client, or amended in any way without prior approval by JBS&G, and should not be relied upon by other parties, who should make their own enquires.

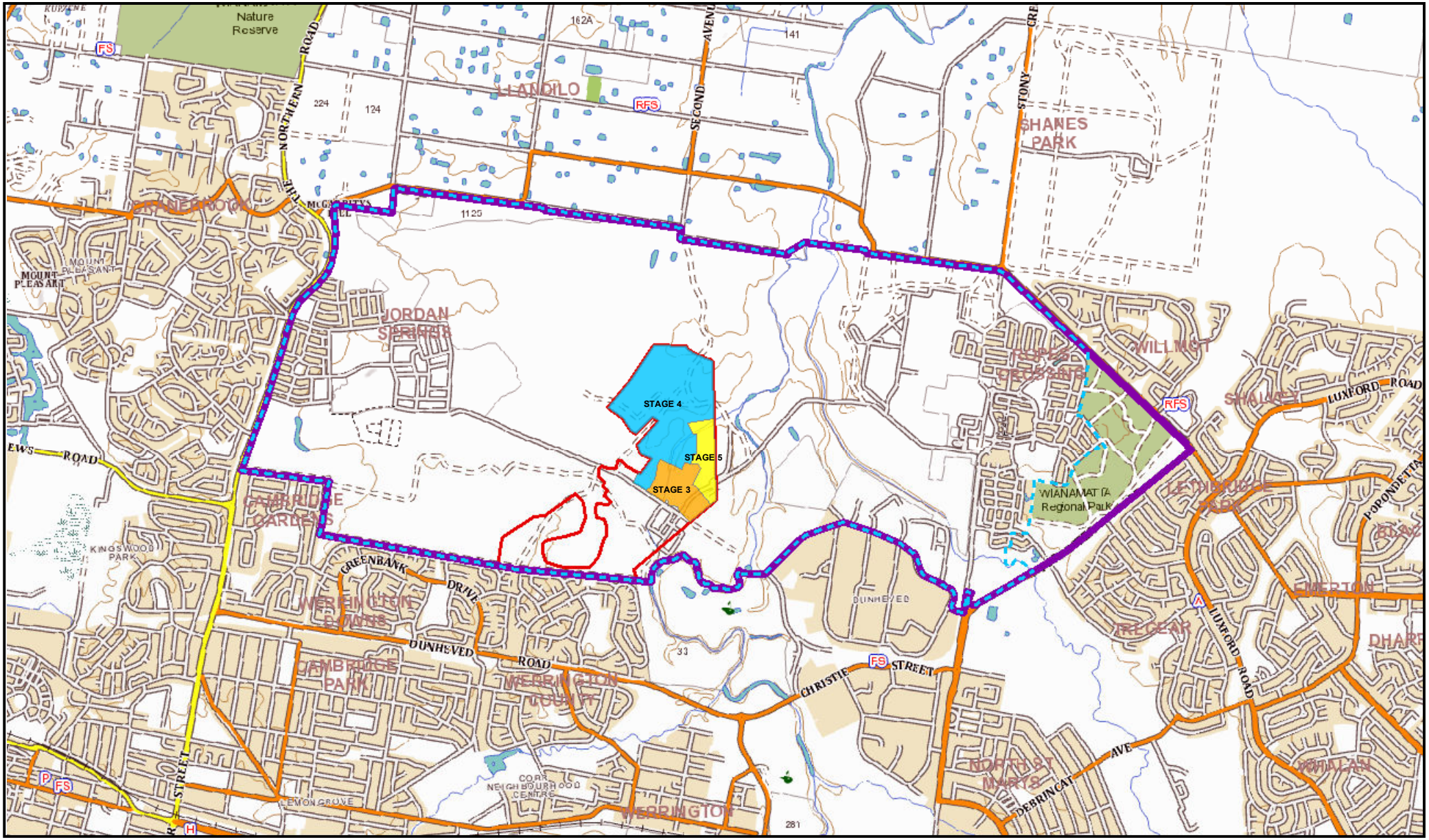
Sampling and chemical analysis of environmental media is based on appropriate guidance documents made and approved by the relevant regulatory authorities. Conclusions arising from the review and assessment of environmental data are based on the sampling and analysis considered appropriate based on the regulatory requirements and site history, not on sampling and analysis of all media at all locations for all potential contaminants.

Limited sampling and laboratory analyses were undertaken as part of the investigations, as described herein. Ground conditions between sampling locations may vary, and this should be considered when extrapolating between sampling points. Chemical analytes are based on the information detailed in the site history. Further chemicals or categories of chemicals may exist at the sites, which were not identified in the site history and which may not be expected at the site.

Changes to the subsurface conditions may occur subsequent to the investigations described herein, through natural processes or through the intentional or accidental addition of contaminants. The conclusions and recommendations reached in this report are based on the information obtained at the time of the investigations.

This report does not provide a complete assessment of the environmental status of the site, and it is limited to the scope defined herein. Should information become available regarding conditions at the site including previously unknown sources of contamination, JBS&G reserves the right to review the report in the context of the additional information.

Figures



Source: Base Image - © SIX Maps www.maps.six.nsw.gov.au, accessed 26-03-2014

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Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date:
A4			
A	Original Issue - R02	SE	11-02-2015

Legend:

- Central Precinct (133.2ha)
- CHK001/1 Audit Statement Boundary
- Former ADI St Marys Property
- STAGE 3
- STAGE 4
- STAGE 5

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Figure 1: Central Precinct Location and Stages 3 to 5

Client: Maryland Development Company

Project: Central Precinct

Job No: 50539 File Name: 50539_01

Source: Base Image - © Near Map www.nearmap.com, imagery date 19-09-2013, accessed 24-03-2014

0 75 150 300 m

Scale: 1:8,000

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R02	SE	11-02-2015

Legend:

- Central Precinct (133.2ha)
- Development Stages Boundary
- Jondan Springs Connector Road (Stage 1) - Approximate Location Only
- CHK001/1 Audit Statement Boundary

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Figure 2: Central Precinct Site Layout and Development Stages

Client: Maryland Development Company

Project: Central Precinct

Job No: 50539 File Name: 50539_02

Source: Base Image - © Near Map www.nearmap.com, imagery date 19-09-2013, accessed 24-03-2014

0 25 50 100 m

Scale: 1:2,500

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R02	SE	11-02-2015

Legend:

- STAGE 3 (12.7ha)
- Central Precinct Residential Boundary
- Stage 3 - Area Subject to Audit (0.1ha)
- Development Stages Boundary
- CHK001/1 Audit Statement Boundary

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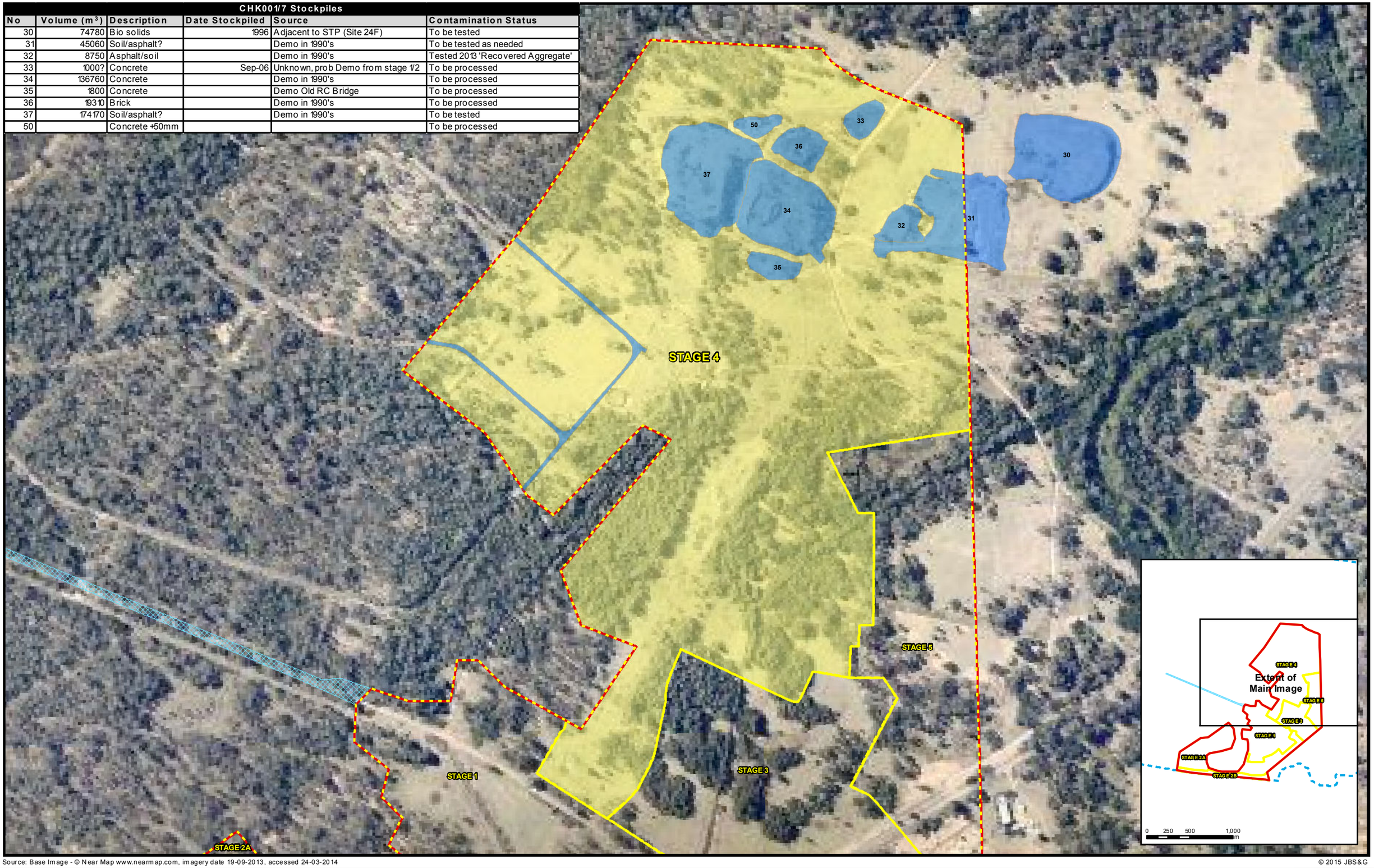
Figure 3A: Stage 3 - Site Layout and Site Subject to Audit

Client: Maryland Development Company

Project: Central Precinct

Job No: 50539 File Name: 50539_03A

CHK001/7 Stockpiles					
No	Volume (m^3)	Description	Date Stockpiled	Source	Contamination Status
30	74780	Bio solids	1996	Adjacent to STP (Site 24F)	To be tested
31	45060	Soil/asphalt?		Demo in 1990's	To be tested as needed
32	8750	Asphalt/soil		Demo in 1990's	Tested 2013 'Recovered Aggregate'
33	1000?	Concrete	Sep-06	Unknown, prob Demo from stage 1/2	To be processed
34	136760	Concrete		Demo in 1990's	To be processed
35	1800	Concrete		Demo Old RC Bridge	To be processed
36	19310	Brick		Demo in 1990's	To be processed
37	174170	Soil/asphalt?		Demo in 1990's	To be tested
50		Concrete +50mm			To be processed



Source: Base Image - © Near Map www.nearmap.com, imagery date 19-09-2013, accessed 24-03-2014

0 50 100 200 m

Scale: 1:5,000

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R02	SE	11-02-2015

Legend:

- STAGE 4 (52.1ha)
- Central Precinct Residential Boundary
- Stage 4 - Area Subject to Audit (8.0ha)
- Development Stages Boundary
- Jondan Springs Connector Road - Approximate Location Only
- CHK001/1 Audit Statement Boundary

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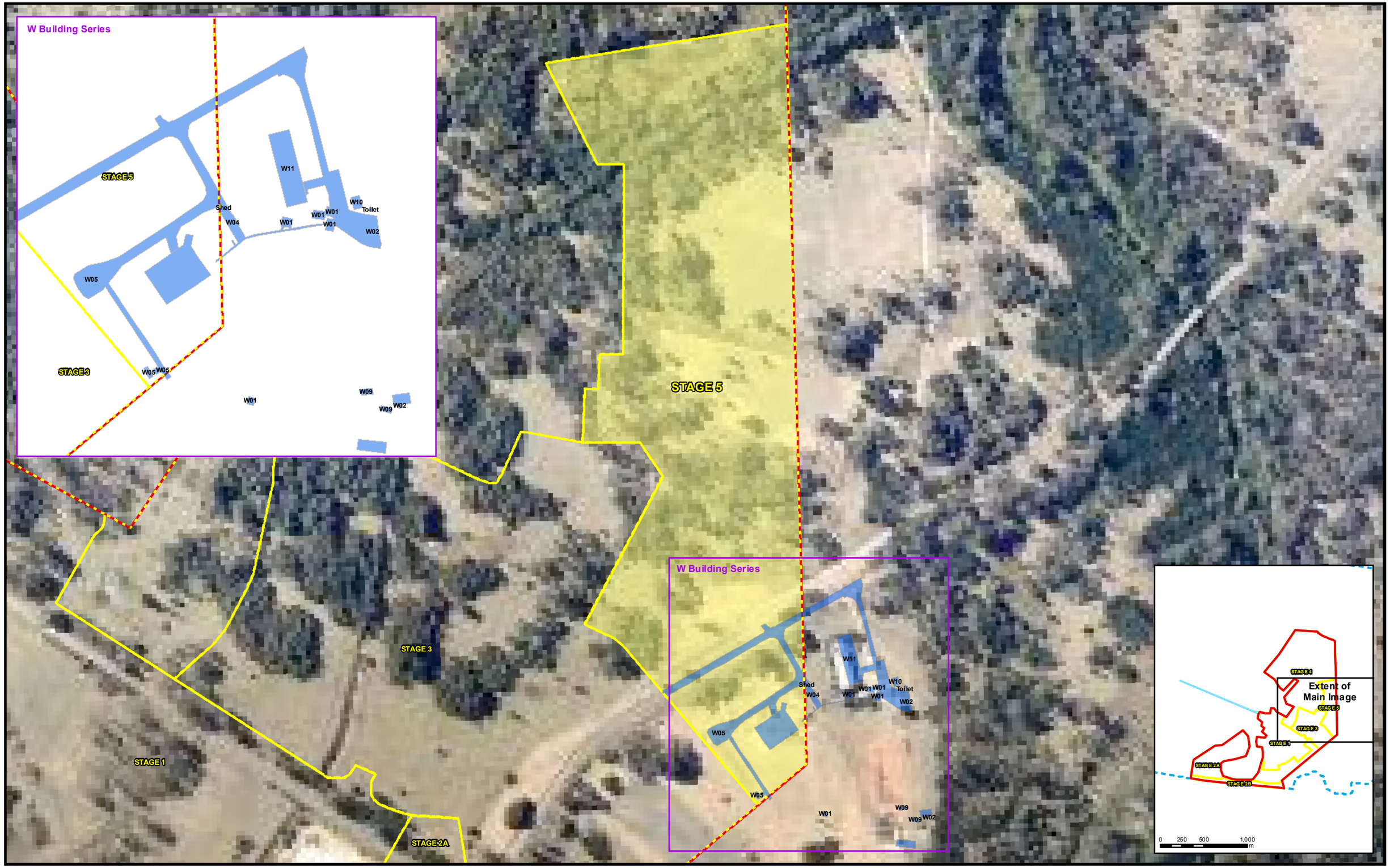
Figure 3B: Stage 4 - Site Layout and Site Subject to Audit

Client: Maryland Development Company

Project: Central Precinct

Job No: 50539 File Name: 50539_03B



Source: Base Image - © Near Map www.nearmap.com, imagery date 19-09-2013, accessed 24-03-2014

0 30 60 120 m

Scale: 1:3,000

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R02	SE	11-02-2015

Legend:

- STAGE 5 (9.6ha)
- Central Precinct Residential Boundary
- Stage 5 - Area Subject to Audit (0.5ha)
- Development Stages Boundary
- CHK001/1 Audit Statement Boundary

