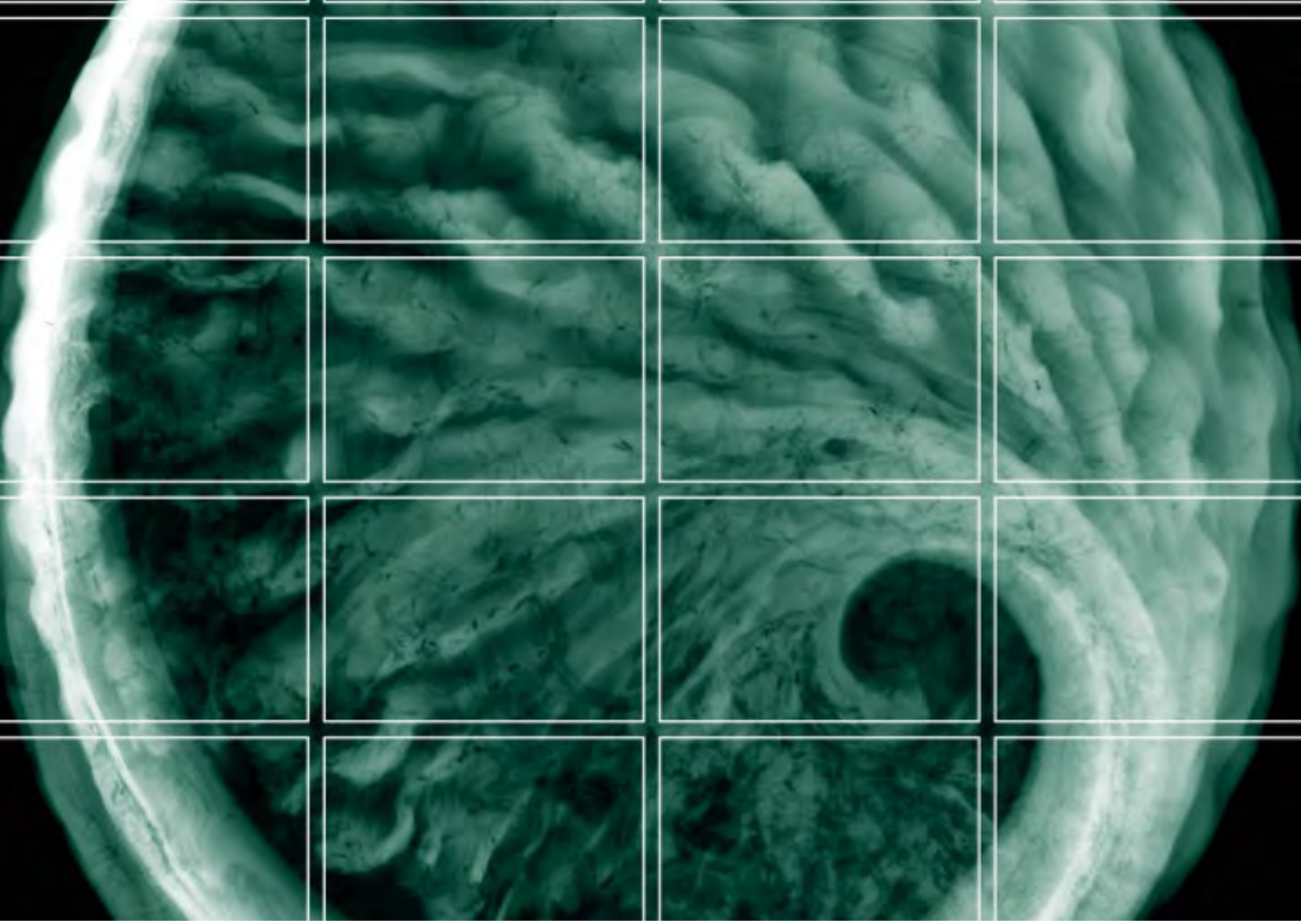
APPENDIX A PREVIOUS SITE CONTAMINATION ASSESSMENTS



Remedial Action Plan

21 Muir Road, Chullora

11 January 2021

Project No.: 0574561

The business of sustainability

ERM

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11 January 2021

Remedial Action Plan

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CONTENTS

Acronyms and Abbreviations

ACM	Asbestos Containing Material
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure, 1999 amended 2013
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CoPC	Constituents of Potential Concern
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DA	Development Application
DP	Deposited Plan
DQI	Data Quality Indicators
DQO	Data Quality Objectives
DSI	Detailed Site Investigation
EMP	Environment Management Plan
ENM	Excavated Natural Material
ERM	Environmental Resources Management Australia Pty Ltd
ESA	Environmental Site Assessment
LAA	Licenced Asbestos Assessor
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NOHSC	National Occupational Health and Safety Commission
NSW EPA	NSW Environmental Protection Authority
OC / OP	Organochlorine / Organophosphate pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PARCC	Precision, Accuracy, Representativeness, Comparability and Completeness
PCB	Polychlorinated Biphenyls
POEO Act	Protection of the Environment Operations Act, 1997
PPE	Personal Protective Equipment
QA / QC	Quality Assurance and Quality Control
RAP	Remedial Action Plan
SEPP	State Environment Planning Policy
SPR	Source – Pathway – Receptor Linkage
TRH	Total Recoverable Hydrocarbons
USEPA	United States Environmental Protection Agency
VENM	Virgin Excavated Natural Material

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by SUEZ Recycling and Recovery Pty Ltd (SUEZ) to prepare a Remedial Action Plan (RAP) for the former waste management centre located at 21 Muir Road, Chullora NSW (the Site).

