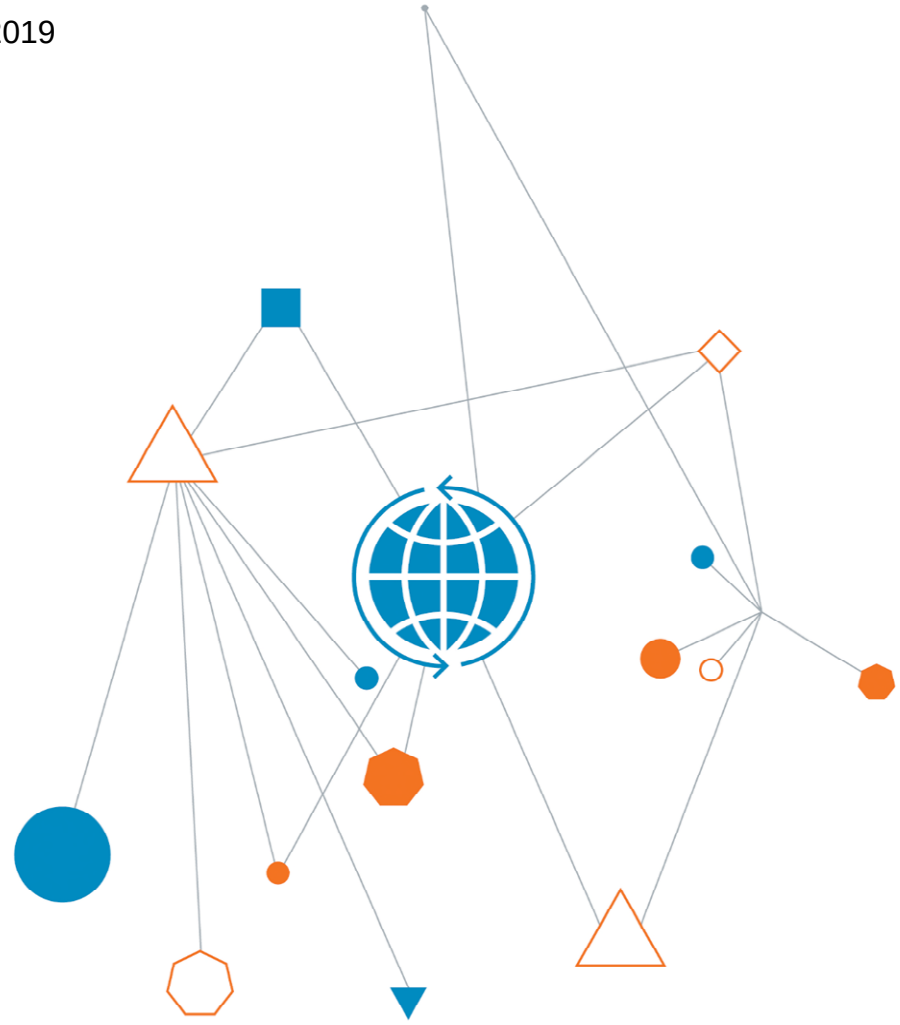
Richard Crookes Constructions

Remedial Action Plan

Sydney Modern Gallery
Art Gallery Road, Sydney NSW

15 October 2019



When you
think with a
global mind
problems
get smaller

This page has been left intentionally blank

Sydney Modern Gallery

Prepared for
Richard Crookes Constructions

Prepared by
Coffey Services Australia Pty Ltd
Level 19, Tower B, Citadel Tower, 799 Pacific Highway
Chatswood
NSW 2067 Australia
t: +61 2 9406 1000 f: +61 2 9415 1678
ABN 55 139 460 521

15 October 2019

SYDGE234348

EA_RAP For Construction

Quality information

Revision history

Revision	Description	Date	Originator	Reviewer	Approver
EA Draft	Complete draft	13/10/2019	ZM	MD	MD
EA_RAP	For Construction	15/10/2019	ZM	MD	MD

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Draft	1	PDF	Richard Crookes Constructions – Jesse Moss	13/10/2019
For Construction	1	PDF	Richard Crookes Constructions – Jesse Moss	15/10/2019

Executive summary

The Sydney Modern Gallery (SMG) is a planned major expansion of the existing Art Gallery adjacent to the Phillip Precinct of the Domain. The expansion is a separate building located north of the Eastern Distributor Motorway (EDM) in an area largely occupied by a disused Navy fuel bunker that was excavated into the hillside in the 1940's. The proposed gallery building will include several levels with different footprints that will involve further excavation west of the bunker adjacent to the EDM.

The SMG will be a multi-level structure. The entry level and Gallery 1 will be located over the existing EDM land bridge (RL 22.9m). The remaining four levels of galleries will be located north of the land bridge, will incorporate part of the disused fuel bunker and will also require excavation into the hillside to the west of the fuel bunker. Lowest gallery level coincides with the bunker floor at RL 1.15m.

Richard Crookes Constructions (RCC) requires a Remedial Action Plan (RAP) to manage identified contamination, to outline validation requirements for the site and to satisfy RCC's contract obligations associated with development of the Sydney Modern Gallery (SMG). RCC engaged Coffey Services Australia Pty Ltd (Coffey) to provide certain geotechnical and environmental professional services relevant to the SMG.

Coffey Geotechnics Pty Limited (Coffey) carried out a Stage 1 Preliminary Environmental Study in 2014 which identified Total Recoverable Hydrocarbon (TRH) and Polycyclic Aromatic Hydrocarbon (PAH) contamination in fill in the northeast of the site as well as strong hydrocarbon odours (Coffey, 2014b). The reported concentrations exceeded human health and/or ecological criteria. However, the source of the contamination was considered to potentially be associated with bituminous material within fill. The contamination did not appear to be associated with the historical fuel storage in the fuel bunkers. To support the Environmental Impact Assessment (EIA), AGNSW engaged Coffey in 2016 to revise the Stage 1 Preliminary Environmental Study. The work undertaken as part of the Revised Stage 1 Preliminary Environmental Study included further assessment and delineation of contamination identified by Coffey in 2014 and assessing the quality of ambient air within the former fuel bunkers (from a contamination perspective) that are included in the proposed project.

Based on currently available information, one remediation area has been identified which is estimated to cover approximately 12m by 25m and is estimated to extend to the top of sandstone, which varies between 1.1m and 2.2m below ground surface (bgs). The proposed remediation comprises excavation of the contaminated soils, offsite disposal to a licensed facility and validation sampling and laboratory analysis of soils from the remedial excavation.

Validation and waste classification requirements for the project include:

- Validation assessment, sampling and laboratory analysis of the remedial excavation. This will include visual and olfactory assessment of soils or bedrock within the remedial excavation to confirm that odorous soil have been adequately treated and confirm that remaining soils contain no unacceptable quantities of materials such as asphalt or other waste materials that may present an aesthetic issue. Validation samples will also be collected and analysed to confirm impacts have been adequately treated.
- Delineation sampling around previous location BH3 to identify the extent of hydrocarbon odours previously identified.
- In-situ or ex-situ waste classification of other soils to be excavated and removed as part of the project.
- Validation of areas of the site not previously assessed, including:
    - EDM Tunnel land bridge and above the former fuel bunkers where soils are proposed to be removed – visual inspection of the concrete surface to confirm that soils have been removed to the extent practicable, prior to construction and / or reinstatement with Virgin Excavated Natural Material (VENM) or validated soils from other areas of the site.
    - The Sydney Modern Gallery outside of the EDM Tunnel land bridge and former fuel bunker areas – sampling on a systematic grid and laboratory analysis, except in areas where buildings are proposed to be constructed. Sampling is not required beneath proposed buildings unless soils are retained. If the buildings are founded on sandstone bedrock then

visual assessment of exposed bedrock will be undertaken by the environmental consultant to confirm the absence of visual or olfactory evidence of contamination.

  - Former Navy electrical substation – if there is insufficient existing data available for soils beneath this area of the site, then targeted validation sampling will be undertaken following demolition.
  - Former fuel bunkers – visual assessment of the interior of the tank should be undertaken to identify minor oil seeps from joints and bolt holes within the fuel bunkers which may present a localised aesthetic issue. If seeps are observed then appropriate management measures should be developed which may include routine cleaning of the seepage point and / or sealing of the seepage points.

- Validation of materials for reuse on site – validation sampling and laboratory analysis to confirm the material is suitable for reuse on site from a contamination perspective.

An Unexpected Finds Procedure (UFP) has also been developed as part of the RAP to enable unexpected contamination to be managed appropriately.

Upon completion of the remediation and validation activities, a Remediation and Validation Report will be prepared in accordance with the NSW OEH Guidelines for Consultants Reporting on Contaminated Sites (2011).

This report should be read in conjunction with the attached “Important Information about your Coffey Environmental Report” which is included at the end of the text.

Table of contents

Tables

Figures

Appendices

Abbreviations

ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AHD	Australian Height Datum
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure
B(a)P	Benzo(a)pyrene – an individual PAH compound
bgs	below ground surface
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and naphthalene
C6-C36	Hydrocarbon chainlength fraction
CEMP	Construction Environmental Management Plan
COPC	Chemical of potential concern
CSM	Conceptual Site Model
DQO	Data Quality Objective
DQI	Data Quality Indicator
EDM	Eastern Distributor Motorway
EIA	Environmental Impact Assessment
EIL	Ecological Investigation Levels
ENM	Excavated Natural Material
EPA	Environment Protection Authority
ESL	Ecological Screening Levels
GME	Groundwater Monitoring Event
HDPE	High Density Polyethylene
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
m	metres
mg/kg	milligrams per kilogram
MW	Monitoring Well
NATA	National Association of Testing Authorities
OCP	Organochlorine Pesticide
OPP	Organophosphorus Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PID	Photoionisation Detector
ppm	parts per million
QA / QC	Quality Assurance / Quality Control
RAP	Remedial Action Plan

RCC	Richard Crookes Constructions
RPD	Relative Percent Difference
SCC	Specific Contaminant Concentration
SEARs	Secretary's Environmental Assessment Requirements
SMG	Sydney Modern Gallery
SOP	Standard Operating Procedures
SSD	State Significant Development
SSP	Site Safety Plan
TCLP	Toxicity Characteristic Leaching Procedure
TPH / TRH	Total Petroleum Hydrocarbon / Total Recoverable Hydrocarbons
UFP	Unexpected Finds Procedure
VENM	Virgin Excavated Natural Material
VOC	Volatile Organic Compound

1. Introduction

Richard Crookes Constructions (RCC) requires a Remedial Action Plan (RAP) to manage identified contamination, to outline validation requirements for the site and to satisfy RCC's contract obligations associated with development of the Sydney Modern Gallery (SMG). RCC engaged Coffey Services Australia Pty Ltd (Coffey) to provide certain geotechnical and environmental professional services relevant to the SMG.

The SMG site is located along the southern side of Art Gallery Road, west of Woolloomooloo Bay in Sydney, NSW. The site occupies an area of approximately 3.95 hectares. The original art gallery building was built between 1896 and 1909 and has been extended several times. The former fuel bunkers are located northeast of the existing art gallery building and were constructed (excavated into sandstone) in the late 1930's. The tanks have capacity to store 14,200 tonnes of fuel oil and were used for storage between the 1940's and mid 1980's, ceasing operation soon after 1985. The tanks were decommissioned in 1992-1993. Between 1995 and 1999, several contamination assessments were undertaken, followed by remediation and validation activities. The outcomes of this work were subject to a statutory site audit and a site audit statement was issued in 1999, stating that the site of the former fuel bunkers was suitable for commercial/industrial land use. The fuel bunkers have remained unused and the area above the bunkers been used as public open space since 1999.

2. The Project

The Sydney Modern Gallery (SMG) is a planned major expansion of the existing Art Gallery adjacent to the Phillip Precinct of the Domain. The expansion is a separate building located north of the Eastern Distributor Motorway (EDM) in an area largely occupied by a disused Navy fuel bunker that was excavated into the hillside in the 1940's. The locality is indicated in Figure 2.1 (Appendix B). The proposed gallery building will include several levels with different footprints that will involve further excavation west of the bunker adjacent to the EDM. The proposed development area is shown in Figure 2 (Appendix B).

The SMG will be a multi-level structure. The entry level and Gallery 1 will be located over the existing EDM land bridge (RL 22.9m). The remaining four levels of galleries will be located north of the land bridge, will incorporate part of the disused fuel bunker and will also require excavation into the hillside to the west of the fuel bunker. Lowest gallery level coincides with the bunker floor at RL 1.15m.

The structural drawings divide the SMG into 4 Zones as shown in Figure 2.2 below.

Figure 2.1– Sydney Modern location relative to existing Art Gallery and Eastern Distributor

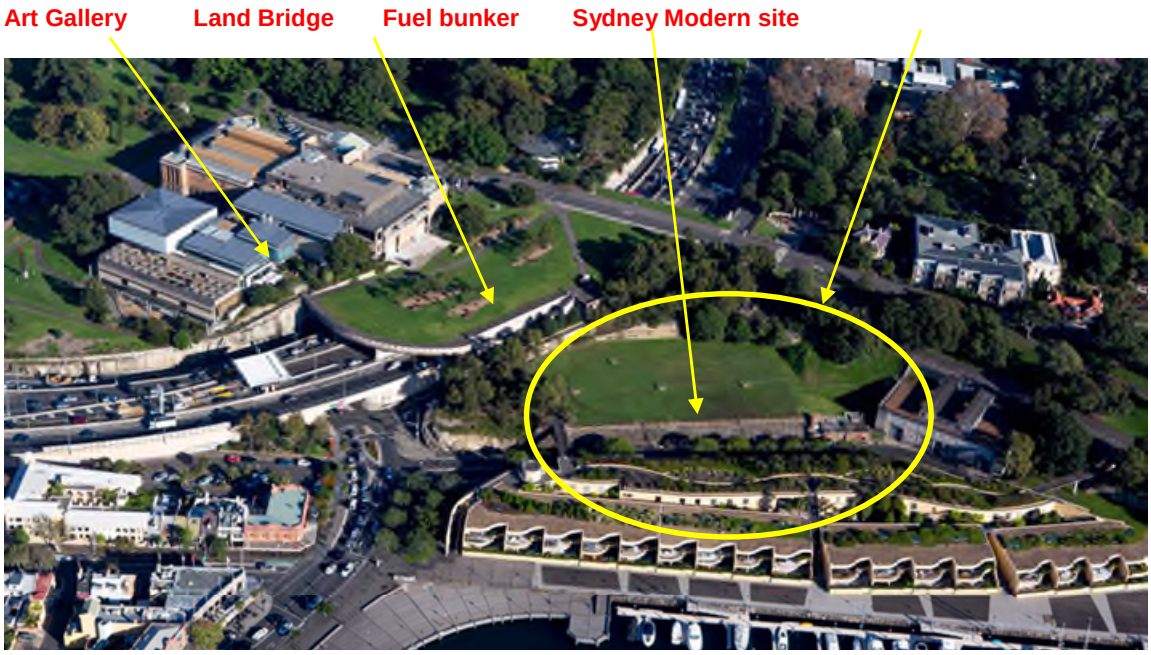
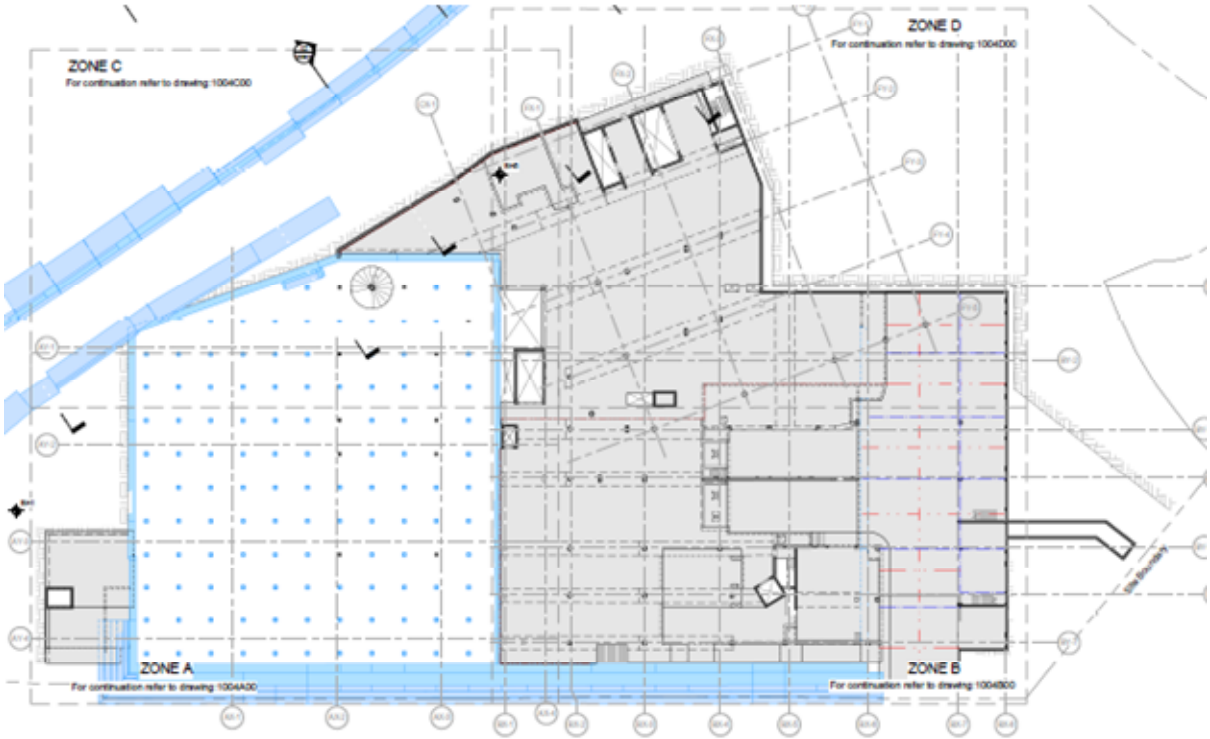


Figure 2.2– Plan showing Structural Zones A to D



Zone A: south tank of existing fuel bunker that will remain as part of the gallery forming the bulk of LL4.

Zone B: north tank of existing bunker that will be demolished. Excavation to LL3 (4.5m AHD) north of bunker.

Zones C and D contain deep excavation to LL4 to west of fuel bunkers, closest to the EDM.

3. Objectives and scope of the RAP

The objective of the RAP is to describe appropriate measures by which identified site contamination can be managed so that the site is suitable for the proposed project (comprising both open space and commercial land uses), in accordance with planning guidelines and guidelines endorsed by NSW Environment Protection Authority (EPA).

The RAP aims to:

- Set the remediation goals;
- Review the available remedial options;
- Select the preferred remedial option;
- Outline the procedures and activities associated with implementation of the preferred remediation option, including assessment and validation requirements;
- Outline the requirements for the contractor to prepare environmental and occupational health and safety plans for the remediation;
- Outline a procedure for dealing with unexpected finds;
- Outline the regulatory compliance requirements for the remedial works;
- Provide details of contacts for the period of remediation works; and
- Provide a framework for the environmental management plan for the site during remediation.

This plan addresses the following:

- Remediation and management of identified contaminated soil arising from the historical use of the site;
- Appropriate unexpected finds procedures;
- Validation of the remediated areas and remaining parts of the site; and
- Health and safety and site control during remediation.

4. SMG Contract – Schedule 39 Requirements

RCC (the Contractor) must submit updated drafts of nominated Contractor's Project Plans (item 9 in Schedule 39) in accordance with the Contract and the Project Brief and in in the nominated period. Item 9.12 describes the required Remediation Action Plan and Acid Sulfate Soils Management Plan, which are required to be submitted "30 Days prior to commencement of any activities on the Site". Item 9.12 is reproduced below.

9.12 Remediation Action Plan and Acid Sulfate Soil Management Plan

a. Remediation Action Plan (RAP) and Site Audit Report have been developed and are provided as part of SSDA Documents.

b. Acid Sulfates Soil Management Plan has been developed and is provided as part of the SSDA Documents

c. The Contractor will review provided documents, comply with identified assessments and investigations and develop RAP, Site Audit Report and Acid Sulfate Soil Management Plan.

d. The Contractor must implement, and maintain a Remediation Action Plan, Site Audit Report and Acid Sulfate Soil Management Plan which identifies how the Contractor will comply with the contamination management requirements of the Contract and the Project Brief, at a standard that satisfies all relevant Authorities.

e. The Remediation Plan must be developed in accordance with the requirements of the following:

   i. Authorities:

      (A) NSW Department of Planning and Environment; and

      (B) NSW Environment Protection Authority;

   ii. Guidelines:

      (A) DUAP Managing Land Contamination: Planning Guidelines - SEPP 55 Remediation of Land.

f. The Contractor must not commence any work upon the Project Site until the Contractor has:

   i. received approval for the Remediation Action Plan from the relevant Authorities or have been advised by the relevant Authorities that such approval is not required; and

   ii. provided a copy of such approval or advice (as the case may be) to Principal.

Coffey notes that assessment and management of acid sulfate soils has been dealt with separately to this RAP. Coffey provided a relevant Acid Sulfate Soil Management Plan (Coffey reference SYDGE234348-EB ASSMP) addressing this specific environmental aspect.

5. Roles and responsibilities

The key parties associated with implementing remediation and validation activities are:

- Principal Contractor – overall coordination of site activities and ultimately responsible for working safely;
- Subcontractors performing specific remediation and/or validation tasks;
- Environmental Consultant – directing remediation activity and undertaking validation sampling; and
- Site Auditor – independently reviewing remediation and validation activities.