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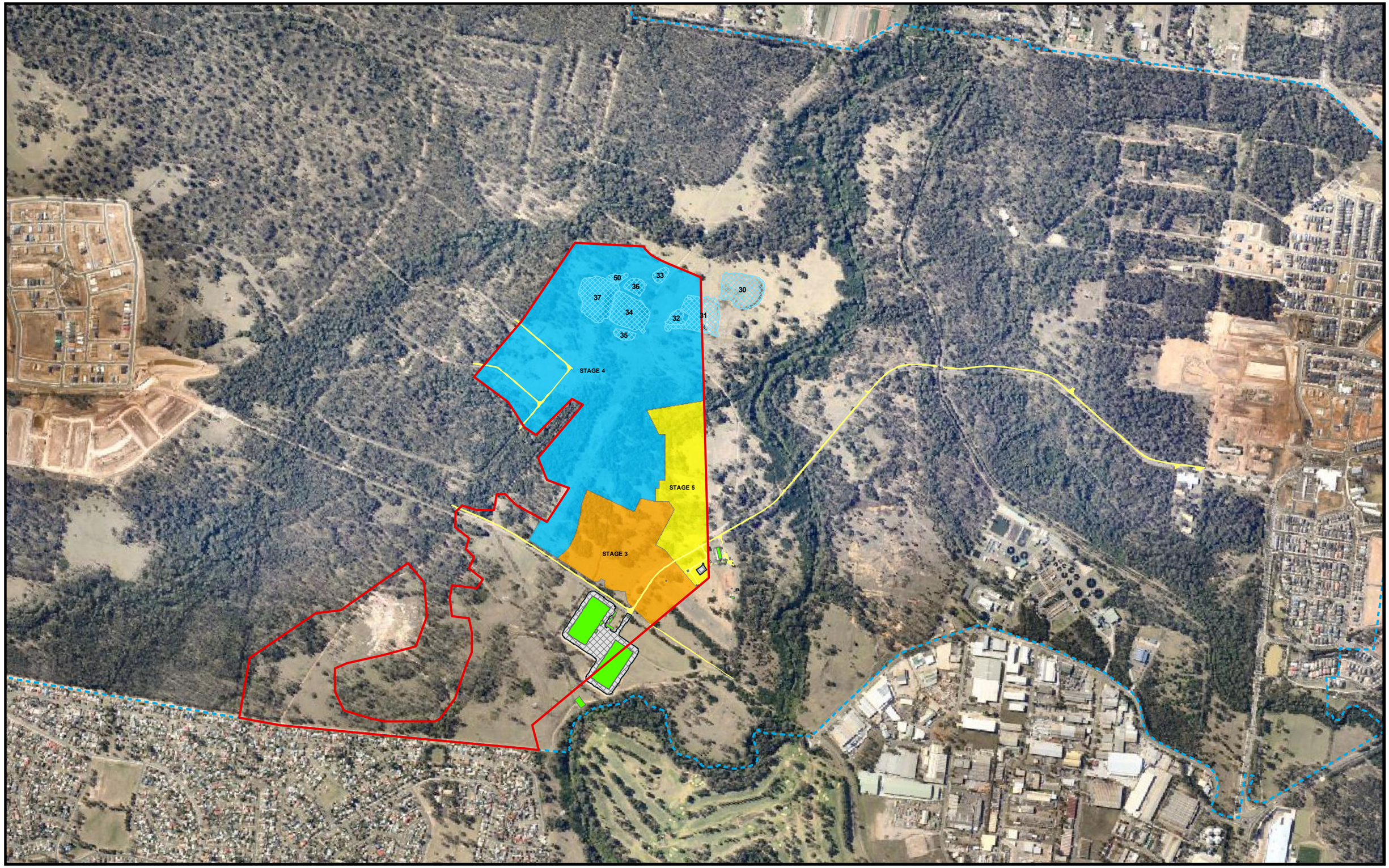
Figure 3C: Stage 5 - Site Layout and Site Subject to Audit

Client: Maryland Development Company

Project: Central Precinct

Job No: 50539 File Name: 50539_03C



Source: Base Image - © Near Map www.nearmap.com, imagery date 19-09-2013, accessed 24-03-2014

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Scale: 1:12,500

Datum: GDA 1994 MGA Zone 56 - AHD

Rev	Description	Drn.	Date
A3			
A	Original Issue - R02	SE	11-02-2015

Legend:

- Central Precinct Residential Boundary
- STAGE 3
- STAGE 4
- STAGE 5
- CHK001/1 Audit Statement Boundary
- CHK001/6 Building Extent
- CHK001/6 Concrete Building Footprint
- CHK001/6 Bitumen Roads
- CHK001/7 Stockpile Footprints

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Figure 4: Central Precinct Site Layout with Site Audit Boundaries

Client: Maryland Development Company

Project: Central Precinct

Job No: 50539 File Name: 50539_04

Appendix A
Site Audit Statements

NSW Environment Protection Authority
SITE AUDIT STATEMENT (SAS)

Site Audit Statement No.: CHK001/1

Site Auditor (accredited under NSW Contaminated Land Management Act 1997):

Name: Christopher H Kidd Company: HLA-Envirosciences Pty Limited
Address: 55-65 Grandview Street, Pymble, NSW Postcode: 2076
Phone: (02) 9988 4422 Fax: (02) 9988 4441

Site Details

ADI St. Marys Property – excluding Eastern Sector, QEL, Site 6 and Site 23, buildings and concrete stockpile.

Address: Forrester Road, St. Marys	Postcode: 2760
Lot and DP Number:	Lot 2 in DP803832 Lot 2 and 3 in DP223888 (part of) Lot 3 in DP789196 Lot 3 in DP598653 (see attached map for excluded areas)
Local Government Area:	Penrith and Blacktown

Site Audit requested by:

Name: Mr P Newton	Company: Department of Urban Affairs and Planning
Address:	Sydney Region West Level 8, Signature Tower 2-10 Wentworth Street Parramatta NSW 2150 Phone: (02) 9895 7142 - Fax: (02) 9895 6270

Name of contact person (if different from above:

Consultancy(ies) who conducted the site investigation(s) and/or remediation:

• ADI Limited	Chemical and Explosives Ordnance Investigations, Remediation and Validation 1990 - 1999
• Mackie Martin & Associates	Groundwater Investigations, 1991

Title(s) of Report(s) reviewed:

1. Historical Report – St Marys Property, ADI Limited, 1996;
2. Validation Report for the Western Sector, ADI St Marys Facility, ADI Limited November 1994;
3. Validation Report for the North Western Sector of the ADI St Marys Facility, Report No. 498800, ADI Limited 1995;
4. Validation Report for the Southern Sector West of the ADI St Marys Property, Report No. 498810, ADI Limited 1996;

5. Validation Report for the Southern Sector East of the St Marys Property, Report No. 498810, ADI Limited 1996;
6. Validation Report for the Northern Sector of the ADI St Marys Property, Report No. 498820, ADI Limited 1996;
7. Validation Report for the Cental Sector East of the ADI St Marys Property, Report No. 498840, ADI Limited 1997;
8. Validation Report for the Central Sector West of the ADI St Marys Property, Report No. 498840, ADI Limited 1996;
9. Validation Report for the North Eastern Sector of the ADI St Marys Property, Report No. 498850, ADI Limited 1996;
10. QA/Verification Survey Results, ADI St Marys Property, Report No. PG980323da ADI Limited, 1999.

Other Information reviewed:

1. Site Investigation Report of St Marys Facility Ammunition and Missiles Division, Volume 4 – Discussions and Conclusions, ADI, June 1991.
2. Remediation Action Plan for the Northern Sector, ADI St Marys Facility, Report No. 498820, ADI Limited 1996;
3. Remediation Action Plan for Central Eastern Sector, ADI St Marys Facility, Report No. 498840, ADI Limited 1996;
4. Remediation Action Plan for the Eastern Sector of the ADI St Marys Property, Report No. 498830, ADI Limited 1996;
5. Stage I Decontamination Audit, ADI St Marys CMPS&F, 1997.

Summary Site Audit Report Title:

Stage 2 Decontamination Audit Report for ADI Site, St Marys.

I have completed a site audit (as defined in the Contaminated Land Management Act 1997) and reviewed the reports and information referred to above with due regard to relevant laws and guidelines. I certify that the site (tick **all** appropriate boxes)

(a) is suitable for the following use(s):

- ✓ residential, including substantial vegetable garden and poultry;
- ~~☐ residential, including substantial vegetable garden, excluding poultry;~~
- ~~☐ residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry;~~
- ✓ residential with minimal opportunity for soil access including units;
- ✓ daycare centre, preschool, primary school;
- ✓ secondary school;
- ✓ park, recreational open space, playing field;
- ✓ commercial/industrial use;
- ~~☐ Other~~

subject to

✓ Conditions

1. Excludes Eastern Sector, QEL, Site 6 and Site 23 which are covered by separate site audit statements, namely CHK001/2, CHK001/3, CHK001/4 and CHK001/5.
2. Excludes areas not yet investigated including the footprint of original buildings, car parks and roads, mainly around former Administration Centre Buildings CHK001/6) and the concrete stockpile in Central Sector West. (Stockpile CHK001/7)
3. An appropriate management plan, including procedures for the safe handling and disposal of any items of ordnance that may be found during earthworks, should be lodged prior to the commencement of development earthworks. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI (see Appendix E of the Site Audit Report).

~~(b) is not suitable for any beneficial use due to risk of harm from contamination~~

~~☐ (comments):~~ .....

I am accredited by the NSW Environment Protection Authority under the Contaminated Land Management Act, 1997 as a site auditor (Accreditation No. 9813).

I **Certify** that:

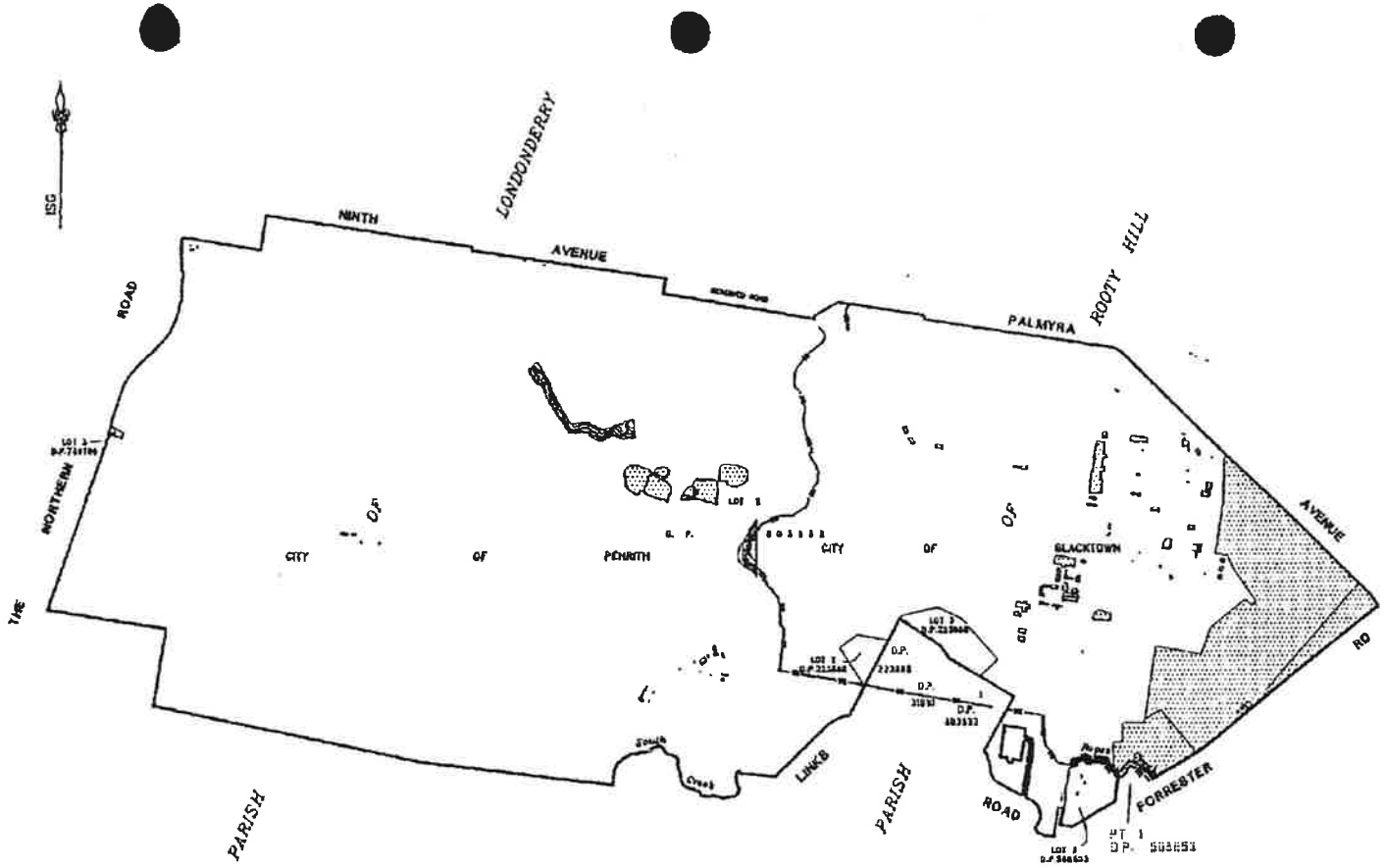
(a) I have personally examined and am familiar with the information contained in this statement, including the reports and information referred to in this statement, and

(b) this statement is to the best of my knowledge, true, accurate and complete, and

(c) on the basis of my inquiries made to those individuals immediately responsible for making the reports, and obtaining the information, referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties for wilfully submitting false, inaccurate or incomplete information.

Signed: _____ Date: 7/6/99



SHADED AREAS ARE EXCLUDED FROM AUDIT STATEMENT CHK001/1

NOTE :

GEOMETRY SHOWN AS SUPPLIED BY ADI LIMITED TO OHN OFFICE 10.5.1999

FOR SITE DETAILS ON EXCLUDED AREAS PLEASE REFER TO DRAWINGS :

5467-123
5467-125
5467-126
5467-127
5467-128
5467-129
5467-130
5467-131
5467-132
5467-133
5467-134
5467-135

NOTES:

PREPARED BY:

Whelans — Surveyors, Planners, Cosmetic Engineers

Whelans Australia Pty Ltd

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Facsimile 02) 9261 5012

Parramatta Office:

Level 1, Suite 2
12 Victoria Road, Parramatta.
NSW 2150
Telephone 02) 9630 4199
Facsimile 02) 9630 4599

PREPARED FOR:

ADI Property

ADI ST MARYS PROPERTY PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/1

ORIGINAL SIZE: A3	
SCALE HOR: 1 : 25,000	VERT: -
CO-ORDS: ISG	DATUM: -
DATE OF SURVEY	DATE OF PLAN: 11 May 1999
SURVEY -	DRAWN Aust/MTB
CHECKED: MTB	DATE 24.5.1999
APPROVED: PW	DATE 24.5.1999
JOB REF: 8662	
CAD REF: 5467-122.DWG	SHEET 1 OF 13 SHEETS

NSW Environment Protection Authority
SITE AUDIT STATEMENT (SAS)

Site Audit Statement No.: CHK001/6

Site Auditor (accredited under NSW Contaminated Land Management Act 1997):

Name: Christopher H Kidd Company: HLA-Envirosciences Pty Limited
Address: 55-65 Grandview Street, Pymble, NSW Postcode: 2076
Phone: (02) 9988 4422 Fax: (02) 9988 4441

Site Details

ADI St. Marys Property – existing buildings and paved areas scattered about the site.
Address: Forrester Road, St. Marys Postcode: 2760
Lot and DP Number: Lot 2 in DP803832
Lot 2 and 3 in DP223888 (part of)
Lot 3 in DP789196
Lot 3 in DP598653
(see attached 7 maps)
Local Government Area: Penrith and Blacktown

Site Audit requested by:

Name: Mr P Newton Company: Department of Urban Affairs and Planning
Address: Sydney Region West
Level 8, Signature Tower
2-10 Wentworth Street
Parramatta NSW 2150
Phone: (02) 9895 7142 - Fax: (02) 9895 6270

Name of contact person (if different from above:

Consultancy(ies) who conducted the site investigation(s) and/or remediation:

- ADI Limited — Chemical and Explosives Ordnance Investigations, Remediation and Validation 1990 - 1999
- Mackie Martin & Associates — Groundwater Investigations, 1991

Title(s) of Report(s) reviewed:

11. Historical Report – St Marys Property, ADI Limited, 1996;
12. Validation Report for the Western Sector, ADI St Marys Facility, ADI Limited November 1994;
13. Validation Report for the North Western Sector of the ADI St Marys Facility, Report No. 498800, ADI Limited 1995;
14. Validation Report for the Southern Sector West of the ADI St Marys Property, Report No. 498810, ADI Limited 1996;

15. Validation Report for the Southern Sector East of the St Marys Property, Report No. 498810, ADI Limited 1996;
16. Validation Report for the Northern Sector of the ADI St Marys Property, Report No. 498820, ADI Limited 1996;
17. Validation Report for the Cental Sector East of the ADI St Marys Property, Report No. 498840, ADI Limited 1997;
18. Validation Report for the Central Sector West of the ADI St Marys Property, Report No. 498840, ADI Limited 1996;
19. Validation Report for the North Eastern Sector of the ADI St Marys Property, Report No. 498850, ADI Limited 1996;
20. QA/Verification Survey Results, ADI St Marys Property, Report No. PG980323da ADI Limited, 1999.