The Site is currently in the planning phase of redevelopment, and a Development Application (DA) has been submitted to the City of Canterbury Bankstown (Council) for “early works and site establishment, including demolition, removal of tress and other vegetation, flood storage works and bulk earthworks, across the footprint of the subject site”. The early works will include raising the surface elevation of the entire Site as a flood mitigation measure.

The objectives of this RAP are to summarise the nature and extent of identified soil contamination based on previous investigations, the extent of remediation required, review the remediation options, identify a feasible remediation strategy to address the identified contamination. The RAP also provides environmental management requirements and health and safety considerations for the works.

It has been concluded through previous investigations that Site contamination may be appropriately managed by institutional controls, however an opportunity exists to improve the condition of the Site during planned flood mitigation works. The goal of the remedial works is to reduce the likelihood of incidental exposure to contaminated fill material.

In order to identify the most appropriate remedial approach for the Site, a number of potentially feasible options which may be incorporated into the flood mitigation works were identified. The options assessed based on environmental health benefit, time constraints, sustainability, site logistics, and cost. Onsite capping and containment has been selected as the preferred remedial option. Capping and containment involves the installation of a physical barrier around the contaminated area to mitigate potential exposure pathways to contaminants. Capping and appropriate surface water management typically affords a sufficient level of protection to future Site users from the underlying contamination.

The remedial methodology will involve the installation of a cap of at least 0.5 m thickness across the required area. In order to accommodate a sufficient cap thickness under the planned final landform, some impacted material will require excavation and replacement. The total area of excavation will be ~11,600 m^2 and the area of fill will be approximately ~18,000 m^2. Due to the potential presence of asbestos containing materials (ACM) in fill across the redevelopment area, works will take place in staged portions in order to control potential exposure and limit the area where asbestos controls are required.

After all excavation and replacement works have been complete, a geofabric marker layer will be installed across the prepared land area prior to import of capping. This marker layer will provide a visual indication of the potential for underlying contamination in the event of future earthworks / intrusive activities. A minimum of 0.5 m of imported virgin excavated natural material (VENM) or excavated natural material (ENM) will then be placed to form the capping layer. The final landform will be a level Site at the eastern portion, with a flood mitigation basin at a lower finished level in the western portion.

Following the completion of the remediation activities a Validation Report will be produced which documents the remedial activities undertaken, presents data to confirm that the cap has been appropriately installed and that the remediation objectives have been met. The Validation Report will include a clear conclusion on the suitability of the Site for the proposed future use.

To protect long term integrity of the cap and to reduce the risk of potentially contaminated soil being inadvertently disturbed in the future a separate Long Term Environmental Management Plan (LTEMP) will be utilised and kept on title for the Site. The LTEMP will outline the extent of contamination present and will detail the health and safety and environmental controls necessary should potentially contaminated material need to be disturbed in the future.

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by SUEZ Recycling and Recovery Pty Ltd (SUEZ) to prepare a Remedial Action Plan (RAP) for the former waste management centre located at 21 Muir Road, Chullora NSW (the Site). The location of the Site as well as the Site boundary and key Site features are presented in *Figure 1, Appendix A* and *Figure 2, Appendix A* respectively.

The Site is currently in the planning phase of redevelopment, and Development Application DA366/2020 (the DA) has been submitted to the City of Canterbury Bankstown (Council) for *"early works and site establishment, including demolition, removal of tress and other vegetation, flood storage works and bulk earthworks, across the footprint of the subject site"*. The early works will include raising the surface elevation of the entire Site by approximately 1 m as a flood mitigation measure.

As previous environmental investigations have identified contamination to be present in fill material at the Site, Council has requested that a RAP be prepared to support the aforementioned DA. The RAP will provided strategies to manage historical contamination at the Site under future Site uses and also provide mitigations and controls to guide the completion of the earth works portion of the planned flood mitigation works.

1.1 Objectives and Scope

The objectives of this RAP are to:

- set a remediation goal that will facilitate the proposed redevelopment works at the Site and the required remedial works in a manner that meets both stakeholder and relevant legislative requirements with regards to the management of risks related to Site contamination;
- provide a remediation strategy which, if implemented correctly, will reduce or eliminate the identified potential risks to receptors;
- provide procedures and plans for the completion of proposed remedial works; and
- identify the environmental safeguards necessary to complete the proposed remedial works in a manner that mitigates the potential risk of negative impacts to worker health and safety and the environment.

In summary, this RAP summarises the nature and extent of identified soil contamination based on previous investigations, the extent of remediation required, review of remediation options, identifies a feasible remediation strategy to address the identified contamination, environmental management requirements and health and safety considerations.

2. SITE BACKGROUND

2.1 Site Identification

The Site is located at 21 Muir Road, Chullora NSW and is currently zoned for commercial/industrial land use. It is bound by Muir Road to the north, the Cooks River to the south and industrial land to the east and west. *Table 2.1* below summaries the Site identification details.

Table 1: Site Identification Details

Item	Description
Site Address	21 Muir Road, Chullora NSW 2190
Legal Identification	2 of Deposited Plan (DP) 1227526
Local Government Authority	Canterbury-Bankstown Council
Current Zoning	IN1 – General Industrial
Development Controls	Bankstown Local Environmental Plan 2015
Site Area	9.2 hectares

2.2 Site History

The Site has historically been used as a resource recovery and waste management centre. The primary Site activity was the processing of recoverable resources and the storage of waste materials such as concrete and plastic.

Prior its use as a resource recovery centre, the Site had been used for industrial purposes dating back to the 1930s. The former workshop buildings were confirmed as the location of an electric rail car workshop and the area in the vicinity of the former weighbridge was historically used as a paint shop, compressor building and fuel storage facility until 1994.