Specific responsibilities of these parties in relation to remediation and validation activities are summarised in Table 1.

Table 1: Roles and responsibilities in relation to this RAP

Personnel	Responsibilities
Principal Contractor RCC	• Facilitate the implementation of this RAP. • Ensure that persons involved with this project have undertaken appropriate occupational health and safety training. • Ensure that a site-specific site safety plan is prepared for the site, which should cover contamination at the site. • Ensure that subcontractors provide adequate Safe Work Method Statements (SWMSs), which should cover contamination if they may potentially be exposed to contaminants or disturb contaminated materials. • Maintain an Unexpected Finds Register for this project. • Ensure that material tracking records relating to the excavation, stockpiling and disposal of waste material are maintained, as well as record associated with importation of materials to site. These records are to be made available to the environmental consultant following completion of the project.
Remediation Contractor TBA	• Comply with this RAP. • Understand the requirements of this RAP. • Prepare SWMS, as required by the Principal Contractor, for specific activities undertaken within the project where contamination may be encountered. • Take reasonable care for their own safety and the safety of others, with respect to contamination. • Attend a site induction and follow site rules and work instructions. • Take action to rectify contamination hazards that should arise during the course of the work. • Immediately report unexpected finds of contamination to the site supervisor or Principal Contractor. • Compliance with other applicable statutory responsibilities related to management of contamination in the workplace.
Environmental Consultant Coffey	• Assist the Principal Contractor and / or Remediation Contractor to provide of safe working environment with respect to contamination, if required. • Issue this RAP and coordinate works to review/update the RAP, as necessary. • Provide onsite supervision of remediation activities, as required. • Provide suitably qualified and competent staff to supervise remediation activities. • Provide advice on handling, management and treatment of potentially contaminated material. • Undertake validation of excavations, waste classification and provide other advice in relation to contamination. • Other activities related to contamination that may be required from time to time.
Site Auditor Tom Onus, Ramboll Australia	• Review implementation of the RAP and make comments on outcomes with respect to regulatory framework in light of the proposed land uses. • Provide a Site Audit Statement and Site Audit Report regarding the suitability of the Remediation Area for proposed use (from a contamination perspective).

Notes:

TBA – To be advised

6. Summary of site details and previous investigations

6.1. General

Coffey has undertaken geotechnical and environmental investigations at this site and has reviewed the following environmental reports when preparing this RAP:

- Coffey Geotechnics Pty Ltd (2012) Geotechnical Investigation, Sydney Modern Project, Art Gallery Road, Sydney, NSW (Ref: GEOTLCOV025037AA-AF, dated 16 May 2014).
- Coffey Geotechnics Pty Ltd (2014) Phase 1 Preliminary Environmental Study, Art Gallery of NSW – Sydney Modern Project, Sydney, NSW (Ref: GEOTLCOV025037AA-AG, dated 6 June 2014); and
- Coffey Geotechnics Pty Ltd (2016) Revised Phase 1 Preliminary Environmental Study, Art Gallery of NSW – Sydney Modern Project, Sydney, NSW (Ref: GEOTLCOV025037AC-R01a, dated 26 May 2015); and

Other reports have been prepared for the site and surrounding areas, and were summarised in the Coffey reports listed above. Relevant information from the listed reports has been summarised in the following sections.

6.2. Site identification

Site identification details and surrounding land uses are summarised in Table 2. The site location is shown in Figure 1 and site layout and surrounding areas are shown on Figures 2 and 3. Figures are included in Appendix B.

Table 2: Site identification details

Address:	Art Gallery Road, Sydney, NSW
Site title identification:	***SMG Site:*** • Lot 34 DP 39586, comprising Royal Botanic Gardens and Domain Trust land to the north of Cahill Expressway, including the former fuel bunkers. • Lot 1013 DP 1199151, comprising land to the west and south of the existing art gallery. • Lots 107 & 108 DP 1105308, comprising the Eastern Distributor and the land bridge above. • Lot 113 DP 1105308, comprising road reserve adjoining Lincoln Crescent and Cowper Wharf Road. • Lot 115 DP 1105308, comprising part of Art Gallery Road above the Eastern Distributor. • Lot 35 DP 39586, comprising land to the south-east of Mrs Macquarie's Road between Lincoln Crescent and Woolloomooloo Bay. • Lot 4 DP 259027, comprising a small lot adjacent to the land bridge on the northern side; and • Lot 36 DP 39586, comprising a triangular parcel of land at the end of Lincoln Crescent. The SMG site also comprises part of Art Gallery Road, Mrs Macquarie's Road, Lincoln Crescent and Cowper Wharf Road.

Area:	The SMG site (excluding the existing art gallery and the seawater heat exchange area) is approximately 3.95 hectares.
Dimensions:	Irregularly shaped: approximately 290m by 170m.
Local government area:	City of Sydney Council
Current zoning:	***Existing art gallery and SMG Site:*** Zone RE1 – Public recreation – proposed expansion area Zone SP2 – Infrastructure (classified road) – proposed expansion area Zone B8 – Metropolitan Centre – current art gallery
Current land use:	***Existing art gallery and SMG Site:*** Public art gallery, recreational areas and parkland
Future land use:	***Existing art gallery and SMG Site:*** Public art gallery and parkland
Adjoining land uses:	• **Northwest:** Art Gallery Road and Royal Botanic Gardens beyond. • **Southwest:** Current art gallery and public parkland beyond. • **Northeast:** Lincoln Crescent, beyond which lie residential properties and light commercial premises. • **Southeast:** Cahill Expressway and central business district (CBD) beyond.
Site coordinates:	335124E; 6250892N (based on the southern corner of current art gallery building)

6.3. Topography, drainage, geology and hydrogeology

Table 3 summarises the topography, drainage, geology and hydrogeology relevant to the site.

Table 3: Topography, drainage, geology and hydrogeology

Elevation and general slope direction:	The surface of the site and surrounding area slopes down towards Woolloomooloo Bay to the northeast of the site. Survey information indicates that the site lies at an elevation of approximately 25m Australian Height Datum (AHD) in the southwest (west of existing art gallery) and approximately 2.5m AHD in the northeast (Lincoln Crescent). The site generally slopes to the southeast from Art Gallery Road.
Closest surface water body:	Woolloomooloo Bay is located approximately 80m northeast of the fuel bunkers (at its closest point).
Drainage:	Stormwater drains and surface runoff following topography.
Regional geology:	Hawkesbury Sandstone of Wianamatta Group.
Soil landscape:	Gymea soils, typically yellow earths and earthy sands from 0.3 to 1m deep on crests of landforms which seems to represent a majority of the undisturbed part of the site.
Acid sulfate soils:	• No known occurrence.
Site specific soil and rock:	• **Topsoil:** Sandy silt, fine grained sands, dark brown, to depths of 0.1m. • **Fill:** Silty Sand/Sand, fine to medium grained, brown to dark brown, grey, orange, with some gravel (including coal and / or bitumen), to depths between 0.8m and 3.2m bgs. • **Weathered sandstone**. Foreign materials: tile and brick fragments at locations BH06 and BH07. Concrete and glass fragments noted at BH03 and BH02a, respectively. Coal and / or bitumen like material at locations BH2, BH4, BH6 and BH7 at depths of between 0.5m and 1.5m.
Evidence of contamination:	• BH02: Very strong hydrocarbon odours from 1.1m • BH03: Hydrocarbon odours from 1m • BH04: Strong hydrocarbon odours between 1m and 1.5m Refer to Figure 4, Appendix B for borehole locations.
Groundwater bores:	• None registered within 500m of site however three groundwater bores are located between 500m and 800m radius of the site. • Two groundwater monitoring wells designated MW1 and MW2 are located along the eastern side of the fuel bunkers adjacent to Lincoln Crescent.
Depth to groundwater:	Ranges between approximately 1.6m and 2.0m bgs at Lincoln Crescent (based on MW1 and MW2 measured in April and May 2016). The groundwater elevation at these locations is estimated to range between approximately 0.4m and 1.3m Australian Height Datum (AHD) based on available nearby survey data. No information on depth to groundwater is available for the majority of the site, however the presence of the Domain Tunnel is expected to result in substantial depression of groundwater levels across much of the site.
Inferred groundwater flow direction:	Northeast, towards Woolloomooloo Bay.

6.4. Results of site history review

Based on a review of records available for this site, the art gallery building was originally constructed between 1896 and 1909 and has been extended several times. From a review of the aerial photographs the original structures appear to remain on site and the immediately adjacent land use has consistently been either parkland or roadways.

The Cahill Expressway was built in the late 1950s to early 1960s and most likely will have involved the import of fill to assist with construction; however the origin of the fill is uncertain. Coffey considers that most general fill material used during the expressway's construction is likely to have been locally derived from the excavation of sandstone along the expressway alignment. It is assumed that other road infrastructure within the area (Art Gallery Road) will have been constructed either during historical expansion of the art gallery or changes in landscaping. As such there is the potential for localised use of imported uncontrolled fill associated with the construction of older roads such as Art Gallery Road. Impacts in uncontrolled fill may arise from the presence of asbestos containing material and/or ash from combustion of coal.

With the exception of the former fuel bunkers, the site history review did not identify sources of contamination that would present a significant constraint to the proposed Sydney Modern Gallery, with respect to contamination. Based on the information provided in the Audit Report the fuel bunkers would be considered suitable for either commercial/industrial use or recreational/open space use as long as the presence of residual oil and potential soil and groundwater hydrocarbon impact in the direct vicinity of the fuel bunkers was considered in either the demolition or use of the fuel bunker structure.

The fuel bunkers are proposed to form part of the SMG and further assessment of seepage water within the bunkers as well as odour and volatile hydrocarbon vapour considerations was undertaken and reported in Coffey (2016b).

Based on the site history review and the site walkover, several potential Areas of Environmental Concern (AECs) and associated Chemicals of Potential Concern (COPC) have been identified and are summarised in Table 4. The site was assessed to have a low to moderate likelihood of contamination being present in the identified AECs.

Table 4: Summary of potentially contaminating activities, potential areas of environmental concern, likelihood of contamination and potential chemicals of concern

Potentially Contaminating Activity/Source	Sub Component / Description	Potential Areas of Environmental Concern	Likelihood of Contamination*	Potential Chemicals of Concern
Garden maintenance	Possible use of pesticides	Contamination (if present) would typically be located in near surface soils adjacent to the art gallery building. *Soil media potentially affected*	Low likelihood of soil contamination based on historical information review and observations made during site visits. Modern agricultural chemicals (i.e. dieldrin, heptachlor and DDT) are generally not persistent in the environment, that is, their predicted persistence is between five to 15 years (NSW EPA, 1995).	OCP, OPP and heavy metals
Uncontrolled Fill	Placement of fill materials of an unknown origin during previous site developments including construction of the Cahill Expressway and surrounding roads.	Contamination (if present) would typically be located in shallow surface soils. *Soil media potentially affected.*	Low likelihood of soil contamination based on historical information review, observations made during site visits and previous soil sampling. It is unknown if there has been infilling as a result of the previous art gallery extensions. If so the proposed redevelopment of the site has little restriction to soil access and may result in an increased potential for exposure during construction. It is considered unlikely that fill imported to site as part of the Cahill Expressway construction would be exposed as part of the proposed Sydney Modern Project however the construction of roads such as Art Gallery Road may have resulted in infilling in the vicinity of road infrastructure. Based on when construction of the Cahill Expressway and other infrastructure in the project area was undertaken, there is potential that fill material which has been imported for use during this construction could have contained potential contaminants. However the likelihood that large volumes of fill was imported to the site from outside of the Cahill Expressway road construction area is considered to be low. The source of fill associated with the construction of older roads such as the Art Gallery Road is less certain and is considered a moderate risk.	Heavy metals, TRH, PAH, asbestos, BTEXN, OCP and PCB
Hazardous building materials	Weathering of hazardous building materials such as lead paint and fibre cement containing asbestos from former site structures Uncontrolled demolition of former site structures that may have contained hazardous materials	Near surface soils in the vicinity of former site structures *Soil media potentially affected.*	Low to moderate likelihood of soil contamination based on historical information review, observations made during site visits and previous soil sampling. The proposed redevelopment of the site has little restriction to soil access and may result in an increased potential for exposure during construction. It is difficult to determine from a review of aerial photographs whether former site structures have been demolished which could have potentially impacted surface soils. Coffey understand that hazardous materials surveys are being undertaken to assess the presence, location and condition of hazardous materials which may require management or removal. If hazardous materials are identified on the exterior of existing site building or structures then assessment of the likelihood of contamination of surrounding soils should be undertaken. Proposed removal of hazardous building materials (if any) will need to be undertaken in accordance with relevant codes of practice and standards to limit the possibility of contamination to surface soils.	Heavy metals (including copper, zinc and lead) and asbestos
Presence of fuel bunkers	Seepage of oil from bunker through joints in walls and floor	Near surface soils in the vicinity of former site structures, namely soils beneath the footpath of Lincoln Crescent. Groundwater beneath Lincoln Crescent, downgradient from the bunker. *Soil media potentially affected.*	Moderate likelihood of soil and groundwater contamination. The proposed redevelopment of the site has little restriction to soil access and may result in an increased potential for exposure during construction. Groundwater was assessed in previous investigations to be present at the bunker/sandstone rock interface to approximately two metres below the level of Lincoln Crescent. The risk of exposure to contaminated soil and/or groundwater in the vicinity of the former fuel bunkers will be limited after completion of construction works (based on the current design). However, contaminated soils and/or groundwater may potentially be encountered in the vicinity of the fuel bunkers and offsite (between Lincoln Crescent and Woolloomooloo Bay) during construction works.	TRH, PAH

Potentially Contaminating Activity/Source	Sub Component / Description	Potential Areas of Environmental Concern	Likelihood of Contamination*	Potential Chemicals of Concern
	Elevated concentrations of contaminants in ambient air within fuel bunkers	Ambient air within fuel bunkers	Moderate likelihood due to potential for residual oil impregnated within bunkers but limited volatility of bunker oil.	TRH, BTEXN
Former Naval electrical substation	Potential leakage or spillage of oils from electrical equipment	Near surface soils in vicinity of former Naval electrical substation (adjacent to north of pump room)	Low likelihood based on presence of a concrete floor within the former electrical substation and likely limited volume of oil storage.	TRH, PCBs

Notes:

* *It is important to note that this is not an assessment of financial risk associated with the AEC in the event contamination is detected, but a qualitative assessment of the probability of contamination being detected at the potential AEC, based on the site history study and field observations.*

TRH = Total Recoverable Hydrocarbons; BTEXN = Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene; PAH = Polycyclic Aromatic Hydrocarbons; Heavy Metals = arsenic, cadmium, chromium, copper, lead, nickel, mercury, zinc; OCP = Organochlorine Pesticides;
OPP = Organophosphorus Pesticides; VHC = Volatile Halogenated Compounds, PCBs = Polychlorinated Biphenyl.

6.5. Results of contamination investigations

6.5.1. Summary of investigation works

A preliminary environmental investigation was included with the geotechnical investigation undertaken by Coffey between the 8 and 24 April 2014 (ref Coffey, 2014b). Soil was sampled for chemical analysis at six geotechnical borehole locations (BH1, BH2, and BH4 to BH7) located across three areas of the site (adjacent to the current art gallery and to the north and south of the fuel bunkers). Further soil assessment comprising the boring of six hand augers was undertaken on 29 April 2016 to delineate soil contamination identified in BH2 and BH4 (bored in in 2014) and to investigate the presence of a suspected concrete slab encountered during drilling of BH2 (2014[1]). This additional work was reported in Coffey (2016b).

The aim of the soil sampling was to screen soils for COPCs identified in areas where future sub-surface works are proposed and to delineate the previously identified contamination. Validation sampling and analysis is proposed as part of future site works to confirm no unacceptable contamination in other areas of the site, as outlined in Section 10.3.1.

The aim of the ambient air sampling was to assess concentrations (if any) of volatile petroleum hydrocarbon contamination in air space inside the former fuel bunkers.

6.5.2. Investigation results

Soils

With reference to the health investigation levels (Table 9), ecological investigation levels and management limits (Table 10) the following is noted:

- Concentrations of COPC were reported either below the adopted HILs and HSLs or below the LOR for the majority of primary samples collected except:
  - BH2 (2014; 0.5m and 1.0m), BH4 (1.0m) and HA05 (1.0m) where Carcinogenic PAH concentrations (expressed as benzo(a)pyrene TEQ) were above the HIL for public open space;
  - BH4 (1.0m) where total PAH concentration was also above the HILs for public open space
- TRH C_{16} – C_{34} concentration was above the Management Limit in BH4 (1.0m).
- TRH C_{16} – C_{34} concentrations were above the open space EIL in BH4 (1.0m) and BH06 (0.5m) as well as benzo(a)pyrene (BaP) in BH2 (2014; 0.5m and 1.0m), BH02 (2016; 0.5m), BH4 (1.0m) and HA05 (0.5m and 1.0m)
- No asbestos was detected in the fill samples collected from the 2014 boreholes and no suspected asbestos containing material was observed in the 2016 hand auger bores.

Borehole locations are shown on Figure 4, Appendix B.

BH2 and BH4 were adjacent to Art Gallery Road and upslope of the former fuel bunkers. Drilling at BH2 terminated on concrete and a very strong hydrocarbon odour was observed in soil removed from 1m to 1.5m below the surface. The borehole log for BH2 notes the presence of concrete, which may

[1] One of the hand auger locations bored in 2016 was named BH02. The reference '2014' or '2016' has been appended to this assessment location name, where relevant, to indicate whether the referenced location was completed in 2014 or 2016.

have been associated with an underground service or concrete structure. The depth of fill at BH04 was 1.25m and a strong hydrocarbon odour was observed in the fill from 1m to 1.25m, immediately above sandstone bedrock.

The 2016 hand auger delineation did not intersect a concrete slab / structure or hydrocarbon odours in the locations, including BH02 which was bored in the vicinity of the BH2 (2014) location. Each hand auger boring terminated on sandstone. A Ground Penetrating Radar (GPR) survey, undertaken during service clearance activities prior to boring of the hand augers, also found no evidence of an underground slab or similar structure.

Concentrations of PAHs and TRH in the delineation hand auger bores, including BH02 (2016), were generally low. Coffey considered that the elevated concentrations of PAHs and / or TRH at BH2 (2014), BH4 and HA5 are associated with the presence of coal or bitumen within the sampled soils because:

- With the exception of HA5, coal or bitumen like materials were observed in samples from these locations, either by Coffey during the fieldworks, or by the laboratory during asbestos analysis;
- The ratio of high molecular weight PAHs relative to the total PAH concentrations is relatively high (typically 8-12% for benzo(a)pyrene). This suggests that the PAHs are associated with a source that has been subject to heating or combustion, such as coal or bitumen;
- Volatile compounds were not recorded in headspace screening of these samples.

Table 1A(1) Schedule B1 of the ASC NEPM (NEPC, 2013) (health investigation levels for soil contaminants) indicates that “where the B(a)P occurs in bitumen fragments it is relatively immobile and does not represent a significant health risk”. This comment also applies to other high molecular weight PAH compounds and immobile PAHs also do not present a significant ecological risk due to their limited bioavailability. The recorded TRH concentrations (and observed hydrocarbon odour) are also likely to be immobile and associated with bitumen or coal within the soils.

Coffey concluded that whilst concentrations of TRH and PAH were reported above the adopted criteria at several locations, these occurrences are likely to be associated with the presence of bitumen or coal material within fill and are immobile in nature. The recorded concentrations of TRH and PAHs therefore do not present an unacceptable health risk to future users of the site, construction workers or ecological receptors. However, localised remediation was warranted in the vicinity of BH2 and BH4 to remove fill material where strong hydrocarbon odours were observed and coal and / or bitumen impacts were recorded.

Air sampling with the fuel bunker

The laboratory results for air samples collected within the former fuel bunker indicated concentrations of BTEX, naphthalene, TRH C_6-C_{10} and TRH >C_{10}-C_{16} were well below the limit of reporting and below the HSL for commercial use.

Groundwater

Groundwater monitoring events (GMEs) were undertaken by Coffey in 2014 and 2016. The GMEs included sampling of the two existing groundwater monitoring wells (MW1 and MW2) adjacent to and downgradient of the former fuel bunkers (refer to Figure 4, Appendix B for locations) as well as sampling of water from the pump room sump at the northern end of the former fuel bunker. The results are reported in Coffey (2014c and 2016a).

The results of these GMEs indicated that residual oil from the bunker fuel tanks had impacted groundwater to the south / southwest. Residual oil droplets / oil smearing was observed in well MW2 during both GMEs but was not indicative of the presence of separate phase hydrocarbons (oil) which may be migrating from the site.

Given that TRH concentrations reported in MW2 were considered to be indicative of emulsified oil rather than dissolved phase hydrocarbons, and the distance to the receiving water body, it was considered unlikely that the hydrocarbon impact detected during the GMEs would cause material environmental impact to receiving waters in Woolloomooloo Bay.

