coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

REMEDIATION ACTION PLAN FOR PROPOSED DEVELOPMENT NETBALL CENTRAL, SYDNEY OLYMPIC PARK, NSW

Prepared for:

Crown Project Services Pty Ltd
Level 15
3 Spring Street
Sydney
NSW 2000

Report Date: 1 June 2012
Project Ref: ENAURHOD04232AB

Written/Submitted by:	Reviewed/Approved by:
	
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SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

1 June 2012

Crown Project Services Pty Ltd
Level 15
3 Spring Street
Sydney
NSW 2000

Attention: Guy Rossiter

Dear Guy

RE: Remediation Action Plan for Proposed Development
Netball Central, Sydney Olympic Park, NSW

Coffey Environments Australia Pty Ltd (Coffey) is pleased to present a Remediation Action Plan (RAP) for the proposed Netball Central development at Sydney Olympic Park, NSW.

We draw your attention to the enclosed sheet entitled “Important Information about Your Coffey Environmental Report” which should be read in conjunction with the report.

We trust that this document meets your requirements. If you require any further information regarding this document, please do not hesitate to contact the undersigned.

For and on behalf of Coffey Environments Australia Pty Ltd

Tot Le
Principal

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CONTENTS

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CONTENTS

CONTENTS

CONTENTS

LIST OF ATTACHMENTS

Tables

Figures

ABBREVIATIONS

AEC	Areas of Environmental Concern
C6-C36	Hydrocarbon chain length fraction
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
COPC	Contaminants of Potential Concern
CMP	Contaminant Management Plan
DQO	Data Quality Objectives
EIL	Ecological Investigation Level
HIL	Health-based Investigation Level
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW DEC	New South Wales Department of Environment and Conservation
NSW DECC	New South Wales Department of Environment and Climate Change (formerly DEC)
NSW DECCW	New South Wales Department of Environment, Climate Change and Water (formerly DECC)
NSW EPA	Environment Protection Authority of New South Wales (formerly OEH)
NSW OEH	New South Wales Office of Environment and Heritage (formerly DECCW)
OCP	Organochlorine Pesticide
OHS	Occupational Health and Safety
OPP	Organophosphorous Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector

ppmv	parts per million volume
PPE	Personal Protective Equipment
QA	Quality Assurance
QC	Quality Control
RAP	Remediation Action Plan
RPD	Relative Percent Difference
SRC	Site Remediation Criteria
SEPP	State Environmental Planning Policy
SMP	Site Management Plan
SOPA	Sydney Olympic Park Authority
TCLP	Toxicity Characteristics Leaching Procedure
TPH	Total Petroleum Hydrocarbon
UCL	Upper Confidence Limit
VOC	Volatile Organic Compounds

1 INTRODUCTION

1.1 Background

Crown Project Service Pty Ltd (CPS) commissioned Coffey Environments Australia Pty Ltd (Coffey) to prepare a Remediation Action Plan (RAP) for the proposed development of the Netball Central, Olympic Boulevard, Sydney Olympic Park (SOP), NSW (the site).

It is understood that the development project will comprise the construction of a four storey building to house the following:

- Five indoor netball courts of international standard;
- One 'Show Court' with provision for approximately 800 spectators; and
- Provision of amenities for players, officials and the public including a cafe and merchandise area, medical rooms, storage and equipment areas and office space.

This RAP was prepared based on Coffey's Phase 1 Preliminary Site Investigation (P1 PSI) conducted at the site in December 2011.

The site location is presented in Figure 1.

1.2 Objectives

The RAP was prepared in order to:

- Provide a cost effective risk-based strategy for the implementation remediation measures that will reduce or eliminate the risk of any identified soil contamination impacting on identified potential receptors;
- Ensure that the site is remediated to a level consistent with the proposed park, recreational open space and playing field land use; and
- Outline the procedures for remediation, validation, and site control and management, as required.
- In addition, the RAP includes the following:
- Provide validation requirements for importation of material for use as a capping layer;
- Requirements for off-site disposal of excavated soils and demolition materials, as required;
- A brief summary of likely site management controls; and
- Attachments detailing Unexpected Finds Protocols and Worker Safety Requirements.

1.3 Scope of Works

The scope of works undertaken in preparation of this RAP included the following:

- Reviewing the site condition, history and surrounding environment;
- Reviewing previous contamination assessment reports pertaining to the site;
- Establishing remediation goals;

- Establishing site remediation criteria (SRC) for the contaminants of concern;
- Identifying and assessing remediation options;
- Recommending a preferred remediation option/s;
- Outlining procedures and activities required for the implementation of the preferred remediation option;
- Outlining requirements for a contingency plan for the remediation;
- Outlining procedures and activities required for validating the remediation;
- Outlining requirements for a site management plan for implementation during remediation;
- Outlining the regulatory compliance requirements for the remedial works; and
- Defining roles and responsibilities for remediation works and validation activities.

2 SITE DESCRIPTION

2.1 Site Identification

A site locality map is presented in Figure 1 and site features showing borehole and test pit locations are presented in Figure 2.

Table 2.1 - Site Identification

Site Address:	Sydney Olympic Park, NSW
Site Identification:	Lot 201 of DP1041756
Site Area:	Approximately 9,000 sqm
Current Land use:	The carpark and landscaped garden areas of the current SOP Sports Centre.
Current Zoning:	The land is excluded land under Auburn Local Environmental Plan 2010. The land zoning and land use provisions of State Environmental Planning Policy (Major Development) 2005 apply to the land.
Adjoining Site Uses:	The site is surrounded by the following: North: Car park of the SOP Aquatic Centre. East: Olympic Boulevard with the SOP Golf Centre and driving range beyond. South: The SOP Tennis Centre. West: Two hockey fields with a car park beyond.
Site co-ordinates	151°4'14.27"E 33°51'11.49"S (based on the eastern c ar park entrance)

2.2 Site Condition

The site comprises a carpark and landscaped garden area of the current SOP Sports Centre and covers an area of approximately 9,000m^2.

A site walkover undertaken on 1 December 2011 during Coffey's P1 PSI and identified the following site features:

- The site is bound by Olympic Boulevard to the east, Shirley Strickland Avenue to the south, Sarah Durack Avenue to the north and the Sports Centre to the west.
- The area surrounding the site exhibits a topographic crossfall down towards the south. The carpark in the southern portion of the site is lower than the northerly portion with elevation stepping down from north to south.

- The northern portion of the site was observed to be generally covered by grass with asphalt pavements and some established and landscaped trees. The southern portion of the site was mainly asphalt car park. Obvious evidence of distressed vegetation phytotoxic impact (e.g. stress or dieback) was not observed.
- A small pond was observed approximately 55m south and down gradient of the site.
- There were no direct indicators observed of fill material being present across the site, however, the building area is elevated by approximately 4m in relation to the car park area. The car park area is located down an embankment which may have been formed by filling or reworking of natural material.
- No evidence of potential hydrocarbon storage or historic releases were identified.
- Minor evidence of staining was observed at ground surface in the southern car park area of the site.
- No evidence of underground storage tanks was observed.
- No obvious evidence of contamination or potentially contaminating activities was observed.

A site layout plan is presented as Figure 2.

2.3 Hydrology

No creeks or rivers surround or dissect the site. The closest waterways to the site are Powells Creek, located approximately 1.1km to the east, Haslams Creek, located approximately 1.5km north and the Parramatta River, located 1.7km northeast of the site at its closest point.

2.4 Geology

Review of the 1:100,000 Sydney Geological Series Sheet 9130 indicates that the foreshores of Homebush Bay and Parramatta River in the vicinity of Sydney Olympic Park are underlain by man-made fill overlying Quaternary-aged stream sediments.

The man-made fill is expected to comprise dredged estuarine sand and mud, demolition rubble, and industrial and household wastes.

The sediments are expected to comprise silty to peaty quartz sand, silt and clay that exhibits ferruginous (i.e. iron rich) and humic (i.e. organic) sedimentation in places. Shell layers are also common.

The fill is underlain by the Triassic Bringelly Shale, Minchinbury Sandstone and Ashfield Shale of the Wianamatta Group comprising shale with some sandstone beds.

Bringelly Shale is the uppermost unit and is described as carbonaceous claystone and laminite with fine to medium grained lithic sandstone. The Ashfield Shale is described as black to dark grey. An intermediate unit, Minchinbury Sandstone, described as fine to medium grained sandstone is situated between the Bringelly and Ashfield Shale units.

The previous P1 PSI undertaken at the site by Coffey in December 2011 (Coffey, 2011) encountered fill to a depth of 2.6m to 6.3m bgs overlying weathered shale bedrock. Silty clay alluvium over silty clay residual soil was reported in the northern portion of the site in the vicinity of the eastern site boundary only. Site specific geology in the lower southern portion of the site comprised fill to approximately 1.2m

bgs overlying alluvium comprising sandy silty clay and residual soil comprising silty clay to approximately 2.7m bgs, over extremely to moderately weathered shale bedrock.

The site is located within the SOP which has been used for uncontrolled landfilling for many years prior to remediation and redevelopment in 2000 and this has resulted in widespread contamination. The landfill waste was excavated during remediation and re-contained within several landfill area, one of which is the Golf Driving Range Landfill which encroaches on the southeast corner of the site.

2.5 Hydrogeology

Based on the hydrology of the surrounding area, it is expected that groundwater beneath the site would flow in a broadly northerly direction towards surface water feature of the Parramatta River.

2.6 Acid Sulphate Soil

The State Environmental Planning Policy (Major Development) 2005 Sydney Olympic Park Acid Sulfate Soils (ASS) Map (Sheet ASS 001) indicates that the site does not lie in an area with high probability of ASS.

2.7 Registered Groundwater Bores

A search for registered groundwater bores within a 500 m radius of the site was undertaken using the NSW Natural Resources Atlas (NSW-NRA, http://nratlas.nsw.gov.au) on 22 May 2012. No records were reported for bores in this radius. The search was expanded to a 1 km radius and records for 10 registered groundwater bores were found located to the northeast and east of the site and used for monitoring purposes.