In 2017, the Site experienced a large fire that resulted in a Section 91 “Clean-Up” Notice under the *Protection of the Environment Operations Act, 1997* (POEO Act). As a result of the fire, the Site infrastructure was demolished to ground level. The Site currently operates as a storage facility for garbage bins and as a servicing, maintenance and parking area for garbage trucks.

A more detailed Site history is presented in the ERM (2019) Stage 2 Contamination Assessment.

2.3 Proposed Future Site Use

Although the works covered under this RAP are limited to flood mitigation works, the works do form the early stages of a significant development at the Site. The Site is planned for development as a new Resource Recovery Facility, which has been designated as State Significant Development (SSD) and as such an Environmental Impact Statement (EIS) is being prepared for the works. Under the SSD works the entire operational portion of the Site (eastern two thirds) would be covered in concrete slab and infrastructure.

2.4 Environmental Setting

2.4.1 Surrounding Land Use

Land use surrounding the Site is summarised below:

- North – commercial/industrial land use (food packaging facility);
- East – ANZAC St, beyond which is commercial/industrial land use;

- South – the Cooks River is directly to the south, with commercial/industrial land use on the southern side of the river; and
- West – a vegetation corridor, beyond which lies commercial/industrial land use.

2.4.2 Topography

The Site is undulating, with an overall slope towards the Cooks River in the south. The elevation ranges between 44 m AHD in the north west to 36 m AHD in the south west. It is expected that runoff water would follow the topography of the land towards the west / south-west.

2.4.3 Geology and Soils

Review of the 1:100,000 'Sydney Geological Series' Sheet 9130 indicated that the Site is underlain by Triassic-aged Bringelly Shale of the Wianamatta Group. This formation comprises shale, carbonaceous claystone, laminate, fine to medium grained lithic sandstone, and rare coal derived from alluvial and estuarine environments.

A review of the 1:25,000 'Liverpool Acid Sulfate Soil Map' indicated that there are no known occurrences of acid sulfate soils (ASS) in the vicinity of the Site. No evidence of suspected ASS have been observed at the Site.

Previous investigations undertaken onsite (DLA, 2016) indicate that the subsurface of the Site in the areas subject to investigation comprised fill materials (ranging from crushed sandstone, gravelly road base and clayey sand) to a maximum depth of 2.8 m below ground level (m bgl) overlying reddish brown / brown and grey residual silty clays. Weathered shale bedrock was encountered at some locations during the Stage 2 Contamination Assessment (ERM, 2019) at depths between 0.1 m and 1.2 m bgl.

2.4.4 Hydrology and Hydrogeology

The Cooks River forms the southern boundary of the western and central parts of the Site. The river then extends through the northern end of the south-eastern 'arm' of the Site and continues in a northerly direction through the eastern portion of the Site, parallel to the eastern Site boundary. The Cooks River in the vicinity of the Site flows in a broadly north-easterly direction, however regionally flows in a south-easterly direction, ultimately discharging to Botany Bay.

Historical gauging recorded groundwater at depths of up to 5.42 m below top of casing (m btoc). Based on the topography of the Site and regional hydrology, the inferred groundwater flow direction was towards the north-east (AECOM, 2015).

A search of the NSW Office of Water groundwater database indicated no registered bores are located within 500 m of the Site.

2.5 Previous Investigations

2.5.1 Historical Investigations

Between 1994 and 1997 at least 5 Environmental Site Assessments (ESAs) were conducted at the Site following the transition of Site ownership from the State Rail Authority to WSN. These early suite of investigations were generally targeted to certain areas, limited in scope and did not identify significant soil or groundwater contamination.

2.5.2 Limited Phase 2 ESA (AECOM, 2015)

A limited ESA conducted by AECOM included 20 boreholes and the installation of 5 groundwater monitoring wells at the Site. 10 boreholes were drilled within the Lot 2 boundary (the Site), with eight encountering fill material.

Soil samples collected as part of the investigation reported Constituents of Potential Concern (CoPCs) below the selected screening criteria. Groundwater samples collected at the Site indicated that there was a low potential for groundwater contamination-related risk to future Site development in the locations tested.

2.5.3 Detailed Site Investigation (DLA, 2016)

The investigation included the collection of soil samples from 21 boreholes advanced onsite to a maximum depth of 1.6 m below ground level (bgl). A number of groundwater monitoring wells which were existing onsite were also sampled during the investigation, with no significant contamination identified.

Although a number of locations reported detectable concentrations of Total Recoverable Hydrocarbons (TRH) and/or Polycyclic Aromatic Hydrocarbons (PAHs) in shallow soils, concentrations in all soil samples were below the applicable ASC NEPM guidelines. Asbestos was not identified at any of the locations sampled.

The report concluded that based on the results of the investigation there was a low likelihood of unacceptable contamination present onsite, however did note four Areas of Environmental Concern (AECs) which required further investigation, two of which concerned shallow soils. These included lead in shallow soils beneath the eastern building (as identified in a historical assessment) and petroleum hydrocarbon ASTs, which were in use at the time.

2.5.4 Stage 2 Contamination Assessment (ERM, 2019)

ERM Services was engaged by Frazier's Property on behalf of SUEZ to complete further intrusive contamination investigation works at the Site in order to assess if the Site was suitable for its proposed use as a Resource Recovery Facility.

ERM Services reported that in order for the sample density at the Site to meet the requirements of the NSW EPA (1995) Sampling Design Guidelines, 107 total locations would be required to be sampled to fully characterise the Site. Given that DLA had recently advanced 21 boreholes, ERM Services advanced an additional 70 test pits and 16 boreholes (86 locations) to achieve the required density. The ERM Services test pits were advanced on a systematic grid pattern across the entire Site to a maximum depth of approximately 3 m bgl. With the demolition of the onsite structures, the investigation was able to access all areas of the Site, including the footprint of former structures that had been damaged by fire. The ERM boreholes were advanced in locations where an excavator could not access to depths of between 0.4 - 1.5 m bgl. The investigation locations advanced during the 2019 DSI are presented in the figure in Attachment A.