6.5.3. Conclusions

The Revised Stage 1 PES identified the following potential sources of contamination at the site:

- Limited use of pesticides – low likelihood;
- Weathering of hazardous materials from current structures and uncontrolled demolition of site structures either currently or historically located on-site – low to moderate likelihood close to the art gallery building and the former fuel bunkers;
- Fill materials of unknown origin – moderate likelihood in localised areas associated with older road construction and art gallery expansions.
- Former fuel bunkers – whilst the site Audit report undertaken by AGC Woodward-Clyde (1999) confirmed the fuel bunker site is suitable for commercial/industrial use, the Audit was conditional and required:
    - Ongoing groundwater monitoring, of which Coffey could find no information. Coffey has undertaken two groundwater monitoring events, one in 2014 and one in 2016. Although residual oil droplets / oil smearing was noted in one well (MW2) during both events, the concentrations were not indicative of the presence of separate phase hydrocarbons (oil) which may be migrating from the site.
    - Consideration of minor oil seeps that may occur from joints and bolt holes and potential odours from residual oil impregnated within the fuel bunker structure. Assessment of odours was undertaken by Hibbs (2016) and risks associated with odours within the fuel bunkers from residual oil was considered to be low. Air conditioning and ventilation of the proposed Sydney Modern buildings would further reduce the likelihood of odour issues. Assessment of potential minor oil seeps will be assessed further once access to the interior of the fuel bunkers is available.

    The potential for residual petroleum hydrocarbon vapours within the fuel bunkers was subsequently identified and assessed by Coffey.
- Former electrical substation to the north of the pump room - low likelihood of TRH and / or PCB contamination.
- An area of fill to the east of the Cahill Expressway and adjacent to Art Gallery Road (in the vicinity of BH2 and BH4 on Figure 4, Appendix B) contains elevated concentrations of PAHs likely associated with coal and / or bitumen and strong hydrocarbon odours were observed during boring of BH2 and BH4. Based on additional assessment and delineation works undertaken, the area of impact appears to be localised. Based on the results and subject to leachate testing as part of future waste classification works, soils in this area would likely classify as General Solid Waste. Visual observation of soil in the vicinity of BH2 and BH4 is also required during excavation works to confirm that the source of B(a)P is likely to be attributed to asphalt waste.

With the exception of the potential sources of contamination noted above, the desktop study did not identify significant AECs or sources of contamination that would present a material constraint to the proposed works, with respect to contamination. However, additional assessment and validation sampling was proposed to confirm the absence of unacceptable contamination in other areas of the site. The requirements are outlined in Section 10.3.1 of this RAP.

Coffey considered that the site can be made suitable for the proposed public open space and commercial land use from a contamination perspective, subject to implementation of this RAP.

6.6. Conceptual site model

With reference to Coffey's previous assessments, a Conceptual Site Model (CSM) has been prepared. The CSM is discussed in the sections below, and is also presented on Figure 5, Appendix B.

6.6.1. Potentially affected media, receptors and transport mechanisms

Table 5 summarises the potentially affected media, key potential receptors to contamination and transport mechanisms.

Table 5: Summary of potentially affected media, key receptors and transport mechanisms

Consideration	Information
Potentially Affected Media	Soil Groundwater Surface water in Woolloomooloo Bay
Potential Transport Mechanisms & Exposure Pathways	Direct dermal contact with contaminated soil, surface water and/or groundwater Ingestion of contaminated soil, surface water and/or groundwater Vapour/volatiles inhalation Inhalation and direct contact with hazardous materials (e.g. asbestos)
Potential Receptors of Contamination	***Site users and construction/maintenance workers*** Potential exposure via vapour inhalation in indoor air Potential exposure via dermal contact with soil, surface water or groundwater and ingestion of soil, surface water or groundwater. Potential exposure via inhalation and direct contact with hazardous materials ***Surface Water ecosystems – Woolloomooloo Bay*** Potential contamination could reach Woolloomooloo Bay via the stormwater drains on the site or by contaminated groundwater seepage into Woolloomooloo Bay. Given that contaminated groundwater may be present beneath the site, and Woolloomooloo Bay is adjacent to the site, this is considered to be a potentially complete pathway.

6.6.2. Potential and complete exposure pathways

Table 6 summarises the identified key potential exposure pathways.

Table 6: Key potential exposure pathways

Receptor	Exposure Pathway	Comment
Site Users and Construction/ Maintenance Workers	Potentially Complete	Site users and workers may be exposed to potentially contaminated soil, surface water and groundwater. Potential for point source top down contamination due to historical activities being performed on the site, and the possible presence of deeper contamination due to fuel storage formerly occurring on the site, means a potentially complete exposure pathway exists.
Surface Water Ecosystems	Potentially complete	Given the proximity of the site to Woolloomooloo Bay, the nature of contamination previously identified and the potential for contaminated groundwater to be present beneath the site, a potentially complete exposure pathway exists.

6.7. Areas requiring remediation/management

Based on currently available information, one remediation area has been identified and is shown on Figure 4, Appendix B. One additional area of potential contamination has also been identified, and delineation sampling is recommended. However, there is the potential for other (likely localised) areas of contamination to be present on the site. Validation of these areas of the site not previously assessed is outlined in Section 10.3.1.

7. Remediation plan

7.1. Remediation goal

The goal of remediation is to manage identified and discovered contamination so that the site is suitable for the proposed project (comprising both open space and commercial land uses), in accordance with planning guidelines and guidelines endorsed by NSW EPA.

7.2. Remediation options

7.2.1. Remediation hierarchy

Section 6(16) of Schedules A and B of the ASC NEPM (2013) provides a preferred hierarchy of options for site clean-up and/or management, which is based on that originally developed in ANZECC and NHMRC (1992). The hierarchy is outlined as follows:

- Onsite treatment of the contamination so that is it destroyed and the associated risk is reduced to an acceptable level;
- Offsite treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which the soil is returned to the site.

If the above is not practicable:

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

Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy can be considered.

Coffey notes that fill material beneath the majority of the Expansion Area will be removed to allow construction new buildings. There is therefore limited opportunity for treatment and reuse.

7.2.2. Preferred remediation option

Based on the type of contamination and the proposed project (which includes subsurface building space), excavation and offsite disposal of impacted soil has been selected as the preferred remediation option because:

- Areas on site potentially available for soil treatment activity have restrictions on surface loading related to the structural capacity of the existing EDM land bridge; and
- The bulk of the fill material on the site requires removal to accommodate proposed buildings and infrastructure, and there is limited opportunity for reuse onsite. Onsite or offsite treatment followed by reuse on site is therefore not practicable.

This method involves the excavation of identified areas of contaminated material requiring remediation and disposal of the excavated material offsite to an appropriate landfill licensed by NSW EPA to receive the contaminated material. Prior to offsite disposal, excavated contaminated soil requires waste classification where the results of samples collected from the material are compared to the NSW EPA (2014a) Waste Classification Guidelines.

If site levels need to be restored following excavation of contaminated soil, suitable fill which has been adequately validated (e.g. Virgin Excavated Natural Material (VENM); refer to Section 10.3.1) may be used. This would preferably be sourced from onsite excavations.

8. Remediation activities

The proposed sequence for remediation activities is as follows:

1. Prepare planning documents;
2. Notifications to regulatory authorities and receipt of appropriate permits (if any);
3. Site establishment;
4. Remediation and management of contaminated areas;
5. Backfilling of remedial excavation (if required);
6. Waste classification and offsite disposal of excavated material;
7. Managing unexpected occurrences; and
8. Preparation of a validation report.

These are discussed further in the subsections below and in Section 10.

8.1. Planning consent

SSD6471 for the SMG was granted conditional planning consent by the Minister on 20 November 2018. Coffey confirms that consent conditions contemplate implementation of this RAP, amongst other activities.

8.2. Notifications to regulatory authorities

The following sections describe relevant notifications under NSW regulations.

8.2.1. Notification to SafeWork NSW

At this stage, notification is not warranted. Notification may be required if asbestos containing materials are identified during site works.

8.2.2. Notification to NSW EPA

At this stage, notification is not warranted because the nature and extent of identified contamination does not trigger notification required under Section 60 of the NSW *Contaminated Land Management Act 1997*.

8.2.3. Transportation of waste

The receiving waste facility will be confirmed by RCC. RCC should note the following with respect to soil and liquid waste generated (as relevant) as part of site remediation:

- The waste generator has responsibility for the waste generated and its disposal to an appropriately licensed facility.
- The waste should be transported and disposed in accordance with the requirements of Protection of the Environment Operations (Waste) Regulation 2014 (the Waste Regulation).
- The waste must be disposed to an appropriately licenced waste facility and prior approval to receive nominated waste should be obtained from this facility. Depending on the facility, up to 7 days should be allowed for this approval process.
- Soil (excluding VENM) and water requiring offsite disposal will be transported and recycled / disposed to either a licensed soil recyclers / landfill or to a licensed liquid waste treatment facility. Material leaving the site will be tracked and documented and a copy of waste receipts from the receiving facility will be provided to the environmental consultant.
- Waste leaving the site that is classified as “restricted solid waste” will need to be transported by an appropriately licensed contractor in accordance the Waste Regulations.
- Waste classified as “hazardous waste” has additional regulations that apply to generating, storing, transporting, treating and disposing of hazardous wastes.
- Additional protocols are required if asbestos waste is identified. Asbestos waste has not been identified by Coffey’s investigations and disposal of asbestos is outside the planned activity for this RAP.

8.3. Site establishment

RCC will erect and maintain safety fencing around the construction site. Additional fencing may be required to designate the remediation area, particularly if construction works will be undertaken concurrently with remediation. The purpose of fencing is to restrict access by unauthorised personnel and minimise inadvertent direct exposure of construction workers and visitors.

The Remediation Contractor will provide staff amenities for remediation workers, especially for decontamination activity.

The Principal Contractor will approve locations for:

- Remediation contractor's staff amenities facilities;
- Temporary stockpiling areas along with sediment and erosion control structures;
- Equipment and truck decontamination areas (i.e. wash down bays); and
- Truck load out areas relative to excavation activity.

Sediment and erosion controls will be set up downslope of the remedial works and stockpiles. These controls are further discussed in Section 11.7.

8.4. Remediation and management of contamination

8.4.1. General

Excavation works must be programmed in such a way to lower the potential for contamination of soils in other areas of the site or cross-contamination of remediated areas. The relatively small size of the remediation area compared to the SMG site reduces the risk of inadvertent spread of contaminated soil.

The following key principals should be adopted for remediation earthworks:

- Temporary fencing can be used to cordon off areas of the site (or create exclusion zones) so that specific work practices involving handling of contaminated soils remain in designated areas. Hold points should be incorporated into the staging to validate areas prior to removal of fencing;
- A designated loading zone may be established that can be validated, and if necessary remediated, at conclusion of remediation.

Adequate safety protection should be provided around the perimeter of excavations that are left open such as temporary fencing or barriers, to reduce the risk of an excavation hazard.

8.4.2. Removal of PAH impacts and odorous fill around BH2 and BH4

Available information indicates that the extent of the odorous contaminated soils is estimated to be 12m by 25m in area and is estimated to extend to the top of sandstone, which varies between 1.1m and 2.2m bgs. This area is shown on Figure 4, Appendix B and is approximate only[2]. However, it is noted that HA01 and BH02 were bored within this area in 2016 and there was no indication of the strong hydrocarbon odours observed in 2014. It is therefore considered that the odorous soils may therefore be present in discrete pockets.

Based on previous results, excavation in the remediation area should occur first and in two stages due to concentrations of PAH (benzo(a)pyrene) in soils below 0.5m bgs exceeding the SCC2 Restricted Solid Waste criteria in NSW EPA (2014a) and further visual assessment and leachability testing being required. These two stages comprise:

- Excavation of soils down to approximately 0.5m bgs within the remediation area and stockpiling of those soils; and

[2] The extent of contamination will be confirmed during remediation and may extend to a larger area.

- Excavation of soils between approximately 0.5m bgs and natural soils or bedrock (whichever occurs first) within the remediation area, with inspection for the presence of asphalt waste or other potential sources of PAHs and stockpiling separately.

A third stage of works may then be undertaken which involves removal of remaining fill from the surrounding area that emits strong hydrocarbon odours or other evidence of contamination.

Although the recorded concentration of benzo(a)pyrene in BH2 and BH4 are above the SCC2 criteria, these soils would classify as General Solid Waste (rather than Hazardous Waste), provided the source of the PAHs is confirmed to be asphalt waste[3]. Coffey (2014b) indicated that this was likely to be the case due to former roads which used to intersect this area, the presence of Art Gallery Road adjacent to the west and bitumen or bitumen-like material being observed in soils samples from boreholes including BH2 and BH4. However, this should be reconfirmed during remediation and supported by testing to confirm that the B(a)P is not leachable (thereby providing an additional line of evidence to support the presence of asphalt waste).

An experienced environmental consultant will be present on site to guide the excavation in the remediation area. Field screening will be carried out with a PID by the environmental consultant, although it is noted that PID readings were low during previous site assessment works. The extent of excavation may be adjusted during excavation and validation soil sampling based on evidence of contamination such as layers of soil containing bitumen materials / asphalt waste or other visual or olfactory evidence of contamination.

Adequate removal of contaminated soils will primarily be validated through visual and olfactory assessment to:

- Confirm the soils containing strong hydrocarbon odours have been adequately removed or do not present an unacceptable aesthetic issue to the proposed site use; and
- Confirm that remaining soils do not contain significant quantities of materials such as asphalt or other waste materials that may present an aesthetic issue.

Validation sampling will also be carried out to confirm that soils left in place or stockpiled for possible reuse on site are acceptable with respect to contamination. This is further discussed in Sections 10.3.2 and 10.3.3.

Hold point: The resulting remediation excavation will be left open until the environmental consultant has received validation results and has confirmed that the contaminated soils have been adequately removed. Once adequate removal of the contaminated material is confirmed, excavation works can resume in the area.

If the source of the benzo(a)pyrene is not found to be associated with asphalt waste, then soils in the vicinity of BH2 and BH4 may be classed as Hazardous Waste unless another applicable Resource Recovery Exemption applies or a site-specific Resource Recovery Exemption is obtained from NSW EPA.

Hazardous Waste requires pre-treatment prior to disposal and immobilisation / onsite treatment options would be developed in accordance with NSW EPA (2014b) Waste Classification Guidelines: Part 2: Immobilisation of Waste.

[3] NSW EPA (2014a) indicates that asphalt waste (including asphalt resulting from road construction and waterproofing works) is pre-classified as General Solid Waste.

8.4.3. Re-sampling and delineation sampling around BH3

The borehole log provided for BH3 in Coffey (2014a) indicates that hydrocarbon odours were observed in sandy fill at approximately 1m depth. Coffey identified no coal-like gravel in BH3, as observed in BH2 and BH4.

While environmental soil samples were collected from BH3, these were not scheduled for analysis. Therefore, isolated soil contamination may be present around BH3. Coffey suggests addition to the remediation works of:

- Re-sampling of BH3; and
- Delineation sampling at approximately 2m to 5m distance around BH3.

The proposed sampling locations are shown on Figure 4, Appendix B.

Each sample location should be drilled (as a borehole) or excavated (as a test pit) to approximately 2m depth or prior refusal on sandstone. Soil samples should be collected from each borehole or test pit, at approximately 0.5m to 1m depth intervals. Sampling should be carried out by an experienced environmental consultant, who should log each borehole / test pit. Headspace screening of the soil samples for volatile compounds should be carried out by the environmental consultant, and evidence of hydrocarbon odours (or other potential contamination) should be noted on the logs.

The borehole / test pit samples should be analysed for (as a minimum):

- Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Total Recoverable Hydrocarbons (TRH);
- Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene (BTEXN); and
- Polycyclic Aromatic Hydrocarbons (PAH).

The results of the laboratory testing should be compared to the validation criteria provided in Section 10.4 of this RAP.

If laboratory results indicate contaminated soils in the vicinity of BH3, then these will need to be excavated, waste classified and disposed offsite. Related excavation and sampling works should be directed by the environmental consultant, in general accordance with the methodologies outlined in this RAP.

8.4.4. Remediation of other areas

Based on existing information, remediation of other areas of the site is not warranted. However, as outlined in Section 10.3.1, validation will be used to confirm no unacceptable contamination in other areas of the site. Contaminated soils and / or rock may be encountered during site preparation works such as in the vicinity of the former fuel bunkers because of the historical use of that area for fuel oil storage.

If contaminated soils are identified during earthworks or validation, then unacceptable contamination will need to be excavated, waste classified and disposed offsite. Related excavation and sampling works should be directed by the environmental consultant, in general accordance with the methodologies outlined in this RAP.

Contaminated materials identified during site preparation or development works should be managed in accordance with the unexpected find procedure presented in Appendix A.

8.4.5. Segregation and stockpiling

Coffey understands that surplus materials will be generated to accommodate the proposed project. This may include removal of soil/fill within building footprints down to sandstone bedrock or concrete. Excavated materials are likely to require offsite disposal. It is important to keep non-impacted materials separated from contaminated soils.

Non-impacted fill soils (confirmed through characterisation) can be either reused onsite or potentially disposed offsite as General Solid Waste (Refer to Section 8.5.1). Where the fill comprises uncontaminated natural soils (i.e. there is no visual or olfactory evidence of contamination or inclusion or man-made materials such as brick, concrete, bitumen etc.), there may be opportunity to assess if the material meets the Resource Recovery Exemption – Excavated Natural Material (ENM) Exemption 2014. This can allow the material to be re-used offsite as construction fill.

The underlying natural soil and rock at this site may satisfy the definition of Virgin Excavated Natural Material (VENM) provided it is not contaminated. This can be assessed by the environmental consultant following remediation and removal of fill soils. Once natural soil and rock is assessed as VENM, it must be kept separate from other material that may be stockpiled onsite. Inadvertent mixing of material types will void VENM certificates issued for that material.

Refer to Section 8.5 for waste classification details. Validation procedures for potential re-use onsite are discussed in Section 10.3.

8.5. Waste classification and offsite disposal of soil

8.5.1. Preliminary waste classification

If the soils classify as General Solid Waste and are considered unsuitable for reuse onsite, these soils will be disposed directly offsite to an appropriately licensed landfill which will accept the waste. If the soils classify as Restricted Solid Waste or Hazardous Waste, alternative disposal or treatment options will be considered. Alternatively, soils may be transferred to an appropriately licensed soil recycling facility, provided contaminant concentrations are below the acceptance criteria for the receiving facility.

A preliminary assessment of the waste classification was carried out as part of Revised Stage 1 Preliminary Environmental Study (Coffey, 2014b) with reference to NSW EPA (2014) Waste Classification Guidelines – Part 1 Classifying Waste. A summary of preliminary waste classification results is provided in Table 7.

Table 7: Preliminary waste classification results

Borehole Location	General Solid Waste (non-putrescible)	Restricted Solid Waste	Hazardous Waste
BH1	✓	-	-
BH2 (2014)	✓[1]	-	✓[1]
BH4	✓[1]	-	✓[1]
BH5	✓	-	-
BH6	✓[1,2]	✓[1,2]	-
BH7	✓[1,2]	✓[1,2]	-
HA1	✓[1,2]	✓[1,2]	-
HA2	✓	-	-
HA3	✓	-	-
HA4	✓	-	-
HA5	✓[1,2]	✓[1,2]	-
BH02 (2016)	✓[1,2]	✓[1,2]	-

Notes
1. Further assessment is required during excavation to confirm that the source of the elevated benzo(a)pyrene is from 'asphalt waste' which is pre-classified as General Solid Waste. If the source is not associated with asphalt waste then the soil may classify as Restricted Solid Waste (BH6 and BH7) and Hazardous Waste (BH2 and BH3) unless a Resource Recovery Exemption applies.
2. Leachate testing data is also required to assess whether concentrations of lead are below the TCLP1 criteria in NSW EPA (2014).

Leachability testing using the Toxicity Characteristic Leaching Procedure (TCLP) could be carried out to assist in refining the waste classification for BH02 and BH05. Assuming favourable TCLP results, the Restricted Solid Waste and Hazardous Waste classifications assessed at BH02 and BH05 could be re-assessed and could classify as General Solid Waste (non-putrescible).

8.5.2. Additional waste classification

The waste classification of materials will be assessed, prior to offsite disposal, in general accordance with the NSW EPA (2014a) Waste Classification Guidelines: Part 1: Classifying Waste. The waste classification process will involve either:

- Collecting representative samples from stockpiled soils:
  - The frequency of sampling is largely dependent on volumes and heterogeneity. For small volumes (<250m^3) samples will be collected at a rate of 1 sample per 25m^3, with a minimum of three samples per stockpile. For larger volumes (>250m^3 to 2,500m^3) and assuming low heterogeneity, a minimum of 10 samples will be collected to statistically assess the stockpile. The environmental consultant will need to assess the sampling frequency based on the volume and heterogeneity of the material, including whether there is visual or olfactory evidence of contamination within the material.

Or

- In situ waste classification:
  - Can be undertaken prior to remediation activities allowing excavated material to be loaded directly into waiting trucks and reducing double handling costs. This can also be undertaken concurrently with site validation sampling (refer to Section 10.3.1). The environmental consultant will select the sampling frequency based on estimated volume of soil to be excavated. The sampling frequency should be consistent with or greater than the proposed sampling frequency for ex-situ waste classification, as outlined above. Samples will also be collected from natural soil for VENM assessment.
  - Visual assessment of exposed bedrock will be undertaken for VENM assessment where the surface cannot be sampled due to the absence of weathered rock.
- Each sample will be screened with a photoionisation detector (PID).
- Laboratory analysis will include:
  - TRH, BTEXN, PAH and heavy metals;
  - Leachability testing using the TCLP for heavy metals and PAH to further assess waste classification, where required.
  - Additional analytes may be required if visual or olfactory evidence of other contaminants or potentially contaminating activities is observed.

Samples will be selected for asbestos analysis if evidence such as building rubble or Asbestos Containing Material (ACM) suggests that fill may be asbestos impacted. Shallow soil samples will also be collected in the vicinity of existing buildings and infrastructure and analysed for asbestos and / or lead if hazardous materials surveys indicate that asbestos or lead paint is present on the exterior of the buildings and infrastructure and is in poor condition.