The registered bore data indicated that the depth to groundwater ranged between approximately 1.80m and 1.83m below ground surface (bgs), and, where indicated, the groundwater bearing zone is within shale.

3 SUMMARY OF SITE HISTORY

A summary of the site history review undertaken by Coffey (2011) is presented below:

- Historical aerial photographs indicate that the site was undeveloped until 1986 when the SOP Sports Centre building was constructed and the site land was developed into a carpark and landscaped area. The site has remained unchanged since this time, however, the surrounding land has undergone extensive development with filling to the west of the site in approximately 1970, construction of the M4 Western Motorway to the south of the site, development of residential properties to the south and west, development of the SOP Golf Centre to the east, tennis courts to the south and southeast and Bicentennial Park to the east of the site.
- A search of the NSW Office of Environment and Heritage (OEH, formerly Department of Environment, Climate Change and Water) online contaminated land record indicates that there is a maintenance of remediation for waste containment areas (Notice Number: 28040) within Sydney Olympic Park, those areas being the Aquatic Centre Car Park Landfill, Bicentennial Park Landfill, Blaxland Common Landfill, Golf Driving Range Landfill, Kronos Hill Landfill, Woo-La-Ra Landfill and Wilson Park Bioremediation. The site is located immediately to the west of the Golf Driving Range Landfill which also encroaches slightly on to the site in the southeast corner of the site.
- The notice states that SOP was used for uncontrolled landfilling for many years before it was redeveloped as the major Olympic Games venue in 2000. This resulted in wide spread contamination of the area. Assessment of the contamination in the areas began in the late 1980s and site remediation began in the early 1990s.
- The remediation strategy was to consolidate and re-contain the waste into several areas within the SOP and consequently the majority of the SOP area had the buried waste removed before it was redeveloped for the Games. The excavated waste was transferred to the designated waste containment areas named above. These areas were capped, landscaped and turned into parkland. Leachate collection and transfer systems were also built to prevent leachate from escaping.
- Wilson Park was a former Gasworks site and the waste was not removed from this particular site as it was for the remainder of the SOP. The nature of the contamination here is waste liquid tar rather than uncontrolled landfilling. However, the remediation strategy adopted was also “cap-and-contain” similar to the remediation of the landfilling areas within the SOP.
- A land title search indicates that the land was owned by The Metropolitan Meat Industry Board until 1983, followed by the Minister for Public Works until 1986 and the Sydney Olympic Park Authority (SOPA) until the present day.
- A search of the NSW OEH Heritage Branch online database (http://www.heritage.nsw.gov.au) reported that there are no heritage-listed structures listed as registered for the site, however, the Sydney Olympic Games Cauldron, used during the Sydney 2000 Olympic Games is located approximately 900m north northwest of the site.
- A search of the Stored Chemical Information Database (SCID) by NSW WorkCover Authority was conducted on 9 December 2011. The search indicated that WorkCover NSW identified no records of licences pertaining to the storage of dangerous goods on the site.
- Coffey reviewed one land use planning certificates issued by Auburn City Council on 29 November 2011 (under Section 149(2) of the Amended Environmental Planning and Assessment Act 1979)

which identified the site as excluded land under the Auburn Local Environment Plan 2010. The land zoning and land use provisions of State Environmental planning Policy (SEPP) (Major Development) apply to the land. The planning certificate notes that the site is located within an Environmental Conservation Area under the provision of SEPP (Major Development) 2005.

The land is significantly contaminated land (or part of the land), within the meaning of the Contaminated Lands Management Act 1997, at the date when the certificate is issued.

4 PREVIOUS INVESTIGATIONS

The following provides a summary of the previous contamination assessments carried out on-site.

Phase 1 Preliminary Site Investigation (Coffey, 2011)

The objectives of the P1 PSI were to:

- Identify past and present potentially contaminating activities;
- Identify potential contamination types;
- Discuss the site condition;
- Provide a preliminary assessment of site contamination; and
- Assess the need for further investigations.

The P1 PSI focussed on potential contamination risks for the proposed redevelopment at the site.

The scope of works undertaken for this assessment included a desktop review, site walkover, data assessment, preliminary site sampling and reporting.

Based on the scope of work undertaken, Coffey made the following conclusions:

- The concentrations of TPH, BTEX, PAHs, OCP, OPP and metals in soil samples analysed were reported either below the laboratory limits of reporting (LORs) or below the adopted assessment criteria.
- The Golf Driving Range landfill site, is located immediately to the east of the site, and it encroaches into the southeastern corner of the site.
- Asbestos fibres in soil were detected in the southeastern corner and northern portion of the site, which are located on the southern and northern edges of the proposed development footprint.

Based on the findings, Coffey considered that the site is suitable for the proposed development of the Netball Central subject to:

The asbestos containing soil material in the shallow soil in the vicinity of TP7 be delineated by collection of additional soil samples surrounding the test pit location and asbestos containing material be removed and the site validated. Asbestos containing soil in the deeper soil samples in TP1 be delineated by additional soil sample collection surrounding the test pit and asbestos containing soil can be managed on site. Management of asbestos contaminated soils may include capping of soils under a suitable barrier, consisting of either:

- Hard pavement (concrete or bitumen); or
- A marker layer of geo-fabric or mesh, covered by a minimum thickness of clean landscape materials (topsoil). The landscape materials will need to be stabilised with suitable vegetation to minimise erosion of the cap.

Removal or disturbance (during construction) of the asbestos containing soil material should be carried out under an Asbestos Removal Plan with supervision by a NSW WorkCover licensed (AS1) contractor. The potential for any dusts generated during construction works will need to be managed with periodic

spraying of water etc. during works, along with suitable erosion and sediment controls. Analytical results from the P1 PSI are presented in Tables 1 and 2.

5 SITE CHARACTERISATION

5.1 Area of Environmental Concern and Contaminants of Potential Concern

Based on the results from previous assessment carried out on-site, the Areas of Environmental Concern (AECs) and Contaminants of Potential Concern (COPCs) are summarised in Table 5.1.

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

Area of Environmental Concern	Contaminants of Potential Concern
TP1 (2.8-3.0m bgs) (located in the southeastern corner of the site)	Asbestos
TP7 (0.5-0.6m bgs) (located in the northwest corner of the site)	Asbestos

5.2 Potential Sensitive Receptors

The following potential sensitive receptors have been considered in this assessment:

- People visiting and working on the site.

6 ASSESSMENT CRITERIA

6.1 Remediation Criteria

The site assessment criteria presented in the following references are generally the primary references used in NSW when setting investigation and remediation (acceptance) criteria for chemical concentrations in soil:

- NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Auditor* Scheme (Second Edition);
- NSW EPA (1994) *Contaminated Sites: Guidelines for Assessing Service Station Sites*; and
- NEPC (1999) *National Environmental Protection (Assessment of Site Contamination) Measure* (NEPM).

Other references were used to supplement the above references where appropriate.

For assessing contamination levels in soil in urban settings, the NSW DEC (2006) *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme* and the NEPC (1999) present health based investigation levels (HILs) for different land uses (e.g. industrial/commercial, residential, recreational etc.) as well as provisional phytotoxicity based investigation levels or ecology based investigation levels (EILs).

Given that the site is to be redeveloped for indoor and outdoor recreation facilities with minimal landscaping, the investigation levels for parks, recreational open spaces, playing fields land use (HIL E) are considered the most applicable for validation purposes.

In addition, the NEPC (1999) EILs have also been adopted for the site given that landscaped areas are to be included as part of the proposed development.

NSW DEC (2006) Guidelines do not provide levels for volatile petroleum hydrocarbon compounds. NSW EPA (1994) *Guidelines for Assessing Service Station Sites* provide an indication of acceptable levels for sensitive land use for petroleum hydrocarbons compounds. The NSW OEH has advised that these guidelines should also be used for less sensitive land uses. For semi-volatile petroleum hydrocarbons (C_{16}–C_{35} and >C_{35}) investigation levels are provided in the NSW DEC (2006) Guidelines, however, these are based on the NEPC (1999) health-based investigation levels, which require the laboratory analysis to unequivocally differentiate between aromatic and aliphatic compounds. The relevant values in NSW EPA service station guidelines will be applied in the first instance as broad criteria to assess TPH concentrations. If TPH impacts are identified in soil, then aromatic/aliphatic investigation levels from NSW DEC (2006) may be utilised to assess the aromatic/aliphatic speciation of TPH.

NSW DEC (2006) states that there are currently no national or NSW EPA endorsed guidelines relating to human health or environmental investigation of material containing asbestos on sites. Site auditors must exercise their judgement when assessing if a site is suitable for a specific use in the light of evidence that asbestos may be a chemical of concern. NSW Health will provide advice to auditors on a case by case basis where appropriate. Enhealth (2005) *Guidelines for Asbestos in the Non-Occupational Environment*, provides some guidance on assessing and managing asbestos in soil although does not provide a threshold concentration or investigation level for asbestos. For this site, Coffey adopted a conservative criterion for asbestos of no detectable asbestos present in the near surface soils.

A summary of site remediation criteria is presented in Table 6.1.

Table 6.1: Summary of Site Soil Remediation Criteria

Analyte	Health-based Investigation Levels (HILs) (mg/kg)[1]	Ecological Investigation Levels (EILs) (mg/kg)[1]	Guidelines for Assessing Service Station Sites (mg/kg)
	HIL E	Interim Urban	
METALS / METALLOIDS			
Arsenic	200	20	-
Cadmium	40	3	-
Chromium (III)	240,000	400	-
Copper	2,000	100	-
Lead	600	600	-
Mercury (inorganic)	30	1	-
Nickel	600	60	-
Zinc	14,000	200	-
ORGANICS			
Total PAH	40	-	-
Benzo(a)pyrene	2	-	-
TPH C_6-C_9	-	-	65
TPH C_{10}-C_{40}	-	-	1000
Benzene	-	-	1
Toluene	-	-	130
Ethylbenzene	-	-	50
Xylenes	-	-	25
OTHER			
Asbestos	ND[2]	-	-

Note:
1. NSW DEC (2006)
2. Not detected in near surface soil, based on NSW EPA Interim Policy.