During the 2019 investigation it was noted that fill materials comprised the upper subsurface of the Site and typically consisted of a combination of ash and slag, clay, sand, and gravel to depths between 0.1 m and 2.8 m bgl. Solid black tarry material was also identified within the fill in the central to eastern portion of the Site. The material was encountered at depths between approximately 0.2 m and 0.4 m bgl and was isolated to the narrow band of material present between a buried slab and the surface slabs. ERM noted that natural material was encountered at the majority of locations at depths of between 0.1 – 2.8 m bgl.

Two soil samples collected from the Site reported chemical contaminants at concentrations above screening criteria. Benzo(a)pyrene (B(a)P) exceeded the adopted direct contact criteria at one location in the central portion of the Site which was associated with a solid tar like material and was statistically determined to be a hot spot. TRH $_{C16-34}$ exceeded management limits in one sample at the eastern-most portion of the Site in the area where the DLA (2016b) investigation had identified similar material. Potential Asbestos Containing Material (ACM) was also noted at 14 locations both at the surface and in fill material in the central to northern portion of the Site. This was confirmed as being ACM at all locations where laboratory analysis was undertaken.

3. DATA QUALITY OBJECTIVES

For the purposes of this RAP, the following data quality objectives (DQOs) have been adopted to define the type and quality of data required to achieve the project objectives outlined in *Section 1.1*. The DQOs were selected with reference to relevant guidelines published by the NSW Environmental Protection Authority (NSW EPA) and the National Environment Protection Council (NEPC) which define minimum data requirements and quality control procedures.

The DQOs have been prepared in line with the DQO process outlined by the NSW EPA in *Guidelines for the NSW Site Auditor Scheme 3rd Edition, 2017* and by NEPC in the *National Environment Protection (Assessment of Site Contamination) Measure, 1999 amended 2013* (ASC NEPM). The proposed application of the seven step DQO approach to this project is described in the following subsections.

3.1 Step One: State the Problem

Based on previous investigations at the Site, contamination is present within soils which are likely to be disturbed as part of development works. As such, processes describing the handling of potentially contaminated excavated material and appropriate remedial strategy is required. The objectives of the RAP are stated in *Section 1.1*.

3.2 Step Two: Identify the Decision

The decision to be made with respect to the contamination at the Site relates to identifying what is the most appropriate remedial strategy (and associated management measures) in order to facilitate the redevelopment works.

Once a strategy is in place and the works completed a decision must be made as to whether the remediation objectives have been met through validation of the works.

3.3 Step Three: Identify the Inputs to the Decision

The inputs required to make the above decisions are as follows:

- historical soil data available for the Site, particularly from DLA (2016) and ERM (2019);
- field observations which will be made during the fieldworks associated with remedial activities;
- survey data taken before, during and after the capping works;
- remedial objectives;
- legislative and stakeholder requirements; and
- an assessment of potential remedial options.

3.4 Step Four: Define the Boundaries of the Study

3.4.1 Spatial and Temporal Boundaries

The extent of the area to which this RAP applies is within the Site boundaries as described in *Section 2.1* and presented on *Figure 2, Appendix A*. The specific areas which will be subject to remediation are defined as the soils within the extent of planned earthworks required as part of the redevelopment works.

Temporally, this RAP applies to the previous investigations, from which data has been utilised in developing this RAP and to the duration of the planned flood mitigation works.

3.4.2 Constraints on the RAP

Constraints on the implementation of the RAP within the established boundaries include:

- the pre-determined extent of the cut and fill excavation;
- future Site design and required final landform;
- external stakeholder intervention; and
- delay in delivery due to inclement weather, flooding or similar.

3.5 Step Five: Develop a Decision Rule

The DQOs have been designed to facilitate the collection of adequate data to address the decisions in Step 2 of the DQO process. The decision rules are oulined below

3.5.1 Remediation Criteria

The adopted initial screening criteria for assessing whether any excavated material is contaminated have generally been sourced from guidelines made or approved under the NSW *Contaminated Land Management Act, 1997* (CLM Act) which includes the ASC NEPM. The criteria have been chosen based on the current and future receptors for the Site under its current land use, which includes:

- National Environment Protection Council, *National Environment Protection (Assessment of Site Contamination) Measure, 1999 amended 2013 – Schedule B1: Guidelines on the Investigation Levels for soil and Groundwater*. Adopted criteria include:
  - Health investigation level (HIL) 'D' – Commercial / Industrial land use; and
  - Management limits for TRH fractions in soil – commercial / industrial land use.
- Co-operative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) *Technical Report No. 10 – Health screening levels for petroleum hydrocarbons in soil and groundwater, 2011 – Part 2: Application Document, Direct Contact*.
  - Health screening level (HSL) 'D' – commercial / industrial land use, for sand (coarse material).

Further consideration of ecological screening criteria is not considered necessary as the proposed redevelopment of the Site includes extensive paved areas and limited access for landscaping. Where landscaping is required, it is anticipated that topsoil will be imported as growth media.

It should be noted that whilst the adopted criteria are not designed to be used as default remediation criteria, in the absence of applicable Site-specific remediation criteria the criteria selected are considered suitable for the redevelopment works.

Materials which are deemed to contain concentrations of CoPCs in excess of the initial screening criteria will be determined to be contaminated and will require further management. This material will be classified in accordance with the NSW EPA *Waste Classification Guidelines Part 1: Classifying waste, 2014*.