NSW EPA also requires existing laboratory data to be considered as part of waste classification assessment. Therefore, laboratory results from the Stage 1 Preliminary Environmental Study (Coffey, 2016b) will also be used to supplement new data to assess waste classification of excavated materials.

8.5.3. Resource recovery exemptions

Resource Recovery Exemptions are offered by the NSW EPA for certain fill materials. The Resource Recovery Exemption most appropriate for fill on-site is the Excavated Natural Material (ENM) Order 2014. Fill material potentially classifying as ENM must be assessed against the conditions outlined in the ENM Order 2014. A copy has been included in Appendix C. In summary the conditions include:

- Developing a specific sampling and analysis plan.
- Discrete and composite sampling of stockpiled material and the specified rate.
- Laboratory testing each sample for heavy metals, electrical conductivity, pH, TRH, BTEXN, PAH, asbestos and foreign materials.
- Comparing laboratory results against listed ENM soil assessment criteria.
- If fill material meets assessment criteria then it can be re-used on another site as construction fill.

8.6. Backfilling of remedial excavations

The requirement for backfilling remedial excavation will depend on the final design of the proposed project. If backfilling is required, either validated imported materials or materials won from other areas of the site can be used, with the latter being preferred. This material will be assessed suitable for use on the site from a contamination and geotechnical perspective, prior to use. Validation of imported material, from a contamination perspective, is further discussed in Section 10.3.3.

Water accumulated within the excavation will be disposed offsite by a licensed liquid waste contractor or reused onsite (e.g. for dust suppression) provided it is suitable for that purpose. Confirmation on the suitability of reuse of water onsite should be obtained from the environmental consultant prior to reuse. Should the volume of water be excessive, consideration will be given to disposal of the water into the sewerage system via a trade waste approval or stormwater system with Council approval.

8.7. Material tracking, documentation and reporting

Copies of material tracking sheets, waste disposal dockets and imported VENM tracking sheets and VENM certificates (if required) shall be kept by the Principal Contractor and be provided to the environmental consultant to be included in the Validation Report.

8.7.1. Disposal

Cradle to the grave material tracking, documentation and reporting applies for materials entering, leaving or being moved around onsite. Uncontrolled movement or spreading of residual contaminated soils to other parts of the site could impair the suitability of the site for the proposed use.

Stockpile material tracking should include stockpile identification, location of placement, approximate dimensions, volume, source location, contamination status and results, treatment undertaken, validation of stockpile footprint (if required) and final destination of stockpile (onsite or offsite). Material tracking information for material moved within the site will need to be provided to the environmental consultant for inclusion in the Validation Report.

Material requiring offsite disposal shall be tracked and the following information shall also be recorded and provided to the environmental consultant:

- Truck and/or bin registration number, date and time of departure;
- Origin of material;
- Material type;
- Approximate volume;
- Waste disposal docket; and
- Relevant waste classification document.

Asbestos waste requires additional tracking and documentation. Although not needed at present, the following applies to asbestos or asbestos containing material:

- The Protection of the Environment Operations (POEO) (Waste) Regulation 2014 requires tracking of loads of asbestos greater than 100 kilograms, or 10 square metres within NSW.
- The POEO (Waste) Regulation 2014 requires the transport of asbestos in NSW to be recorded from the place of generation to its final destination using the NSW EPA's new online "WasteLocate" system.

8.7.2. Importation of fill

Fill material being imported to the site, including soil-like materials for landscaping, shall be tracked and the following information shall be recorded and provided to the environmental consultant:

- Truck and/or bin registration number, date and time of entry
- Origin of material
- Material type
- Approximate volume
- VENM certificate, ENM Report or material specification
- Proposed use onsite
- Observations of material and confirmation it matches approved material.

8.8. Contingency plan

The following contingency plans have been considered:

- If unacceptable levels of contamination are identified by the environmental consultant within remediation excavations, the Principal Contractor will be provided options and estimated time and cost for further assessment, excavation and/or management for approval to extend planned remediation works.
- If excavated materials have a higher classification than general solid waste managed as asbestos waste, alternative management strategies or onsite treatment could be considered.

An addendum to this RAP would be provided should an unexpected occurrence take place resulting in remediation objectives not being able to be met. Addenda to the RAP should be provided to the site auditor for review.

8.9. Managing unexpected finds

An unexpected find can be broadly defined as:

- Encountering ‘suspicious’ material such as (but not limited to) oily materials or materials with unusual odours, drums, metal or plastic chemical containers, buried solid waste, ash, slag, coke, bitumen or brightly coloured material, etc.

An unexpected finds procedure has been developed to manage such occurrences and is included in Appendix A.

9. Quality control plan

The quality assurance/quality control plan described in the following subsections is designed to achieve the site-specific Data Quality Objectives (DQOs) that will demonstrate accuracy, precision, comparability, representativeness and completeness of the data generated and the procedures for assessing the DQOs are met.

9.1. Soil sampling methodology

Sample collection will be undertaken with the assistance of an excavator or as a manual grab sample directly from the excavation. Where an excavator is used, samples will be collected as manual grab samples from the centre of the excavator bucket to avoid potential cross-contamination. A new pair of disposable nitrile gloves will be used for handling each sample.

Soil samples from the stockpiles will be collected by hand at least 0.3m below the surface of the stockpile to obtain a representative sample. A new pair of disposable nitrile gloves will be used for handling each sample. If stockpiles are large then it may be necessary to excavate trenches into the stockpile, using an excavator, in order to observe materials and collect representative samples from the middle of the stockpile.

Soil samples will be placed in clean, laboratory prepared and supplied 250mL glass jars, which will be filled to minimise headspace and immediately sealed with Teflon lined caps to reduce the loss of volatiles. Sample containers will be then labelled and placed directly into cooler boxes containing ice for temporary storage and then later transport to the laboratory. Asbestos samples (if required) will be placed in plastic zip-lock bags and labelled. Samples will be then placed into a chilled esky for transport to a NATA accredited laboratory under chain of custody control.

A portion of each soil sample will be placed inside a sealed plastic bag for field headspace screening for volatile organic compounds (VOCs). Samples will be screened using a PID which will be calibrated using 100ppm isobutylene calibration gas prior to use.

9.2. Field quality control procedures

Field quality control for sampling will include:

- Sampling will be performed in general accordance with procedures listed in Schedule B2 of the ASC NEPM and relevant Australian standards for environmental sampling;
- Where non-disposable sampling equipment is used (e.g. a trowel), it will be decontaminated with Decon-90 and rinsed with deionised water between sampling locations.
- Using appropriate sample preservation methods as recommended by the laboratory;
- Duplicate samples will be collected at a frequency of 5% blind duplicates (of number of primary samples) and 5% split duplicates, and assessed by calculating the Relative Percentage Differences (RPDs) between primary and duplicate results using a control limit of:
  - When the result is less than 10 times the laboratory reporting limit then the control limit is nominally 50%, but will be reviewed for each RPD above 50%; and
  - When the result is greater than 10 times the laboratory reporting limit then the control limit is 50%.
- Where non-disposable sampling equipment is use, one rinsate sample will be collected per day of sampling or from each item of sampling equipment such as the stainless steel trowel. The rinsate sample results will be used to confirm effective decontamination; and
- Laboratory prepared trip spike and blank water samples will be transported into the field with the laboratory samples and despatched to the laboratory for analysis of volatile contaminants (if applicable). Trip spike and blank samples are used to indicate potential loss of and cross contamination of volatile contaminants during transport and sample preparation at the laboratory. Recovery of volatiles in trip spike samples should be between 60% and 110%.

9.3. Laboratory quality control and procedures for checking control data

NATA accredited laboratories will be used for laboratory analysis. The laboratory will implement a quality control plan conforming to the ASC NEPM Schedule B3 Guidelines for Analysis of Potentially Contaminated Soils.

The laboratory should analyse reagent blanks, spike samples, duplicate spikes, matrix spikes, and surrogates spikes and duplicates for quality control.

The Environmental consultant will assess laboratory quality control data by:

- Checking that the results reported are consistent with field observations;
- Checking that the reporting limits and procedures are satisfactory;
- Checking that the samples are analysed within holding times and that NATA accredited methods were used to determine the result;
- Checking that laboratory blanks/reagent blanks are less than the laboratory reporting limits;
- Checking the reproducibility of samples by calculating the RPDs between primary and duplicate laboratory samples using the laboratory control limit;
- Checking that laboratory spikes, surrogate spikes, matrix spikes and duplicate matrix spike recoveries (where reported) are within acceptable control limits; and
- Where data quality indicators are not met, the data and quality control measures will be reviewed to assess the likely cause of the incidence and influence this incidence may have on usability of data for its intended purpose.

10. Validation plan

10.1. General

The objective of the validation plan is to provide a program of work that is adequate to demonstrate that the remediation goals have been met.

10.2. Validation methodology

Validation soil sampling will be completed with reference to the following guidelines:

- Schedule B2 of the ASC NEPM.
- NSW EPA (1995) Sampling Design Guidelines.

The validation methodology uses a combination of field observations (appearance and odour) and headspace screening for volatile hydrocarbons to indicate effective removal of impacted soils. Samples will be collected from the walls and base of excavations to provide quantitative evidence for validation. Excavations and sampling locations will be measured and recorded on a figure presented in the final validation report. If results satisfy assessment criteria, then the excavation may be reinstated (if necessary).

The same validation methodology will be adopted for assessing excavated soils for re-use or for assessing the suitability of imported materials for use onsite.

Validation procedures, quality control and assessment criteria are described in the following sections.

10.3. Validation procedures

10.3.1. Site validation

General site validation requirements

Because the site has been assessed at a preliminary level, potential for other contamination yet to be identified cannot be precluded. Therefore, to satisfy the SEARs Key Issue 8 and the Site Audit process, the remaining areas of the site require validation. The following validation sampling and analysis is proposed for the site:

- Soils are proposed to be removed above the EDM Tunnel land bridge and above the former fuel bunkers. Validation of these areas will comprise visual inspection by the environmental consultant to confirm that soils have been adequately removed to the extent practicable, prior to construction and / or reinstatement with VENM or validated soils from other areas of the site. In the event that some unexcavated soils remain in these areas, then validation will be undertaken consistent with other areas of the site, as outlined below.
- The SMG area outside of the EDM Tunnel land bridge and former fuel bunker areas (where soils are to be removed) is approximately 1.05 Ha in area. Applying the NSW EPA (1995) Sampling Design Guidelines, a minimum of 22 sampling locations are required to assess an area of 1.1 Ha. Incorporating the existing 2014 sampling locations, a further 16 sample locations would be required to satisfy these guidelines. Sampling locations will be placed on an approximate 22m grid, which will detect a hotspot of approximately 13m radius with 95% confidence.
- Historical aerial photography (from 1943 via the Spatial Information Exchange) indicates that the proposed remediation area may have been disturbed by quarrying prior to fuel bunker construction. The disturbed area appears to extend from the proposed remediation area to the former fuel bunker area. Given the potential for contamination to exist in this area as “discrete pockets”, additional sample locations should be included in the validation programme for this area of the site. Sample locations in this area should be placed on an approximate 10m grid (assuming an area of approximately 800m^2, this equates to eight sampling locations).
- Depending on fill thickness and heterogeneity, one to two samples will be collected per location. As a general guide, for fill less than 1.5m in thickness, one sample will be collected and analysed; whilst deeper fill (i.e. greater than 1.5m in thickness), a minimum of two samples will be collected. If several fill units are encountered at a given location, additional samples will be collected and analysed to adequately characterise the material.
- Each sample will be screened for presence of volatile hydrocarbons using a PID.
- Laboratory analysis will include:
  - 75% of samples collected will be analysed for TRH, PAHs, BTEXN and heavy metals (at least one sample to be analysed per sampling location);
  - 50% of samples collected will also be additionally analysed for phenolic compounds, OCPs, OPPs and PCBs.
- Sampling is not required beneath proposed buildings unless soils will remain in-situ. If the buildings are founded on sandstone bedrock then visual assessment of exposed bedrock will be undertaken by the environmental consultant to confirm the absence of visual or olfactory evidence of contamination.

Samples will be selected for asbestos analysis should evidence such as building rubble or ACM suggest potential for asbestos impact of fill material. Shallow soil samples will also be collected in the vicinity of existing buildings and infrastructure and analysed for asbestos and / or lead if hazardous

materials surveys indicate that asbestos or lead paint is present and could be released to ground by weathering.

Should validation sampling identify additional areas of contamination, the nature and extent of contamination will be assessed, and where it is deemed necessary, the impacted area will be remediated. The remediation method is likely to be similar to that described in Section 8.4.2.

Former Naval electrical substation validation

Previous site assessment reports will be reviewed (if available) to assess the need for validation as part of the current program.

If there is insufficient data available for soils beneath this area of the site, then targeted validation sampling will be undertaken following demolition. This will comprise collection of at least two shallow soil samples beneath the floor slab of the former substation (within the upper 0.5m bgs) and analysis for TRH and PCBs.

Additional sampling to delineate the extent of impact may be required if there is visual or olfactory evidence of contamination.

Former fuel bunkers

Suitability of the former fuel bunkers for commercial / industrial was previously assessed and a site audit statement and site audit report was prepared by AGC Woodward-Clyde (1999) indicating that they were suitable for use from a contamination perspective (subject to groundwater monitoring and assessment of residual oil seepage). Assessment of volatile hydrocarbons in the air space within the fuel bunkers was undertaken and reported by Coffey (2016b).

AGC Woodward-Clyde (1999) noted that minor oil seeps may occur from joints and bolt holes and there is the potential for odours to be generated from residual oil impregnated within the fuel bunker structure. Residual odours were assessed by Hibbs (2016) and no chemical odours were identified during inspections into the north or south side of the former fuel bunker (circa April 2016). However, assessment of oil seepages is still to be undertaken once safe access inside the fuel bunkers is available.

Visual assessment of the interior of the tank should be undertaken to identify minor oil seeps from joints and bolt holes within the fuel bunkers which may present a localised aesthetic issue. If seeps are observed then appropriate management measures should be developed which may include routine cleaning of the seepage point and / or sealing of the seepage points.

Sampling and analysis of soils for waste classification is discussed in Section 8.5.

10.3.2. Validation of remedial excavations

Validation sampling and analysis of remedial excavation will be undertaken in general accordance with the Schedule B2 of the ASC NEPM and NSW EPA (1995) guidelines. The excavator or hand tools will be used for collection of soil validation samples from the walls and the base of the excavation, where appropriate.

Remediation around BH2 and BH4

The number of samples will depend on the final shape and size of the excavation. The following sampling and analysis plan is considered appropriate for validating this remedial excavation:

- 1 sample per 10m laterally along the walls. If the excavation is greater than 1.5m deep, then two samples will be collected and analysed every 10m metres laterally along walls;

- 1 sample per 100m^2 from the base; and
- Each sample will be analysed for TRH, PAHs and lead.

Field observations and field screening will be used to assess residual impacts Soil sampling and laboratory analysis of representative samples will also be undertaken to confirm satisfactory validation.

Based on our current knowledge of this area, the remedial excavation is expected to be approximately 12m by 25m in area and up to 2.2m (deep). The estimated excavation area is shown in Figure 4, Appendix B. We expect a minimum of 6 to 12 wall samples and 4 base samples, with 1 or 2 duplicate samples and other quality control samples as appropriate.

Other remediation areas

If other remediation areas are identified by site validation or during construction activity, then validation sampling, after remediation, will comprise:

- Collection and analysis of at least one sample per 10m laterally along walls of excavations. The required depth of the sample should be assessed by the environmental consultant based on visual or olfactory evidence of contamination and headspace screening results.
- If the excavation is greater than 1.5m deep, then two samples will be collected and analysed every 10m metres laterally along walls.
- Collection and analysis of at least one sample per 100m^3 from the base of excavations.
- Where sandstone bedrock forms the base or walls of the excavation visual validation will be undertaken to confirm that impacted fill materials or natural soils have been removed to the extent practicable and that there is no visual or olfactory evidence of unacceptable contamination (e.g. oil saturated rock, strong odours etc.).
- As a minimum, samples will be analysed for TRH, PAHs and lead. Samples may need to be analysed for other contaminants, depending on the source of the contamination.

Additional samples may be required if visual or olfactory evidence of contamination or different types of fill in the walls and base of the excavations is observed.

10.3.3. Validation of materials for re-use on-site

If soils are to be reused onsite as part of the development, the validation of such material is required. The sampling frequency is largely dependent on volumes and heterogeneity. For small volumes (<250m^3) samples will be collected at a rate of 1 sample per 25m^3 with a minimum of 3 samples. For larger volumes (say >250m^3 to 2,500m^3) and assuming low heterogeneity, a minimum of 10 samples will be collected to statistically assess the stockpile.

The sampling frequency may be reduced if the material has been won from areas previously validated. In some cases, additional sampling may not be required and visual validation will be sufficient to compare back to original validation results. The environmental consultant will assess sampling frequency based on the volume intended for reuse and results of other validation sampling.

Representative samples will be screened for volatile hydrocarbons and selected for laboratory analysis. Samples will be analysed for TRH, BTEX, PAHs and heavy metals. If evidence such as building rubble or suspected ACM suggests that asbestos may be present within fill material, then that material will be recommended for disposal off-site as Special Waste (asbestos).

10.3.4. Validation of imported materials

Based on the proposed project, it is unlikely that imported materials will be required as backfill for remedial excavations. However, if backfill is required, the following validation process is required for imported materials.

The validation of imported materials requires a two-step process. The first step is to establish if the material can be accepted at the site in compliance with the Protection of the Environment Operations (POEO) Act. The second step is to assess if the material is suitable for the future proposed use of the site. The material must be able firstly to be placed on the site without triggering the requirement for an environmental protection licence for disposal of waste. Secondly, the material is assessed for compatibility with the proposed use of the site.

Step 1 – Is the material compliant with POEO Act provisions?

Imported material used as construction fill will be required to meet the definition of VENM or to meet the requirements for Excavated Natural Material (ENM) as defined in the POEO Act 1997 and POEO Amendment (Waste) Regulation 2014. If the proposed material is VENM (e.g. sourced from a quarry or construction site), then a certificate from the source site will be requested describing the material and confirming that this material meets the definition of VENM. If validation samples are collected, then typical results should report no detectable organic compounds and concentrations of heavy metals indicative of natural background levels. If the material is ENM, a "statement of compliance" must be provided by the generator. If the material is a manufactured material such as topsoil, then it must be commercially available to the public, produced to a specification and a copy of the specification stating its composition is to be provided.

Step 2 – Is the material consistent with the proposed future use of the site?

Materials imported to the site (e.g. mulch and topsoil for landscaping and materials for construction purposes) will need to be validated by the environmental consultant through the following process:

- Visual inspections of the material will be made at the source sites before the material is imported to the site;
- If the material is offered under the ENM Exemption 2014, then the environmental consultant shall review details of classification of the material under the ENM Order 2014 (see Table 11);
- Sampling of VENM materials at the **source site** will be carried out to confirm that the VENM is suitable for use on-site:
  - If the material to be imported to the site **does** have a current suitable VENM (or similar certificate stating its suitability for importation), at least two samples of the material will be collected and analysed for heavy metals, TRH, BTEXN and PAH (as a minimum) to confirm material characteristics.
- If the material to be imported to the site **does not** have a current suitable ENM certificate (or similar certificate stating its suitability for importation), material supplier will be asked to provide an appropriate certificate, otherwise this source of material may be rejected; and
- Observations will be made by the environmental consultant of the material(s) as delivered to site, to confirm that the material appears consistent with the source.

The results of testing for VENM will be compared to relevant published background concentrations listed in

Table 10.

10.4. Validation assessment criteria

Assessment criteria have been selected with consideration of the proposed land use. The land use is consistent with public open space and industrial / commercial scenario, as described in ASC NEPM Schedule B7. Laboratory results of validation samples will be compared to guidelines representing the applicable land use scenario for activity on the site, which are provided within the following references:

- National Environment Protection (Assessment of Site Contamination) 1999 (April 2013), NEPC 2013, Canberra.
- Friebel and Nadebaum (2011) CRC Care Technical Report No. 10 – Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater.
- Olszowy, Torr and Imray (1995) Trace Element Concentrations in Soils from Rural and Urban Areas of Australia - Contaminated Sites Monograph Series No. 4. South Australian Health Commission.

The applicable validation criteria from these guidelines are listed in the following table references:

- Table 1A (1) – Health-based Investigation Levels (HILs) for Public Open Space (HIL C) and Commercial / Industrial land uses (HIL D);
- Table 1A (3) – Soil Health Screening levels (HSLs) for vapour intrusion for Public Open Space (HSL C) and Commercial / Industrial Land Uses (HSL D);
- Table 1B (4) & (5) – Ecological Investigation Levels (EILs) for Urban Residential and Public Open Space and Commercial / Industrial;
- Table B3 – Soil Health Screening Levels for Vapour Intrusion (Intrusive Maintenance Worker – shallow trench) (CRC Care, 2011), depth 0m to <2m;
- Table B4 – Soil Health Screening levels for Direct Contact (HSL-D and Intrusive Maintenance Worker) (CRC Care, 2011);
- Table 1B (7) – Management Limits for TPH Fractions F1 to F4 for fine soil;
- NSW soils for new suburbs in low traffic areas listed on page 17 (Olszowy et al (1995)). Indicative for imported materials used to backfill excavation only.