6.2 Waste Classification Criteria

Waste classification will be conducted in general accordance with the procedures for classifying waste as detailed in the *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW DECC, 2009).

7 REMEDIATION ACTION PLAN

7.1 Remediation Goal

The remediation goal is to render the site suitable for its proposed netball court and associated amenities land use based on a setting of park, recreational open space, playing field land use with minimal landscaping.

7.2 Location of Remediation and Sampling Required

Based on the available data for the site, the location of the soil requiring remediation is summarised in Table 7.1 and the estimated extent of the asbestos impacted soils are presented on Figure 2.

The horizontal and vertical extent of contamination will be defined following delineation investigation works around the identified contaminated soil locations.

Table 7.2: Location of Remediation and Sampling Required

Contamination Source	Location	Sampling Requirement
Asbestos impacted soils	TP1 (2.8-3.0m bgs) and TP7 (0.5-0.6m bgs)	Vertical sampling: fill (sandy clay) to depths of at least 3.0m bgs in the location of TP1 and at 1.5m bgs in the location of TP7. Lateral sampling: delineate the asbestos impact by collecting samples from a 5m radius from the sampling locations.

It should be noted that the estimated lateral extent of the remediation may change based on the outcomes of the delineation works.

7.3 Remediation Option Assessment

Remediation of soils on the site are required under the Department of Urban Affairs and Planning's State Environment Protection Policy (SEPP) 55 to address soil contamination on the site and reduce potential risk to human health and the environment.

Based on the data presented in the contamination assessments and the estimated extent of remediation presented in Section 7.2 of this RAP, five remediation options were considered for implementation at the site. These are discussed in Table 7.2.

Table 7.3: Remediation Options

No.	Option	Assessment
1.	Leave the contamination undisturbed.	Applying this option is likely to result in an unacceptable level of human health risk. This option is not considered to be acceptable as it would compromise the proposed land use.

No.	Option	Assessment
2.	Excavation and off-site disposal of material that does not comply with the adopted assessment criteria.	Asbestos contaminated material would be removed and disposed to an appropriately licensed facility following classification in accordance with NSW DECC (2009). The advantages of this option include the potential for minimising ongoing management of the land, as well as minimising restrictions on future land use following remediation and validation. The disadvantages of utilising this option include significant costs associated with waste transport and disposal, and the potential for medium to large areas of the site to be disturbed.
3.	On-site ex-situ containment of material that does not comply with the adopted assessment criteria.	Contaminated materials would be excavated and buried in purpose-built containment cell on the site. The advantage of this option is reduced waste transport and disposal costs. The disadvantages of this option include the on-going management of land for containment of contaminated soil, the construction costs of containing the material and potentially restricted land use in its vicinity. A long term contamination management plan (CMP) would be required to manage risks associated with potential future disturbance of the contained contamination. The CMP would need to be legally enforceable. The contained contaminant requirement for maintenance of the CMP would need to appear on any Section 149 Planning Certificate issued for the site (which may affect future value and use of the site).
4.	On-site in-situ containment of material that does not comply with the adopted assessment criteria.	Contaminated materials could be capped in in-situ. That is, the material would not be excavated. The advantage of this option is to eliminate waste transport and disposal costs, as well as eliminating costs associated with excavating material for containment in another location. The disadvantages of this option include the on-going management of the capped material, the construction costs of containing the material and potentially restricted land use in its vicinity. The placement of a cap on the site may also impact future use of the site. A long term CMP would be required to manage risks

No.	Option	Assessment
		associated with potential future disturbance of the contained contamination. The CMP would need to be legally enforceable. The requirement for maintenance of the CMP would need to appear on any Section 149 Planning Certificate issued for the Site (which may affect future value and use of the site).
5.	Excavation and on-site treatment of impacted soils	This option would involve excavation of impacted soil and treatment on site for re-use. The advantage of this option is minimisation of waste transport and disposal costs and potential creation of re-usable fill material (on the site). The disadvantages of this option are that there is currently there is no proven on-site treatment technology to treat/destruct asbestos.

7.4 Preferred Remediation Option and Rationale

Factors considered in assessment of the remediation option included:

- Reliability;
- Regulatory Approvals;
- Relative Cost;
- Time-frame; and
- Ongoing monitoring and future liability.

Based on these factors, Option 2 was selected as the most appropriate and cost-effective method of remediation of the site in the vicinity of TP7 and Option 4 was selected as the most appropriate and cost-effective method of remediation of the site in the vicinity of TP1.

7.5 Overview of Adopted Remediation and Management Activities

The following sub-sections present procedures for management, remediation and validation of the site to render the site suitable for the on-going park and recreational land use, with respect to the identified contamination.

The normal environmental and engineering control measures required for general earthworks would need to be in place. Unless otherwise identified, all activities discussed below will be the responsibility of the contractor and its representative.

An overview of the adopted remediation and management activities is presented in Table 7.5.

Table 7.5: Overview of Adopted Remediation and Management Activities

Areas of Concern to be Addressed	Proposed Remediation and Management Activities
Localised soil impacted with asbestos in the vicinity of TP7	• Delineate the extent of asbestos containing soils in a 10m radius surrounding TP7 by additional sampling and testing (Section 8.2) • Based on the delineation results, excavate the asbestos containing soil to 1.5m bgs (Section 8.3) • Dispose of the excavated material to a licensed landfill as per a waste classification (Section 8.5) • If unexpected contamination is found on site, stop works immediately and follow the unexpected finds protocol (Section 8.6) • If required, backfill the excavation with clean imported VENM (Section 8.7) • If unexpected events arise during remediation and earthworks, follow the remediation contingency plan (Section 8.8)
Deep soil impacted with asbestos in the vicinity of TP1	• Delineate the extent of asbestos containing soils in a 10m radius surrounding TP7 by additional sampling and testing (Section 8.2) • Cap the asbestos containing soils under a suitable barrier layer (Section 8.3) • Complete a long-term CMP for on-going management of these materials (Section 8.4) • Dispose of the excavated material to a licensed landfill as per a waste classification (Section 8.5) • If unexpected contamination is found on site, stop works immediately and follow the unexpected finds protocol (Section 8.6) • If required, backfill the excavation with clean imported VENM (Section 8.7) • If unexpected events arise during remediation and earthworks, follow the remediation contingency plan (Section 8.8)

8 REMEDIAL STRATEGY

8.1 Site Preparation and Environment Controls

Site preparation and environmental controls are presented in Section 13.

8.2 Delineation of Asbestos Impacted Soils

Asbestos impacted soils will be laterally and vertically delineated by collecting soil samples in a 10m radius surrounding TP7 and TP1.

Laboratory results will take approximately one week to be delivered and, therefore, delineation should take place before the site is redeveloped in order to avoid stand-down time while waiting for laboratory results.

8.3 Validation of Excavation

Area of TP7

Once the extent of the asbestos containing soil in TP7 has been delineated, the asbestos containing soil will be excavated and disposed of off-site as *Asbestos Waste.* Preliminary waste classification undertaken in Coffey, 2011 indicated that soil in the vicinity of TP1 and TP7 could be disposed of off-site as *General Solid Waste to be managed as asbestos waste.*

The excavation works will be undertaken by an AS1 contractor and guided by a suitably qualified environmental consultant. The excavated material will be:

1. Stockpiled on-site for further sampling for waste classification, if required, to facilitate appropriate off-site disposal (refer to Section 8.5);
2. Loaded onto trucks and transported for off-site disposal at a licensed landfill following the waste classification.

Following removal of the soil, the resulting excavations will be validated in accordance with the directions summarised in Section 11.

Area of TP1

Once the extent of the asbestos containing soil in TP1 has been delineated, the asbestos contaminated soils will be managed by capping the soils under a suitable barrier that may consist of either hard pavement (concrete or bitumen) or by using a marker layer of geo-fabric or mesh, covered by a minimum thickness of clean landscape materials (topsoil). The landscape materials will need to be stabilised with suitable vegetation to minimise erosion of the cap. A long-term contamination management plan (CMP) should be completed for the on-going management of these materials. A long term CMP is outlined in Section 8.4.

Excavation and validation can take place during site re-development when excavators are already on-site.

The areas will be managed in accordance with the directions summarised in Section 13.

8.4 Long Term Contamination Management Plan

The objectives of the CMP are to:

- Implement a monitoring program to check the integrity and performance of the remedial and management measures;
- Provide a framework for appropriate health and safety and environmental controls and/or requirements to be implemented in relation to general site users and workers undertaking activities at the site.

The CMP will include and/or discuss:

- A summary of site characteristics;
- A drawing identifying the presence of contaminated soil;
- The assumptions on which exposure settings and risk management are based;
    - Outline of a long term maintenance and monitoring/inspection program for topsoil layer and grass cover (in capping area).
- Outline of general administrative controls, site rules and restrictions for general site users;
- Outline of administrative, health and safety and environmental controls/requirements if disturbance of the capping area is required;
- Details of monitoring/validation program for the topsoil or capping layer;
- Contingency plans.

8.5 Waste Classification and Off-site Disposal

Excavated soil requiring off-site disposal will be classified in accordance with NSW DECC (2009) Waste Classification Guidelines Part 1: Classifying Waste by a suitably qualified environmental consultant, prior to disposal.

All soil for off-site disposal will be analysed at an adequate frequency. The frequency will depend on the volume and variability of the material. As a minimum, soil for off-site disposal will be sampled at a rate of one sample per 25m3 bulk soil volume or by sufficient samples to enable classification based on comparison of the 95% upper confidence limit (UCL) of the mean. A reduced sampling frequency may be acceptable for larger volumes.