3.5.2 Suitability of Capping

The suitability of capping material bought to the Site will be based on the requirements of virgin excavated natural material (VENM) and excavated natural material (ENM) as described in Section 6.5.

The decision to be made around the appropriateness of the cap thickness which will achieved by the remedial works (minimum 0.5m) will be through the analysis of survey data collected during the program.

3.5.3 Quality Assurance and Quality Control

The suitability of any soil data collected will be assessed based on comparison with acceptable limits for field and laboratory Quality Control (QC) samples outlined in relevant guidelines made or approved under the ASC NEPM. A summary of the Quality Assurance (QA) and QC procedures to be adopted is presented in *Section 6* of this report.

3.6 Step Six: Specify Limits on Decision Errors

The acceptable limits on decision errors applied during the review of the results will be based on the data quality indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness (PARCC) in accordance with the ASC NEPM, 2013 *Schedule B3 - Guideline on Laboratory Analysis of Potentially Contaminated Soils.*

Laboratory data is required to be within levels specified by laboratory methods, which are largely based on United States Environmental Protection Agency (USEPA) protocols, including specified sample holding times. Analytical results for any laboratory-prepared spike samples (including trip spikes) are required to be within the limits specified by the laboratory (generally a minimum of 70-130%). If rinsate blanks are collected, any detections of CoPCs will be assessed and discussed in relation to suitability of field decontamination.

The potential for decision errors will be minimised by:

- completing a robust QA/QC assessment of the validation data and application of the probability that 95% of data will satisfy the DQIs, therefore a limit on the decision error would be 5% that a conclusive statement may be incorrect;
- assessing whether appropriate sampling and analytical density has been achieved for the purposes of characterising the material being sampled designing sampling plans in accordance with NSW EPA *Sampling Design Guidelines, 1995 and ASC NEPM, 2013*;
- ensuring that the criteria set was appropriate for the ongoing use of the Site; and
- following completion of remedial works, a cap must be in place over accessible areas such that no incidental contact with contaminants can occur.

3.7 Step Seven: Optimise the Design for Obtaining Data

The DQOs have been developed based on a review of existing data. The aim of establishing the DQOs outlined above prior to the commencement of the project is to facilitate the collection of a suitably accurate, precise, comparable, representative and complete data set to validate the effectiveness of the remedial works.

4. CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) was developed for the Site as part of the Stage 2 Contamination Assessment (ERM, 2019). As significant groundwater contamination which requires remediation has not been identified at the Site during previous groundwater assessments, remediation of groundwater is not required to be addressed as part of this RAP. Therefore this CSM relates only to potential source-pathway-receptors (SPR) linkages associated with soils. The CSM is summarised in the subsections below.

4.1 Potential Sources of Contamination

ERM (2019) identified the following potential sources of contamination:

- fill material of unknown origin and quality (i.e. generated on Site and imported to the Site);
- demolition of former building potentially containing hazardous materials;
- historical workshop and rail siding activities;
- fuel storage; and
- historical waste management activities.

4.1.1 Constituents of Potential Concern

The CoPCs which have been confirmed as present through previous investigation at the Site include:

- Asbestos;
- Benzo(a)Pyrene; and
- Total Recoverable Hydrocarbons (TRH).

4.2 Nature and Extent of Contamination

The findings of the Stage 2 Contamination Assessment (ERM, 2019) represent the most recent and comprehensive characterisation of fill material at the Site. The nature and extent of contamination which had been confirmed as present by both ERM (2019) and historical investigations are outlined in the following subsections. The potential risks which these impacts may pose to Site receptors is discussed in Section 4.4. The Areas of known contamination are also shown on Figure 3, Appendix A.

4.2.1 Asbestos

Fragments of asbestos have been found in fill material across the Site as illustrated on Figure 3, Appendix A. Detections have generally been observed within the layer of fill material between 0.1 m and 2.8 m bgl. Based on the known distribution in fill material, the likely source of the asbestos is likely to be the importation of contaminated fill material. Although the frequency of asbestos fragment detections has been higher at the southern and northern portions of the Site, isolated fragments have also been identified beneath the footprints of former buildings. Based on this distribution of impacts, it is considered that asbestos may be encountered in fill across the Site.

4.2.2 Benzo(a)Pyrene

A discrete area where Benzo(a)pyrene (B(a)P) concentrations were above the screening criteria is present in the central portion of the Site (see Figure 3, Appendix A). ERM (2019) concluded that this detection was likely to represent a localised ‘hotspot’, related to the presence of a tar like material in the area. Due to the density of test pitting and soil sampling achieved across the history of the Site with no other observations of the tar like material associated with the B(a)P it is considered unlikely that widespread impacts exist at the Site.

4.2.3 TRH

DLA (2016b) and ERM (2019) identified TRH C16-34 exceeding commercial/industrial management limits at the eastern-most portion of the Site beneath the office car parking area (see Figure 3, Appendix A). The concentrations were limited to one test pit and did not exceed any of the adopted human health screening criteria.

4.3 Potential Receptors

Potential receptors identified as part of the Stage 2 Contamination Assessment (ERM, 2019) relevant to onsite soils are:

- current and future construction and maintenance workers; and
- current and future users of the Site.

4.4 Potential Exposure Pathways

The primary exposure pathway for onsite soils is expected to be via dermal contact, ingestion (direct) or inhalation (dust and/or free asbestos fibres). If no Site management controls were in place it is considered SPR linkages may potentially be complete for onsite workers. However, as concluded by ERM (2019), the potential complete SPR linkages could be appropriately managed by an Environmental Management Plan (EMP) and health and safety plan.