Based on this rationale, the selected validation criteria have been deemed appropriate to assess effectiveness of remediation activities, the potential for re-use of excavated materials and use of imported material onsite. Ecological screening and investigation levels are not considered applicable where materials are reused beneath pavements or buildings, due to exposure pathways being incomplete.

This rationale is also applicable for imported materials used to backfill the remedial excavations. Validation of imported material is discussed in Section 10.3.1.

The rationale for the selection of these guidelines is discussed in the following sections. The adopted validation criteria for this site are listed in Table 9.

10.4.1. Health Investigation Levels (HILs)

The HILs are applicable for assessing human health risk via relevant exposure pathways. HILs were developed for a broad range of metals and organic substances. These are generic to each soil type and apply generally to a depth of 3m below the soil surface.

10.4.2. Health Screening Levels (HSLs)

The HSLs were developed by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) and are included in Schedule B1 of the ASC NEPM.

The derivation of the most appropriate HSL for the given land use is also dependent on source depth for vapour intrusion, sampling depth interval, soil type and several other key limitations. An eight step process is to be followed when selecting the correct HSL for a site and include:

1. Identification of key limitations to the application of health screening levels;
2. Identification of key receptors and scenarios;
3. Identification of relevant soil type;
4. Identification of impacted media and depths;
5. Identification of source concentrations to be compared with health screening levels;
6. Selecting appropriate HSL and consideration of combining vapour intrusion and direct contact exposure;
7. Applying adjustments to the HSLs based on vapour biodegradation, soil organic carbon content, air exchange rate, and soil moisture content; and
8. Adjustments for cancer risk assessment - modification of acceptable cancer risk level, assessment of cumulative cancer risk.

The selection of the HSLs is discussed in Table 8.

Table 8: Selection rationale for HSLs

Step	Rationale
1 **Key Limitations**	• **Contamination source:** Based on laboratory results, soil observations and aerial photograph review, the source of identified contamination is likely to be asphalt waste (bitumen). Strong hydrocarbon odours and mid to heavy end hydrocarbons indicative of a diesel or bitumen source have also been recorded. Fuel oil could also be present in the vicinity of the former fuel bunkers. • **Groundwater:** ▪ No registered bores within 500m of site. ▪ Sydney is supplied with town water. ▪ Direct contact with groundwater is considered unlikely. ▪ Impacts to groundwater have been assessed. • **Ecological receptors:** Yes. • **Odours:** Hydrocarbon odours noted at BH2, BH3 and BH4 from 1m bgs. • **Soil source thickness:** Given depth to rock, contamination is likely restricted to fill above the rock and is expected to generally be less than 1.5m in thickness. • **Crawl spaces:** None • **Basements:** Yes (predominantly in bedrock below fill).
2 **Key Receptors and Scenarios**	• **Land use scenarios:** public open space and industrial / commercial. • **Receptors and exposure pathways:** ▪ Onsite: – Users of the site under commercial/industrial settings such as workers and site visitors through various pathways (e.g. dermal contact, inhalation, ingestion, etc.). – Maintenance workers in sub-surface trenches via vapour inhalation and direct contact with impacted soils (note – volatile contamination has not been recorded at elevated concentrations to date). – Users of open space areas mostly members of the general public through various pathways (e.g. dermal contact, inhalation, ingestion, etc.).

Step	Rationale
	– Non-human receptors would include underground services that can be adversely affected upon exposure to petroleum hydrocarbons. – The site is situated within Sydney but open space comprising trees, shrubs and grassed areas will attract a combination of native and feral transitory wildlife. ▪ Offsite: – Potential exposure pathways for humans and the environment are associated with the transportation of potential contamination via groundwater to offsite areas such as Woolloomooloo Bay. – Groundwater contamination has been identified and associated with former fuel bunkers. However, identified soil contamination is unlikely to contribute to existing groundwater contamination, as it is within fill material overlying sandstone or concrete. Therefore, it is considered that there is a low likelihood of this receptor being exposed to site contamination. However, the precautionary principle will be adopted and distant environmental receptors will be considered as part of this assessment.
3 **Identification of Relevant Soil Type**	The current soil profile comprises sandy or clayey fill overlying sandstone rock. In consideration of these site specific subsurface conditions, the HSLs adopted for vapour intrusion will be based on a conservative depth range between 0m to <1m, and will assume a *Coarse Sand* soil type.
4 **Identification of Impacted Media and Depths**	Soil criteria will apply for varying depths based on the depth of the samples (or inferred shallowest depth of which the sample is meant to characterise).
5 **Selection of Relevant Source Concentrations**	Each sample analysed for TRH/BTEXN will be compared to the selected HSLs and management limits. Remaining contaminants of concern will be compared to HILs.
6 **Selecting Appropriate HSLs**	• **Criteria selection:** Refer to Section 10.4 • **Combined exposure pathway assessment for vapour intrusion:** ▪ For this site, an intrusive maintenance worker would have a combined exposure pathway of both vapour inhalation (from soil and possibly groundwater) and direct contact within the upper 2m of the soil profile. Other site users, for example relating to potential future development, an employee working within a building, are unlikely to be exposed to more than one pathway, as it is reasonable to assume a gallery worker will not be involved in sub-surface activities. In the case of the proposed project, concrete pavements and buildings cover the majority of the site thereby reducing direct contact with soils for the majority of site users. ▪ If the site were to remain in its current configuration, that is, no buildings and limited pavement, then vapour intrusion will only be a consideration for trench workers.
7 **Applying Adjustments to HSLs**	At this stage, no HSL adjustments are required or can be justified based on available information. This will be reassessed at the time of validation sampling and following receipt of laboratory results.
8	Adjustment to HSLs for cancer risk is not considered necessary as the nominated lifetime cancer risk is relevant to the jurisdiction and the only known or suspected carcinogens recorded at elevated concentrations is PAHs (assessed as the toxic equivalence factor relative to

Step	Rationale
Adjustments for Cancer Risk Assessment	benzo(a)pyrene). This will be reassessed at the time of validation sampling and following receipt of laboratory results.

10.4.3. Management limits

The purpose of the Management Limits is to "avoid or minimise" potential effects of petroleum hydrocarbons. Schedule B1 of the ASC NEPM provides these as an interim Tier 1 guidance to manage potential effects of:

- Formation of observable Light Non-Aqueous Phase Liquid (LNAPL);
- Fire and explosive hazards; and
- Effects on buried infrastructure.

The application of the management limits requires the consideration of site-specific factors such as the depth of building services and depth to groundwater, to assess the maximum depth to which the limits should apply.

10.4.4. Ecological Investigation Levels (EILs) / Ecological Screening Levels (ESLs)

The ESLs and EILs have been developed for assessing risk to terrestrial ecosystems and have been developed for areas of ecological significance and two broad classes of land use. They apply to the top 2m of soil, which corresponds to the root zone and habitation zone of many species.

The ESLs are associated with selected petroleum compounds and broadly apply to coarse and fine-grained soils. For this site, the dominating soil type is coarse (Table 8, Step 3).

The EILs are associated with selected metals and organic compounds. These EILs depend on specific soil physiochemical properties. Site specific data including clay content, pH and Cation Exchange Capacity (CEC) and Ambient Background Concentrations (ABC) were obtained to derive site specific EILs for zinc, copper, chromium and nickel.

Added Contaminant Limit (ACL) for lead, arsenic, DDT, naphthalene is generic and does not refer to soil physiochemical properties.

The ASC NEPM Toolbox[4] was used to determine EILs for copper, chromium (III), nickel and zinc. ACL listed in Tables 1B(4) and 1B(5) were added to the ABC to derived site specific EILs for lead, arsenic, DDT, naphthalene. Site history information indicates contamination (if any) is likely to have been present for more than 2 years; therefore ACL for aged contamination is considered appropriate for the site.

[4] Calculation assumed 5% total organic carbon

10.4.5. Published background concentrations

The background concentrations published by Olszowy et al (1995), as recommended in Schedule B1 of the ASC NEPM, will be used to provide a general reference for heavy metals in soils imported to the site.

10.4.6. Adopted assessment criteria

Based on the above rationale and site-specific information, remediation validation criteria selected are listed in Table 9 and Table 10. Assessment criteria may be revised should the excavation be backfilled with material that does not fall into the definition of 'sand' as defined in the US Soil Conservation Service Classification Chart (CRC CARE, 2011).

The validation criteria (background concentrations) provided in Table 10 will also apply for VENM assessments of material to be imported to site (if material to be imported has a current and suitable VENM certificate or similar).

Table 9: Validation criteria for human health

Contaminant of Concern	HIL-C and HSL-C (mg/kg)	HIL-D and HSL-D (mg/kg)	HSL-C Direct Contact[3] (mg/kg)	HSL-D Direct Contact[3] (mg/kg)	Intrusive Maintenance Worker[3/4] (mg/kg)
Arsenic	300[1]	3,000[1]	-	-	-
Cadmium	90[1]	900[1]	-	-	-
Chromium	300[1]	3,600[1]	-	-	-
Copper	17,000[1]	240,000[1]	-	-	-
Lead	600[1]	1,500[1]	-	-	-
Mercury	80[1]	730[1]	-	-	-
Nickel	1,200[1]	6,000[1]	-	-	-
Zinc	30,000[1]	400,000[1]	-	-	-
F1 (TPH C_6-C_9 less BTEX)	NL[2]	260 [2]	5,100	26,000	82,000 / NL
F2 (TPH C_{10}-C_{16} less Naphthalene)	NL[2]	NL[2]	3,800	20,000	62,000 / NL
F3 (TPH C_{16}-C_{34})	NL[2]	NL[2]	5,300	27,000	85,000 / NL
F4 (TPH C_{34}-C_{40})	NL[2]	NL[2]	7,400	38,000	120,000 / NL
Benzene	NL[2]	3 [2]	120	430	1,100 / 77
Toluene	NL [2]	NL [2]	18,000	99,000	120,000 / NL
Ethylbenzene	NL[2]	NL[2]	5,300	27,000	85,000 / NL
Total Xylene	NL [2]	230 [2]	15,000	81,000	130,000 / NL
Naphthalene	NL[2]	NL[2]	1,900	11,000	29,000 / NL
Carcinogenic PAH as Benzo(a)pyrene TEQ	3[1]	40[1]	-	-	-
Total PAHs	300[1]	4,000[1]	-	-	-

Contaminant of Concern	HIL-C and HSL-C (mg/kg)	HIL-D and HSL-D (mg/kg)	HSL-C Direct Contact[3] (mg/kg)	HSL-D Direct Contact[3] (mg/kg)	Intrusive Maintenance Worker[3/4] (mg/kg)
Phenol	120 to 40,000[1]	660 to 240,000[1]	-	-	-
OCP	10 to 400[1]	45 to 3,600 [1]	-	-	-
PCBs	1[1]	7 [1]	-	-	-
Asbestos	< LOR	< LOR	-	-	-

Table 9: notes:

1. Table 1A(1) – Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 2013)
2. Table 1A(3) – Soil Health Screening Levels for Vapour Intrusion (NEPC, 2013)
3. Table B4 - Soil Health Screening levels for Direct Contact and Intrusive Maintenance Worker (CRC Care, 2011)
4. Table B3 – Soil Health Screening Levels for Vapour Intrusion (Intrusive Maintenance Worker) (CRC Care, 2011)

NL = HSL's are non-limiting
TEQ = Toxicity Equivalent Quotient
LOR = Laboratory reporting limit

Table 10: Validation assessment criteria for ecological values, management limits and adopted range for background concentrations

Contaminant of Concern	Published background range (mg/kg)	Ecological Investigation and Screening Levels for Residential and Public Open Space (mg/kg)	Ecological Investigation and Screening Levels for Commercial/ Industrial (mg/kg)	Management Limits for Residential and Public Open Space[5] (mg/kg)	Management Limits for Commercial/ Industrial[5] (mg/kg)
Arsenic	5 to 11[1]	100[3]	160[3]	-	-
Cadmium	0.25[1]	-	-	-	-
Chromium	6 to 21[1]	190*	320*	-	-
Copper	6 to 32[1]	110*	150*	-	-
Lead	13 to 44[1]	1,100[2]	1,800[2]	-	-
Nickel	5 to 50[1]	35*	60*	-	-
Mercury	0.05[1]	-	-	-	-
Zinc	17 to 77[1]	310*	440*	-	-
F1 (TPH C_6-C_9)	< LOR	180[4]	215[4]	700	700
F2 (TPH C_{10}-C_{16})	< LOR	120[4]	170[4]	1,000	1,000
F3 (TPH C_{16}-C_{34})	< LOR	300[4]	1,700[4]	2,500	3,500
F4 (TPH C_{34}-C_{40})	< LOR	2,800[4]	3,300[4]	10,000	10,000
Benzene	< LOR	50[4]	75[4]	-	-
Toluene	< LOR	85[4]	135[4]	-	-

Contaminant of Concern	Published background range (mg/kg)	Ecological Investigation and Screening Levels for Residential and Public Open Space (mg/kg)	Ecological Investigation and Screening Levels for Commercial/ Industrial (mg/kg)	Management Limits for Residential and Public Open Space[5] (mg/kg)	Management Limits for Commercial/ Industrial[5] (mg/kg)
Ethylbenzene	< LOR	70[4]	165[4]	-	-
Total Xylene	< LOR	105[4]	180[4]	-	-
Naphthalene	< LOR	170[3]	370[3]	-	-
Benzo(a)pyrene	< LOR	0.7[4]	1.4[4]	-	-
OCP	< LOR	180 (DDT)[3]	640 (DDT)[3]	-	-
Other organics	< LOR	-	-	-	-
Asbestos	< LOR	-	-	-	-

Table 10: notes:

1. NSW soils for new suburbs in low traffic areas listed on page 17 (Olszowy et al (1995)). Only adopted for imported materials as a general reference. Depending on source of material, other reference data may be adopted.
2. Table 1B(4) – Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 2013)
3. Table 1B(5) – Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 2013)
4. Table 1B(6) – Schedule B(1), Guideline on the Investigation Levels for Soil and Groundwater (NEPC, 2013)
5. Table 1B(7) – Management Limits for TRH Fractions F1 to F4 in soils

* The ASC NEPM Toolbox was used to determine EILs for copper, chromium (III), nickel and zinc. Soil specific contaminant limits based on pH of 8; CEC of 5; clay content 5% (given some clay was identified in previous assessments based on borehole logs); low traffic volume.
LOR = Laboratory reporting limit

10.4.7. Excavated natural material validation criteria

Where materials to be imported to the site are assessed as ENM, the laboratory results obtained under the ENM Order 2014 will be compared to the absolute maximum and maximum average concentrations provided in Table 2 of the Protection of the Environment Operations (2014) Waste Regulation – The Excavated Natural Material Order 2014 (a copy is provided in Appendix C).

The ENM criteria are presented in Table 11.

Table 11: Excavated natural material validation criteria

Contaminant of Concern	Maximum average concentration (mg/kg unless otherwise noted)[1]	Absolute maximum concentration (mg/kg unless otherwise noted)[2]
Mercury	0.5	1
Cadmium	0.5	1
Lead	50	100
Arsenic	20	40
Chromium	75	150
Copper	100	200
Nickel	30	60
Zinc	150	300
Electrical Conductivity	1.5 dS/m	3 dS/m
pH	5 to 9 units	4.5 to 10
Total PAHs	20	40
Benzo(a)pyrene	0.5	1
Benzene	NA	0.5
Toluene	NA	65
Ethylbenzene	NA	25
Total Xylenes	NA	15
TRH C_{10}-C_{36}	250	500
Foreign materials (rubber, plastic, bitumen, paper, cloth, paint and wood)	0.05%	0.10%
Table 9 notes: **1. Column 2 of Table 2 of POEO (2014) Waste Regulation – The Excavated Natural Material Order 2014** **2. Column 3 of Table 2 of POEO (2014) Waste Regulation – The Excavated Natural Material Order 2014**		

10.5. Validation report

Field observations and laboratory data will be reviewed and assessed by applying general chemical data validation guidelines. The data that is accepted will be compared to the validation assessment criteria. Statistical interpretation of validation data may be used for contaminants of concern other than asbestos. Based on the comparison, the areas that have been satisfactorily remediated will be identified and will be flagged as “No Further Action Required”. Where the remediation objectives have not been met, the environmental consultant will communicate to the Principal Contractor which areas are affected and an alternative remediation strategy may then be considered.

Upon completion of the remediation and validation activities, a Remediation and Validation Report will be prepared in accordance with the NSW OEH Guidelines for Consultants Reporting on Contaminated Sites (2011) and include the following information:

- Summary of previous investigations and desktop study;
- Summary of remediation works undertaken;
- Summary of validation results and field observations;
- Waste classification;
- Disposal and imported materials dockets;
- Figures and photos showing remediation and validation activities and sampling locations; and
- Site survey plan.

The validation report will be written with reference to Schedules B1 and B2 of the ASC NEPM. The report will provide a statement as whether the objectives of the remediation have been met and the site is suitable for its planned use.

11. Environmental management plan

The following sections outline the management of anticipated potential environmental issues resulting from remediation activity. A Construction Environmental Management Plan (CEMP) has been prepared by the Principal Contractor. This section of the RAP has been prepared in conjunction with the information provided in the CEMP.

11.1. Air emissions

The main type and source of potential air emissions from the site during ex-situ remedial works is anticipated to be odours released from the walls and base of open excavations and from the stockpiled / transported soil prior to final disposal and/or reuse. The actual concentrations of the air emissions will vary depending on weather conditions and the contamination status of the soils. Coffey notes that volatile contaminants of potential concern have not been detected at the site. However, strong hydrocarbon odours were recorded in BH2 and BH4 in 2014, but were not observed in the same location during supplementary assessment in 2016.

If oil seepages are observed in the vicinity of the fuel bunkers during site works then odour impacts in these areas will need to be assessed and managed to ensure no unacceptable odour with indoor areas for future use.

Air emission and odour controls during remediation will ensure that no offensive odours will be detected at the site boundary. If considered necessary, the following odour management procedures could be used:

- Undertaking the excavation works in a staged manner to limit the surface area of odorous material exposed.
- Application of odour suppressants (such as Biosolve or Killsmell) via spray applicator.
- Covering of the stockpiled soil, to suppress the release of the odours.

In addition, as a precautionary management measure if odours are apparent in the remediation excavation, air monitoring will be carried out during the excavation works using a PID that measures VOCs. Workers will immediately withdraw from the work area if VOCs are greater than 10ppm in the workers' breathing zone. The project manager and safety officer must approve re-entry into the work area. A range of actions from the use of respirators by site personnel, to watering or covering of stockpiles, to the suspension of site works will be used to improve air quality.

Records of air monitoring conducted during excavation works will be made available to relevant regulatory officers (i.e. NSW EPA, SafeWork NSW, Council) upon request.

11.2. Dust

Remedial works on the site will involve excavation, stockpiling, transportation and placement of soil and general movement of vehicles across the site. Dust generation is therefore considered to be a potential environmental impact to the surrounding environment and the public.

The following potential sources of dust generation have been identified, and the measures to be taken to reduce dust levels are as follows.

11.2.1. General site area

RCC will construct a 2.1m high timber hoarding along the eastern boundary adjacent to the remediation area.

A communication and complaints register will be implemented on site and maintained by the Principal Contractor to ensure that concerns of members of the public are recorded and addressed.

11.2.2. Excavation areas

If dust migration from excavation areas is considered excessive due to high winds, the works will be delayed or limited during these periods.

11.2.3. Stockpile areas

If excessive dust is generated from stockpile areas, the material will be covered by high density polyethylene (HDPE) sheeting. This will aid in minimising the off-site movement of dust. In addition, regular dampening of active stockpiles with water mist may also be carried out to minimise dust generation. Note that the amount of water used for dust suppression needs to be kept to a minimum to prevent runoff.

Where practicable, stockpiles will not exceed the height of the perimeter fencing in order to reduce dust and odours spreading to the surrounding environment.

11.2.4. Haulage of soils

Trucks transporting contaminated soil (for disposal) from or imported fill to the site must be covered in order to minimise dust generation.

Installation and use of a tyre grid / wash should be considered to prevent dust being transported off-site via vehicular movement to and from the site.

Remediation contractors will be briefed on the need to keep dust generation to a minimum. If observations indicate that unacceptable levels are being generated, work will cease until measures have been undertaken to reduce the dust, or until adverse weather conditions abate. This may involve an alteration of the work plan or the use of water sprays.

11.3. Noise controls

Noise impacts will be managed by Contractors nominated in the *Noise and Vibration Management Plan*.

11.4. Vibration controls

Vibration impacts during remediation works are anticipated to be minimal. Some localised vibrations may be generated through excavation activities and will be managed by Contractors nominated in the *Noise and Vibration Management Plan* and the *Geotechnical Excavation Monitoring Plan*. Contractors are bound to comply with the statutory regulations regarding vibration limitations in residential areas and education facilities and hours as restricted by the City of Sydney Council.

11.5. Soil management

Information for preparation of site plans identifying excavation areas, validation samples and soil movements will be recorded during the remediation works. Stockpiles will be labelled and movement of materials to and from stockpiles will be monitored and recorded to confirm that the stockpiles are properly classified according to contaminant concentrations and to minimise potential for mixing of differently classified soils.

Soil removed during remediation works will be observed for evidence of contamination, and clean material will be segregated from impacted material accordingly. Where practicable, the stockpiles will not be placed near active 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 the requirement for stockpiles to be covered with HDPE lining to prevent runoff will be assessed.

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

Potential or actual acid sulfate soils are not known to occur on the site. Any such occurrence will be managed in accordance with the *Acid Sulfate Soil Management Plan*.