Samples will be analysed for the following analytes, as a minimum: TPH, PAH, heavy metals and asbestos, which were the contaminants of potential concern identified during previous assessments. Leachability tests based on the toxicity characteristics leaching procedures (TCLP) will likely be required. Previous laboratory analysis data may be utilised, where appropriate. Preliminary waste classification undertaken in Coffey, 2011, indicated that the soil excavate from the site could be classified, in accordance with the NSW DECCW (2009) Waste Classification Guidelines: Part 1 Classifying Waste, as General solid waste with the exception of in the vicinity of TP1 and TP7 which would be classified as General Solid Waste to be managed as asbestos waste and in the vicinity of BH1 to be classified as Restricted Solid Waste. However, TCLP tests are recommended to be undertaken for nickel for samples in the vicinity of BH1 in order to be able to reclassify the soil as general solid waste prior to be disposed off site.

The classified waste soil will be transported in NSW EPA permitted vehicles, according to the classification, to an appropriately licensed landfill for disposal.

The contractor undertaking the works should maintain appropriate records of waste classification, transportation and off-site disposal (landfill dockets etc). These records will be included in the final validation report.

8.6 Unexpected Finds Protocol

Should unexpected potential contamination be found on-site, works should stop immediately. The affected area should be isolated with a minimum five metre radius barrier to minimise potential for disturbance to the affected soils.

Unexpected potential contamination could include, but not be limited to:

- Unexpected staining or odours;
- Potential asbestos containing materials; or
- Unexpected underground storage tanks, buried drums or machinery, etc.

The following general approach for managing unexpected finds should be adopted:

- Immediately notify sub-contractors on-site and the Coffey Project Manager of the identified or suspected contamination;
- An appropriately qualified environmental consultant should carry out an assessment of the nature and extent of the unexpected contamination, which may include sampling, laboratory analysis and reporting;
- Additional remediation work (including an amendment to this RAP) may be required; and
- Validation of the remediation should be carried out to assess the success of the remediation works.

8.7 Importation of Fill

If required, excavations created on-site should be backfilled with clean imported virgin excavated natural material (VENM).

The contractor will be responsible for providing geotechnical specifications for the backfilling of the excavation and for undertaking the backfilling in accordance with these specifications. The backfilled material will be compacted by the use of the machine track rolling over the top.

If material is required to be imported for backfilling of excavations it should classify as VENM in accordance with the NSW DECC (2009) *Waste Classification Guidelines – Part 1: Classifying Waste*.

The Contractor must advise Coffey of the proposed source site. Coffey will then assess each proposed source site to assess whether material sourced from that site is likely to classify as VENM. This would generally include a site visit, review of existing reports (if any) and potentially a site history review as well as limited sampling and analysis.

8.8 Remediation Contingency Plan

A contingency plan is outlined in Table 8.8, listing some potential events that may arise during the remediation and earthwork activities that will be undertaken if unexpected conditions occur.

The Remediation Contractors is to assess other potential events that could occur (if any) and identify contingency measures prior to commencement of remediation.

Table 8.8: Contingency Plan

Unexpected Event	Action
Identification of unexpected contaminated materials during the remediation/ excavation works	If during the remediation/excavation work, material is encountered which appears to be potentially contaminated and appears to be different from the soils described in our previous assessment reports, the following procedures should apply: • Any suspicious material/soil which has already been excavated should be bunded and stockpiled on a minimum of two layers of polythene or low-density polyethylene sheet of at least 0.25mm thickness, protected from erosion and all seepage retained. • Excavation works at that part of the site where the suspicious material (soil) was encountered should cease until an assessment is carried out by a suitably qualified environmental consultant. • Based on a visual assessment, the environmental consultant will provide interim advice on health and safety of remedial works, soil storage and soil disposal to allow remediation to proceed if possible. • Based on sampling and analysis of the material, the environmental consultant will provide advice as to remedial requirements for the material. In the context of the above, “suspicious” material would include concentrated fibrous bundles, oily or odorous material, drums, metal or plastic chemical containers or brightly coloured material etc.
Environmental or health and safety controls fail or environmental or OHS monitoring indicates potential hazards	Environmental and health and safety contingencies would be presented in the site management plan (remediation phase) to be prepared by the responsible contractor.
Other	Any other unexpected events which may affect the outcome of the remediation would be notified to the environmental consultant. Potential actions to address the unexpected event will be assessed and presented.

9 REMEDIATION SCHEDULE AND HOURS OF OPERATION

The hours of operation will be consistent with the requirements imposed by SOPA.

It is understood the remediation is to commence following approval of the development application (DA) which is to be submitted on 4 June 2012. It is anticipated that the works will be undertaken over the duration of a few weeks although this program could potentially be extended depending on weather and other site specific constraints.

10 SAMPLING, ANALYSIS AND QUALITY PLAN

Data Quality Objectives (DQOs) for validation activities have been developed generally in accordance with the seven step process outlined in the *Guidelines for the NSW Site Auditor Scheme (2nd edition)* (NSW DEC, 2006).

Table 10.1: Data Quality Objectives

State the problem	The primary objective is to assess whether, following the site remediation and validation, the site is suitable for parks, recreational open space land use with minimal landscaping. The main problems are: • If and what additional soil assessment works are required? • What is the waste classification of soils to be disposed off-site? • How should soils be validated? • What validation sampling layout should be used? • What contaminants should be analysed for?
Identify the decision	The decisions that are required to be made in this project include: • Is the number of samples to be collected sufficient to identified the extent of the contamination hot spots? • Does the validation data indicate that the site is suitable for the proposed land use or is further remediation required?
Identify inputs to the decision	The primary inputs to assessing the above include: • The results from previous assessments carried out at the site. • Site Remediation Criteria (SRC). • Additional data collected by Coffey during remediation and validation works including field measurements/observations and laboratory analytical results. • Outcome of quality assurance assessment from relevant data. • Applicable regulatory guidelines.
Define the boundaries of the study	Horizontally, the study boundaries are defined by Olympic Boulevard to the east, the SOP Sports Centre to the west, the grass verge abutting the carpark to the south and the extent of the landscaped area to the north. Vertically the study boundary is defined by the vertical extent of soil contamination.

Develop a decision rule	The decision rules for the project will be as follows: • If the results of the analytical data quality control assessment (also referred to as a data useability assessment) are acceptable, then the data will be deemed suitable for the purposes of the project. In this regard, data will be assessed against completeness, comparability, representativeness, precision and accuracy; and • If the reported assessment and validation results are within the SRC, then the site will be considered suitable for the proposed land use; and • If the reported assessment and validation results exceed the SRC, then the potential impact of such contamination will be assessed with a view to further assessment or remediation/management of contamination.
Acceptable limits on decision error	There are two types of error: • deciding that the site is suitable for the proposed land use when it is not; and • deciding that the site is not suitable for the proposed land use when it is. The assessment will aim to conclude with 95% confidence that the site soils are suitable for the proposed land use. Consequently, the 95% UCL will be used to assess the mean concentrations of contaminants of potential concern (where appropriate).
Optimise the design for obtaining data.	Assessment and validation methods and sampling will target COPCs based on information from previous contamination assessments. Sampling/observations will focus on: • The bases and walls of remediation excavations; • The bases and walls of additional assessment sampling locations; and • Stockpiles for off-site disposal.

10.1 Fieldwork Quality Assurance / Quality Control (QA/QC)

10.1.1 Preparation

Sampling equipment required for fieldwork should include the following (where appropriate):

- Notebook/indelible marker pens;
- Decontamination buckets;
- Deionised or distilled water and Decon 90 detergent;
- Laboratory prepared sample jars;
- Eskies and ice;

- Disposable nitrile gloves;
- Personal protective equipment (PPE); and
- Camera.

10.1.2 Decontamination Procedures

Non-disposable sampling equipment coming into in contact with soil will be decontaminated before and between sampling events to minimise the possibility of cross contamination between samples and minimise the risk of impacting sample integrity. The decontamination process will include the following procedure:

- Washing of the equipment in a solution of phosphate free detergent (e.g. Decon 90) and potable water; and
- Rinsing with distilled water.

10.1.3 Soil Sampling Procedures

Once the extent of the asbestos containing soil has been identified and removed in TP7, samples of soil from the walls and floor of the excavation will be obtained by the excavator/backhoe bucket, in order to avoid the need for personnel to enter the excavation. It should be noted that no personnel is allowed to enter into a Confined Space without having proper training, entry certificates and other required documentation and most excavation pits will fall into the confined space category.

A sample is to be taken from at least 0.15 m below the surface of the soil in the bucket. Personnel will change gloves between each sample and collect soils for analysis that have not come in direct contact with the bucket to minimise potential cross contamination.

Samples of soil from stockpiles (i.e. both the excavated and stockpiled soil) will be obtained by using a hand auger, shovel or the excavator bucket. Personnel will change gloves between each sample to minimise potential cross contamination.

Sampling equipment will be decontaminated as described in Section 10.1.2.

The samples collected for laboratory analysis will be placed in laboratory prepared and supplied glass jars, and sealed with a Teflon-lined lid and a clean “zip-lock” plastic bag.

Soil samples will be placed directly into clean “zip-lock” plastic bags and soil samples screened for volatile organic compounds (VOCs) using a photoionisation detector (PID) calibrated to a known concentration of isobutylene in air. The detection limit of the PID is generally considered to be between 0.5 to 1 parts per million per volume of air (ppmv). The headspace in the soil sample will be allowed to equilibrate for five minutes before the PID suction tube is used to puncture the airtight plastic bag. The readings obtained during the headspace screening will be used as relative indicators of the presence of VOCs and do not represent actual concentrations. Details of the VOC concentrations, sample type, and location will be recorded on standard field forms.

10.1.4 Storage and Transport Procedures

Samples will be placed in laboratory prepared containers. The sample containers will then be placed directly into a chilled cooler for transportation to the NATA accredited analytical laboratory with the Chain of Custody form.