5. REMEDIAL ACTION PLAN

5.1 Remedial Goal

Although it has been concluded that Site contamination may be appropriately managed by institutional controls, an opportunity exists to improve the condition of the Site during planned flood mitigation works. The remedial goals for the Site are therefore as follows:

- to complete the planned flood mitigation work in such a way that the overall condition of the Site is improved from a contamination perspective; and
- reduce the risk that contaminated material present at the can pose to current and future Site receptors.

The goal of the remedial works is not to address all contamination present at the Site, however any significantly contaminated soil or unexpected finds will be appropriately removed from the Site and taken to a facility that can lawfully accept the material.

5.2 Extent of Remediation

The extent of contamination at the Site is described as part of the historical investigations and is outlined in the CSM presented in *Section 4* of this report. In general, asbestos impacts are located within fill material across the Site. The fill material layer at the Site is considered to be potentially contaminated with bonded ACM. A localised benzo(a)pyrene 'hotspot' exists at the centre of the Site which has not been identified at any other location at the Site. If these issues are not managed appropriately it is plausible that SPR linkages may be completed for onsite receptors.

Based on the widespread nature of potentially asbestos impacted fill material, it is considered that the extent of remediation should broadly incorporate the areas where Site receptors may contact fill material.

5.3 Remedial Options Assessment

In order to identify the most appropriate remedial approach for the Site, a number of potentially feasible options were identified and assessed. Each remedial option was examined and the remedial strategy was selected based on environmental impacts, time constraints, Site logistics, potential health impacts and cost. The various options are outlined in the following subsections.

5.3.1 Onsite Treatment

Treatment of soil contamination is often the preferred strategy where large volumes of heavily contaminated soils require remediation.

Onsite in situ treatment of asbestos contaminated media is generally not possible and therefore the fill material would require excavation and physical removal of fragments by sorting. The B(a)P issue would be unlikely to be efficiently dealt with under this scenario due to the limited extent and would require a different approach.

Considering the estimated volume of material required to be remediated, ex-situ sorting of all fill material onsite would take an extended period of time to complete and have significant costs associated with mobilisation and monitoring. There is also potentially avoidable disturbance of impacted materials. However, the benefits of onsite treatment of contamination are that offsite disposal of contaminated media is limited and the remaining soils are suitable for reuse with no further management.

Onsite removal of asbestos from fill material is generally a labour intensive and inefficient process and would therefore take an extend period of remediation to complete. For this reason physical sorting is often undertaken at sites where significant volumes of asbestos is buried, which is not the case at this Site. Due to the relatively low volume of asbestos in fill material would not be an efficient process at this Site. Due to the small hotspot quantity of benzo(a)pyrene impacts, onsite treatment would similarly not be an efficient or feasible option.

5.3.2 Excavate and Offsite Disposal

Landfill disposal is the simplest of all remediation methods, and involves the excavation of the contaminated materials, and disposal offsite to a NSW EPA approved landfill disposal site licensed to accept the relevant category of waste. The formed excavation is then backfilled using VENM/ENM as required.

The selection of an appropriate landfill will normally depends upon the results of classification of the waste, in this case Special Waste (asbestos). Specific criteria are applicable to asbestos waste including transport protocol and restricted disposal options. Offsite disposal is not considered to be a sustainable option due to limited municipal landfill space and the volume of truck movements on public road required to transport large volumes of material. Offsite disposal is also often prohibitively expensive due to high landfill fees and the NSW EPA Waste Levy.

The option for bulk excavation and offsite disposal is not considered to be feasible due to the quantity of potentially impacted asbestos material and the significant disposal associated with this option. This option is considered to be the most expensive and least sustainable option for improving Site conditions. Offsite disposal may be possible for smaller quantities of material, such as the benzo(a)pyrene impacts, where this strategy is deemed the most appropriate.

5.3.3 Onsite Capping and Containment

Onsite capping and containment involves the installation of a physical barrier around the contaminated area to prevent potential exposure pathways to contaminants. The inclusion of a capping system and appropriate surface water controls/management typically affords a sufficient level of protection to future Site users from the underlying contamination. Although a well maintained cap and contain system is generally effective in protecting Site receptors, contamination does remain onsite. Therefore a long term Environmental Management Plan (EMP) must be implemented for capping to ensure that future disturbance / excavation work is minimised and where necessary, carried out in strict accordance with appropriate workplace health and safety and environmental management procedures.

Given that the flood mitigation works being undertaken at the Site aims to raise the level of the Site, a cap and contain strategy would fit well with the planned scope of works. The methodology would involve the movement of some impacted material in order to allow for a sufficient cap of clean material of at least 0.5 m thickness. As the cut and fill operation is a net import to the Site, this methodology would not require the excavation and offsite disposal of material and thus is considered a more sustainable option as the requirement for use of valuable landfill space is negated. Following the works, all accessible areas of the Site where incidental exposure may occur would be capped with validated materials from offsite sources. Long-term management of the containment measures will be required through an LTEMP to continue to mitigate the risk of exposure to contaminants.

5.4 Preferred Strategy

The remediation strategy must be capable of achieving the technical, environmental and economic objectives of the overall project, while being a cost-effective solution that does not bring about unacceptable long-term liabilities, and does not impose any unreasonable constraints on the present operations and/or future Site development. Based on the analysis of options assessment, the preferred approach for the remediation of the Site is: **Capping and Containment**

This methodology is the most suitable for the following reasons:

- Asbestos is inert, non-leachable and when placed within an appropriately designed cap poses negligible risk of migrations;

- B(a)P material at the Site is limited in extent and does not appear to be mobile in the subsurface. Although this material may require excavation as part of the flood mitigation works, in which case it will be disposed offsite, the material could also likely be appropriately managed in-situ through a cap and contain strategy.
- The planned flood mitigation works will raise the level of the Site and will require a net import of material. The works can be structured in such a way that the imported material can form a cap of clean material.
- Although some excavation would be require to accommodate a cap of a minimum thickness, the excavated material can be replaced in other areas of the Site beneath the cap and therefore the following unsustainable work aspects are not required:
    - Unnecessary disturbance of in-situ asbestos containing material
    - Road transport of bulk contaminated material
    - Offsite disposal to landfill of contaminated material
    - Importation of additional material to replace off the disposed material in order to achieve the required finish levels

The proposed methodology is thus considered the most efficient of the potential remediation methodologies evaluated; and

Given the nature of the redevelopment works, a suitably constructed cap will be able to be integrated into the long-term management of the Site and should not significantly affect any future redevelopment works based on the current and proposed future land use scenario.