11.6. Residual oil in fuel bunkers

Volatile hydrocarbons in indoor air and hydrocarbons in water in a drainage sump within the fuel bunkers was previously found to be low to undetectable (Coffey, 2016b). However, the previous site Audit report for the fuel bunkers indicated the potential for minor oil seeps from joints and bolt holes within the fuel bunkers which may present a localised aesthetic issue.

11.7. Water management

Seepage water and stormwater may accumulate in open excavations. Based on the level of contamination present, accumulated water (if any) will be either pumped, treated and discharged to sewer (under agreement with the appropriate authorities) or will be pumped out and disposed off-site by a licensed contractor, to a NSW EPA licensed Liquid Waste Treatment Facility.

Surface water runoff must be controlled on the site to ensure that potentially impacted material and/or water is not discharged to the surrounding area. The surface water runoff and sediment entrained in the water will be managed by installing silt control barriers along the perimeter of the site to filter solid particles from the surface water, as it may flow off-site. Silt control barriers will also be placed around the stockpiles of excavated soils, where the migration of potentially impacted material can occur. Surface water runoff should also be directed away from the excavations.

Daily checks of fences and silt barriers erected for remediation works will be undertaken and built up sediments will be removed and placed in the stockpiles if excessive. In addition, silt control barriers will be replaced if they have deteriorated.

11.8. Traffic

Traffic will be managed in accordance with the *Construction Pedestrian Management Plan*.

11.9. Working hours

Working hours for on-site remedial works will be completed in accordance with the Department of Planning and Environment / NSW EPA requirements. These working hours include:

- 7:00am to 6:00pm Monday to Friday (inclusive);
- 8:00am to 1:00pm Saturdays; and
- No work on Sundays or public holidays.

Works may be undertaken outside these hours where:

- The delivery of vehicles, plant or materials is required outside these hours by authorities;
- It is required in an emergency to avoid loss of life, or damage to property and/or to prevent environmental harm; or
- A variation is approved in advance in writing by the Director General or nominated representative.

In certain instances these hours may be modified to restrict the use of particularly noisy machinery such as rock breakers, rock saws and pile drivers etc. These activities are to be scheduled within the following times (unless written approval is provided by the Director General or nominated representative):

- 9:00am to 12:00pm, Monday to Friday;
- 2:00pm to 5:00pm, Monday to Friday; and
- 9:00am to 12:00pm, Saturday.

11.10. Access restriction

The proposed excavations will be undertaken within a secured site that is not accessible to members of the public. Appropriate barricading will be erected to distinguish the remedial work zone from other parts of the site.

The remedial work zone is restricted access solely to authorised staff and contractors who have appropriate induction and personal protective equipment. Signage, including the Principal Contractor's details and contact numbers, will be erected near entrance gates to the site. The signage will remain displayed on the site entrances throughout the duration of the remediation works. The responsible site supervisor shall control site access and shall authorise visitors on an "as needed" basis.

12. Workplace health and safety

The environmental consultant (including subcontractors) will prepare a safety plan prior to the commencement of the remedial and validation works in order to manage associated risks posed to workers at the site as well as people in the surrounding areas. The Site Safety Plan (SSP) will consider the following:

- Hazard Identification and Control;
- Air monitoring during earthworks;
- Chemical Hazard Control;
- Handling Procedures;
- Personal Protective Equipment;
- Work Zones;
- Decontamination procedures;
- Contingency Plans; and
- Incident Reporting.

The SSP will be periodically reviewed and updated prior to various project tasks being conducted.

13. Incident response procedures

In the event of a serious environmental incident resulting from remediation works, the Remediation Contractor will immediately information the Site Safety Supervisor. Depending on the nature and severity of the incident, one or more of the following may be contacted:

- The fire brigade/ambulance/police on 000;
- Principal Contractor's project manager: Anthony Di Cecco – 0437 677 813
- Excavation sub-contractor project manager: TBC
- NSW EPA on 131 555
- SafeWork NSW on 131 050
- City of Sydney Council on (02) 9265 9333, where applicable

Other useful contact numbers are:

- St Vincent's Hospital, 390 Victoria St, Darlinghurst, NSW; Phone: (02) 8382 1111
- Woolloomooloo Police Station: 10/164 Cathedral St, Woolloomooloo NSW 2011; (02) 8356 0132
- Other emergency numbers will be included in the SSP.

An example of a major incident would include significant spillage of hazardous or toxic liquids to stormwater or sewer.

In the case of minor incidents (such as a localised hydraulic oil spillage), the Principal Contractor should respond to the incident (e.g. containment of a minor oil spillage). Site workers are required to report accidents or incidents to the Principal Contractor at the work site.

The Remediation Contractor will provide a "spill kit" for use in the remediation area which includes absorbents (such as socks, mats, pillows, saw dust or equivalent) capable of containing up to 10L of hydrocarbons. These will be applied immediately in the event of a hydrocarbon spill.

14. Community relations

The procedures outlined in the RAP will ensure that the impact on the surrounding community from the site works will be controlled. Inquiries regarding environmental and contamination issues from members of the local community will be documented and referred to Principal Contractor.

15. Complaints

Complaints received shall be recorded and attended to promptly in consultation with the Principal Contractor. On receiving a legitimate complaint, works will be reviewed to determine whether issues relating to the complaint can be avoided or minimised.

16. Limitations

This report should be read in conjunction with the attached "Important Information about your Coffey Environmental Report" which is included at the end of the text.

17. References

Acid Sulfate Soil Management Advisory Committee (1998) Acid Sulfate Soils Manual.

AGC Woodward-Clyde (1999) Woolloomooloo Fuel Bunker Summary Audit Report. 14 April 1999.

Coffey (2014a) Geotechnical Investigation, Sydney Modern Project, Art Gallery Road, Sydney, NSW. GEOTLCOV25037AA-AF. 16 May 2014.

Coffey (2014b) Art Gallery of NSW, Sydney Modern Project, Stage 1 Preliminary Environmental Study. GEOTLCOV25037AA-AG. 6 June 2014.

Coffey (2014c) Groundwater Monitoring Adjacent to Bunker Fuel Tank Site, Art Gallery of NSW. GEOTLCOV25037AA-AH. 2 July 2014.

Coffey (2016a) Sydney Modern Project – Groundwater monitoring adjacent to former fuel bunkers. GEOTLCOV25037AC-L01a. 19 May 2016.

Coffey (2016b) Art Gallery of NSW, Sydney Modern Project, Revised Stage 1 Preliminary Environmental Study. GEOTLCOV25037AC-R01a. 6 June 2016.

Coffey (2016c) Art Gallery of NSW, Remedial Action Plan, Sydney Modern Project, Art Gallery Road, Sydney, NSW. GEOTLCOV25037AC-R02a. June 2016.

Coffey (2016d) Art Gallery of NSW, Acid Sulfate Soil Management Plan, Sydney Modern Project, Art Gallery Road, Sydney, NSW. GEOTLCOV25037AC-R04b. July 2016 (draft).

Friebel & Nadebaum (2011) Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater (technical paper No.10) Guidelines, CRC for Contamination Assessment and Remediation of the Environment (CRC CARE).

Hibbs & Associates Pty Limited (2016) Former Garden Island Fuel Bunker – Preliminary Odour Assessment. 15 April 2016.

NEPC (2013) National Environment Protection (Assessment of Site Contamination) Measure 1999, amended April 2013. National Environment Protection Council.

NSW EPA (1995) Sampling Design Guidelines.

NSW EPA (2014a) Waste Classification Guidelines: Part 1: Classifying Waste.

NSW EPA (2014b) Waste Classification Guidelines: Part 2: Immobilisation of Waste.

NSW EPA (2014c) Waste Classification Guidelines: Part 4: Acid Sulfate Soils.

NSW EPA (2014d) Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 - The excavated natural material order 2014.

NSW OEH (2011) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites, OEH 2011/0650, ISBN 0 7310 3892 4, Office of Environment and Heritage, Sydney.

Olszowy, Torr and Imray (1995) Trace Element Concentrations in Soils from Rural and Urban Areas of Australia - Contaminated Sites Monograph Series No. 4. South Australian Health Commission.

Important information about your **Coffey** Environmental Report

Introduction

This report has been prepared by Coffey for you, as Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice,

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored 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 potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within 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 that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. 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.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different 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 a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Coffey prepared the report and has familiarity with the site, Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Coffey disowns any responsibility for such misinterpretation.

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 or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

Appendix A - Unexpected Finds Procedure

Richard Crookes Constructions – Jesse Moss

Unexpected Finds Procedure

Sydney Modern Gallery
Art Gallery Road, Sydney, NSW

15 October 2019

In a
turbulent
world
we provide
clear thinking

This page has been left intentionally blank

Unexpected Finds Procedure

Prepared for
Richard Crookes Constructions – Jesse Moss

Prepared by
Coffey Services Australia Pty Ltd
Level 19, Tower B, 799 Pacific Highway
Chatswood NSW 2067 Australia
t: +61 2 9406 1000 f: +61 2 9415 1678
ABN: 55 139 460 521

15 October 2019

SYDGE234348-EB_UFP

Quality information

Revision history

Revision	Description	Date	Author	Reviewer
EB Draft	Unexpected Finds Procedure	13/10/2019	ZM	MD
EB_UFP	For Construction	15/10/2019	ZM	MD

Distribution

Report Status	No. of copies	Format	Distributed to	Date
Draft	1	pdf	Richard Crookes Constructions – Jesse Moss	13/10/2019
For Construction	1	pdf	Richard Crookes Constructions – Jesse Moss - Jesse Moss	15/10/2019

Table of contents

Tables

Figures

1. Identification of potential unexpected finds

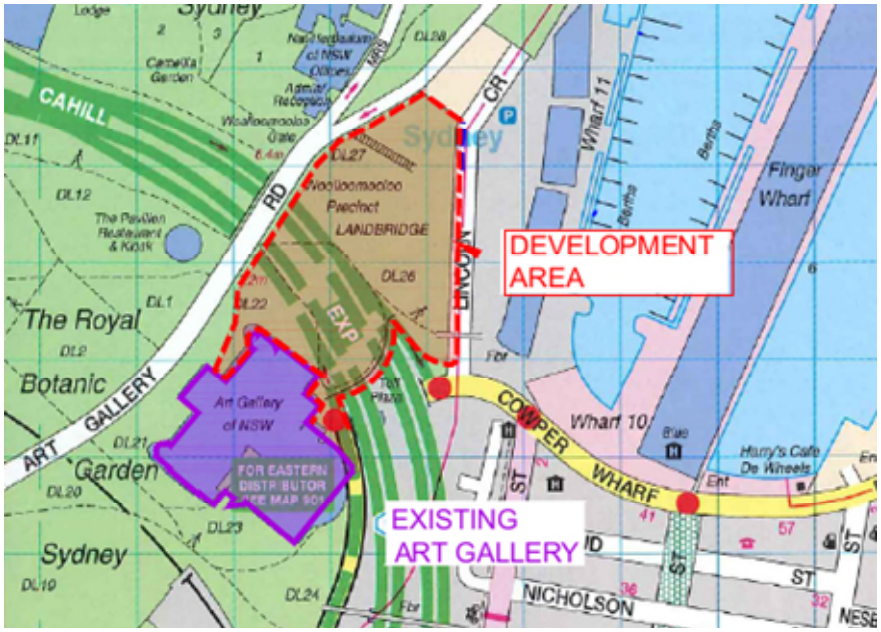
1.1. Background

The Sydney Modern Gallery (SMG) is a planned major expansion of the existing Art Gallery adjacent to the Phillip Precinct of the Domain. The expansion is a separate building located north of the Eastern Distributor Motorway (EDM) in an area largely occupied by a disused Navy fuel bunker that was excavated into the hillside in the 1940's. The proposed gallery building will include several levels with different footprints that will involve further excavation west of the bunker adjacent to the EDM. A location plan for the SMG site is provided as Figure 1.

The SMG will be a multi-level structure. The entry level and Gallery 1 will be located over the existing EDM land bridge (RL 22.9m). The remaining four levels of galleries will be located north of the land bridge, will incorporate part of the disused fuel bunker and will also require excavation into the hillside to the west of the fuel bunker. Lowest gallery level coincides with the bunker floor at RL 1.15m.

Richard Crookes Constructions (Principal Contractor - RCC) requires an Unexpected Finds Procedure (UFP) to manage finds of unexpected contamination which may arise during earthworks and to satisfy RCC's contract obligations associated with the SMG development. RCC engaged Coffey Services Australia Pty Ltd (Coffey) to provide certain geotechnical and environmental professional services relevant to the SMG. The objective of this unexpected finds procedure is to enable previously unidentified areas of contamination within the SMG site to be dealt with appropriately to mitigate potential health and / or environmental risks. The procedure provides information on expected conditions and provides examples of unexpected finds along with control measures appropriately addressing the find.

Figure 1 Locality Map for SMG Site



1.2. Responsibility

RCC, as Principal Contractor, is responsible for implementing this Unexpected Finds Procedure (UFP) and requiring its subcontractors engaged in excavation to adopt this UFP, so that unexpected contamination finds can be appropriately managed.

The UFP is to be implemented by contractors during any construction works where the ground surface may be disturbed (earthworks). The UFP provides a procedure to be followed in the event of an unexpected find of contamination during earthworks.

This UFP applies for the period of earthworks being carried out at the SMG site, including remediation works described in the Remedial Action Plan (RAP). A copy of the UFP is included in Appendix A to the RAP.

After earthworks are completed, this UFP does not provide procedures for on-going management of residual contamination. On-going management will be addressed as part of site validation under the RAP.

1.3. Expected subsurface conditions

Subsurface conditions encountered in previous investigations included fill material overlying sandstone rock. The fill material and its constituents did not vary significantly throughout the site. Table 1 provides a high level summary of these materials likely to be encountered.

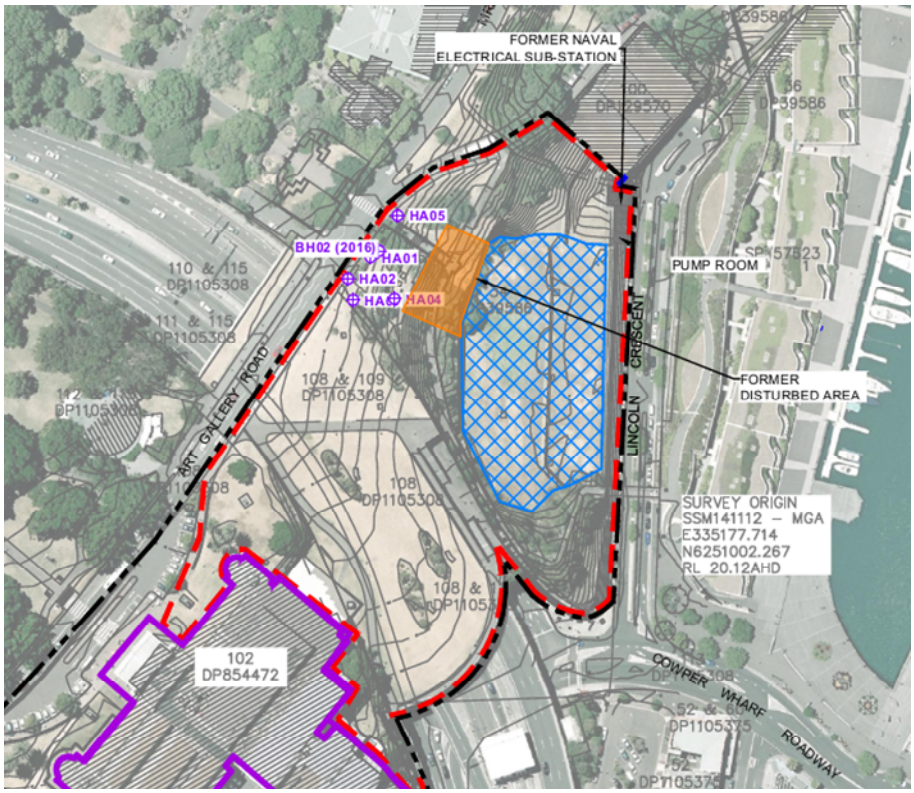
Table 1: Expected Subsurface Conditions

Material / Origin	Description
Topsoil	Sandy silt, fine grained sands, dark brown, to depths of approximately 0.1m.
Fill	Silty Sand / Sand, fine to medium grained, brown to dark brown, grey, orange, coal gravel, to depths between 0.8m and 3.2m bgs. Foreign materials: tile and brick fragments at locations BH6 and BH7. Concrete and glass fragments at BH03 and BH02a, respectively. Coal and / or bitumen like material at locations BH2, BH4, BH6 and BH7 at depths of between 0.5m and 1.5m. Evidence of contamination included: • BH2: Very strong hydrocarbon odours from 1.1m • BH3: Hydrocarbon odours from 1m • BH4: Strong hydrocarbon odours between 1m and 1.5m
Sandstone	Weathered sandstone.

The location of identified contamination on the site is indicated in Figure 2.

Subsurface conditions departing substantially from those described above may constitute an unexpected find and can be managed through the implementation of the actions outlined in Section 1.5.

Figure 2 Area of Identified Contamination on the SMG Site



1.4. Unexpected finds

Unexpected finds of potential contamination on site may be identified by visual (appearance) and/or olfactory (odour) observations during earthworks.

Based on previous investigation results, unexpected finds are likely to be in two categories, non-specific and specific. Non-specific unexpected finds refers to any possible occurrence within any area of the site not investigated. The second category refers to areas of the site where, for example, contamination was identified yet the source or the extent was not confirmed.

1.4.1. Non-specific unexpected finds

Based on information from previous investigations and site history, potential ‘unexpected finds’ which could reasonably be possible within the site (although unexpected) are discussed in Table 2.

It is not practical to cover all types of possible unexpected finds. In cases not described in Table 2, when the ground condition or consistency appears impacted, then the precautionary principle is followed and the unexpected finds procedure described in the following section should be activated.

Table 2: Summary of Non-specific Unexpected Finds

Potential Unexpected Find	Observed Characteristic	Typical Key Contaminant of Concern	Example of an unexpected find where applicable
Asbestos containing materials and/or buried asbestos pipes	It is often very difficult to identify the presence of asbestos by sight. The only way to be certain is to have a sample of the material analysed by a laboratory. Cement bound asbestos (fibro cement sheet) may be present in building materials such as wall sheeting, pipes and roofing, backing of electrical switch boards, linoleum floor tiles etc and may be found as fragments of broken building materials (often found close to the building) and building wastes. Friable forms of asbestos including lagging and insulation may occur as fibrous material which flakes and powders easily. Textured coatings used to improve fire-resistance may also contain asbestos.	Asbestos	
Buried waste materials	May include a variety of waste materials, inclusive of waste oil drums, wood, plastic, metal fragments, building rubble (e.g. concrete, brick, asphalt, asbestos containing materials), lead paint. We do not consider that a trivial piece or fragment of foreign material constitutes as an unexpected find (e.g. a single brick).	Total Recoverable Hydrocarbons (TRH) Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN) Polycyclic Aromatic Hydrocarbons (PAHs) Volatile Halogenated Compounds (VHCs) Asbestos Heavy metals – usually arsenic, cadmium, chromium, copper lead, mercury, nickel and zinc	
Underground storage tanks (USTs)	Though unlikely but can be identified as follows: • A buried steel underground tank; • Deeper sand fill is sometimes observed and / or hydrocarbon odours or staining. • Encountering relatively small concrete footings or steel pipelines, sometimes with observed hydrocarbon odours or staining.	TRH, BTEXN, PAHs, VHCs, phenols, lead	

Potential Unexpected Find	Observed Characteristic	Typical Key Contaminant of Concern	Example of an unexpected find where applicable
Ash or slag deposits	Ash materials typically light weight, grey and white gravel and sand sized (1mm to 10mm) particles (see photograph example). Slag materials can be varied in consistency and colour. Typically slags from steelmaking are pale grey to grey, however can be blue/green/grey, loose or cemented. Slag gravels can be very angular and appear to have a vesicular (i.e. 'honeycomb') shape.	PAHs, heavy metals	
Hydrocarbon Compounds	May be identified by a hydrocarbon (e.g. petrol, diesel or oil) odour which may vary in strength from possible (just detectable) to very strong (easily detectable at a distance from the source). The odour may or may not be accompanied by specific areas of dark staining (black-grey) or larger scale discolouration of strata from a previously identified 'natural colour' e.g. staining of orange and brown clay to dark grey and green.	TRH, BTEXN, PAHs, lead	
Other unusual odours	• Solvent odour – sweet • Acetone odour – nail polish remover • Alcohol odour - sweet • Sulphur (rotten egg) odour (possibly associated with Acid Sulfate Soils) • Acidic (Acetic/Formic/Citric) odour – sharp or burning. • Ammonia odour - pungent • Caustic odour	Variable	

1.4.2. Specific unexpected finds

Previous investigations identified TRH and PAH contamination and strong hydrocarbon odours in the part of the SMG site indicated in orange on Figure 2. The extent of the odorous contaminated soils is estimated to be 12m by 25m in area and is estimated to extend to the top of sandstone, which varies between 1.1m and 2.2m bgs.

The unexpected finds procedure for specific areas of the site will be required to manage the following possible circumstances:

- The impacted material extends beyond the estimated extent.
- Additional contaminants are discovered during remediation works (that is, the type of contamination has changed).

1.5. Management of unexpected finds of contamination

1.5.1. Training and induction of personnel and limitations

All personnel involved in earthworks on site are to be inducted for awareness of potential unexpected finds. The induction can be undertaken at the time of general site induction and refreshed during toolbox meetings.