Samples will be transported to the laboratory with sufficient time to perform analysis within the applicable holding period.

10.1.5 Intra-laboratory Duplicates

Intra-laboratory field duplicates will be collected on an average frequency of one sample per ten samples collected (10%). The analytical results of the two spilt samples will be compared to assess the precision of the sampling protocol and to provide an indication of variation in the sample source.

10.1.6 Inter-Laboratory Duplicates

Inter-laboratory field duplicates will be collected on an average frequency of one sample per twenty samples collected (5%). The analytical results of the two split samples will be compared to assess the precision of the sampling protocol, provide an indication of variation in the sample source and to assess the accuracy of the primary laboratory.

10.1.7 Rinsate Samples

Rinsate samples will be prepared in the field using empty bottles and the distilled water/potable water used for the cleaning of non-disposable sampling equipment. These samples will be a check on field decontamination procedures and sample device cleanliness.

A rinsate sample will be collected and analysed for each day of field work carried out, where non-disposable sampling equipment has been used.

10.1.8 Trip Blanks

Trip blanks are a check on sample contamination originating from sample transport, shipping and site conditions. The blank will remain with the sample containers during sampling and during the return trip to the lab. At no time during these procedures will the blanks be opened. Upon return to the lab the blank will be analysed, if needed, as any other field sample. A trip blank will be used and analysed for a batch of samples released to the laboratory, where the contaminants being assessed are volatile in nature (e.g. BTEX or TPH C6-C9).

10.2 Laboratory QA/QC

10.2.1 Laboratory Selection

The primary laboratory proposed for this project is mgt-Labmark Pty Ltd, Lane Cove West, which is NATA-accredited for the analyses to be undertaken. The secondary laboratory proposed for this project is SGS Australia Pty Ltd, Alexandria, which is NATA-accredited for the analyses to be undertaken.

Laboratory Quality Control would include the following:

- The laboratory analysis of samples will be undertaken by a NATA accredited environmental testing laboratory;
- The NATA accredited environmental testing laboratory will implement a quality control plan; and
- The laboratory will include reagent blanks, spike samples, duplicate spikes, matrix spikes, and surrogates spikes and duplicates to assess the laboratory quality control.

Should an alternative laboratory be required during the project, then the above selection criteria will still apply.

10.2.2 Data Assessment

The laboratory quality control data shall be assessed as follows:

- Checking that the reporting limits and procedures are satisfactory;
- Checking that the samples are analysed within holding times;
- Checking that laboratory blanks / reagent blanks are less than the laboratory reporting limits;
- Checking the reproducibility of samples by calculating the Relative Percentage Differences (RPDs) between primary and duplicate laboratory samples; and
- Checking that spikes, surrogate spikes, matrix spikes and duplicate matrix spike recoveries are within acceptable control limits.

Data Quality Indicators that will be adopted for quality control samples are presented in Table 10.2.

Table 10.2: Data Quality Indicators for Quality Control Samples

Type of Quality Control Sample	Control Limit
Duplicate Samples	RPDs within 50% for soil (higher RPDs are acceptable for low concentrations)
Spikes	Recoveries within the following ranges 70% - 130% for inorganics / metals 60% - 140% for organics
Blanks and Rinsate Samples	Analytes not detected.

11 VALIDATION STRATEGY AND WASTE CLASSIFICATION

In order to obtain agreement that the site has undergone appropriate and effective remediation works, a validation of the remedial works in the vicinity of TP7 will be undertaken. This section summarises the scope of works required to achieve validation suitable for the proposed commercial/industrial land use.

There are currently no national or NSW EPA endorsed guidelines relating to human health or environmental investigation of material containing asbestos on sites. For this site, Coffey adopted a conservative criterion for asbestos of no detectable asbestos present in the near surface soils.

11.1 Validation of Excavations

At the completion of soil removal works, field visual observation for asbestos or asbestos containing material (ACM) will be undertaken on the excavation pit. Should field screening indicate that there is a low likelihood of contamination in the residual soils, then soil validation samples will be collected from the walls and base of the excavation.

The following sampling density will be adopted for excavation validation purposes:

- Collection of soil samples from the walls of each excavation at a rate of approximately one sample per 10 lineal metres with a minimum of one sample from each excavation wall. Where significant changes in lithology are noted within the excavation, soil validation samples should be collected from each soil horizon; and
- Collection of soil samples from the base of each excavation at a rate of approximately one sample per 25m^2 with a minimum of one sample per excavation base.

Selected soil samples will be analysed for asbestos.

11.2 Validation of Imported Fill

Where fill material is to be imported to the site to facilitate backfilling of excavations, the material will comply with the following criteria:

- the definition of Virgin Excavated Natural Material (VENM) as defined in NSW DECC (2009) *Waste Classification Guidelines*;
- sample analysis results below laboratory limits of reporting (LOR) for organic contaminants; and
- sample analysis results within expected metal concentration background ranges (as nominated in Table 5-A of NEPC (1999).

The material shall be assessed by a suitably qualified environmental consultant prior to importation. This assessment shall include:

- a visual inspection of the source site and the proposed fill material (if exposed); and
- collection and laboratory analysis of spatially representative samples of the proposed fill material.

Samples shall be collected at a rate of one sample per 100m^3 of imported fill, with a minimum of two samples per source site.

The samples shall be submitted to a NATA accredited laboratory for analysis for TPH, PAH, BTEX, OCP, PCB, heavy metals and asbestos. The range of contaminants requiring analysis may need to be revised, depending on the environmental consultant's understanding of historical source site usage and the visual assessment of the material.

Observations will be made by Coffey of the material from each source as it is delivered to site, to check that the material appears consistent with the source and that there is no visual or olfactory evidence of potential contamination such as staining, anthropogenic materials or odours.

Copies of dockets pertaining to imported fill soils will be provided by the remediation contractor to confirm the source, type and quantities of materials.

11.3 Waste Classification

Soil samples will generally be collected at a rate of one sample per 25m3 for each stockpile. A reduced sampling frequency may be acceptable for larger volume.

The soil samples will generally be analysed for TPH, BTEX, heavy metals, and PAH. Soil samples may also require analysis for TCLP.

The procedures for classifying waste are detailed in the Waste Classification Guidelines Part 1: Classifying Waste (NSW DECC, 2009).

12 REPORTING

At the completion of remediation and validation works, a validation report will be prepared in general accordance with NSW OEH (2011) and other relevant guidance documentation.

The validation report will include:

- Executive Summary;
- Scope of work;
- Site identification and description;
- Summary of site history;
- Summary of site condition and surrounding environment;
- Summary of topography, geology and hydrogeology;
- Remediation activities undertaken;
- Validation sampling and analysis plan (including Methodology);
- Field and laboratory QA/QC and data evaluation;
- Basis for soil acceptance criteria;
- Validation sampling results;
- Site characterisation;
- Ongoing site monitoring requirements (if any); and
- Conclusions and recommendations.

13 SITE MANAGEMENT PLAN

13.1 General

The Contractor must implement a Site Management Plan (SMP) that addresses environmental, occupational health and safety hazards and risks during the remediation.

13.1.1 Occupational Health and Safety

The Remediation Contractor will ensure that a project specific occupational health and safety plan has been prepared. This RAP does not relieve the Remediation Contractor of their responsibility for the health and safety of their employees, sub-contractors and visitors to the site, nor their responsibility for preventing contamination of areas outside remediation work areas.

Specific safe work method procedure details for the remediation of contamination on the site shall be the responsibility of the Remediation Contractor and will depend upon the equipment used and the overall sequence of removal.

The Environmental Consultant will prepare a project specific occupational health and safety plan to address health and safety risks associated with the activities they will be carrying out on the site during remediation works.

For the purposes of health and safety during remediation, Coffey recommends that potential asbestos impacted materials are removed under an Asbestos Removal Plan (ARP) prepared by a qualified occupational hygienist. The ARP outlines the occupational hygiene measures (such as air monitoring) to be implemented during asbestos removal works, provide mitigation strategies if the criteria described in the above measures are exceeded and provide direction regarding the handling and removal of asbestos impacted materials to be conducted by an AS1 licensed contractor. A clearance certificate must be provided at the completion of the final topsoil layer by the qualified occupational hygienist.

13.1.2 Dust and Material Handling

The remedial works will involve excavation of the subsurface, stockpiling, transportation and placement of soil, and general movement of vehicles across the site. As such, dust generation is considered a potential impact to the surrounding environment and the public.

The following management measures should be implemented to prevent dust impacts.

General Site Area

- High density weave shadecloth shall be placed around the site boundaries.

Excavation Areas

- If dust migration from excavation areas is considered excessive due to high winds, exposed soils shall be wetted down or the works should be delayed or limited during these periods.

Stockpile Areas

- Temporary stockpiling of excavated materials may result in dust generation. If excessive dust is generated, the material will be covered by high density polyethylene (HDPE) sheeting.

- Stockpiles should be positioned where erosion of the stockpile will be minimised and/or securely covered with a tarpaulin or HDPE sheeting where this is not possible.
- Regular dampening of stockpiles with water mist may be carried out to minimise dust generation. Note that the amount of water used for dust suppression needs to be minimal in order to prevent runoff.
- Stockpiles should not exceed the height of the fencing in order to reduce potential for dust spreading to the surrounding environment.
- Whenever possible the temporary stockpiling of soils should be established on sealed concrete.
- HDPE sheeting should be placed under the soil stockpiles to mitigate contaminants from seeping into uncontaminated soils.

Haulage of Soils

- Trucks transporting contaminated soil from the site or imported fill to the site should be covered in order to minimise dust generation.
- The following procedures should be followed on-site to limit the potential for transport of soil/dust off-site via vehicular movement;
  - Vehicles on-site should remain on paved areas where possible;
  - Minimal vehicular traffic will be entering and exiting the site;
  - The excavator will be taken to and from the site on a float; and
  - Vehicles, plant and equipment will be washed/brushed down before leaving the site.