6. REMEDIATION STRATEGY

6.1 Remediation Strategy Overview

Based on the current understanding of the extent of contamination and the requirement for remediation activities at the Site, a summary of the process of implementation of the preferred remediation strategy proposed to be adopted is presented in below:

The remediation strategy proposed incorporates the following elements:

1. Regulatory Approvals and Stakeholder consultation;
2. Site establishment;
    a. Establishment of health and safety and environmental controls
    b. Removal of remaining concrete slabs present at the Site
    c. Pre survey of Site to establish Site levels prior to capping
3. Remediation Implementation;
    a. Excavation of Contaminated fill material to accommodate 0.5 m cap
    b. Re-placement of excavated material
    c. Survey of re-placed material to confirm 0.5 m cap can be accommodated;
    d. Placement of geofabric marker layer;
    e. Placement of capping layer; and
    f. Survey of final works as executed capping level to confirm appropriate cap thickness across the Site.
4. Validation of Remediation Works
5. Implementation of Long Term Environmental Management Plan

Also to be considered within the remediation strategy is:

1. Waste Management; and
2. Contingency Plans.

6.2 Regulatory Approvals and Licences

The flood mitigation works require a Development consent from Council. Willow Tree Planning has prepared a Statement of Environmental Effects (SoEE) for the works to support the DA (Willow Tree Planning 2020). The SoEE includes a comprehensive review of applicable Commonwealth, State and local legislation and policies, including State Environmental Planning Policy (SEPP) No.55 Remediation of Land. The SoEE determined that the appropriate consent authority was Canterbury Bankstown Council.

6.3 Site Establishment and Pre-Works

Prior to the commencement of remedial works, Site establishment and mobilisation works are to be completed. This includes:

- establishment of a Contractor's Site office of temporary work sheds and amenities for Site workers;
- establishment of a car parking area for Site workers and visitors to the Site;
- establishment of traffic routes including a management plan for the Site to update and reflect the restricted access as well as new vehicle routes for remediation work;

- removal of all remaining concrete slabs and disposal offsite to a recycling facility;
- set up of exclusion areas including remediation areas, contamination reduction (decontamination zone) area, areas not including in redevelopment works; and
- establishment of the area to be managed under the construction environmental management plan (CEMP).

6.4 Remediation Implementation Works

The area proposed for redevelopment, including the respective excavation and fill areas are presented in *Figure 4, Appendix A*. Due to the potential presence of ACM in fill materials across the redevelopment area, works will take place in staged portions in order to control potential exposure and limit the area where asbestos controls are required. As the total area of excavation will be ~11,600 m^2 and the area of fill will be approximately ~18,000 m^2. For the staging of works these areas will be divided into sections one and two, with works progressing into section two only once section one is complete. A contractor earthworks specification is included in Appendix C.

Prior to commencement of earthworks, the work area where excavation and filling will take place will be established as an exclusion zone (refer to Section 7.3.1 for details), where additional controls will be required related to the disturbance of potential contaminated material as described in Section 7. The excavation and the fill areas will be designated as close together as possible to limit the haulage required between the areas. Once cut and fill operations are complete in each section, a Licensed Asbestos Assessor (LAA) will inspect the area, to assess the effectiveness of the asbestos controls to management movement of asbestos fibres.

Both the excavation and fill areas will be managed under the environmental management plan as detailed in Section 7. Material will be loaded into a transported to the fill destination by dump truck, where it will be placed and spread progressively.

After all sections have been complete, the portion of Site shown on *Figure 5, Appendix A* will be capped with the exception of the flood mitigation area, which will maintain a lower finished level in line with its designed function. Once the subgrade landform is confirmed as suitable for import of the capping material (to meet geotechnical requirements and sufficient volume for final landform design), a geofabric marker layer will be installed across the land area prior to import of capping. A minimum of 0.5 m of imported virgin excavated natural material (VENM) or excavated natural material (ENM) as defined by POEO Act (See section 6.5) will be placed to form the capping layer. This marker layer will provide a visual indication of the potential for underlying contamination in the event of future earthworks / intrusive activities. The final landform will be a level Site at the eastern portion, with a flood mitigation basin at the western portion.

In the case that a surplus volume of fill material requires excavation during the works to the extent that the conditions of consent cannot be complied with and/or a 0.5 m cap cannot be accommodated the excess material will require classification and offsite disposal in accordance with NSW EPA *Waste Classification Guidelines, 2014* as per *Section 6.6.2*.

6.5 Importation of Material

The proposed cut and fill material balance has allowed for approximately 48,200 m^3 of imported material for the redevelopment works. Material brought onto the Site must either be virgin excavated natural material (VENM) or excavated natural material (ENM) as defined by POEO Act.

VENM must be accompanied by a validation certificate from the supplier which adequately certifies that the material is VENM, or otherwise be subject to validation sampling prior to importation to the Site. ENM classification will be carried out by the comparison of contaminant concentrations against the thresholds presented in *The Excavated Natural Material Order: Table 4* (NSW EPA, 2014). Source sites should be inspected to observe the areas of excavation and the type of material which should be expected to be received at the Site.