Other Information reviewed:

6. Site Investigation Report of St Marys Facility Ammunition and Missiles Division, Volume 4 – Discussions and Conclusions, ADI, June 1991.
7. Remediation Action Plan for the Northern Sector, ADI St Marys Facility, Report No. 498820, ADI Limited 1996;
8. Remediation Action Plan for Central Eastern Sector, ADI St Marys Facility, Report No. 498840, ADI Limited 1996;
9. Remediation Action Plan for the Eastern Sector of the ADI St Marys Property, Report No. 498830, ADI Limited 1996;
10. Stage I Decontamination Audit, ADI St Marys CMPS&F, 1997.

Summary Site Audit Report Title:

Stage 2 Decontamination Audit Report for ADI Site, St Marys.

I have completed a site audit (as defined in the Contaminated Land Management Act 1997) and reviewed the reports and information referred to above with due regard to relevant laws and guidelines. I certify that the site (tick **all** appropriate boxes)

(a) is suitable for the following use(s):

- ~~☐ residential, including substantial vegetable garden and poultry;~~
- ~~☐ residential, including substantial vegetable garden, excluding poultry;~~
- ~~☐ residential with accessible soil, including garden (minimal home grown produce contributing less than 10% fruit and vegetable intake), excluding poultry;~~
- ~~☐ residential with minimal opportunity for soil access including units;~~
- ~~☐ daycare centre, preschool, primary school;~~
- ~~☐ secondary school;~~
- ~~☐ park, recreational open space, playing field;~~
- ✓ commercial/industrial use;
- ✓ Other – May continue to be used for existing commercial use and carparks, but underlying soils need to be tested for chemical and ordnance contamination after demolition.

subject to

✓ Conditions

1. Soils under existing buildings, car parks, roads and the concrete stockpile shall be tested for ordnance and/or chemical contamination when these facilities are removed; site audits statements for these areas will also be required.
2. An appropriate management plan, including procedures for the safe handling and disposal of any items of ordnance that may be found during earthworks, should be lodged prior to the commencement of development earthworks. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI (see Appendix E of the Site Audit Report).

~~(b) is not suitable for any beneficial use due to risk of harm from contamination~~ per

☐ ~~(comments):~~ per .....

I am accredited by the NSW Environment Protection Authority under the Contaminated Land Management Act, 1997 as a Site Auditor (Accreditation No. 9813).

I Certify that:

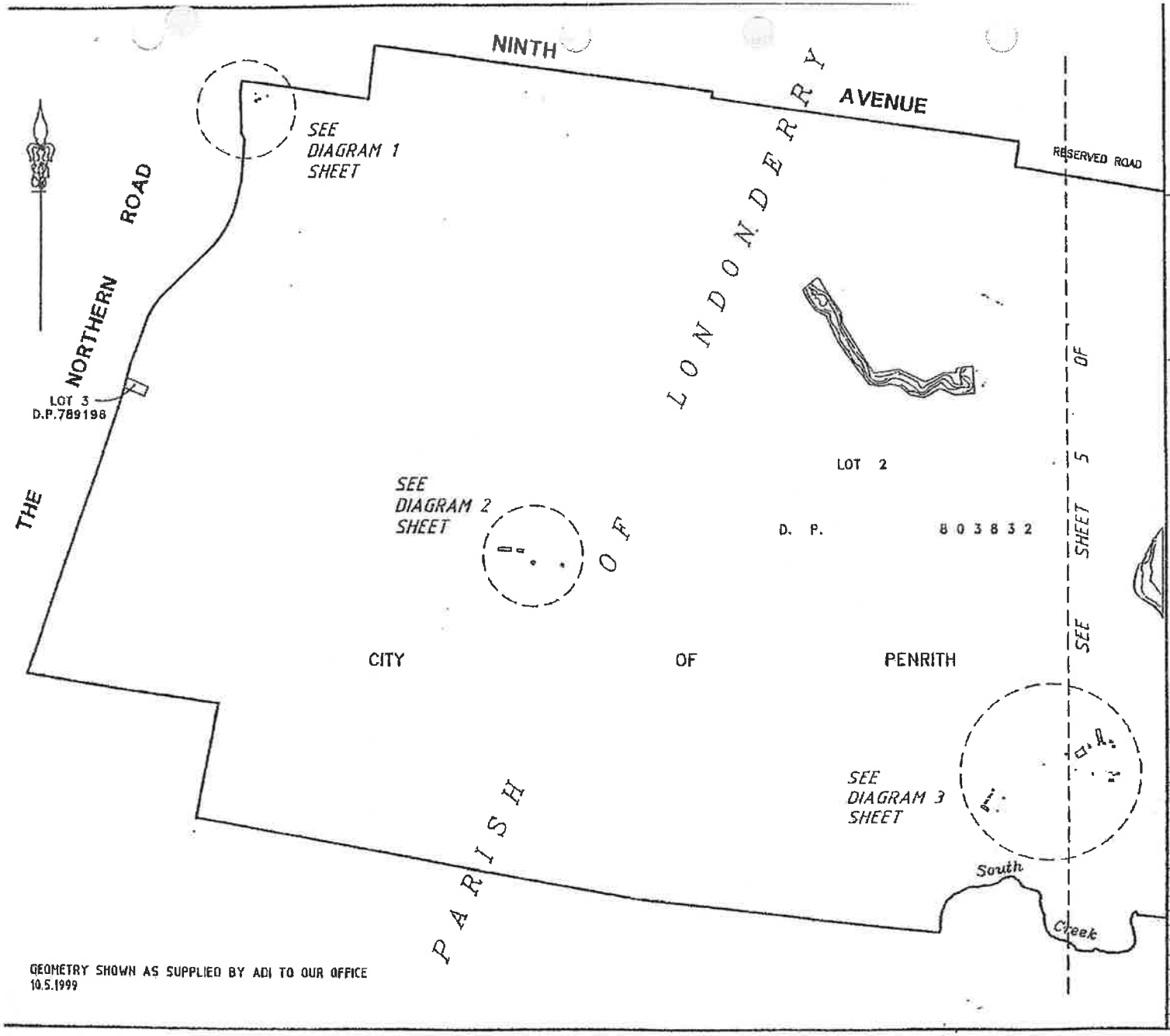
(a) I have personally examined and am familiar with the information contained in this statement, including the reports and information referred to in this statement, and

(b) this statement is to the best of my knowledge, true, accurate and complete, and

(c) on the basis of my inquiries made to those individuals immediately responsible for making the reports, and obtaining the information, referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties for wilfully submitting false, inaccurate or incomplete information.

Signed: _____ Date: 7/6/99



GEOMETRY SHOWN AS SUPPLIED BY ADI TO OUR OFFICE 10.5.1999

NOTES:

PREPARED BY:

Whelans — Surveyors, Planners, Geomatic Engineers

Whelans Australia Pty Ltd

Head Office:

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Level 5, 141 Elizabeth Street
Sydney, New South Wales.
2000 Australia
Telephone 02) 9283 2400
Facsimile 02) 9261 5012

Parramatta Office:

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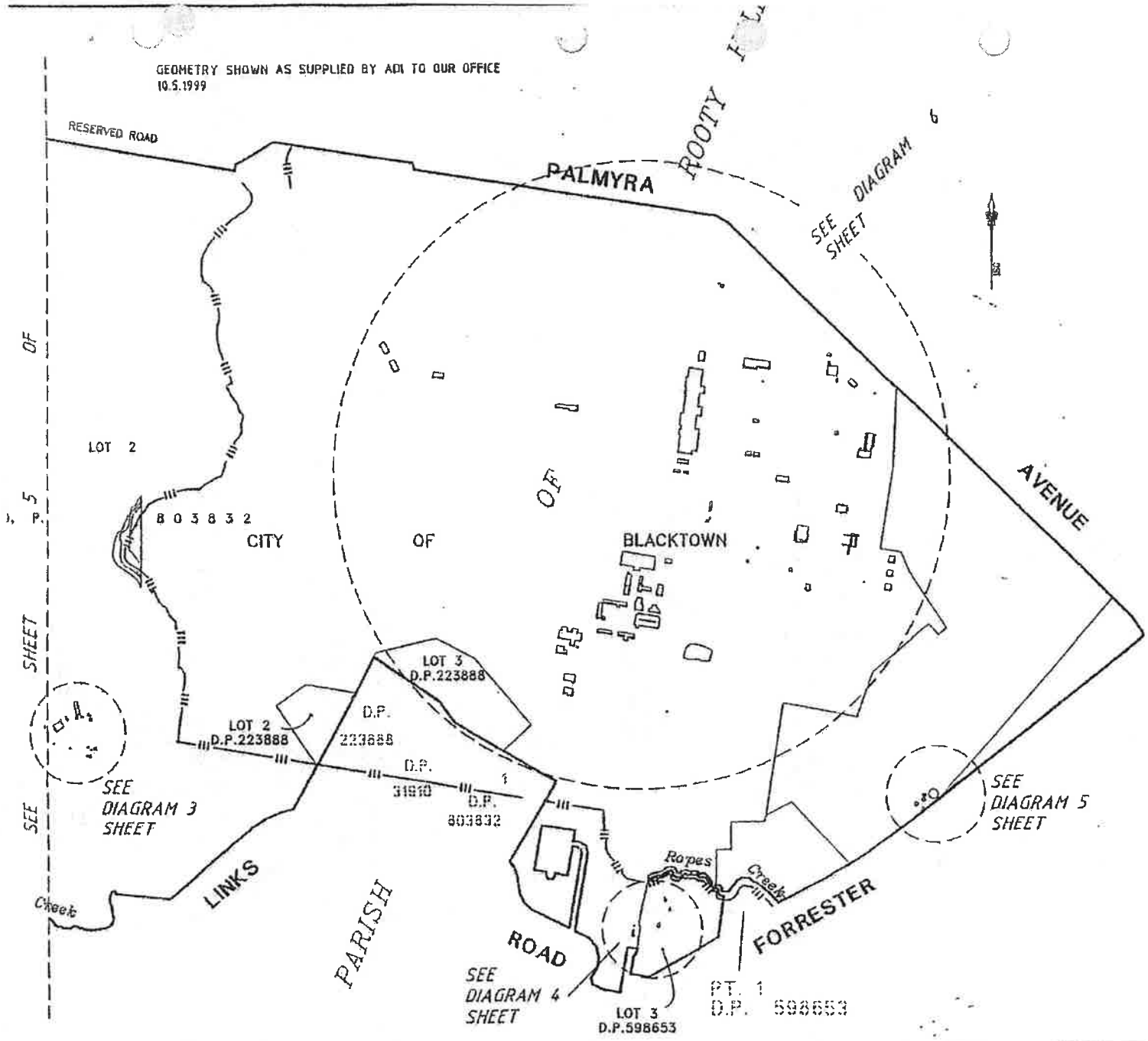
12 Victoria Road, Parramatta.
NSW 2150
Telephone 02) 9630 4199
Facsimile 02) 9630 4599

PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPERTY RETAINED BUILDINGS/PAVED AREA PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/6

ORIGINAL SIZE: A3	
SCALE HOR: 1:2500	VERT:
CO-ORDS:	DATUM:
DATE OF SURVEY	DATE OF PLAN: 19 MAY 1999
SURVEY	DRAWN DDW
CHECKED: DDW	DATE 24.5.1999
APPROVED: PW	DATE 24.5.1999
JOB REF: 8662	
CAD REF: 5467-126	SHEET 7 OF 13 SHEETS



NOTES:

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PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPERTY RETAINED BUILDINGS/PAVED AREA PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/6

ORIGINAL SIZE:		A3	
SCALE HOR:	12500	VERT:	
CO-ORDS:		DATUM:	
DATE OF SURVEY		DATE OF PLAN:	19 MAY 1999
SURVEY		DRAWN	DDW
CHECKED:	DDW	DATE	24.5.1999
APPROVED:	PW	DATE	24.5.1999
JOB REF:	8662		
CAD REF:	5467-125	SHEET 6	OF 13 SHEETS

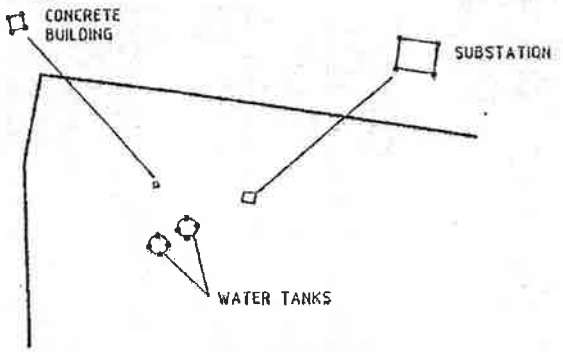

DIAGRAM 1

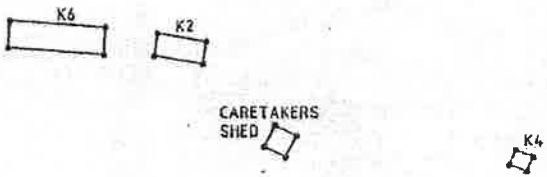

DIAGRAM 2

CONCRETE BUILDING	274588 1267987 274590 1267987 274590 1267985 274588 1267985
SUBSTATION	274625 1267979 274626 1267983 274631 1267982 274630 1267978
WATERTANK	274606 1267968 274603 1267964 274598 1267968 274602 1267972
WATERTANK	274589 1267965 274586 1267960 274591 1267957 274594 1267960
K6	275465 1266407 275425 1266410 275426 1266422 275466 1266419
K2	275507 1266403 275487 1266407 275488 1266416 275508 1266413
CARETAKERS SHED	275532 1266368 275537 1266377 275546 1266373 275541 1266364
K4	275642 1266357 275635 1266360 275637 1266367 275645 1266364

COORDINATES ARE APPROXIMATE ONLY

GEOMETRY SHOWN AS SUPPLIED BY ADI TO OUR OFFICE 10.5.1999

NOTES:

PREPARED BY:

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PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPERTY RETAINED BUILDINGS/PAVED AREA PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/6