13.1.3 Noise

Noise producing machinery and equipment will only be operated during working hours as approved by SOP Authority (SOPA) and/or NSW EPA.

Australian Standard *AS2436-1981 Guide to noise control on construction, maintenance and demolition sites* outlines guidelines for the minimisation of noise on construction and demolition sites and these should be followed at all times.

No “offensive noise” as defined under the *Protection of the Environment Operations Act 1997* shall be created during remediation works/activities.

All associated mechanical plant, equipment and the like used during remediation works/activities shall use all practical and reasonable noise attenuating devices and measures to minimise noise being transmitted from the site.

All equipment and machinery shall be operated in an efficient manner to minimise the emission of noise.

13.1.4 Soil Management

Stockpiles should be labelled to ensure that the stockpiles are properly tracked and classified according to contaminant concentrations and to ensure that mixing of differently classified soils does not occur.

The soil removed during the excavation works should be stockpiled on paved areas or impervious polyethylene sheeting (if required), and will be bunded with silt barriers to mitigate runoff from the stockpile to surrounding areas.

Stockpiles shall not be placed near drainage lines, gutters or stormwater pits. Additional drainage control works will be constructed on-site should the need arise.

If wet weather conditions are encountered, excavation works will cease and stockpiles covered with HDPE lining to mitigate runoff (if required).

Stockpiles will be positioned to minimise potential for stockpile erosion where possible.

The excavation and stockpile areas will be isolated from the surrounding site areas through the use of temporary barricades and fencing.

13.1.5 Water Management

It is possible that excavations may remain open, during which surface water ingress may occur. In order to minimise the need for treatment/disposal of potentially contaminated surface water from excavations, the Remediation Contractor shall implement controls to divert surface water away from open excavations.

It is possible that during excavation works, groundwater ingress may occur. The Remediation Contractor shall pump groundwater ingress from the excavations, transport and dispose of it at an appropriately licensed liquid waste facility.

13.1.6 Traffic

No major traffic disruptions are expected as a result of the on-site works. Excavation and other equipment will be transported to the site in accordance with regulatory requirements.

13.1.7 Working Hours

Remediation work shall only be conducted during hours approved by SOPA.

13.1.8 Access Restriction

Access to the site will be restricted to authorised staff and contractors who have been inducted and appropriately trained for the works being undertaken.

A chain wire fence shall be installed around the perimeter of the site.

Signage, including contractor details and contact numbers, will be erected near the gate at the site. The signage will remain displayed on the site entrance throughout the duration of the remediation works.

The site supervisor shall control site access and shall authorise visitors on an “as needed” basis.

13.1.9 Communication and Complaints

Communication and complaints received for the site must be reported to the principal contractor.

All communications and complaints shall be assessed and an appropriate response, corrective and/or preventative action implemented (as necessary).

A communication and complaints register will be operated on site to ensure that concerns of local residences and businesses are recorded and addressed.

14 REGULATORY COMPLIANCE REQUIREMENTS

In general, the remedial work should therefore be carried out in accordance with SEPP55 and appropriate NSW EPA requirements.

Pre-approval from a licensed disposal facility will be required prior to removal of contaminated soil or liquid from the site.

Handling (including excavation) of any asbestos containing materials and removal of any asbestos from the site will need to be undertaken by an AS1 licensed contractor in accordance with NSW WorkCover regulations.

Other legislative requirements which may be applicable include but not limited to:

- Contaminated Land Management Act 1997 (DECCW);
- Environmental Planning and Assessment Act 1979 (DIPNR);
- Protection of the Environment Operations Act 1997 (DECCW);
- Waste Avoidance and Resource Recovery Act 2001 (DECCW); and
- OHS Act 2000 and OHS Regulations 2001.

It is understood that the remediation does not required to comply with the auditing scheme in NSW, although voluntary compliance with the relevant principles of the auditing scheme is recommended.

15 ROLES AND RESPONSIBILITES

The following provisional roles and responsibilities have been allocated for the duration of the project. In the event that project personnel change, relevant parties will be notified.

Table15.1: Project Personnel

Personnel	Contact Number
Site Owner SOPA	Phone: TBC
Environmental Consultant / Project Manager Imogen Powell (Coffey Environments Australia Pty Ltd)	Phone: (02) 8083 1600 Mobile: 0407 332 925 Fax: (02) 8765 0762
Remediation Contractor Crown Project Services Pty Ltd	Phone: (02) 9252 4420 Mobile: 0426 210 215 Fax: (02) 9252 4430

16 REFERENCES

Contaminated Land Management Act 1997 (amended July 2009).

Environmental Planning and Assessment Act 1979.

Protection of the Environment Operations Act 1997.

Waste Avoidance and Resource Recovery Act 2001.

OHS Act 2000 and OHS Regulations 2001.

Australian Standard AS4482.1 (1997). *Guide to the sampling and investigation of potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds*.

Australian Standard AS2436 (1981). *Guide to noise control on construction, maintenance and demolition sites*.

Coffey Environments (2011). *Phase 1 Preliminary Site Investigation Proposed Development Netball Central Olympic Park NSW,* (ref: GEOTLCOV24420AA-AE).

Enhealth (2005). *Guidelines for Asbestos in the Non-Occupational Environment*.

NEPC (1999). *National Environmental Protection (Assessment of Site Contamination) Measure,* National Environment Protection Council.

NSW DEC (2006). *Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition),* Department of Environment and Conservation NSW.

NSW DECC (2009). *Waste Classification Guidelines, Part 1: Classifying Waste*, NSW Department of Environment and Climate Change.

NSW EPA. (1994). *Contaminated Sites: Guidelines for Assessing Service Station Sites,* NSW Environment Protection Authority.

NSW OEH (2011). *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites,* NSW Office of Environment and Heritage.

NSW EPA (1995). *Contaminated Sites: Sampling Design Guidelines for Contaminated Sites,* NSW Environment Protection Authority.

17 LIMITATIONS

The findings contained within this report are the result of discrete/specific sampling methodologies used in accordance with normal industry practices. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, however, can it be considered that these findings represent the actual state of the site at all points.

We draw your attention to “Important Information About Your Coffey Environmental Report” which outline or discuss limitations associated with interpreting contamination site assessment and validation data and drawing conclusions based on the data.

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

Important information about your **Coffey** Environmental Report

Uncertainties as to what lies below the ground on potentially contaminated sites can lead to remediation costs blow outs, reduction in the value of the land and to delays in the redevelopment of land. These uncertainties are an inherent part of dealing with land contamination. The following notes have been prepared by Coffey to help you interpret and understand the limitations of your report.

Your report has been written for a specific purpose

Your report has been developed on the basis of a specific purpose as understood by Coffey and applies only to the site or area investigated. For example, the purpose of your report may be:

- To assess the environmental effects of an on-going operation.
- To provide due diligence on behalf of a property vendor.
- To provide due diligence on behalf of a property purchaser.
- To provide information related to redevelopment of the site due to a proposed change in use, for example, industrial use to a residential use.
- To assess the existing baseline environmental, and sometimes geological and hydrological conditions or constraints of a site prior to an activity which may alter the sites environmental, geological or hydrological condition.

For each purpose, a specific approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible, quantify risks that both recognised and unrecognised contamination pose to the proposed activity. Such risks may be both financial (for example, clean up costs or limitations to the site use) and physical (for example, potential health risks to users of the site or the general public).

Scope of Investigations

The work was conducted, and the report has been prepared, in response to specific instructions from the client to whom this report is addressed, within practical time and budgetary constraints, and in reliance on certain data and information made available to Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on those instructions, requirements, data or information, and they could change if such instructions etc. are in fact inaccurate or incomplete.

Subsurface conditions can change

Subsurface conditions are created by natural processes and the activity of man and may change with time.

For example, groundwater levels can vary with time, fill may be placed on a site and pollutants may migrate with time.

Because a report is based on conditions which existed at the time of the subsurface exploration, decisions should not be based on a report whose adequacy may have been affected by time.

Consult Coffey to be advised how time may have impacted on the project and/or on the property.

Interpretation of factual data

Environmental site assessments identify actual subsurface conditions only at those points where samples are taken and when they are taken. Data derived from indirect field measurements and sometimes other reports on the site are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Actual conditions may differ from those inferred to exist, because no professional, no matter how well qualified, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of Coffey through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other problems encountered on site.

Your report will only give preliminary recommendations

Your report is based on the assumption that the site conditions as revealed through selective point sampling are indicative of actual conditions throughout an area.

This assumption cannot be substantiated until project implementation has commenced and therefore your report recommendations can only be regarded as preliminary. Only Coffey, who prepared the report, is fully familiar with the background information needed to assess whether or not the report's recommendations are valid and whether or not changes should be considered with redevelopment or on-going use of the site. If another party undertakes the implementation of the recommendations of this report there is a risk that the report will be misinterpreted and Coffey cannot be held responsible for such misinterpretation.

coffey environments
SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

Important information about your **Coffey** Environmental Report

Your report is prepared for specific purposes and persons

To avoid misuse of the information contained in your report it is recommended that you confer with Coffey before passing your report on to another party who may not be familiar with the background and the purpose of the report. In particular, a due diligence report for a property vendor may not be suitable for satisfying the needs of a purchaser. Your report should not be applied for any purpose other than that originally specified at the time the report was issued.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, retain Coffey to work with other professionals who are affected by the report. Have Coffey explain the report implications to professionals affected by them and then review plans and specifications produced to see how they have incorporated the report findings.

Data should not be separated from the report

The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists, engineers or geologists based on their interpretation of field logs (assembled by field personnel), field testing and laboratory evaluation of field samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

Contact Coffey for additional assistance

Coffey is familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to land development and land use. It is common that not all approaches will be necessarily dealt with in your environmental site assessment report due to concepts proposed at that time. As a project progresses through planning and design toward construction and/or maintenance, speak with Coffey to develop alternative approaches to problems that may be of genuine benefit both in time and cost.