Personnel involved in earthworks are required to implement the initial parts of this Procedure during earthworks.

It is not practical to cover all types of possible unexpected finds. If the ground condition or consistency appears impacted, then the unexpected finds procedure should be implemented as a precaution.

Additionally, it is noted that some forms of potential contamination may not be evident visually or through odour. The unexpected finds procedure does not provide protect against potential health risks from such contaminants.

1.5.2. Procedure in the event of an unexpected find

If an unexpected find of potential contamination is encountered during earthworks, then the following procedure should be followed:

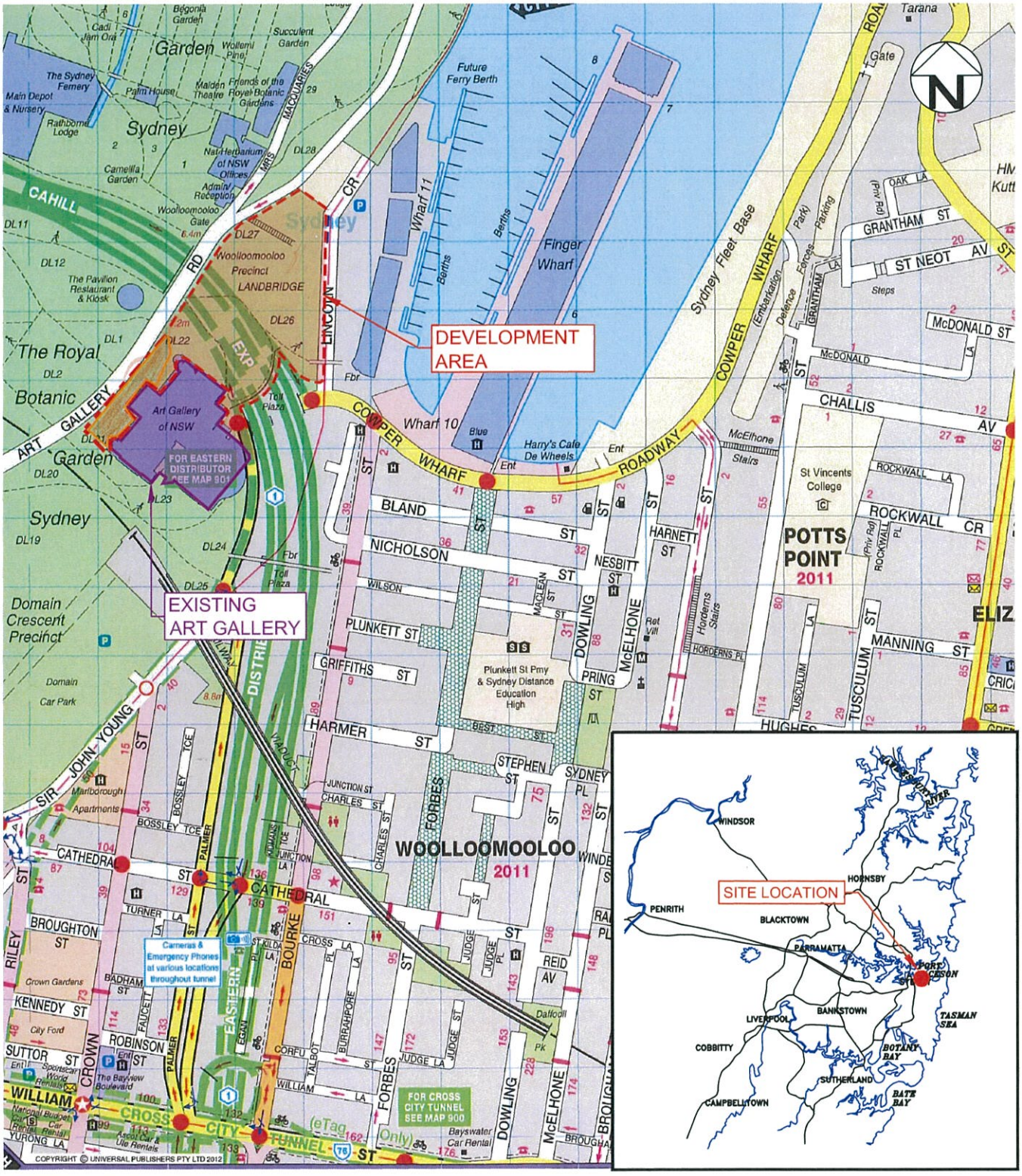
1. Stop work in the area as soon as it is safe to do so and move to a meeting point, preferably up-wind of the find.
2. Contact the Safety Supervisor for the site and advise of the hazard and request assistance to assess the hazard.
3. Have a suitably qualified person, or the Safety Supervisor, assess the potential risk to human health posed by the unexpected find and assess if evacuation or emergency services need to be called.
4. Establish an exclusion zone around the affected area using fencing and/or appropriate barriers and signage. Additional control measures are required for:
    a. Odours and/or volatile compounds: odours suppression and no smoking signage.
    b. Potential asbestos containing materials: if area is small cover with weighted plastic sheeting or geofabric. For larger areas, ensure material remains damp to prevent dust generation.

5. Contact the appointed environmental consultant for advice and request a site visit to undertake an assessment of the unexpected find.
6. The environmental consultant will assess the unexpected find and provide advice as follows:
    a. Preliminary assessment of the contamination and need for immediate management controls (if any);
    b. What further assessment and/or remediation works are required and how such works are to be undertaken in accordance with contaminated site regulations and guidelines;
    c. Notify the Site Auditor of the unexpected find of contamination;
    d. In the case of asbestos, adopt appropriate management protocols and identify requirements for controlled removal;
    e. Prepare an addendum to the Remedial Action Plan (RAP) (if necessary) or provide clean up advice;
    f. Remediation works required (where applicable);
    g. Validation works required following remediation works (if applicable).
7. Works are not to recommence in the affected area until appropriate advice has been obtained from the environmental consultant, the site auditor has been made aware of the changed conditions and the environmental consultant has recommended that works resume.
8. If it is deemed safe to do so, the environmental consultant will provide clearance for works to resume in the affected area. We note that following removal of asbestos impacted materials, WHS regulations require issue of a Clearance Certificate by a Licensed Asbestos Assessor if asbestos is friable or is more than 10m^2 of bonded asbestos cement material. The environmental consultant may seek an opinion from the site auditor before providing clearance. If it is not considered to be safe, earthworks in the area must remain on hold until appropriate assessment, remediation and/or validation measures have been actioned.

A simple one-page summary of the sequence of actions recommended in the UFP.

Below is a summary version of the **Unexpected Finds Procedure** and can be used as a handout:

Appendix B - Figures



GENERAL AREA MAP

SOURCE:UBD STREET DIRECTORY GREGORYS SYDNEY, NEW SOUTH WALES 48TH EDITION, 2013, MAP:J

50 0 50 100 150 200 250

Scale (metres) 1:5000

drawn	DH / AW
approved	-
date	13 / 10 / 19
scale	AS SHOWN
original size	A4

coffey
A TETRA TECH COMPANY

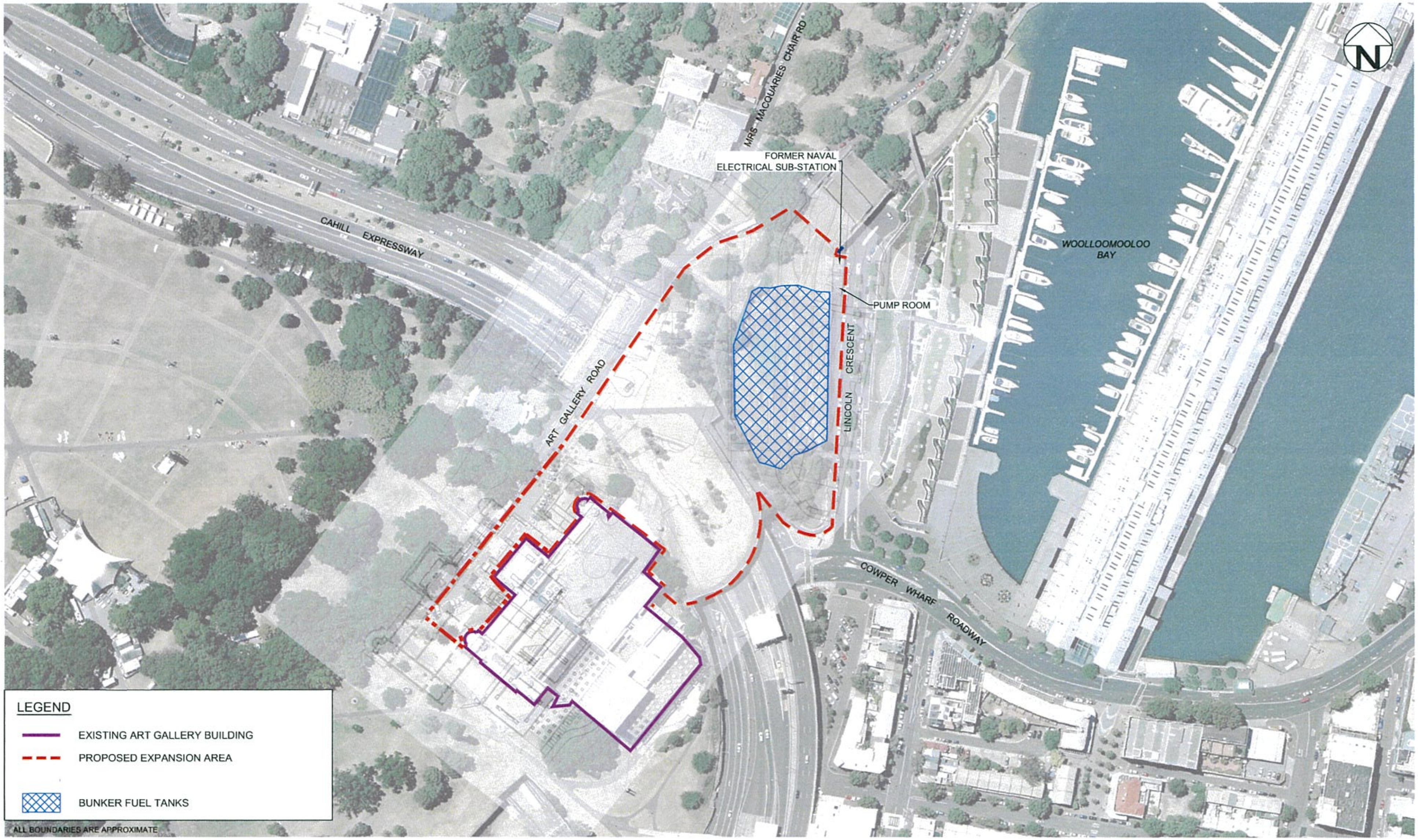
client: RICHARD CROOKES CONSTRUCTIONS

project: REMEDIAL ACTION PLAN
SYDNEY MODERN GALLERY
ART GALLERY ROAD, SYDNEY, NSW

title: SITE LOCATION PLAN

project no: SYDGE234348-EA | figure no: FIGURE 1 | rev: A

PLOT DATE: 27/07/2016 9:29:57 AM DWG FILE: F:\GEOTECHNICS\1 PROJECTS\GEOTL\COV250\GEOTL\COV250\37AC ART GALLERY NSW CONTAMINATION ASSESSMENT\DRAWINGS\GEOTLCOV25037AC-R03B.DWG



AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.2
AERIAL IMAGE ©: 2014 SINCLAIR KNIGHT MERZ

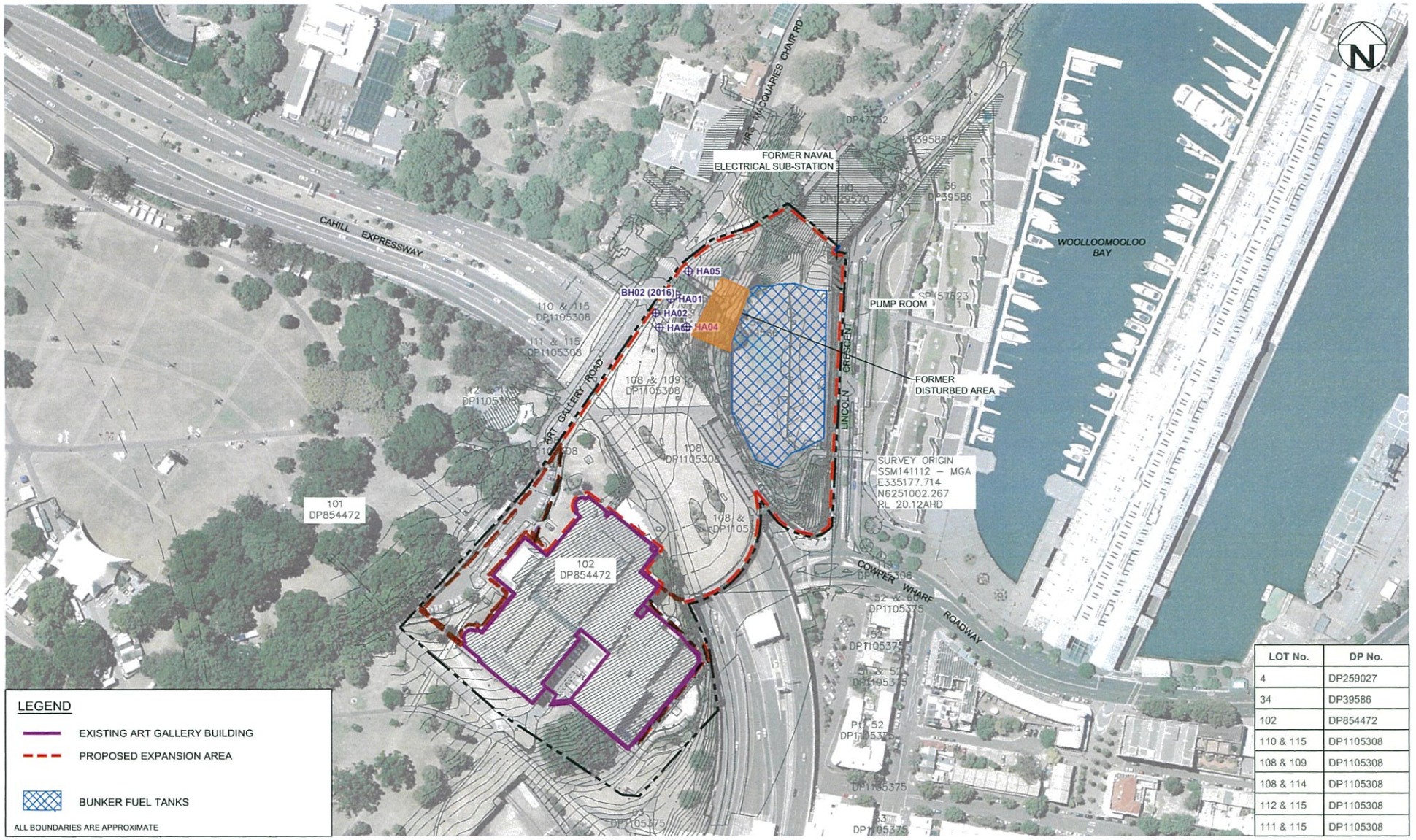
revision	no.	description	drawn	approved	date

20 0 20 40 60 80 100
Scale (metres) 1:2000

drawn	DH / AW
approved	-
date	13 / 10 / 19
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client:	RICHARD CROOKES CONSTRUCTIONS
project:	REMEDIAL ACTION PLAN SYDNEY MODERN GALLERY ART GALLERY ROAD, SYDNEY, NSW
title:	DEVELOPMENT AREA
project no: SYDEN234348-EA	figure no: FIGURE 2 — rev: A



LOT No.	DP No.
4	DP259027
34	DP39586
102	DP854472
110 & 115	DP1105308
108 & 109	DP1105308
108 & 114	DP1105308
112 & 115	DP1105308
111 & 115	DP1105308

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.2
AERIAL IMAGE ©: 2014 SINCLAIR KNIGHT MERZ

revision	no.	description	drawn	approved	date

20 0 20 40 60 80 100
Scale (metres) 1:2000

drawn	DH / AW
approved	-
date	13 / 10 / 19
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

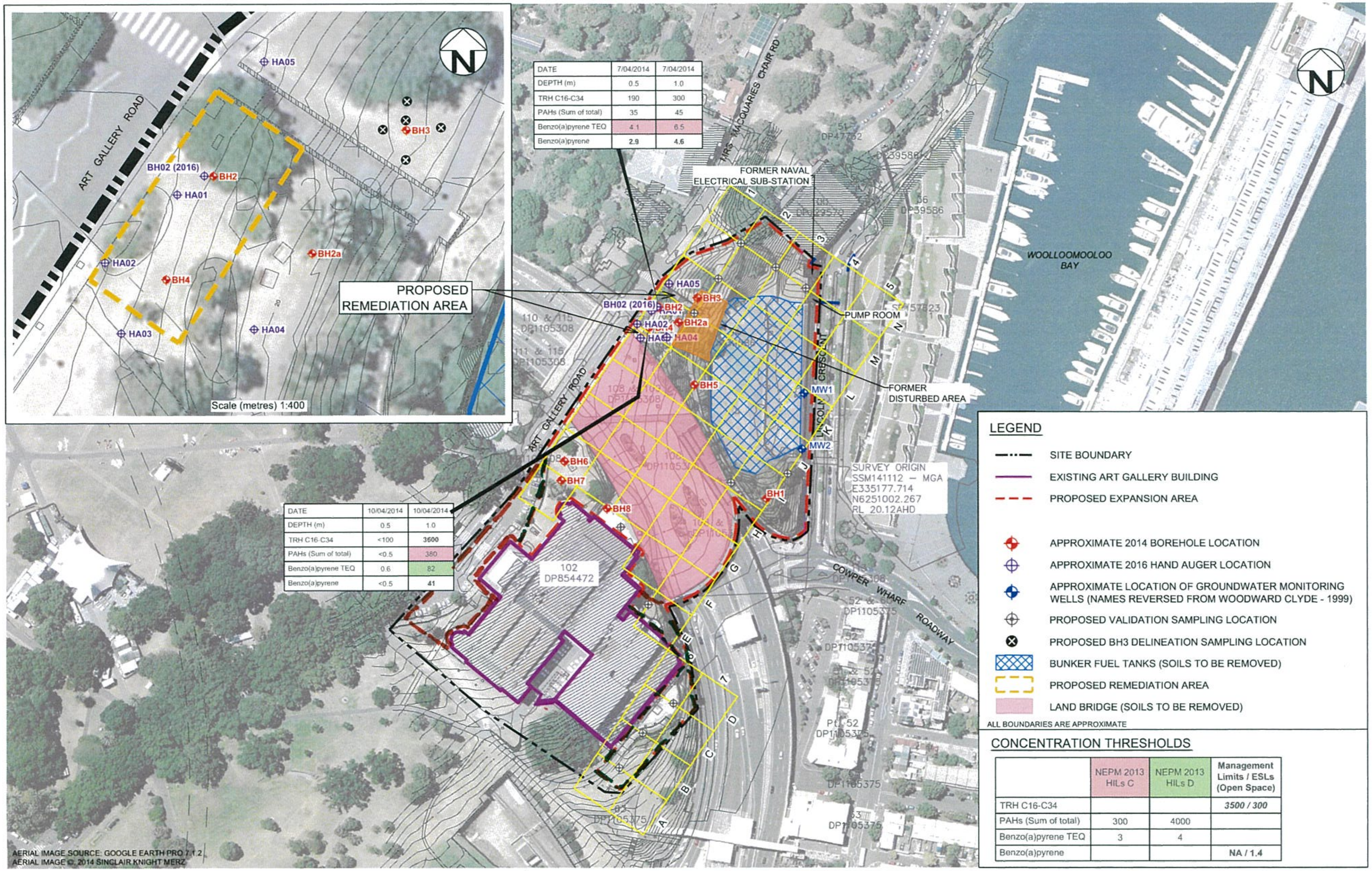
client: RICHARD CROOKES CONSTRUCTIONS

project: REMEDIAL ACTION PLAN
SYDNEY MODERN GALLERY
ART GALLERY ROAD, SYDNEY, NSW

title: SITE SURVEY DRAWING

project no: SYDEN234348-EA | figure no: FIGURE 3 | rev: A

PLOT DATE: 21/07/2019 9:28:00 AM DWG FILE: F:\GEOTECHNICS\1 PROJECTS\GEOTLCOV2500\GEOTLCOV25037\AC ART GALLERY NSW CONTAMINATION ASSESSMENT\DRAWINGS\GEOTLCOV25037AC-R03B.DWG



DATE	7/04/2014	7/04/2014
DEPTH (m)	0.5	1.0
TRH C16-C34	190	300
PAHs (Sum of total)	35	45
Benzo(a)pyrene TEQ	4.1	6.5
Benzo(a)pyrene	**2.9**	**4.6**

DATE	10/04/2014	10/04/2014
DEPTH (m)	0.5	1.0
TRH C16-C34	<100	**3600**
PAHs (Sum of total)	<0.5	380
Benzo(a)pyrene TEQ	0.6	82
Benzo(a)pyrene	<0.5	**41**

LEGEND

- SITE BOUNDARY
- EXISTING ART GALLERY BUILDING
- PROPOSED EXPANSION AREA
- APPROXIMATE 2014 BOREHOLE LOCATION
- APPROXIMATE 2016 HAND AUGER LOCATION
- APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELLS (NAMES REVERSED FROM WOODWARD CLYDE - 1999)
- PROPOSED VALIDATION SAMPLING LOCATION
- PROPOSED BH3 DELINEATION SAMPLING LOCATION
- BUNKER FUEL TANKS (SOILS TO BE REMOVED)
- PROPOSED REMEDIATION AREA
- LAND BRIDGE (SOILS TO BE REMOVED)