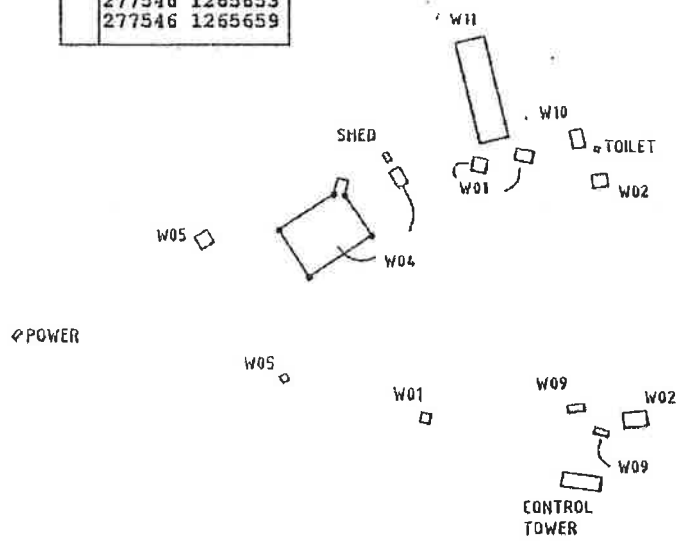
ORIGINAL SIZE:	A3		
SCALE HOR:	2000	VERT:	
CO-ORDS:		DATUM:	
DATE OF SURVEY		DATE OF PLAN:	MAY 1999
SURVEY		DRAWN	ODW
CHECKED:	ODW	DATE	24.5.1999
APPROVED:	PW	DATE	24.5.1999
JOB REF:	8862		
CAD REF:	5467-127	SHEET 8	OF 13 SHEETS

BDG No	EASTING	NORTHING
X7	277113	1265596
	277111	1265594
	277105	1265598
	277107	1265601
X6	277106	1265581
	277101	1265585
	277091	1265570
	277096	1265566
X4	277076	1265549
	277082	1265545
	277091	1265559
	277086	1265563
X3	277067	1265535
	277072	1265542
	277094	1265527
	277089	1265520
X9	277127	1265521
	277125	1265518
	277122	1265520
	277124	1265523
X5	277142	1265565
	277145	1265563
	277150	1265568
	277145	1265571

BDG No	EASTING	NORTHING
W01	277452	1265655
	277456	1265654
	277457	1265658
	277453	1265658
	277475	1265762
	277481	1265760
	277479	1265755
	277474	1265756
	277493	1265765
	277500	1265764
	277499	1265759
	277492	1265760
W04	277433	1265729
	277407	1265712
	277395	1265731
	277418	1265746
	277444	1265749
	277440	1265755
	277444	1265758
	277448	1265751
W05	277399	1265671
	277397	1265674
	277395	1265672
	277396	1265670
	277360	1265728
	277365	1265731
	277368	1265726
	277363	1265723

BDG No	EASTING	NORTHING
TOILET	277519	1265773
	277521	1265766
	277516	1265765
	277514	1265772
POWER	277283	1265688
	277285	1265686
	277287	1265689
	277286	1265691
W11	277477	1265767
	277468	1265809
	277480	1265811
	277489	1265770
SHED	277439	1265759
	277437	1265763
	277439	1265764
	277441	1265761
CONTROL TOWER	277453	1265658
	277511	1265634
	277527	1265632
	277526	1265626

BDG No	EASTING	NORTHING
W09	277529	1265648
	277530	1265651
	277524	1265652
	277524	1265650
	277513	1265658
	277513	1265661
	277520	1265662
	277520	1265659
W02	277453	1265658
	277511	1265634
	277527	1265632
	277526	1265626
	277536	1265658
	277536	1265652
	277546	1265653
	277546	1265659



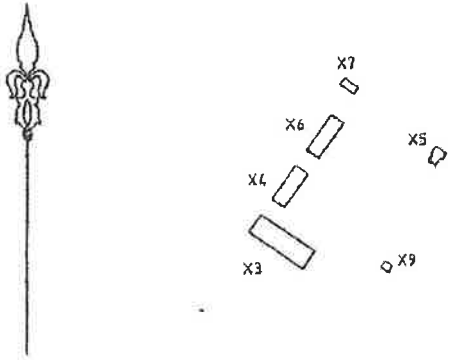


DIAGRAM 3

NOTES:

PREPARED BY:

Whelans — Surveyors, Planners, Geomatic Engineers

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PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPPERTY
RETAINED BUILDINGS & PAVED AREA
PLAN TO ACCOMPANY SITE
AUDIT STATEMENT CHK001/6 [illegible]

ORIGINAL SIZE:	A3
SCALE HOR: 2000	VERT:
CO-ORDS:	DATUM:
DATE OF SURVEY	DATE OF PLAN: MAY 1999
SURVEY	DRAWN DDW
CHECKED: DDW	DATE 24.5.1999
APPROVED: PW	DATE 24.5.1999
JOB REF: 8692	
CAD REF: 5467-128	SHEET 10 OF 13 SHEETS

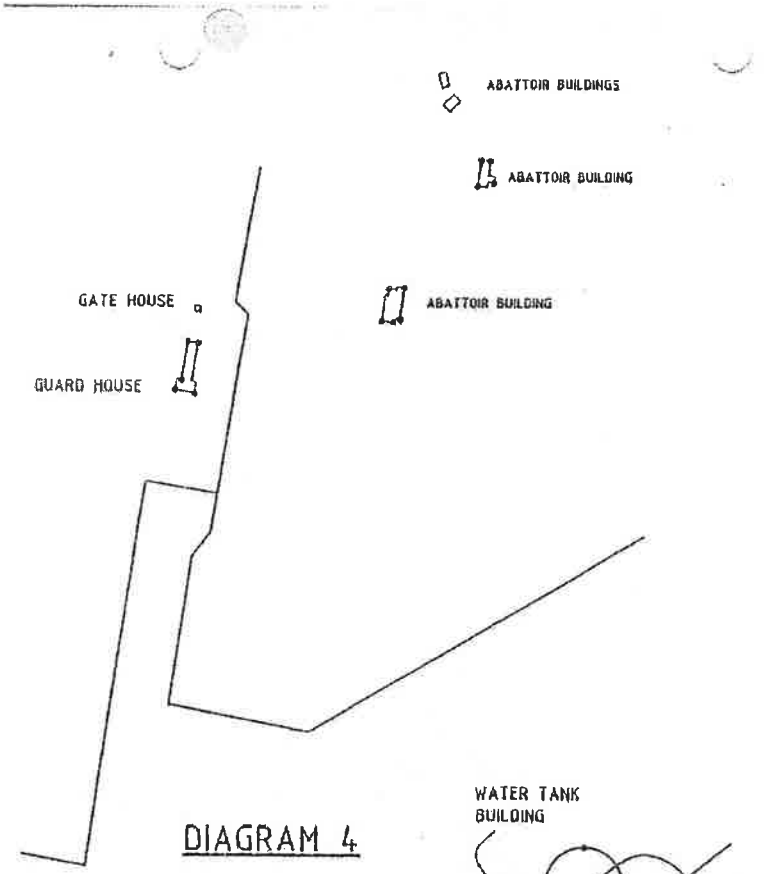

DIAGRAM 4

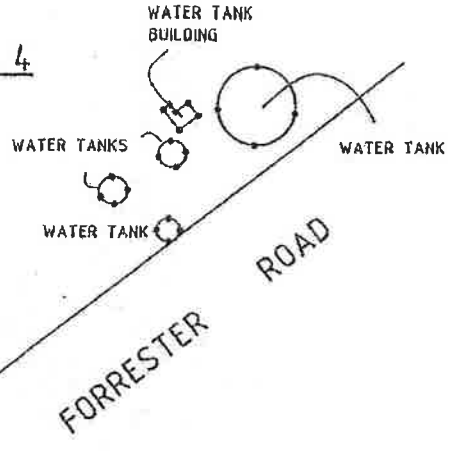

DIAGRAM 5

COORDINATES ARE APPROXIMATE ONLY

GEOMETRY SHOWN AS SUPPLIED BY ADI TO OUR OFFICE 10.5.1999

BDG No	EASTING	NORTHING
WATER TANK BUILDING	2[illegible]5	1265484
	280349	1265492
	280351	1265494
	280354	1265491
	280359	1265495
WATER TANKS	280389	1265510
	280403	1265494
	280385	1265477
	280371	1265496
	280357	1265477
	280358	1265474
	280350	1265468
	280347	1265475
	280326	1265452
	280322	1265458
	280334	1265459
	280330	1265464
	280354	1265445
	280356	1265441
	280347	1265444
	280349	1265436
GATE HOUSE	279372	1265033
	279375	1265032
	279372	1265030
	279374	1265030
GUARD HOUSE	279369	1265017
	279374	1265016
	279372	1264995
	279364	1264997
	279366	1265001
ABATTOIR BUILDINGS	279459	1265041
	279453	1265040
	279450	1265027
	279454	1265026
	279457	1265027
	279491	1265094
	279495	1265093
	279489	1265083
	279496	1265084
	279473	1265130
	279476	1265131
	279478	1265125
	279475	1265124
	279475	1265117
	279480	1265121
	279482	1265118
	279478	1265114

NOTES:

PREPARED BY:

Whelans
Surveyors
Planners
Geomatic Engineers

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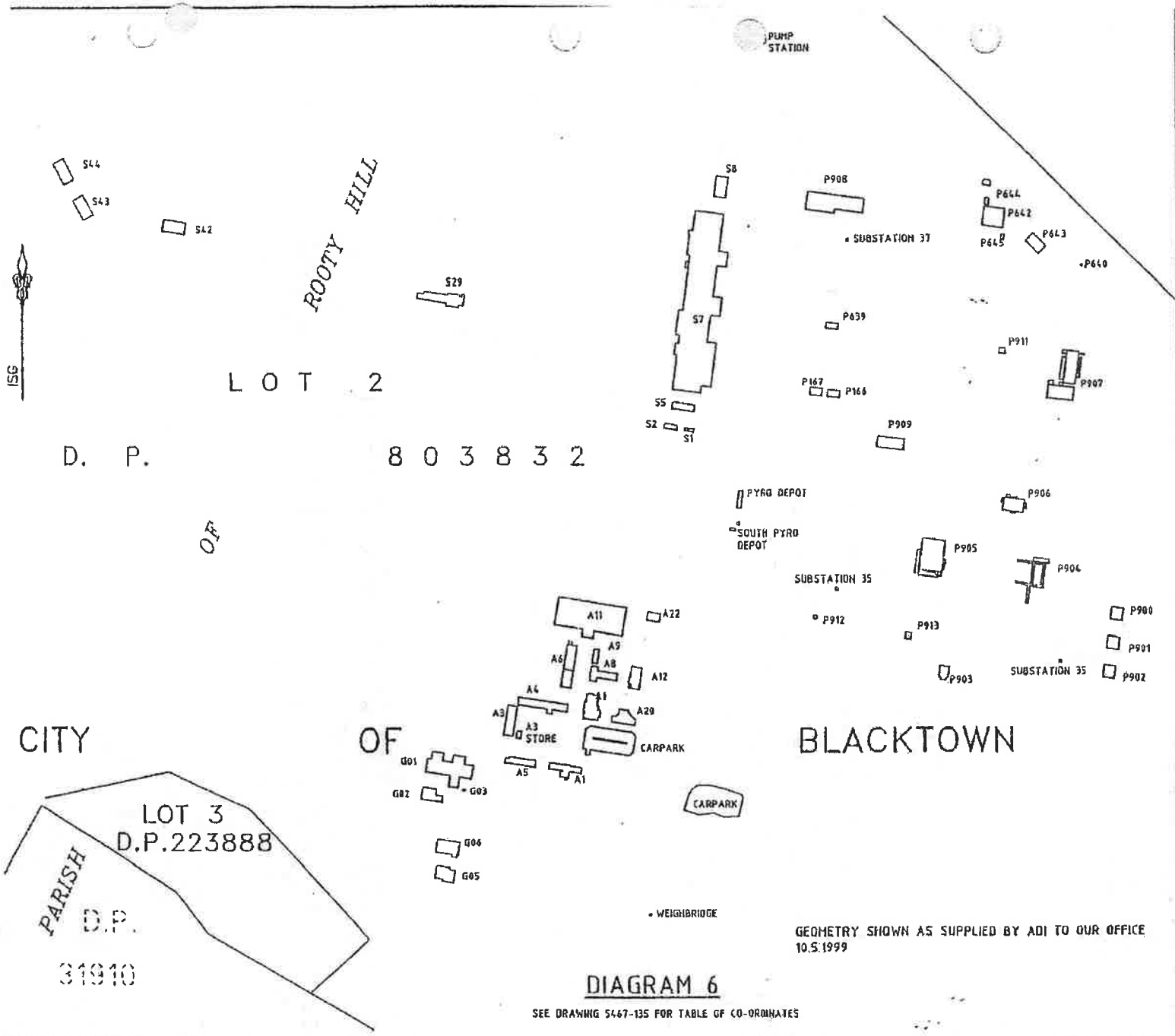
PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPERTY RETAINED BUILDINGS/PAVED AREA PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/6

ORIGINAL SIZE:	A3		
SCALE HOR:	2000	VERT:	
CO-ORDS:		DATUM:	
DATE OF SURVEY		DATE OF PLAN:	MAY 1999
SURVEY		DRAWN	ACAD/DDW
CHECKED:	DDW	DATE	24.5.1999
APPROVED:	PW	DATE	24.5.1999
JOB REF:	8662		
CAD REF:	S467-129	SHEET 11 OF 13 SHEETS	



GEOMETRY SHOWN AS SUPPLIED BY ADI TO OUR OFFICE 10.5.1999

DIAGRAM 6

SEE DRAWING 5467-135 FOR TABLE OF CO-ORDINATES

NOTES:

PREPARED BY:

Whelans — Surveyors, Planners, Geomatic Engineers

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Facsimile 02) 9630 4599

PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPERTY RETAINED BUILDINGS/PAVED AREA PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/6

ORIGINAL SIZE: A3	
SCALE HOR: 6000	VERT:
CO-ORDS:	DATUM:
DATE OF SURVEY	DATE OF PLAN: MAY 1999
SURVEY	DRAWN ACAD/DDW
CHECKED: DDW	DATE 24.5.1999
APPROVED: PW	DATE 24.5.1999
JOB REF: 8662	
CAD REF: 5467-134	SHEET 12 OF 13 SHEETS

BDG NO	EASTING NORTHING
A11	279334 1266254 279340 1266297 279449 1266279 279442 1266237
A22	279484 1266274 279505 1266270 279503 1266258 279482 1266261
A9	279398 1266217 279406 1266215 279403 1266194 279394 1266195
A8	279394 1266191 279435 1266178 279402 1266172 279390 1266168
A6	279344 1266158 279359 1266155 279370 1266222 279354 1266224
A4	279276 1266141 279274 1266129 279353 1266117 279355 1266128
A3	279260 1266128 279274 1266126 279266 1266077 279252 1266079
A3 STORE	279273 1266086 279271 1266074 279281 1266085 279279 1266073
A5	279302 1266026 279304 1266037 279262 1266043 279254 1266033
A1	279324 1266023 279326 1266033 279377 1266025 279357 1266017 279342 1266010
A7	279360 1266107 279404 1266108 279405 1266143 279307 1266146
A22	279454 1266162 279455 1266155 279470 1266153 279475 1266187
A12	279425 1266100 279462 1266094 279453 1266119 279437 1266113

BDG NO	EASTING NORTHING
CAR/ PARK	279567 1265996 279556 1265990 279542 1265953 279567 1265945 279606 1265940 279631 1265942 279640 1265975 279609 1265990
CAR/ PARK	279391 1266093 279384 1266089 279379 1266056 279383 1266046 279453 1266044 279464 1266076
G01	279203 1266029 279200 1266006 279178 1265991 279126 1266018 279138 1266052
G02	279144 1265979 279145 1265989 279122 1265993 279119 1265972 279153 1265966
G06	279142 1265881 279146 1265903 279182 1265897 279177 1265871
G05	279174 1265850 279171 1265829 279141 1265838 279144 1265854
S42	278527 1267007 278511 1266998 278529 1266966 278545 1266974
S43	278578 1266916 278560 1266949 278544 1266939 278562 1266907
S44	278729 1266884 278732 1266903 278696 1266909 278693 1266890
S29	279324 1266023 279326 1266033 279377 1266025 279376 1266015
S8	279618 1266973 279614 1266941 279595 1266944 279600 1266976
S7	279564 1266923 279611 1266916 279524 1266631 279588 1266635