Responsibility

Environmental reporting relies on interpretation of factual information based on judgement and opinion and has a level of uncertainty attached to it, which is far less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. To help prevent this problem, a number of clauses have been developed for use in contracts, reports and other documents.

Responsibility clauses do not transfer appropriate liabilities from Coffey to other parties but are included to identify where Coffey's responsibilities begin and end. Their use is intended to help all parties involved to recognise their individual responsibilities. Read all documents from Coffey closely and do not hesitate to ask any questions you may have.

Tables

Remediation Action Plan for Proposed Development
Netball Central, Sydney Olympic Park NSW

Table 1
Soil Analytical Results - TPH, BTEX, PAHs, Metals and Asbestos
Netball Central

Field ID								BH1	BH1	BH2	BH2	BH7	BH7	BH8	DUP1		TP1	TP1	TP2
Sample Depth								0.1-0.2	3-3.2	0.1-0.2	1.5-1.6	0.1-0.2	4.5-4.7	1.5-1.7			0.2-0.3	2.8-3	0-0.1
Sampled Date								1/12/2011	1/12/2011	1/12/2011	1/12/2011	1/12/2011	1/12/2011	1/12/2011	1/12/2011		2/12/2011	2/12/2011	2/12/2011
Lab ID								S11-De02195	S11-De02196	S11-De02197	S11-De02198	S11-De02209	S11-De02211	S11-De02213	S11-De02232	RPD	S11-De02215	S11-De02216	S11-De02217
Lab Report Number								320832	320832	320832	320832	320832	320832	320832	320832		320832	320832	320832
PID (ppm)								0	0	0	0	0	0	0	0		0.1	0	0
Comment															Duplicate of BH8 1.5-1.7				
Analyte	**Units**	**LOR**	**CRC CARE HSL-D 0-<2m (1)**	**Recreational Guidelines (NEHF E) (2006) (2)**	**Commercial/ Industrial Guidelines (NEHF F) (2006) (3)**	**Service Stations Use NSW EPA (1994) (4)**	**NSW 2008 General Solid Waste (CT1)**												
TPH C6 - C9	mg/kg	10	260-370			65		<10	-	<10	-	<10	-	<10	<10	NA	<10	-	<10
TPH C10 - C14	mg/kg	50	NL					<50	-	<50	-	<50	-	<50	<50	NA	<50	-	<50
TPH C15 - C28	mg/kg	100						<100	-	<100	-	<100	-	<100	<100	NA	<100	-	<100
TPH C29-C36	mg/kg	100						<100	-	<100	-	<100	-	<100	<100	NA	<100	-	<100
TPH+C10 - C36 (Sum of total)	mg/kg	100				1000		<100	-	<100	-	<100	-	<100	<100	NA	<100	-	<100
Benzene	mg/kg	0.5	3			1	10	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	NA	<0.5	-	<0.5
Ethylbenzene	mg/kg	0.5	NL			1.3	600	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	NA	<0.5	-	<0.5
Toluene	mg/kg	0.5	NL			1.4	288	<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	NA	<0.5	-	<0.5
Xylene (m & p)	mg/kg	1						<1	-	<1	-	<1	-	<1	<1	NA	<1	-	<1
Xylene (o)	mg/kg	0.5						<0.5	-	<0.5	-	<0.5	-	<0.5	<0.5	NA	<0.5	-	<0.5
Xylene Total	mg/kg	1.5	230			14	**1000**	<1.5	-	<1.5	-	<1.5	-	<1.5	<1.5	NA	<1.5	-	<1.5
Acenaphthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Benzo(a) pyrene	mg/kg	0.5		2	5		**0.8**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Benzo(b)&(k)fluoranthene	mg/kg	1						<1	<1	<1	<1	<1	<1	<1	<1	NA	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Fluorene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Naphthalene	mg/kg	0.5	NL					<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	NA	<0.5	<0.5	<0.5
PAHs (Sum of total)	mg/kg	1		40				<1	<1	<1	<1	<1	<1	<1	<1	NA	<1	<1	<1
Arsenic	mg/kg	1		200	500		**100**	1.1	7.2	1.8	3.5	2.1	6.3	6.1	4.4	32%	7.9	4.4	2
Cadmium	mg/kg	0.1		40	100		**20**	<0.1	0.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	NA	0.1	<0.1	<0.1
Chromium (III+VI)	mg/kg	2		200*	500*		**100**	6.8	6.5	9.5	13	3.4	16	11	9.2	18%	12	13	3
Copper	mg/kg	2		2000	5000			4.9	31	18	4.8	9.3	10	20	20	0%	18	13	7
Lead	mg/kg	2		600	1500		**100**	7.3	24	6.2	8	13	16	22	16	32%	45	18	9.9
Mercury	mg/kg	0.05		30	75		**4**	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NA	0.07	<0.05	<0.05
Nickel	mg/kg	1		600	3000		**40**	6.4	72	33	1.9	4.3	2.3	9.8	8.5	14%	9.8	1.4	5.5
Zinc	mg/kg	5		14000	35,000			11	240	24	<5	25	14	65	55	17%	69	8.3	20
Asbestos	mg/kg	NA						ND	ND	ND	ND	ND	ND	ND	-	-	ND	Chrysotile and	ND

Comments:

(1) 2011 CRC CARE Health Screening Levels for vapour intrusion for soil (commercial/industrial (HSL-D))

(2) 2006 Guidelines for the NSW Site Auditor Scheme 2nd Edition. NEHF E - Parks recreational open space, playing fields including secondary schools

(3) 2006 Guidelines for the NSW Site Auditor Scheme 2nd Edition. NEHF F - Commercial/Industrial: includes premises such as shops and offices as well as factories

(4) 1994 NSW EPA Guide for Assessing Service Stations - Health & Ecological

Highlighted Exceeds the nominated investigation level

BOLD RPD outside acceptance range

* As Chromium VI

NL Not Limiting - indication that the HSL exceeds the saturation concentration and therefore would not result in an unacceptable health risk from vapours

Table 1
Soil Analytical Results - TPH, BTEX, PAHs, Metals and Asbestos
Netball Central

Field ID								TP2	DUP2	RPD	TP3	TP3	TP4	TP4	TP7	TP7	TP8
Sample Depth								0.4-0.5			0.5-0.6	1.5-1.6	0-0.1	0.4-0.6	0.5-0.6	1.4-1.6	0.1-0.2
Sampled Date								2/12/2011	2/12/2011		2/12/2011	2/12/2011	2/12/2011	2/12/2011	2/12/2011	2/12/2011	2/12/2011
Lab ID								S11-De02218	S11-De02233		S11-De02220	S11-De02221	S11-De02223	S11-De02224	S11-De02228	S11-De02229	S11-De02230
Lab Report Number								320832	320832		320832	320832	320832	320832	320832	320832	320832
PID (ppm)								0	0		0	0	0	0	0	0	0
Comment									Duplicate of TP2 0.4-0.5								
Analyte	**Units**	**LOR**	**CRC CARE HSL-D 0-<2m (1)**	**Recreational Guidelines (NEHF E) (2006) (2)**	**Commercial/ Industrial Guidelines (NEHF F) (2006) (3)**	**Service Stations Use NSW EPA (1994) (4)**	**NSW 2008 General Solid Waste (CT1)**										
TPH C6 - C9	mg/kg	10	260-370			65		-	-	-	<10	-	<10	-	<10	-	<10
TPH C10 - C14	mg/kg	50	NL					-	-	-	<50	-	<50	-	<50	-	<50
TPH C15 - C28	mg/kg	100						-	-	-	<100	-	<100	-	<100	-	<100
TPH C29-C36	mg/kg	100						-	-	-	<100	-	210	-	<100	-	<100
TPH+C10 - C36 (Sum of total)	mg/kg	100				1000		-	-	-	<100	-	210	-	<100	-	<100
Benzene	mg/kg	0.5	3			1	10	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5
Ethylbenzene	mg/kg	0.5	NL			1.3	600	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5
Toluene	mg/kg	0.5	NL			1.4	288	-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5
Xylene (m & p)	mg/kg	1						-	-	-	<1	-	<1	-	<1	-	<1
Xylene (o)	mg/kg	0.5						-	-	-	<0.5	-	<0.5	-	<0.5	-	<0.5
Xylene Total	mg/kg	1.5	230			14	**1000**	-	-	-	<1.5	-	<1.5	-	<1.5	-	<1.5
Acenaphthene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a) pyrene	mg/kg	0.5		2	5		**0.8**	<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b)&(k)fluoranthene	mg/kg	1						<1	<1	NA	<1	<1	<1	<1	<1	<1	<1
Benzo(g,h,i)perylene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	0.5	<0.5	<0.5
Fluorene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	mg/kg	0.5	NL					<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	0.5						<0.5	<0.5	NA	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
PAHs (Sum of total)	mg/kg	1		40				<1	<1	NA	<1	<1	<1	<1	<1	<1	<1
Arsenic	mg/kg	1		200	500		**100**	3.2	2.2	37%	3.7	3.7	1.9	3.4	6.8	3.3	1.7
Cadmium	mg/kg	0.1		40	100		**20**	<0.1	0.2	**67%**	0.2	0.1	0.2	<0.1	0.6	<0.1	<0.1
Chromium (III+VI)	mg/kg	2		200*	500*		**100**	15	5.5	**93%**	9.5	6.5	5.2	5.3	22	5.7	<2
Copper	mg/kg	2		2000	5000			23	17	30%	19	10	24	11	21	11	11
Lead	mg/kg	2		600	1500		**100**	11	9.6	14%	23	11	16	11	69	12	6.8
Mercury	mg/kg	0.05		30	75		**4**	<0.05	<0.05	NA	<0.05	<0.05	0.06	<0.05	0.09	<0.05	<0.05
Nickel	mg/kg	1		600	3000		**40**	49	<1	**192%**	2.4	1.7	3.4	<1	7.2	<1	1.2
Zinc	mg/kg	5		14000	35,000			31	<5	**144%**	18	7.5	58	<5	300	<5	9.4
Asbestos	mg/kg	NA						ND	-	-	ND	ND	ND	ND	Chrysotile	ND	ND