ALL BOUNDARIES ARE APPROXIMATE

CONCENTRATION THRESHOLDS

	NEPM 2013 HILs C	NEPM 2013 HILs D	Management Limits / ESLs (Open Space)
TRH C16-C34			***3500 / 300***
PAHs (Sum of total)	300	4000	
Benzo(a)pyrene TEQ	3	4	
Benzo(a)pyrene			**NA / 1.4**

no.	description	drawn	approved	date

revision

Scale (metres) 1:400

Scale (metres) 1:2000

drawn	DH / AW
approved	-
date	13 / 10 / 19
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client: RICHARD CROOKES CONSTRUCTIONS

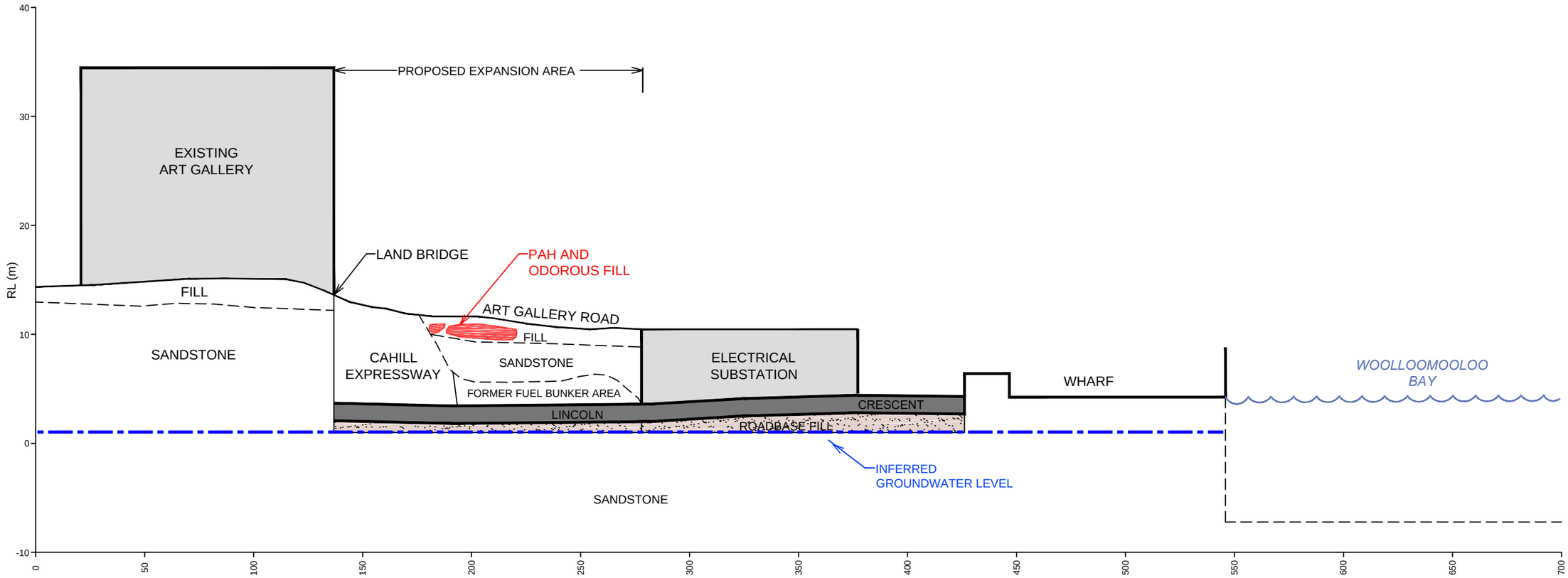
project: REMEDIAL ACTION PLAN
SYDNEY MODERN GALLERY
ART GALLERY ROAD, SYDNEY, NSW

title: SITE LAYOUT PLAN SHOWING PROPOSED REMEDIATION AREAS & VALIDATION SAMPLING LOCATIONS

project no: SYDGE234348-EA | figure no: FIGURE 4 | rev: A

SOUTH-WEST

NORTH-EAST



revision	no.	description	drawn	approved	date

5 0 5 10 15 20

Scale (metres) 1:400

20 0 20 40 60 80 100

Scale (metres) 1:2000

drawn	DH / AW
approved	-
date	13 / 10 / 19
scale	AS SHOWN
original size	A3

coffey
A TETRA TECH COMPANY

client: RICHARD CROOKES CONSTRUCTIONS

project: REMEDIAL ACTION PLAN
SYDNEY MODERN PROJECT
ART GALLERY ROAD, SYDNEY, NSW

title: CONCEPTUAL SITE MODEL

project no: SYDGE234348-EA | figure no: FIGURE 5 | rev: A

PLOT DATE: 27/07/2016 11:03:04 AM DWG FILE: F:\GEOTECHNICS\LPROJECTS\GEOTLCOV250\GEOTLCOV25037AC ART GALLERY NSW CONTAMINATION ASSESSMENT\DRAWINGS\GEOTLCOV25037AC-R03B.DWG

Appendix C – The ENM Order 2014

Resource Recovery Order under Part 9, Clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014

The excavated natural material order 2014

Introduction

This order, issued by the Environment Protection Authority (EPA) under clause 93 of the Protection of the Environment Operations (Waste) Regulation 2014 (Waste Regulation), imposes the requirements that must be met by suppliers of excavated natural material to which 'the excavated natural material exemption 2014' applies. The requirements in this order apply in relation to the supply of excavated natural material for application to land as engineering fill or for use in earthworks.

1. Waste to which this order applies

1.1. This order applies to excavated natural material. In this order, excavated natural material means naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil) that has:

a) been excavated from the ground, and
b) contains at least 98% (by weight) natural material, and
c) does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated natural material does not include material located in a hotspot; that has been processed; or that contains asbestos, Acid Sulfate Soils (ASS), Potential Acid Sulfate soils (PASS) or sulfidic ores.

2. Persons to whom this order applies

2.1. The requirements in this order apply, as relevant, to any person who supplies excavated natural material, that has been generated, processed or recovered by the person.

2.2. This order does not apply to the supply of excavated natural material to a consumer for land application at a premises for which the consumer holds a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under clause 39 'waste disposal (application to land)' or clause 40 'waste disposal (thermal treatment)' of Schedule 1 of the POEO Act.

3. Duration

3.1. This order commences on 24 November 2014 and is valid until revoked by the EPA by notice published in the Government Gazette.

4. Generator requirements

The EPA imposes the following requirements on any generator who supplies excavated natural material.

Sampling requirements

4.1. On or before supplying excavated natural material, the generator must:

4.1.1. Prepare a written sampling plan which includes a description of sample preparation and storage procedures for the excavated natural material.

4.1.2. Undertake sampling and testing of the excavated natural material as required under clauses 4.2, 4.3, and 4.4 below. The sampling must be carried out in accordance with the written sampling plan.

4.2. The generator must undertake sampling and analysis of the material for ASS and PASS, in accordance with the NSW Acid Sulfate Soil Manual, Acid Sulfate Soils Management Advisory Council, 1998 and the updated Laboratory Methods Guidelines version 2.1 – June 2004 where:

4.2.1. the pH measured in the material is below 5, and/or

4.2.2. the review of the applicable Acid Sulfate Soil Risk Maps (published by the former Department of Land and Water Conservation and available at http://www.environment.nsw.gov.au/acidsulfatesoil/riskmaps.htm) indicates the potential presence of ASS.

4.3. For stockpiled material, the generator must:

4.3.1. undertake sampling in accordance with Australian Standard 1141.3.1-2012 Methods for sampling and testing aggregates – Sampling – Aggregates (or equivalent);

4.3.2. undertake characterisation sampling by collecting the number of samples listed in Column 2 of Table 1 with respect to the quantity of the waste listed in Column 1 of Table 1 and testing each sample for the chemicals and other attributes listed in Column 1 of Table 4. For the purposes of characterisation sampling the generator must collect:

4.3.2.1. composite samples for attributes 1 to 10 and 18 in Column 1 of Table 4.

4.3.2.2. discrete samples for attributes 11 to 17 in Column 1 of Table 4.

4.3.2.3. The generator must carry out sampling in a way that ensures that the samples taken are representative of the material from the entire stockpile. All parts of the stockpile must be equally accessible for sampling.

4.3.2.4. for stockpiles greater than 4,000 tonnes the number of samples described in Table 1 must be repeated.

4.3.3. store the excavated natural material appropriately until the characterisation test results are validated as compliant with the maximum average concentration or other value listed in Column 2 of Table 4 and the absolute maximum concentration or other value listed in Column 3 of Table 4.

Table 1

Sampling of Stockpiled Material		
Column 1	**Column 2**	**Column 3**
Quantity (tonnes)	**Number of samples**	**Validation**
<500	3	Required
500 – 1,000	4	
1,000 – 2,000	5	
2,000 – 3,000	7	
3,000 – 4,000	10	

4.4. For in situ material, the generator must:

4.4.1. undertake sampling by collecting discrete samples. Compositing of samples is not permitted for in-situ materials.

4.4.2. undertake characterisation sampling for the range of chemicals and other attributes listed in Column 1 of Table 4 according to the requirements listed in Columns 1, 2 and 3 of Table 2. When the ground surface is not comprised of soil (e.g. concrete slab), samples must be taken at the depth at which the soil commences.

4.4.3. undertake sampling at depth according to Column 1 of Table 3.

4.4.4. collect additional soil samples (and analyse them for the range of chemicals and other attributes listed in Column 1 of Table 4), at any depth exhibiting discolouration, staining, odour or other indicators of contamination inconsistent with soil samples collected at the depth intervals indicated in Table 3.

4.4.5. segregate and exclude hotspots identified in accordance with Table 2, from material excavated for reuse.

4.4.6. subdivide sites larger than 50,000 m² into smaller areas and sample each area as per Table 2.

4.4.7. store the excavated natural material appropriately until the characterisation test results are validated as compliant with the maximum average concentration or other value listed in Column 2 of Table 4 and the absolute maximum concentration or other value listed in Column 3 of Table 4.

Table 2

***In Situ* Sampling at surface**				
Column 1	**Column 2**	**Column 3**	**Column 4**	**Column 5**
Size of *in situ* area (m^2)	**Number of systematic sampling points recommended**	**Distance between two sampling points** (m)	**Diameter of the hot spot that can be detected with 95% confidence** (m)	**Validation**
500	5	10.0	11.8	Required
1000	6	12.9	15.2	
2000	7	16.9	19.9	
3000	9	18.2	21.5	
4000	11	19.1	22.5	
5000	13	19.6	23.1	
6000	15	20.0	23.6	
7000	17	20.3	23.9	
8000	19	20.5	24.2	
9000	20	21.2	25.0	
10,000	21	21.8	25.7	
15,000	25	25.0	28.9	
20,000	30	25.8	30.5	
25,000	35	26.7	31.5	
30,000	40	27.5	32.4	
35,000	45	27.9	32.9	
40,000	50	28.3	33.4	
45,000	52	29.3	34.6	
50,000	55	30.2	35.6	

Table 2 has been taken from NSW EPA 1995, *Contaminated Sites Sampling Design Guidelines*, NSW Environment Protection Authority.

Table 3

***In Situ* Sampling at Depth**	
Column 1	**Column 2**
Sampling Requirements *	**Validation**
1 soil sample at 1.0 m bgl from each surface sampling point followed by 1 soil sample for every metre thereafter. From 1.0 m bgl, sample at the next metre interval until the proposed depth of excavation of the material is reached. If the proposed depth of excavation is between 0.5 to 0.9 m after the last metre interval, sample at the base of the proposed depth of excavation.	Required if the depth of excavation is equal to or greater than 1.0 m bgl

* Refer to Notes for examples

Chemical and other material requirements

4.5. The generator must not supply excavated natural material waste to any person if, in relation to any of the chemical and other attributes of the excavated natural material:

4.5.1. The chemical concentration or other attribute of any sample collected and tested as part of the characterisation of the excavated natural material exceeds the absolute maximum concentration or other value listed in Column 3 of Table 4:

4.5.2. The average concentration or other value of that attribute from the characterisation of the excavated natural material (based on the arithmetic mean) exceeds the maximum average concentration or other value listed in Column 2 of Table 4.

4.6. The absolute maximum concentration or other value of that attribute in any excavated natural material supplied under this order must not exceed the absolute maximum concentration or other value listed in Column 3 of Table 4.

Table 4

Column 1	Column 2	Column 3
Chemicals and other attributes	**Maximum average concentration for characterisation** (mg/kg 'dry weight' unless otherwise specified)	**Absolute maximum concentration** (mg/kg 'dry weight' unless otherwise specified)
1. Mercury	0.5	1
2. Cadmium	0.5	1
3. Lead	50	100
4. Arsenic	20	40
5. Chromium (total)	75	150
6. Copper	100	200
7. Nickel	30	60
8. Zinc	150	300
9. Electrical Conductivity	1.5 dS/m	3 dS/m
10. pH *	5 to 9	4.5 to 10
11. Total Polycyclic Aromatic Hydrocarbons (PAHs)	20	40
12. Benzo(a)pyrene	0.5	1
13. Benzene	NA	0.5
14. Toluene	NA	65
15. Ethyl-benzene	NA	25
16. Xylene	NA	15
17. Total Petroleum Hydrocarbons C_{10}-C_{36}	250	500
18. Rubber, plastic, bitumen, paper, cloth, paint and wood	0.05%	0.10%

* The ranges given for pH are for the minimum and maximum acceptable pH values in the excavated natural material.

Test methods

4.7. The generator must ensure that any testing of samples required by this order is undertaken by analytical laboratories accredited by the National Association of Testing Authorities (NATA), or equivalent.

4.8. The generator must ensure that the chemicals and other attributes (listed in Column 1 of Table 4) in the excavated natural material it supplies are tested in accordance with the test methods specified below or other equivalent analytical methods. Where an equivalent analytical method is used the detection limit must be equal to or less than that nominated for the given method below.

4.8.1. Test methods for measuring the mercury concentration.

4.8.1.1. Analysis using USEPA SW-846 Method 7471B Mercury in solid or semisolid waste (manual cold vapour technique), or an equivalent analytical method with a detection limit < 20% of the stated absolute maximum concentration in Column 3 of Table 2 (i.e. < 0.20 mg/kg dry weight).

4.8.1.2. Report as mg/kg dry weight.

4.8.2. Test methods for measuring chemicals 2 to 8.

4.8.2.1. Sample preparation by digesting using USEPA SW-846 Method 3051A Microwave assisted acid digestion of sediments, sludges, soils, and oils (or an equivalent analytical method).

4.8.2.2. Analysis using USEPA SW-846 Method 6010C Inductively coupled plasma - atomic emission spectrometry, or an equivalent analytical method with a detection limit < 10% of the stated absolute maximum concentration in Column 3 of Table 2, (e.g. 10 mg/kg dry weight for lead).

4.8.2.3. Report as mg/kg dry weight.

4.8.3. Test methods for measuring electrical conductivity and pH.

4.8.3.1. Sample preparation by mixing 1 part excavated natural material with 5 parts distilled water.

4.8.3.2. Analysis using Method 103 (pH) and 104 (Electrical Conductivity) in Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).

4.8.3.3. Report electrical conductivity in deciSiemens per metre (dS/m).

4.8.4. Test method for measuring Polynuclear Aromatic Hydrocarbons (PAHs) and benzo(a)pyrene.

4.8.4.1. Analysis using USEPA SW-846 Method 8100 Polynuclear Aromatic Hydrocarbons (or an equivalent analytical method).

4.8.4.2. Calculate the sum of all 16 PAHs for total PAHs.

4.8.4.3. Report total PAHs as mg/kg dry weight.

4.8.4.4. Report benzo(a)pyrene as mg/kg.

4.8.5. Test method for measuring benzene, toluene, ethylbenzene and xylenes (BTEX).

4.8.5.1. Method 501 (Volatile Alkanes and Monocyclic Aromatic Hydrocarbons) in Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).

4.8.5.2. Report BTEX as mg/kg.

4.8.6. Test method for measuring Total Petroleum Hydrocarbons (TPH).

4.8.6.1. Method 506 (Petroleum Hydrocarbons) in Schedule B (3): Guideline on Laboratory Analysis of Potentially Contaminated Soils, National Environment Protection (Assessment of Site Contamination) Measure 1999 (or an equivalent analytical method).

4.8.6.2. Report as mg/kg dry weight.

4.8.7. Test method for measuring rubber, plastic, bitumen, paper, cloth, paint and wood.

4.8.7.1. NSW Roads & Traffic Authority Test Method T276 Foreign Materials Content of Recycled Crushed Concrete (or an equivalent method).

4.8.7.2. Report as percent.

Notification

4.9. On or before each transaction, the generator must provide the following to each person to whom the generator supplies the excavated natural material:

- a written statement of compliance certifying that all the requirements set out in this order have been met;
- a copy of the excavated natural material exemption, or a link to the EPA website where the excavated natural material exemption can be found; and
- a copy of the excavated natural material order, or a link to the EPA website where the excavated natural material order can be found.

Record keeping and reporting

4.10. The generator must keep a written record of the following for a period of six years:

- the sampling plan required to be prepared under clause 4.1.1;
- all characterisation sampling results in relation to the excavated natural material supplied;
- the volume of detected hotspot material and the location;
- the quantity of the excavated natural material supplied; and
- the name and address of each person to whom the generator supplied the excavated natural material.

4.11. The generator must provide, on request, the characterisation and sampling results for that excavated natural material supplied to the consumer of the excavated natural material.

5. Definitions

In this order:

application or apply to land means applying to land by:

- spraying, spreading or depositing on the land; or
- ploughing, injecting or mixing into the land; or
- filling, raising, reclaiming or contouring the land.

Bgl means below ground level, referring to soil at depth beneath the ground surface.

composite sample means a sample that combines five discrete sub-samples of equal size into a single sample for the purpose of analysis.

consumer means a person who applies, or intends to apply excavated natural material to land.

discrete sample means a sample collected and analysed individually that will not be composited.

generator means a person who generates excavated natural material for supply to a consumer.

hotspot means a cylindrical volume which extends through the soil profile from the ground surface to the proposed depth of excavation, where the level of any contaminant listed in Column 1 of Table 2 is greater than the absolute maximum concentration in Column 3 of Table 2.

***in situ* material** means material that exists on or below the ground level. It does not include stockpiled material.

***in situ* sampling** means sampling undertaken on *in situ* material.

N/A means not applicable.

stockpiled material means material that has been excavated from the ground and temporarily stored on the ground prior to use.

systematic sampling means sampling at points that are selected at even intervals and are statistically unbiased.

transaction means:

- in the case of a one-off supply, the supply of a batch, truckload or stockpile of excavated natural material that is not repeated.
- in the case where the supplier has an arrangement with the recipient for more than one supply of excavated natural material, the first supply of excavated natural material as required under the arrangement.

Manager Waste Strategy and Innovation

Environment Protection Authority

(by delegation)

Notes

The EPA may amend or revoke this order at any time. It is the responsibility of each of the generator and processor to ensure it complies with all relevant requirements of the most current order. The current version of this order will be available on ' www.epa.nsw.gov.au

In gazetting or otherwise issuing this order, the EPA is not in any way endorsing the supply or use of this substance or guaranteeing that the substance will confer benefit.

The conditions set out in this order are designed to minimise the risk of potential harm to the environment, human health or agriculture, although neither this order nor the accompanying exemption guarantee that the environment, human health or agriculture will not be harmed.

Any person or entity which supplies excavated natural material should assess whether the material is fit for the purpose the material is proposed to be used for, and whether this use may cause harm. The supplier may need to seek expert engineering or technical advice.

Regardless of any exemption or order provided by the EPA, the person who causes or permits the application of the substance to land must ensure that the action is lawful and consistent with any other legislative requirements including, if applicable, any development consent(s) for managing operations on the site(s).

The supply of excavated natural material remains subject to other relevant environmental regulations in the POEO Act and Waste Regulation. For example, a person who pollutes land (s. 142A) or water (s. 120), or causes air pollution through the emission of odours (s. 126), or does not meet the special requirements for asbestos waste (Part 7 of the Waste Regulation), regardless of this order, is guilty of an offence and subject to prosecution.

This order does not alter the requirements of any other relevant legislation that must be met in supplying this material, including for example, the need to prepare a Safety Data Sheet. Failure to comply with the conditions of this order constitutes an offence under clause 93 of the Waste Regulation.

Examples

In situ sampling at depth

Example 1.

If the proposed depth of ENM excavation is between 1 m bgl and 1.4 m bgl, then:

- 1 sample on surface (as per the requirements of Table 2).
- 1 sample at 1 m bgl.
- No further depth sampling after 1 m bgl, unless required under section 4.4.4.

Example 2.

If the proposed depth of ENM excavation is at 1.75 m bgl, then:

- 1 sample on surface (as per the requirements of Table 2).
- 1 sample at 1 m bgl.
- 1 sample at 1.75 m bgl.
- No further depth sampling after 1.75 m bgl, unless required under section 4.4.4.

Example 3.

If the proposed depth of ENM excavation is at 2.25 m bgl, then:

- 1 sample on surface (as per the requirements of Table 2).
- 1 sample at 1 m bgl.
- 1 sample at 2 m bgl.
- No further depth sampling after 2 m bgl, unless required under section 4.4.4.

This page has been left intentionally blank