BDG NO	EASTING NORTHING
S5	279525 1266609 279523 1266598 279560 1266592 279561 1266604
S2	279533 1266570 279511 1266573 279510 1266565 279531 1266562
S1	279192 1266788 279189 1266769 279114 1266781 279115 1266791
RAIL/ WAY	279599 1266565 279580 1266465 279575 1266465 279605 1266652
P908	279750 1266952 279746 1266923 279837 1266917 279840 1266939
SUB/ ST 37	279810 1266872 279814 1266872 279814 1266876 279814 1266876
P639	279593 1266784 279608 1266782 279604 1266751 279589 1266753
P167	279772 1266631 279770 1266618 279752 1266621 279753 1266634
P166	279799 1266627 279798 1266615 279779 1266617 279781 1266630
P909	279860 1266552 279858 1266533 279900 1266528 279902 1266546
P900	280258 1266276 280239 1266278 280236 1266259 280255 1266257
P901	280251 1266231 280232 1266234 280229 1266215 280248 1266212
P902	280245 1266186 280242 1266167 280223 1266170 280226 1266189
P903	279973 1266187 279959 1266189 279971 1266170 279957 1266172

BDG NO	EASTING NORTHING
SUBSTATION 35	280151 1266194 280155 1266193 280156 1266197 280152 1266198 279792 1266307 279792 1266311 279796 1266310 279796 1266306
P913	279910 1266231 279902 1266231 279903 1266241 279913 1266240
P912	279763 1266268 279763 1266262 279757 1266263 279758 1266268
P904	280136 1266352 280111 1266355 280105 1266311 280125 1266309
P905	279931 1266385 279967 1266380 279924 1266329 279960 1266327
P906	280063 1266452 280096 1266448 280093 1266427 280060 1266431
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P911	280056 1266698 280066 1266697 280065 1266687 280055 1266689
P640	280192 1266831 280190 1266832 280189 1266831 280190 1266829
P642	280063 1266923 280032 1266927 280028 1266896 280058 1266892
P643	280111 1266883 280133 1266862 280120 1266850 280099 1266870
P644	280039 1266929 280032 1266930 280034 1266940 280040 1266939 280041 1266958 280029 1266960 280030 1266966 280031 1266966

NO	EASTING NORTHING
P645	280059 1266871 280060 1266881 280065 1266880 279799 1266627
PYRO DEPOT	279634 1266465 279630 1266436 279637 1266435 279641 1266464
SOUTH PYRO DEPOT	279634 1266408 279631 1266408 279631 1266413 279635 1266412 279619 1266399 279628 1266398 279629 1266402 279619 1266404
WEIGH/ BRIDGE	279487 1265773 279484 1265774 279485 1265777 279488 1265776

TABLE OF CO-ORDINATES OF RETAINED BUILDINGS AND PAVED AREA

COORDINATES ARE APPROXIMATE ONLY

NOTES:

PREPARED BY:

Whelans Surveyors Planners Geomatics Engineers

Whelans Australia Pty Ltd

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PREPARED FOR:

ADI PROPERTY

ADI ST MARYS PROPERTY
RETAINED BUILDINGS/PAVED AREA
PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/6

ORIGINAL SIZE:	A3
SCALE HOR:	VERT:
CO-ORDS:	DATUM:
DATE OF SURVEY	DATE OF PLAN: MAY 1999
SURVEY	DRAWN ACAD/DDW
CHECKED: DDW	DATE 24.5.1999
APPROVED: PW	DATE 24.5.1999
JOB REF: 8662	
CAD REF: 5467-135	SHEET 13 OF 13 SHEETS

NSW Environment Protection Authority

SITE AUDIT STATEMENT (SAS)

Site Audit Statement No.: CHK001/7

Site auditor (accredited under NSW Contaminated Land Management Act 1997):

Name: Christopher H Kidd Company: HLA-Envirosciences Pty Limited
Address: 55-65 Grandview Street, Pymble, NSW Postcode: 2076
Phone: (02) 9988 4422 Fax: (02) 9988 4441

Site Details

ADI St. Marys Property –Concrete Stockpile
Address: Forrester Road, St. Marys Postcode: 2760
Lot and DP Number: Lot 2 in DP803832 (part of)
(see attached map)
Local Government Area: Penrith and Blacktown

Site Audit requested by:

Name: Mr P Newton Company: Department of Urban Affairs and Planning
Address: Sydney Region West
Level 8, Signature Tower
2-10 Wentworth Street
Parramatta NSW 2150
Phone: (02) 9895 7142 - Fax: (02) 9895 6270

Name of contact person (if different from above:

Consultancy(ies) who conducted the site investigation(s) and/or remediation:

- ADI Limited — Chemical and Explosives Ordnance Investigations, Remediation and Validation 1990-1999
- Mackie Martin & Associates — Groundwater Investigations, 1991

Title(s) of Report(s) reviewed:

4. Historical Report – St Marys Property, ADI Limited, 1996;
5. Validation Report for the Central Sector West of the ADI St Marys Property, Report No. 498840, ADI Limited 1996;
6. QA/Verification Survey Results, ADI St Marys Property, Report No. PG980323da ADI Limited, 1999.

Other Information reviewed:

3 Site Investigation Report of St Marys Facility Ammunition and Missiles Division, Volume 4 – Discussions and Conclusions, ADI, June 1991.
4 Stage I Decontamination Audit, ADI St Marys CMPS&F, 1997.

Summary Site Audit Report Title:

Stage 2 Decontamination Audit Report for ADI Site, St Marys.

I have completed a site audit (as defined in the Contaminated Land Management Act 1997) and reviewed the reports and information referred to above with due regard to relevant laws and guidelines. I certify that the site (tick **all** appropriate boxes)

(a) **is suitable for the following use(s):**

- ~~❑ residential, including substantial vegetable garden and poultry;~~
- ~~❑ residential, including substantial vegetable garden, excluding poultry;~~
- ~~❑ residential with accessible soil, including garden (minimal home-grown produce contributing less than 10% fruit and vegetable intake), excluding poultry;~~
- ~~❑ residential with minimal opportunity for soil access including units;~~
- ~~❑ daycare centre, preschool, primary school;~~
- ~~❑ secondary school;~~
- ~~❑ park, recreational open space, playing field;~~
- ~~❑ commercial/industrial use;~~
- ✓ Other – May continue to be used as stockpile for crushed concrete, but underlying soils need to be tested for chemical and ordnance contamination after stockpile removed.

subject to

- ✓ Conditions

1. On removal of all or part of the stockpile the underlying ground should be tested for both chemical and ordnance contamination. The testing should follow similar methods and levels of quality assurance as other parts of the ADI St Marys site. Appropriate remediation and validation should be performed (if necessary) the work reviewed by a site auitor.
3. Appropriate management plan including procedures for the safe handling and disposal of any items of explosive ordnance, shall be in place before development earthworks commences and shall remain in place to cover any excavation on the site during its ongoing use. This plan should be similar to the "Remnant Contamination Management Plan" submitted by ADI (see Appendix E of the Site Audit Report).
4. The final surface of any earthworks in areas which are to be used for active recreational land uses, e.g. sports grounds, school grounds and picnic areas, or low density residential use, should, on completion of the earthworks, be surveyed with a metal detector by appropriately qualified and experienced personnel and the work reviewed by an independent site auditor.

~~(c) is not suitable for any beneficial use due to risk of harm from contamination~~

~~❑ (comments): ...~~

I am accredited by the NSW Environment Protection Authority under the Contaminated Land Management Act, 1997 as a Site Auditor (Accreditation No. 9813).

I Certify that:

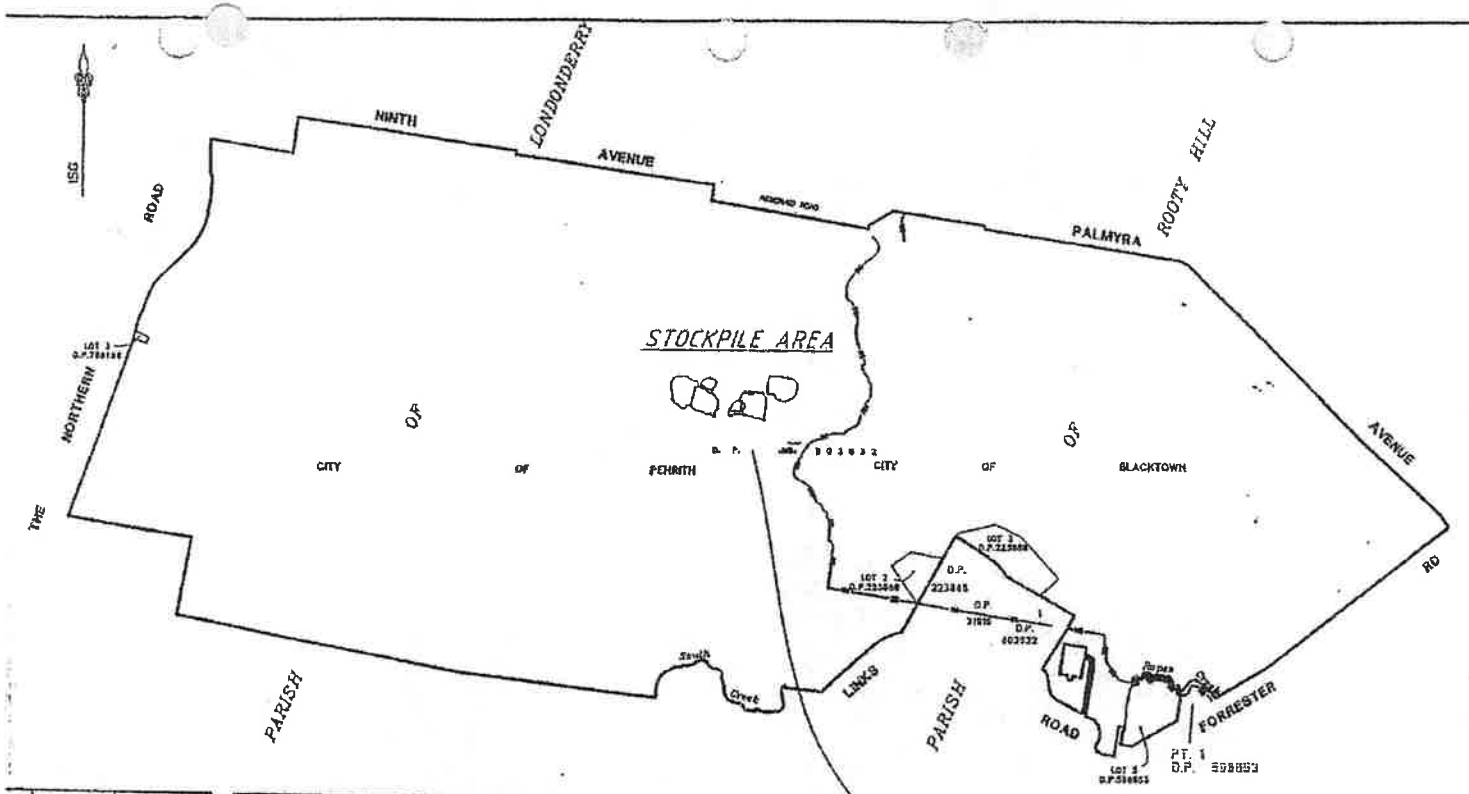
(g) I have personally examined and am familiar with the information contained in this statement, including the reports and information referred to in this statement, and

(h) this statement is to the best of my knowledge, true, accurate and complete, and

(i) on the basis of my inquiries made to those individuals immediately responsible for making the reports, and obtaining the information, referred to in this statement, those reports and that information are, to the best of my knowledge, true, accurate and complete.

I am aware that there are penalties for wilfully submitting false, inaccurate or incomplete information.

Signed: _____ Date: 7/6/99



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	276 991	1 266 727
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	277 056	1 266 793
	277 098	1 266 775
	277 123	1 266 759
	277 140	1 266 738
	277 127	1 266 730
	277 101	1 266 639
	277 078	1 266 630
	277 060	1 266 624
	277 039	1 266 635
	277 151	1 266 751
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	277 208	1 266 715
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	277 201	1 266 704
	277 245	1 266 656
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71	277 544	1 266 691
72	277 536	1 266 700
73	277 528	1 266 701
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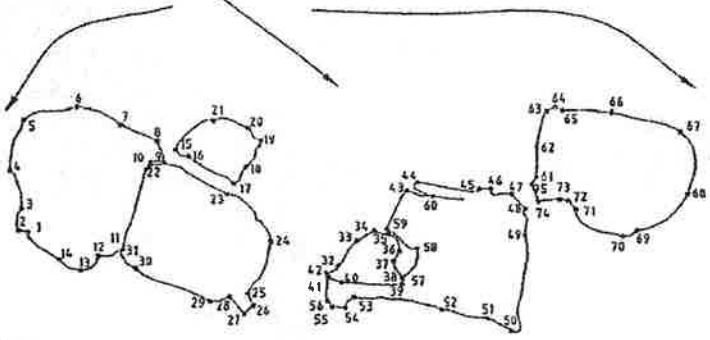
COORDINATES ARE APPROXIMATE ONLY

GEOMETRY SHOWN AS SUPPLIED BY ADI TO OUR OFFICE 10.5.1999



STOCKPILE AREA
NOT TO SCALE

NOTES:

PREPARED BY:

Whelans
Surveyors
Planners
Geomatic Engineers

Whelans Australia Pty Ltd

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PREPARED FOR:

ADI Property

ADI ST MARYS PROPERTY STOCKPILE AREA PLAN TO ACCOMPANY SITE AUDIT STATEMENT CHK001/7

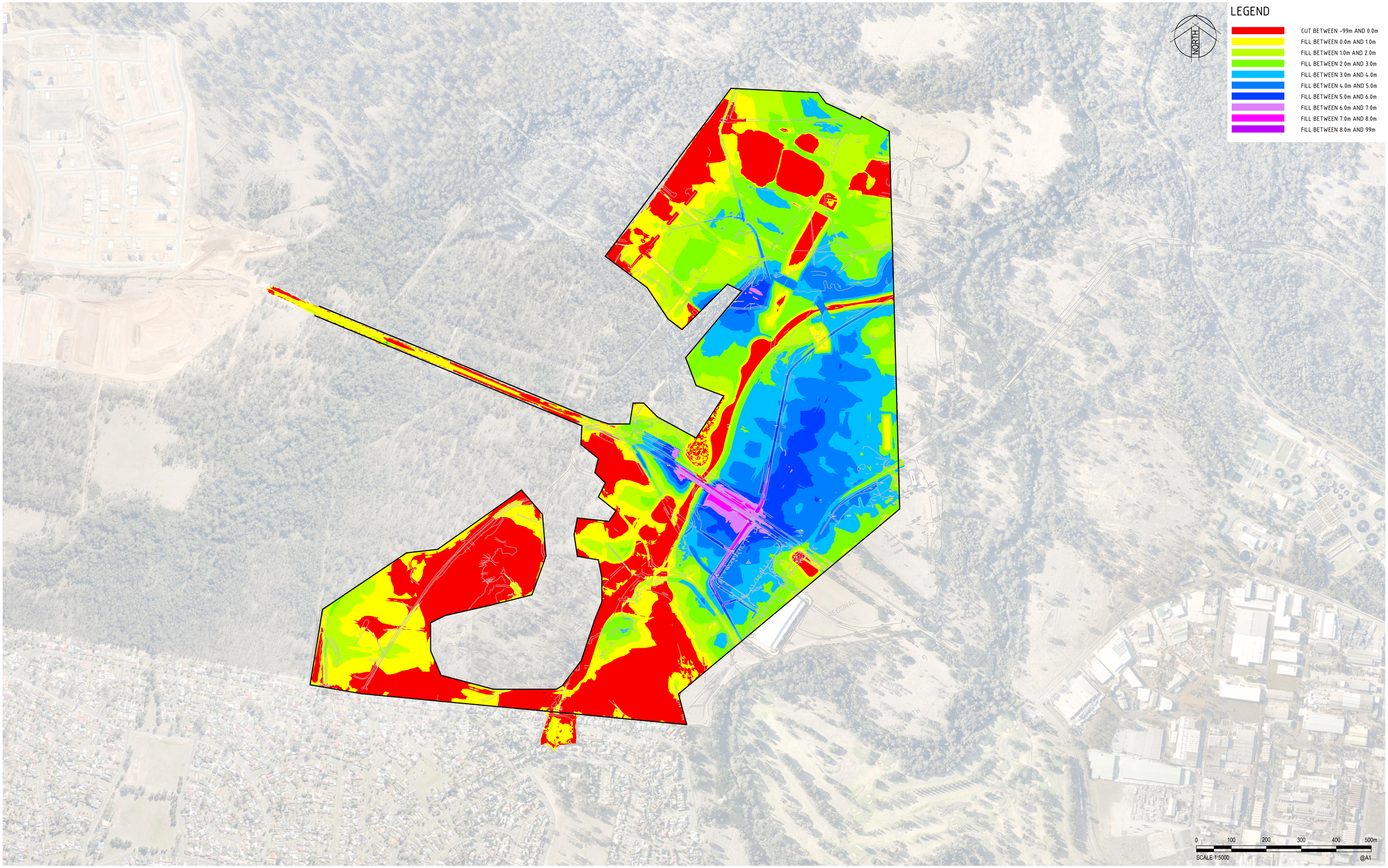
ORIGINAL SIZE:	A3
SCALE HOR: 1 : 25,000	VERT: –
CO-ORDS: ISG	DATUM: –
DATE OF SURVEY	DATE OF PLAN: 11 May 1999
SURVEY –	DRAWN Acad/DW
CHECKED: DDW	DATE 24.5.1999
APPROVED: PN	DATE 24.5.1999
JOB REF: 8662	
CAD REF: 5467-133.DWG	SHEET 8 OF 13 SHEETS