Comments:

(1) 2011 CRC CARE Health Screening Levels for vapour intrusion for soil (commercial/industrial (HSL-D))

(2) 2006 Guidelines for the NSW Site Auditor Scheme 2nd Edition. NEHF E - Parks recreational open space, playing fields including secondary schools

(3) 2006 Guidelines for the NSW Site Auditor Scheme 2nd Edition. NEHF F - Commercial/Industrial: includes premises such as shops and offices as well as factories

(4) 1994 NSW EPA Guide for Assessing Service Stations - Health & Ecological

Highlighted Exceeds the nominated investigation level

BOLD RPD outside acceptance range

* As Chromium VI

NL Not Limiting - indication that the HSL exceeds the saturation concentration and therefore would not result in an unacceptable health risk from vapours

Table 2
Soil Analytical Results - OCPs and OPPs
Netball Central

Field ID								BH7	DUP2	TP1	TP1	TP2	TP2
Sample Depth								0.1-0.2		0.2-0.3	2.8-3	0-0.1	0.4-0.5
Sampled Date								1/12/2011	2/12/2011	2/12/2011	2/12/2011	2/12/2011	2/12/2011
Lab ID								S11-De02209	S11-De02233	S11-De02215	S11-De02216	S11-De02217	S11-De02218
Lab Report Number								320832	320832	320832	320832	320832	320832
Comment													
Analyte	**Units**	**LOR**	**CRC CARE [1]**	**Recreational Guidelines (NEHF E) (2006) [2]**	**Commercial/ Industrial Guidelines (NEHF F) (2006) [3]**	**Service Stations Use NSW EPA (1994) [4]**	**NSW 2008 General Solid Waste (CT1)**						
4,4-DDE	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
a-BHC	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
b-BHC	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlordane (cis)	mg/kg	0.05		100				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Chlordane (trans)	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
d-BHC	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DDD	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
DDT	mg/kg	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Dieldrin	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aldrin+Dieldrin	mg/kg	0.1		20				<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan II	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endosulfan sulphate	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Endrin ketone	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
g-BHC (Lindane)	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor	mg/kg	0.05		20				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hexachlorobenzene	mg/kg	0.05						<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Methoxychlor	mg/kg	0.2						<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Demeton (total)	mg/kg	1						<1	<1	<1	<1	<1	<1
Monocrotophos	mg/kg	10						<10	<10	<10	<10	<10	<10
Profenofos	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Prothiofos	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Stirophos	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Azinophos methyl	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chlorpyrifos	mg/kg	0.5					**4**	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Coumaphos	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Diazinon	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dichlorvos	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dimethoate	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Disulfoton	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethoprop	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenitrothion	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fensulfothion	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fenthion	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Malathion	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl parathion	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Mevinphos (Phosdrin)	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Parathion	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phorate	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ronnel	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Trichloronate	mg/kg	0.5						<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Comments:

(1) 2011 CRC CARE Health Screening Levels for vapour intrusion for soil (commercial/industrial (HSL-D))

(2) 2006 Guidelines for the NSW Site Auditor Scheme 2nd Edition. NEHF E - Parks recreational open space, playing fields including secondary schools

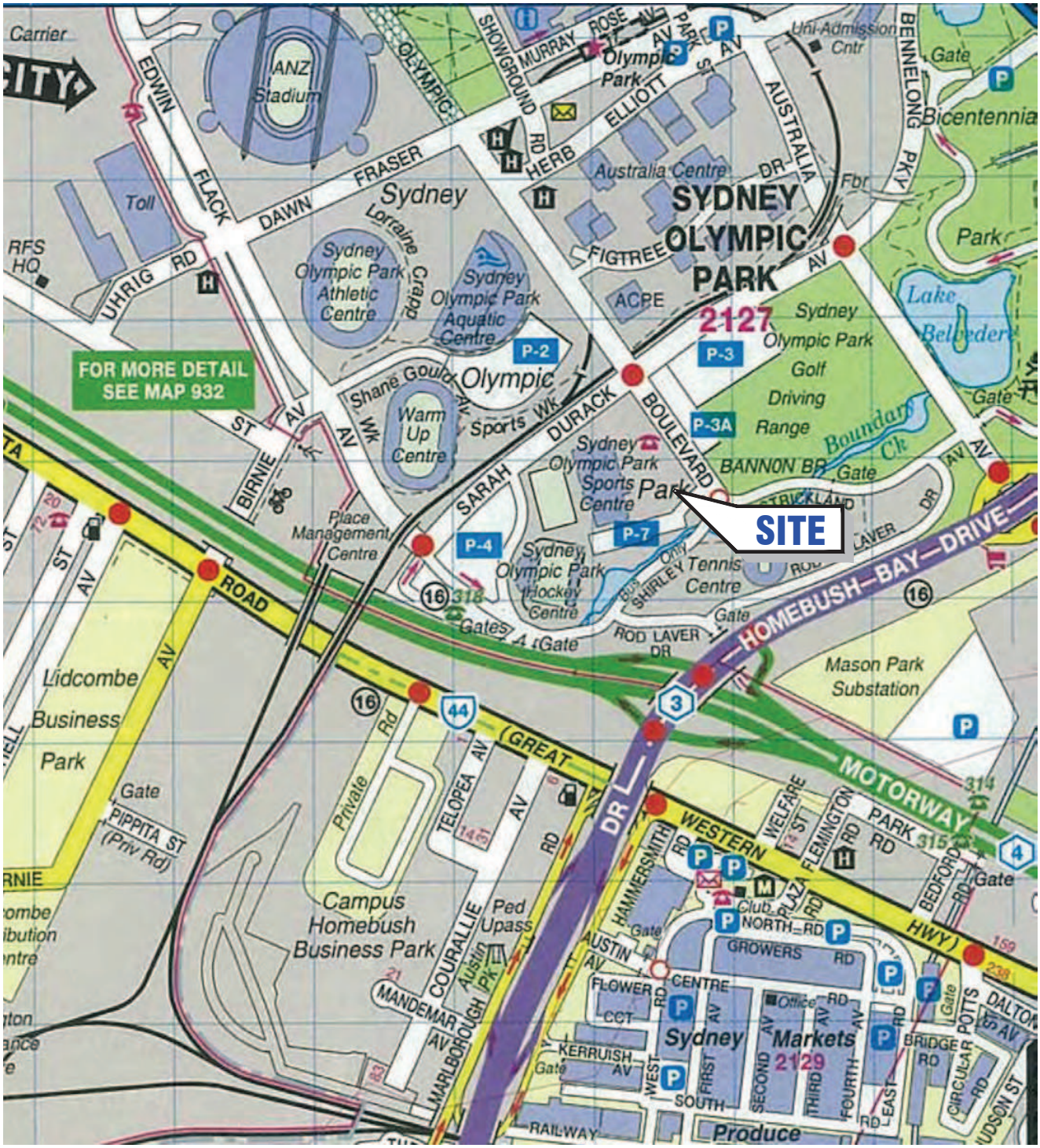
(3) 2006 Guidelines for the NSW Site Auditor Scheme 2nd Edition. NEHF F - Commercial/Industrial: includes permises such as shops and offices as well as factories

(4) 1994 NSW EPA Guide for Assessing Service Stations - Health & Ecological

bold Exceeds the nominated investigation level

Figures

Remediation Action Plan for Proposed Development
Netball Central, Sydney Olympic Park NSW



SOURCE: UBD STREET DIRECTORY GREGORYS SYDNEY, NEW SOUTH WALES 47TH EDITION, 2012, MAP: 232

100 0 100 300 500

Horizontal Scale (metres) 1:10,000

drawn	MV
approved	TL
date	01/06/12
scale	AS SHOWN
original size	A4

coffey environments

SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

client:	CROWN PROJECT SERVICES PTY LTD
project:	REMEDIATION ACTION PLAN FOR PROPOSED DEVELOPMENT NETBALL CENTRAL OLYMPIC BOULEVARD, SYDNEY OLYMPIC PARK, NSW
title:	SITE LOCALITY MAP
project no: ENAURHOD04234AB-D01	figure no: FIGURE 1

DWG FILE: F:\PROJECTS\ENAURHOD\ENAURHOD04 GOVINDI\ENAURHOD04200-04299\ENAURHOD04234 NETBALL CENTRE OLYMPIC PARK\ENAURHOD04234AB RAP\DRAWINGS\ENAURHOD04234AB-D01.DWG

LEGEND

- TP — APPROXIMATE TESTPIT LOCATION
- BH — APPROXIMATE BOREHOLE LOCATION
- PROPOSED NETBALL CENTRAL DEVELOPMENT
- ESTIMATED AREA REQUIRING CONTAMINATION REMEDIATION OR MANAGEMENT

Coffey Environments Australia Pty Ltd

10 0 20 40 60

Scale (metres) 1:1250

drawn	MV
approved	TL
date	01/06/12
scale	AS SHOWN
original size	A4

coffey environments

SPECIALISTS IN ENVIRONMENTAL, SOCIAL AND SAFETY PERFORMANCE

client: CROWN PROJECT SERVICES PTY LTD

project: REMEDIATION ACTION PLAN FOR PROPOSED DEVELOPMENT NETBALL CENTRAL OLYMPIC BOULEVARD, SYDNEY OLYMPIC PARK, NSW

title: SITE LAYOUT PLAN & IMPACTED AREAS REQUIRING REMEDIATION OR MANAGEMENT

project no: ENAURHOD04234AB-D01 figure no: FIGURE 2

DWG FILE: F:\PROJECTS\ENAURHOD\ENAURHOD04 GOVT\NDIENAURHOD04200-04299\ENAURHOD04234 NETBALL CENTRE OLYMPIC PARK\ENAURHOD04234AB RAPIDRAWINGS\ENAURHOD04234AB-D01.DWG