Appendix B
Central Precinct Cut and Fill Plan

DATE PLOTTED: 4 February 2015 11:28 AM BY - BRITTANY HOLZHEIMER

XREF's: Xref-89914020-Survey

CAD File: \\cardno.com\global\AU\NSW\Directory\Structure\Projects\8999\FY14\20_CENTRAL PRECINCT_AD\ST MARY'S\Drawings\01 Masterplanning\Sketches\89914020-SK244(1).dwg



Rev.	Date	Description	Des.	Verif.	Appd.
1	4/02/2015	ISSUED FOR INFORMATION	BJH	SCP	SCP

Lend Lease

Cardno (NSW/ACT) Pty Ltd | ABN 95 001 145 035
Level 9, The Forum, 203 Pacific Highway
St. Leonards, NSW 2065
Tel: 02 9496 7700 Fax: 02 9439 5170
Web: www.cardno.com.au

Drawn	BJH	Date 4/02/2015
Checked	SCP	Date 4/02/2015
Designed	BJH	Date 4/02/2015
Verified	SCP	Date 4/02/2015
Approved	SCP	4/02/2015

Client: LEND LEASE

Project: CENTRAL PRECINCT

Title: CUT/FILL PLAN

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

Datum	Scale	Size
A.H.D.	1:5000	A1

Drawing Number: 89914020-SK244

Revision: 1

Appendix C
Environmental Management Procedures

Dust and Airborne Hazard Control		EMP01
Responsibility:	Remediation Contractor	
Frequency:	All site works	
Location:	Central Precinct – Stages 3 to 5	
Objective:	To minimise dust emissions from demolition and earthworks.	

Procedure

Dust and Asbestos Risk

Excavation and handling of soils has the potential to generate dust emissions.

Asbestos containing materials have been found to be present in fill materials located across the site. Previous environmental assessments have identified that asbestos occurs within the bonded matrix of these fibre cement fragments. No free asbestos fibres have been identified in soils.

Addison et. al. ('The Release of Dispersed Asbestos from Soil', Institute of Occupational Medicine Report No. TM/88/14, September 1988) have found that very high levels of respirable dust require to be generated before significant airborne concentrations of asbestos fibres were produced from soils contaminated with respirable asbestos fibres. It is considered that fibre cement sheet fragments require to be subjected to intensive mechanical processes to cause the release of asbestos fibres.

Asbestos containing fibre cement fragments present in the site sub-surface on the site are not considered to pose a risk. However where the fragments are disturbed by excavation works asbestos fibres will potentially be released. Measures to control dust emissions will be sufficient to control potential asbestos emissions.

Standards

All operations on site are to be conducted so that concentrations of dust and other hazardous substances satisfy those stipulated in NSW EPA published and endorsed guidelines. These guidelines include:

- NEPC (1998) 'National Environment Protection Measure for Ambient Air Quality' and
- Environmental criteria provided to NSW DEC (August 2005) 'Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales'.

Control

Measures shall be undertaken to reduce airborne emissions from site activities including:

- Water sprays used for dust suppression across unsealed areas of the site, stockpiles and other dust generating areas. All potential dust generating areas (i.e. areas of exposed soils) require to be wetted down using a water spray;
- Dust screens will be erected around the perimeter of the site;
- Ensuring vehicles leave via the designated (stabilised) site access;
- Stockpile heights shall be minimised where possible;
- Where stockpiles are to be left in place for periods of time, they shall be covered; and
- Where unfavourable meteorological conditions exist (i.e. strong winds directed at residential properties) site works shall be restricted to those with low potential for atmospheric emissions. This shall also include consideration of reduced production rates during these periods to minimise dust emissions.

It is noted that additional specific requirements have been developed for soils which are identified as potentially malodorous as detailed in EMP02 Odour Control and EMP04 Handling of Environmentally Impacted Soil which shall also reduce dust and potential asbestos emissions. The requirements of this procedure should be reviewed in accordance with the additional requirements of these other procedures.

Odour Prevention and Control	EMP02
Responsibility:	Remediation Contractor JBS&G
Frequency:	Disturbance of potentially malodorous / impacted soils
Location:	Central Precinct – Stages 3 to 5
Objective:	To minimise potential odour impacts

Procedure

Given the nature and extent of the impacted soils being removed from the site, there are unlikely to be any odour issues. However, should odour be detectable at the site boundary, and then appropriate actions will be taken to reduce the odours, which may include the following.

Odour Prevention and Control Measures

Where malodorous soils are identified control measures may include (but are not limited to):

- Sealing of the malodorous soil surface by covering. Appropriate sealing may include spraying of the malodorous surface with a hydromulch, or placement of a sufficient thickness of non-impacted soils over the malodorous materials; and/ or
- Spraying of the exposed malodorous soil surface with an odour suppressant. A mixture of 'Anotec 0307' (http://anotec.com.au/prod.htm) or similar and water may be suitable to be used for this purpose. This may be prepared by the mixing of one 20L drum of Anotec 307 in 1,000L of water; and/or
- Maintenance of equipment, where required.

Material Tracking and Transporting	EMP03
Responsibility:	Remedial Contractor JBS&G
Frequency:	Handling of environmentally impacted soils, including stockpiled soils
Location:	Central Precinct – Stages 3 to 5
Objective:	To control and document where materials are excavated, stored, removed and/or replaced

Procedure

- Any contaminated soils disposed off-site will need to be controlled as per the EPA requirements of waste tracking and acceptance, where classified as a waste that must be tracked[1].
- For validation purposes all truck movements will be documented on and offsite and both disposal dockets/weighbridge receipts and truck movement records must be collected and provided to JBS&G.
- Trucks will be loaded in a designated area away from the contaminated material excavations. The transporting contractor shall ensure that there is no material tracked out onto the street and that the load is securely covered. In addition, all site vehicles must leave the site in a forward direction.
- All appropriate road rules shall be observed and state roads will be selected as far as practicable over local roads when deciding on the transport route to the off-site material disposal location.
- Any fibre impacted materials identified during remedial works will require offsite disposal to a facility suitably licensed to accept the waste. Removal of asbestos waste will only be carried out by a licensed contractor holding appropriate licenses, consents and approvals from NSW EPA, WorkCover and / or other Authorities to transport and dispose of the asbestos waste materials in accordance to the classification guidelines.
- Asbestos waste must be transported in a covered leak-proof vehicle to prevent spills. Material impacted with asbestos fibres must be covered in a manner to prevent the emission of any dust.

[1] Accessed 18/07/2013 - http://www.environment.nsw.gov.au/resources/owt/trackwaste07522.pdf

Handling of Environmentally Impacted Soil	EMP04
Responsibility:	Remedial Contractor JBS&G
Frequency:	Handling of environmentally impacted soils, including stockpiled soils
Location:	Areas of site containing environmentally impacted soils
Objective:	To control potential environmental emissions from contaminated soils

Procedure

Potential hazardous emissions (dust, odour and vapours) may be released during the handling of environmentally impacted materials on the site. Measures shall be put in place to minimise such emissions. These measures shall include:

- Measures detailed in EMP01 Dust and Airborne Hazard Control;
- Measures detailed in EMP02 Odour Control; and
- Handling and processing of all impacted soils as generated by remediation excavations as per a materials tracking system (EMP03).

Where air quality management provisions are insufficient to allow monitoring criteria as detailed in EMP08 Air Monitoring – Asbestos then the relevant works shall be ceased until more favourable meteorological conditions or more appropriate work methods are available. The Remediation Consultant shall advise more appropriate meteorological conditions.

Air Monitoring – Asbestos	EMP08
Responsibility:	Remedial Contractor JBS&G
Frequency:	Daily
Location:	Site boundaries
Objective:	To assess compliance with environmental standards for works

Purpose

Airborne Asbestos Fibre Monitoring during non-friable and friable asbestos removal/management works are required to be undertaken in accordance with relevant codes of practice, be representative of site conditions and be readily repeatable.

Scope

This is applied to all airborne asbestos fibre monitoring works during asbestos removal/management works.

Procedure

Airborne asbestos fibre monitoring during asbestos removal/management works is to be undertaken using the following instruments:

- NATA Calibrated Continuous Air Sampling Pump;
- Flexible Perspex Tubing;
- Filter holder and filter; and
- NATA Calibrated Field Rotameter.

Pump and Rotameter Flow Calibration

Air sampling pumps and field rotameters shall be calibrated at the NATA accredited testing laboratory for initial calibration to NATA standards prior to their use in the field.

Following the initial calibration of air sampling equipment, calibration must be completed after 6 months and thereafter calibration must be completed annually.

Required Pre-Sampling Works (Prior to Site Arrival)

All pumps shall be fully charged prior to use for sampling.

Asbestos air filters and associated cassettes shall be obtained from NATA testing laboratory prior to sampling. Alternatively, contact equipment supply outlet or alternate NATA testing laboratory.

Sufficient filter cassettes, containing new laboratory prepared filters, must be available for:

- One filter per sampling location; and
- One blank filter per day per site.

The condition of all pumps and tubing shall be inspected to ensure that it is leak proof.

It shall be ensured that all sampling pumps, field rotameters, and filter cassettes are clearly marked with a unique identifier.

Airborne Asbestos Fibre Monitoring Method

Asbestos sampling shall be undertaken in accordance with National Occupational Health and Safety Commission (2005) 'Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibre 2nd Edition' [NOHSC: 3003 (2005)]. Further, and in accordance with the requirements of this method, the following guidance shall also be adhered to:

- Sample locations on each site must at least include one sample location that is upwind and one downwind of the potential asbestos fibre generating activity with an additional sample location on each work area boundary.
- Sampling pumps shall be operated at a flow rate that is determined by the proposed sample duration in order to collect a representative sample ideally between 400 and 600 litres. Sample sizes less than 100 litres or greater than 1000 litres shall be discarded.
- Sampling pumps shall be operated with a 'dummy' filter cassette attached to simulate sampling conditions for a period of at least 15 minutes prior to the commencement of sampling to ensure their proper operation. The 'dummy' filter cassette shall not be used for sampling purposes. The flow rate shall be set using the calibrated field rotameter during this time.
- At the commencement of sampling, the 'dummy' filter cassette will be replaced with a new, unused filter cassette with a unique identification. A flow reading shall be collected with the calibrated field rotameter. The sample identification, flow rate, time at the commencement of sampling and sampling location shall be recorded on field notes.
- Care must be taken to ensure the security of the sampling pumps during sampling. Where possible, pumps shall be secured to fixed items by the use of 'cable ties' at a height of approximately 1.5 m above the ground.
- Upon completion of the sampling period, the protective cowl without the base plug shall be replaced on the filter whilst the sampling pump is still operating.
- The calibrated rotameter shall be used to record the flow rate at the completion of the sampling period and shall be recorded on daily field notes.
- The sampling pump shall then be switched off, and the filter cassette base plug replaced, the filter cassette removed and placed into a sealed zip lock bag or storage container. One zip lock bag or storage container is to be used per site. Sample completion times shall be recorded on daily field notes. This process shall be repeated for all collected samples.
- Where flow rates differ between the commencement and completion of the sampling period by 10% (+ or -), the sample shall be deemed non representative and discarded.

- A blank filter shall be placed into the zip lock bag with the primary samples for each site and shall be submitted with each days samples to the NATA testing laboratory. The laboratory shall be instructed to report the results of the blank filter as well as the primary samples for each site on a same day turnaround, unless otherwise indicated.
- Personal sampling shall be undertaken via the same method, however, the filter cassettes shall be attached to the lapel of the worker being assessed, with the filter opening within the workers breathing zone (30 cm radius from mouth and nose).

Records of daily field notes shall be kept at the JBS&G Sydney office.

All samples must be delivered to the testing laboratory no later than 4.00 pm on the day of sampling where practicable. Where sampling has been completed for night works or weekend works, samples must be delivered to the testing laboratory as early as practicable the next business day.

All samples shall be accompanied by a completed JBS&G Chain of Custody form.

Reporting Airborne Asbestos Monitoring Results

Interim air monitoring clearance shall be reported to the client via email by the Operations Manager the evening of each sampling event, when samples have been delivered to the testing laboratory prior to 4.00 pm. Final air monitoring reports shall be issued the following business day after the monitoring event as early as practicable. Where samples are delivered to the testing laboratory after 4.00 pm, results shall not be received until the following business day**.**

Flora and Fauna	EMP09
Responsibility:	Remediation Contractor JBS&G
Frequency:	All site works
Location:	All areas on the site where threatened flora or fauna or noxious and exotic weeds are potentially present
Objective:	To eliminate potential impacts to threatened species and minimise noxious and exotic weeds

Procedure

No threatened or endangered flora or fauna species have been identified on the site. Where a potentially endangered flora or fauna species is encountered during the project advice will be obtained by an appropriately qualified ecologist and works shall be undertaken in a manner that negates potential impact.

Noxious and Exotic Weeds

Where noxious or exotic weeds are identified in areas of proposed earthworks these shall be removed and disposed of.

Heritage / Archaeological	EMP10
Responsibility:	Remediation Contractor JBS&G
Frequency:	All site works
Location:	Central Precinct – Stages 3 to 5
Objective:	To ensure that any potential items of heritage or archaeological significance are appropriately recorded and handled

Procedure

No heritage items have been identified on the site. Where a potential item of archaeological or heritage significance is uncovered during remedial works, then works shall be ceased in proximity of the item and advice sought from an appropriately qualified archaeological or heritage consultant.

Visual Impacts	EMP11
Responsibility:	Remediation Contractor
Frequency:	All site works
Location:	Central Precinct – Stages 3 to 5
Objective:	To minimise visual impacts of works to surrounding areas

Procedure

Visual impacts of the works shall be minimised where possible to retain the visual amenity of the area in proximity of the site. This shall be undertaken by:

- Provision of site fencing with dust screen (ie shade cloth) to height of fencing;
- The stockpiles shall not exceed a maximum height of 2 m;
- Selection of natural colours (ie green or brown) for site amenity structures as visible from outside of the site where possible; and
- Shielding of plant and equipment associated with other soil and water treatment areas by use of fencing provided with dust screen.

Emergency Response	EMP12
Responsibility:	Remediation Contractor JBS&G
Frequency:	Where uncontrolled releases of potential environmental pollutants occurs
Location:	All areas on site
Objective:	To minimise environmental impacts of all incidents

Procedure

Environmental incidents on the site which require potential emergency response would relate to a spill of hazardous liquid or material on soils on the site, or in proximity of a stormwater discharge point.

For spills on land the following shall be undertaken:

- Identify source of spill and stop when / if safe to do so;
- Identify area of spill and clear area of all personnel;
- Notify Lend Lease (within 24hrs), and JBS&G of spill;
- Construct earthen bunding using earth moving equipment available on site to contain spill;
- JBS&G to coordinate the pumping of liquid waste out of the containment structure and disposal to a licensed waste facility;
- If solid waste, JBS&G coordinate the excavation and removal of the hazardous material to a secure area (or Soil Storage Area); and
- Assess soils in vicinity of environmental incident for contamination and conduct remediation works where contamination has occurred.

For spills to the site stormwater system the following shall be undertaken:

- Identify source of spill and stop when / if safe to do so;
- Identify onshore circumference of spill and clear area of all personnel;
- Notify Lend Lease and JBS&G of spill with 24 hours;
- JBS&G instruct containment of area of spill in water by placement of temporary absorbent beams to create 'coffer dam' around stormwater outlet to prevent discharge of spilt material;
- JBS&G coordinate a liquid waste tanker to be bought onto site and pump directly from water contained within the impacted area of the constructed coffer dam until visual evidence of spill removed.

Notification of a pollution incident causing or threatening to material harm must be reported to the NSW EPA immediately. All emergency responses should be followed up with EMP25 Incident Reporting and EMP26 Review.

Noise Control	EMP13
Responsibility:	Remediation Contractor JBS&G
Frequency:	All site works
Location:	Site boundaries and nearest off-site occupied areas
Objective:	To minimise impacts of noise emissions on adjoining land users

Procedure

The remediation works shall comply with the NSW EPA's Environmental Noise Control Manual for the control of noise from construction sites which specifies that:

- For a cumulative period of up to 4 weeks, the noise level as measured by the LA10 (15 minute) emitted by the works to specific residences should not exceed the background noise level, LA 90 (15 minute), by more than 20dB(A).

The following measures shall be employed during the works to minimise environmental noise emissions in proximity of the site:

- Normal hours of work will be between 7.00am and 5.00pm Monday to Friday and 8.00am to 4.00pm on Saturdays. No work shall be conducted on Sundays or public holidays or outside the above hours unless considered an emergency;
- Plant should be located as far as practical from the sensitive receptors to minimise noise emissions;
- The use of plant and machinery shall not cause vibrations to be felt or capable to be measured at the neighbouring premises;
- All machinery and equipment used on site will be in good working order and be fitted with appropriate silencers when necessary;
- If generators or pumps are required for use on the site, they will be properly shrouded to reduce emitted noise levels;
- A communication and complaints register will be maintained to ensure that any concerns of local residents and members of the public are recorded and addressed as detailed in EMP24 Community Consultation;
- When complaints are received regarding noise, the following procedure should be adopted:
    - The particular activity causing the complaint should be suspended pending further investigation;
    - Noise and/or vibration monitoring should be carried out on a trial basis;
    - Where monitoring indicates that the noise or vibration emission goal is exceeded than additional noise or management control should be investigated;
    - The activity should proceed with the additional mitigation methods in place and the resultant noise impact reassessed.
- Concerns over noise generation will be communicated to all site personnel and contractors during inductions.

Where the controls provided are insufficient to minimise noise levels to the required level, a noise monitoring program shall be developed, if required.

Traffic Management and Site Access	EMP14
Responsibility:	Remediation Contractor
Frequency:	Heavy vehicle movements as generated by works
Location:	Road network in proximity of site
Objective:	To minimise impacts on local road network

Procedure

- During remediation works, perimeter fencing must maintained to restrict access to the site. Only authorised persons will be able to enter the site;
- Vehicle access to the site shall be stabilised to prevent the tracking of materials from the site and the adjoining driveway/access point to the road will be swept or cleaned as-needed;
- The principal remediation contractor shall arrange appropriate traffic management plans to be in place prior to transporting contaminated material off site;
- Heavy vehicles shall enter and exit the site by using the existing site access; and
- All vehicles carrying materials to/from the site must have their loads covered with tarpaulins or similar. The tyres of heavy vehicles leaving the site will be appropriately cleaned.

Soil Storage Area (Stockpile Management)	EMP16
Responsibility:	Remediation Contractor JBS&G
Frequency:	Storage / stockpiling of soils
Location:	Soil Storage Area
Objective:	To ensure that any environmental emissions from treatment areas comply with environmental guidelines

Procedure

The Soil Storage Area (SSA) is to be used for the stockpiling of any contaminated soils generated by remediation works on the site, until such time the material is able to be placed in its final location.

Soils stored in the Soil Storage Area shall be managed through one or more of the following measures:

- No stockpiles or other materials shall be placed on footpaths or nature strips and will be away from all stormwater infrastructure (including drainage lines, stormwater pits, gutters, etc);
- All stockpiles likely to generate substantial dusts or potential asbestos fibres shall be covered and, if left for more than 24 hours, be stored in a secure area; and
- Sediment and erosion control measures.

Sediment Control	**EMP17**
Responsibility:	Remediation Contractor
Frequency:	Disturbance of soils or storage of exposed soils
Location:	Stockpiles and exposed areas generated by earthworks
Objective:	To control potential sediment generation and migration

Procedure

All remedial works shall be conducted in accordance with a soil and water management plan, which is to be kept on site and made available to Council Officers upon request. The plan shall be developed in accordance with Lend Lease (2012) '*EHS Requirements for Contractors*' and Landcom (2004) '*Managing Urban Stormwater – Soils and* Construction'.

All erosion and sediment controls must be maintained in a functional condition throughout remediation works.

To prevent the migration of contaminated soil off site, silt fences shall be constructed at the down-gradient site boundaries. Any material which is collected behind the sediment control structures shall be removed off site with the contaminated soil.

In a storm event, the structures located on site for sediment control shall be monitored and replaced or altered if necessary. Collected material shall be managed in accordance with remediation works.

Equipment

The following general equipment will be required to allow construction of sediment control devices:

- Gravel filter sock;
- Sediment fencing;
- Stakes / star pickets; and/or
- Plastic or other material to cover stockpiles.

Sediment Control Devices – Stormwater Drains

Figure 17-1 shows the sediment control devices that shall be applied to all stormwater drains across the site.

Sediment Control Devices – Stockpiles

Where possible, stockpiles will be placed upslope of open excavations, so all sediment from stockpiles is able to enter the open excavation. Stockpiling will be required throughout the works. These shall be located away from stormwater inlets in controlled areas of the site (such as the Soil Storage Area in EMP16).

Figure 17-2 shows the sediment controls that will be applied to stockpiles where run-off is unable to enter the open excavation.

Stormwater Diversion

Where stockpiles are required to remain in place for a period of time, controls shall be put in place to minimise the contact of stormwater flows with stockpiled materials. This shall include the use of stormwater diversion devices.

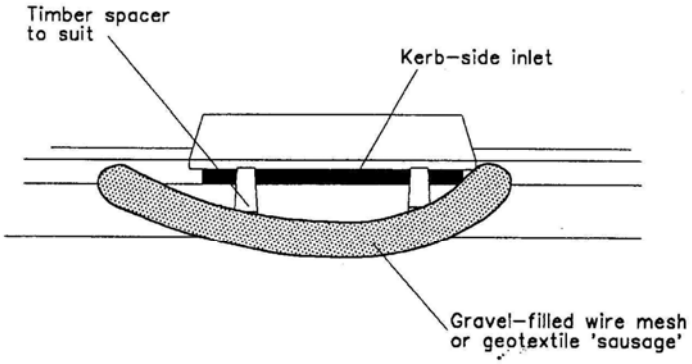
Stormwater diversion devices that will be used on the project are shown on **Figure 17-3**.

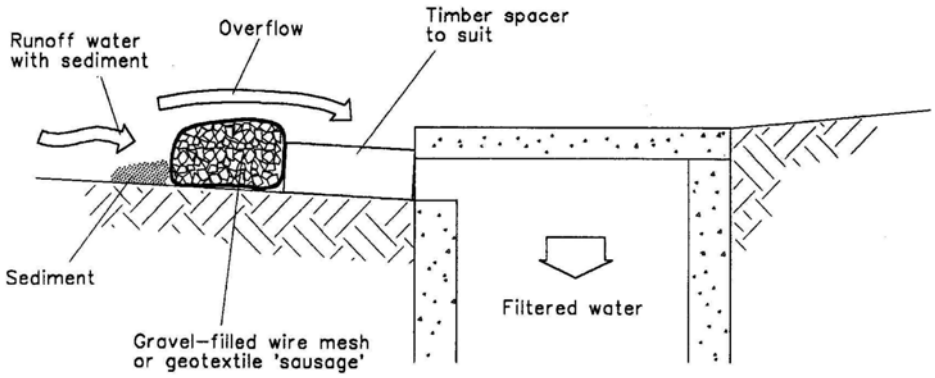
Staging of Works

Works shall be staged so as to minimise the quantity of stockpiled material at any one time.

Covering Stockpiles

Stockpiles will be covered where required.

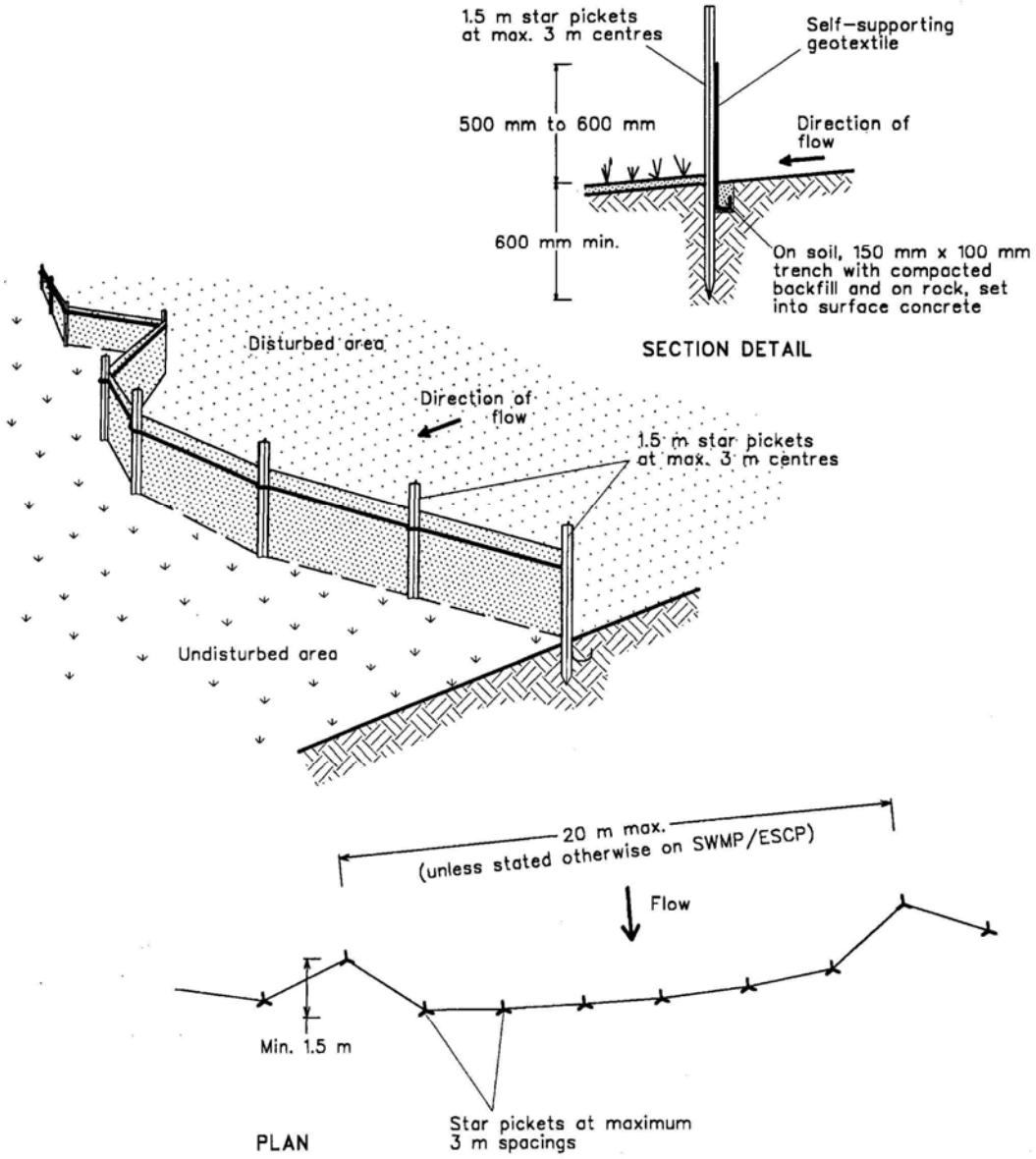




NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

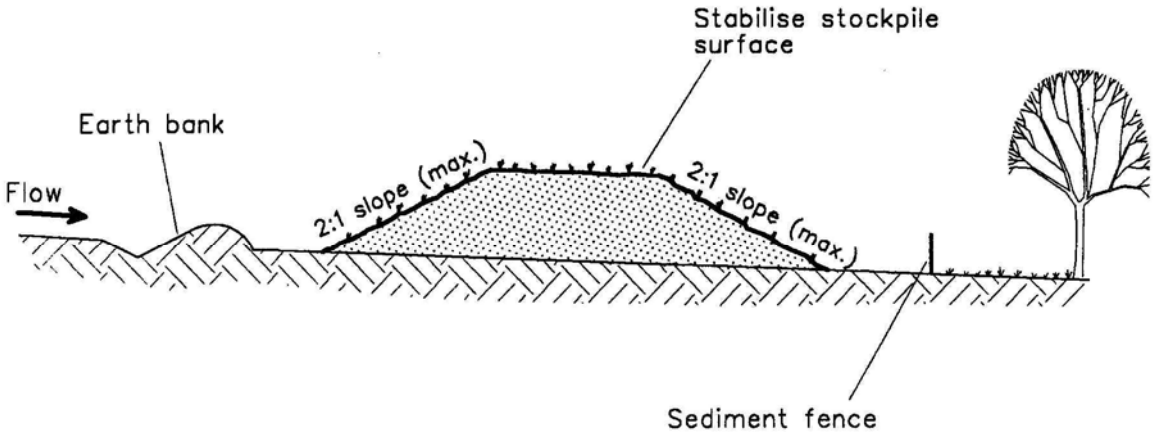
Construction Notes

1. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit.
2. Fill the sleeve with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening of the kerb inlet leaving a 100 mm gap at the top to act as an emergency spillway.
5. Maintain the opening with spacer blocks.
6. Form a seal with the kerbing and prevent sediment bypassing the filter.
7. Fit to all kerb inlets at sag points.



Construction Notes

1. Construct sediment fence as close as possible to parallel to the contours of the site.
2. Drive 1.5 metre long star pickets into ground, 3 metres apart.
3. Dig a 150 mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
4. Backfill trench over base of fabric.
5. Fix self-supporting geotextile to upslope side of posts with wire ties or as recommended by geotextile manufacturer.
6. Join sections of fabric at a support post with a 150 mm overlap.



Construction Notes

1. Locate stockpile at least 5 metres from existing vegetation, concentrated water flows, roads and hazard areas.
2. Construct on the contour as a low, flat, elongated mound.
3. Where there is sufficient area topsoil stockpiles shall be less than 2 metres in height.
4. Rehabilitate in accordance with the SWMP/ESCP.
5. Construct earth bank (Standard Drawing 5-2) on the upslope side to divert run off around the stockpile and a sediment fence (Standard Drawing 6-7) 1 to 2 metres downslope of stockpile.

Operation of Site Office	EMP18
Responsibility:	Remediation Contractor
Frequency:	Duration of remedial works
Location:	Remediation Contractor Site Office and Amenities Building
Objective:	To minimise waste generation from the Site Office

Procedure

The following procedures apply to the operation of the Site office:

- Remediation Contractors are responsible for the daily cleaning of their respective work areas and placing of their waste in the bins.
- An adequate number of litter bins will be made available at the site, including the works and lunch areas.
- Remediation Contractor and suppliers will be required to identify and utilise products made from recycled materials, or include a recycle component and ability for recycling of unused components or wholly at the completion of the works.
- All domestic waste will be managed via a bin system provided in the vicinity of the designated eating areas. Waste areas will be clearly signposted.
- All human waste and associated waste water will be collected via portable toilet and sanitary systems.

Decontamination of Heavy Equipment	EMP19
Responsibility:	Remediation Contractor
Frequency:	Heavy equipment demobilisation from the site
Location:	Heavy equipment decontamination area.
Objective:	To ensure that contamination does not leave the site

Procedure

Heavy earthmoving equipment will come in contact with contaminated soils while engaged in remedial activities on the site. Prior to heavy equipment moving off the site, or conducting operations in validated areas (ie non contaminated areas), decontamination will be required to be undertaken. A heavy vehicle decontamination station shall be provided on the site to this effect. This station shall be provided with:

- A stabilised base;
- Long handled brushes for general exterior cleaning; and
- Long handled brushes, rods and shovels for dislodging contaminants and contaminated soil caught in tyres and the undersides of vehicles and equipment.

Decontamination shall be appropriate for the extent of potential contact with contaminated materials on the site. It is noted that trucks engaged on the site only to be loaded with contaminated materials will have sufficiently less potential contamination than earthmoving machinery used to excavate or stockpile contaminated materials, and decontamination need not be as comprehensive as described. All impacted material generated during the decontamination procedure will be assessed and appropriately characterised by JBS&G prior to either onsite reuse or offsite disposal as per EPA 2014.

Environmental Monitoring	EMP20
Responsibility:	Remediation Contractor JBS&G
Frequency:	Duration of remedial works
Location:	Site boundaries
Objective:	To assess compliance with environmental standards for works

Procedure

Asbestos Monitoring

During the removal of any asbestos contaminated soils perimeter air monitoring will be conducted as per the SRAP.

Air monitoring will be conducted in accordance with the requirements of the National Occupational Health and Safety Commission (NOHSC) *Asbestos Code of Practice and Guidance Notes,* in particular the Guidance note for the estimation of airborne asbestos dust [NOHSC 3002:2005].

Asbestos monitoring shall be conducted in accordance with EMP08 Air Monitoring – Asbestos.

Volatile monitoring

In the event that impacted material containing volatile COPC is uncovered during development works, a PID may be utilised at boundary locations to ensure a control limit of 80 ppm is not exceeded.

Waste Classification		**EMP21**
Responsibility:	Remediation Contractor JBS&G	
Frequency:	Where soils and/or liquids are identified as requiring to be disposed off-site	
Location:	Central Precinct – Stages 3 to 5	
Objective:	To ensure that contaminated and surplus material on the site are disposed in a lawful manner	
Procedure Waste shall be classified in accordance with *Waste Classification Guidelines* (EPA 2014). Any hazardous and/or intractable wastes (if any) shall be removed and disposed of in accordance with the relevant regulatory requirements. In particular, any hazardous wastes will be transported by a EPA licensed transporter.		

Excavation Water and Impacted Surface Water	EMP22
Responsibility:	Remediation Contractor JBS&G
Frequency:	Generation of contaminated water
Location:	Stormwater control structures
Objective:	To prevent contamination of surface water bodies downgradient of the site.

Procedure

No groundwater remediation or dewatering is proposed as part of the works. No approvals are required under the *Water Act* 1912.

All clean water running through the site will be diverted around and through the site without contamination.

Any water accumulated within the remediation excavations may either be:

- Re-used on site for dust control or odour suppression systems; or
- Discharged to stormwater subject to council approval.

Discharge Standards – Discharge to Stormwater

Waters shall not be discharged from the site into stormwater unless contaminant levels are found to comply with all relevant guidelines contained within ANZECC/ARMCANZ (2000) 'Australian and New Zealand Guidelines for Fresh and Marine Water Quality'

Water Not Meeting Criteria

Where contaminant levels in waters for discharge are found to exceed those listed and re-use on site is not available, these waters shall be disposed of as either a licensed liquid waste facility or sewer after obtaining a trade waste permit.

Sampling and Analysis of Water

JBS&G shall undertake testing and inspection of waters to assess the compliance of waters with the discharge criteria. Testing shall be undertaken daily at the discharge point and shall provisionally include the following parameters:

- Heavy metals (As, Cd, Cu, Cr, Pb, Hg, Ni and Zn);
- Total petroleum hydrocarbons (TPH);
- Total suspended solids (TSS); and
- pH

In undertaking this assessment, JBS&G may eliminate parameters from the testing regime that are inappropriate for the potential contaminants on the site, or are consistently found to be well below assessment criteria.

Imported Fill Protocol		**EMP23**
Responsibility:	Remediation Contractor JBS&G	
Frequency:	Throughout remedial works where imported fill is required	
Location:	Central Precinct – Stages 3 to 5	
Objective:	To assess the environmental condition of fill materials used on site	
Procedure <u>Soils</u> Fill materials imported on the Central Precinct are required to be either VENM or ENM under the *Protection of the Environment Operations (Waste) Regulation 2014*. Requirements will be documented in the Central Precinct Imported Fill Materials Protocol and specific details will be provided in the SRAP.		

Community Consultation		EMP24
Responsibility:	Remediation Contractor JBS&G	
Frequency:	Prior to and throughout remedial works	
Location:	Communities in proximity of the site	
Objective:	To ensure the expectations of the community are met in the completion of remedial works.	

Procedure

A sign shall be displayed throughout the duration of the works with the contact details of the remediation contractor and project manager. Council shall also be notified of these details at least 14 days prior to commencing works.

Owners and/or occupants of premises adjoining and across the road from the site will be notified at least two days prior to the commencement of remediation works.

Complaints from adjoining residents or workers on site will be directed initially to the remediation contractor on site. Following that, discussion with the environmental consultant and the complainant will investigate the issue and remedy it as required or applicable.

Incident Reporting		EMP25
Responsibility:	Remediation Contractor JBS&G	
Frequency:	When environmental incidents occur	
Location:	Areas on site where incidents have occurred	
Objective:	To provide a reporting and review mechanism for incidents to allow the update of the REMP	

Procedure

The Remediation Contractor shall facilitate the completion of environmental incident forms for any environmental incident that occurs on the site. JBS&G shall review all incident forms. Incident forms shall include community complaints that require remedial actions. Relevant Authorities shall be notified of any incidents requiring emergency response within 24 hours of that incident.

The environmental incident form is provided as **Form 25-1**.

Incident Reporting	Form 25-1

INCIDENT DESCRIPTION

Section to be completed by the person reporting the incident.

INCIDENT CLASS (tick as appropriate)

Fatal	☐	Medical Treatment Case	☐	Near Miss	☐
Lost Time Injury	☐	First Aid	☐	Property Incident	☐
Restricted Work Case	☐	Occupational Illness	☐	Environmental Incident	☐

Date of Incident: _____ Time of Incident: _____

Name of Employee(s) involved / affected: _____

Location: _____

Nature of Incident: _____

(including description of situation prior to incident, actual incident and actions taken for immediate response / treatment of the incident)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

FURTHER INFORMATION REQUIRED FOR INCIDENT DETAILS

Where applicable attach Police/Statutory Authority Reports, Medical Certificates, Witness Statements, Photos etc

PERSON REPORTING INCIDENT (if not nominated above)

Name: _____ Incident report date: _____

Employment / Job Role: _____ Signature: _____

INJURIES (where applicable):

Name: _____ Occupation and company: _____

Injury (kind and severity): _____

Treatment (ie How?: first aid, hospital, sent home, other): _____

WITNESSES

Name	Area/Company	Contact Details
_____	_____	
_____	_____	

INCIDENT EVALUATION

Section to be completed by the Remediation Contractor and relevant personnel concerned with the incident.

Cause(s) and Contributing Factor(s): List those factors that caused / contributed to the incident.	Controls which could be used: Consider: Hierarchy of Controls (elimination, substitution …..etc.). List all that are appropriate.
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

What was the task being performed at the time of the incident? _____

Was the person trained / inducted? _____

Was there adequate Supervision? _____

Was there a risk assessment for the task, were controls implemented? _____

_____

ACTION PLAN (RECTIFICATION / PREVENT RECURRENCE)

General Manager to assess and decide on appropriate actions in response to the incident. Upon completion of recommended action(s), the General Manager is to sign off as confirmation. Completion of the actions shall also act as the close out of the report.

Recommended Action	Target Date	Action By	Task Completed (Initial and Date)

Agreed Actions Complete and Incident Closed Out

Authorised by General Manager: _____ (Signature and date)

ADMINISTRATION

Improvement Register is to be updated by the General Manager, ensuring confidentiality of persons involved in the incident.

Incident has been added to Improvement Register: # _____

WorkCover or Insurer Notification required: _____ Completed Date: _____

Circulation register to be completed upon receiving and reviewing this report.

CIRCULATION

Name: _____Signature: _____

Date: _____

(Person Reporting)

Name: _____Signature: _____

Date: _____

(General Manager)

Name: _____ Signature: _____

Date: _____

(Client – if applicable)

REMP Review	EMP26
Responsibility:	JBS&G Maryland Development Company
Frequency:	Subsequent to environment incidents. Subsequent to changes in program of works.
Location:	Not applicable
Objective:	To ensure that the REMP is current and appropriate for the site

Procedure

Subsequent to any environmental incidents on the site and/or a significant modification to the implemented scope of works the REMP shall be reviewed by JBS&G. Following approval by MDC, all revised versions of the REMP shall be re-distributed to all parties by JBS&G.

Training	EMP27
Responsibility:	Remediation Contractor JBS&G
Frequency:	Throughout implementation of Remediation Environmental Management Plan
Location:	-
Objective:	To ensure that persons responsible for preparation of the REMP are competent.

Procedure

Any person who is required to be responsible for technical / monitoring activities in relation to the implementation of the REMP shall:

- Be inducted as the requirement and method of the specific activity;
- Have undertaken the 24 hour Health and Safety Training for Hazardous Waste / Materials under OSHA 29 CFR 1910:120 or equivalent; and
- Where required have completed a Workcover approved Asbestos Removal Supervisor course or equivalent.

Appendix D
Unexpected Finds Protocol

CENTRAL PRECINCT UNEXPECTED FINDS PROTOCOL

Potential Contamination Indicated

Inform Principal Contractor - Quarantine the Area of Concern

Could it be Ordnance?

YES

Ordnance

Contact Ordnance Contractor

Notify Site Auditor and supply proposed Contingency Action Plan

Can the item be positively identified as NOT Ordnance

YES

NO

Conduct Ordnance Search and Clearance of AOC

Remediate and Clear AOC

NO

Could it be Asbestos or Chemical?

YES

NO

Asbestos or Chemical

Contact Environmental Consultant

Notify Site Auditor and supply proposed Contingency Action Plan

Assess the Area of Concern

Characterise/delineate the Area of Concern

Is Contamination Present?

NO

YES

Refer to the Conceptual Remedial Strategy (Stage 1 and 2 or Stages 3 -5) (JBS&G 2015b and 2015c)

Employ appropriate contractor to complete remediation works

Environmental Consultant to Validate the Area of Concern

Report

Principal Contractor removes quarantine

Resume normal site activities

BE AWARE
UNEXPECTED HAZARDS MAY BE PRESENT

asbestos

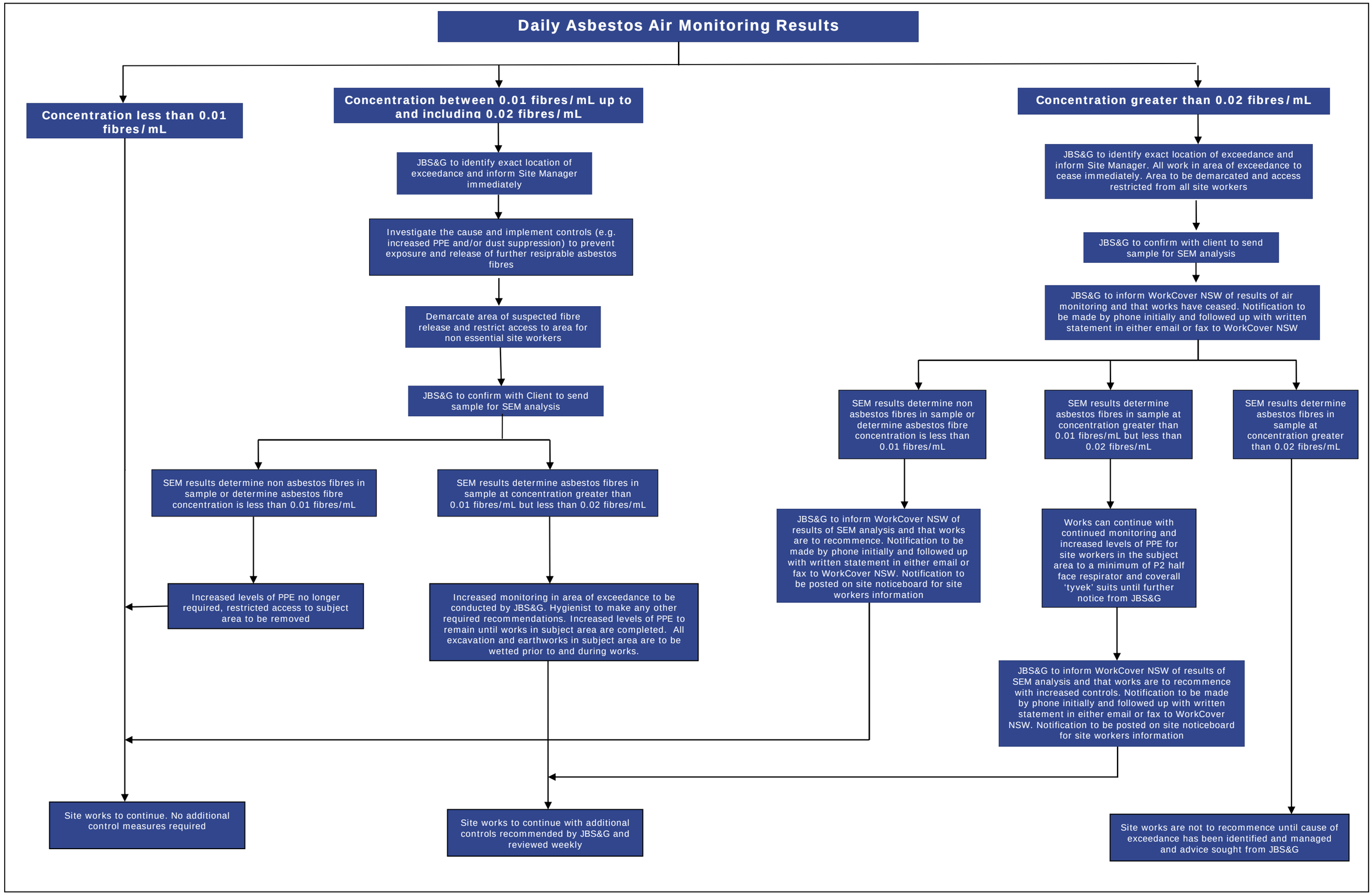
if you <u>SEE</u> or <u>SMELL</u> anything unusual

<u>STOP WORK</u> & contact the Site Foreman

Do not restart working before the area has been investigated and cleared by an Environmental Consultant and Site Auditor if required

Appendix E
Airborne Asbestos Monitoring Action Flowchart

Flowchart 1 – Airborne Asbestos Monitoring Action Flow Chart



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