Imported soil will be observed by a suitably qualified and experienced person as it is delivered to Site to confirm:

- That it appears consistent with the source; and
- That there is no visual or olfactory evidence of potential contamination such as staining, anthropogenic materials or odours.

In the case that discrepancies exist, the imported material will be refused entry to the Site and not considered suitable for use until appropriately validated.

The appointed contractor will provide SUEZ with copies of dockets pertaining to all imported materials (including materials such as roadbase, gravel and landscaping materials to confirm the source, type and quantities of materials. These are to be included in the validation report. A Site diary / import records will also be required toi be maintained with details to facilitate cross checkin of imported materials, volumes, source sites and truck movements for both the import and export of any materials from the Site.

6.6 Contingency Plans

6.6.1 Unexpected Finds

An Unexpected Finds Protocol has been developed as part of the construction planning for implementation during Site works, primarily associated with excavation and civil activities. It has been prepared to ensure appropriate management of natural soils / fill which may contain levels of chemical or asbestos contamination and other possible contamination scenarios should they be encountered during Site works.

The Unexpected Finds Protocol is presented in *Appendix B*.

6.6.2 Waste Management and Classification

All asbestos impacted fill is proposed to be beneficially reused on Site as part of cut and fill works and capped as part of the RAP requirements. However, if material is surplus to Site requirements to the extent that a 0.5 m cap thickness cannot be accommodated,, or unexpected finds are uncovered that may not be suitable for reuse on Site the material may be required to be disposed offsite to a licensed facility. Prior to disposal, the material will be assessed and classified by a suitably qualified and experienced environmental consultant in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014).

The sampling frequency and analytical schedule may need to be adjusted on a “case by case” basis compared to the frequencies endorsed by the ASC NEPM (2013), depending on factors such as:

- The volume of the material;
- The homogeneity of the material; and
- The visual assessment of the material.

Where possible, to assist in efficient classification and offsite disposal, less impacted soils will be segregated from those which have visual or olfactory indicators of contamination, or are suspected to contain asbestos.

Soil samples collected for waste classification purposes will be analysed for a typical suite of potential contaminants. The analytical suite may be reduced where existing data is available, however this would be at the discretion of a suitably qualified and experienced environmental consultant.

The results of the laboratory analysis will be compared against Tables 1 and 2 of the *Waste Classification Guidelines* (NSW EPA, 2014). The existing analytical data for fill soils will also be considered when classifying soils for offsite disposal.

All soils that require offsite disposal as part of the remediation works will be disposed to an appropriately licensed landfill facility. Copies of dockets pertaining to disposal of soils will be provided by the remediation contractor to confirm the source, type and quantities of materials, as well as waste tracking information. These will be included in the validation report.

6.7 Validation Reporting

Following the completion of the remediation activities a Validation Report will be produced which documents the remedial activities undertaken and how the data collected during the works has been used to confirm that the remediation objectives have been met.

The Validation Report will include a clear conclusion on the suitability of the Site for the proposed future use.

6.8 Long Term Management

To reduce the risk of potentially contaminated soil being inadvertently disturbed in the future a separate LTEMP will be utilised and kept on title for the Site. The LTEMP will outline the extent of contamination present, measures required to preserve the long term integrity of the cap and will detail the health and safety and environmental controls necessary should potentially contaminated material need to be disturbed in the future.

7. REMEDIATION ENVIRONMENTAL MANAGEMENT PLAN

7.1 Construction Environmental Management Plan

An overarching Construction Environmental Management Plan (CEMP) has been prepared for the works, which will provide detailed information on overarching controls and mitigations which in be in place for the broader flood mitigation works. This RAP is intended to fit beneath the CEMP within the hierarchy of the works documentation. The information provided in this RAP relates to the areas where contaminated soils may be encountered, in particular where excavation of potentially contaminated fill material will occur, or the placement of contaminated materials. Where appropriate, this RAP refers back to the CEMP for specific controls in order to avoid duplication of the documentation and also avoid potential conflicting advice.

7.2 Health and Safety

The Principal Contractor will prepare a project specific occupational health and safety plan for the remediation works. This plan shall identify the potential risks associated with the works and detail the health and safety measures and procedures that are to be adopted to protect both on Site workers and the general public.

7.3 Contamination Control Plan

Asbestos remediation will be carried out in general accordance with the following publications:

- *Code of Practice: How to Safely Remove Asbestos* (Safe Work Australia, 2019);
- *Code of Practice: How to Manage and Control Asbestos in the Workplace* (Safe Work Australia 2018); and
- *Managing Asbestos in or on Soil* (Workcover NSW, 2014).

To facilitate the movement of potentially contaminated asbestos soils across the Site, the following measures will be implemented.

7.3.1 Exclusion Zones

The sections of the Site which are designated for active excavation or placement of contaminated fill material will be marked clearly as exclusion zones, where special controls are required (as detailed in the below subsections). The Site Manager will be responsible for ensuring that all Site operatives are aware of the exclusion zones and the conditions and controls within them. It will be the Principal Contractors responsibility to determine the final extent of the exclusion zone.

Access to exclusion zone will be determined and controlled by the Site Manager, or their nominated representative. Only authorised and inducted persons are to be permitted in the restricted work area. The general public is not permitted onsite. Appropriate warning signs and/or barriers are to be placed around the work area maintaining at least 3 meter buffer from the impacted area.

The exclusion zone will apply to the section of active works, once works are completed in each section the exclusion zone can be removed and the next section can be set up as an exclusion zone.

7.3.2 Appropriate PPE

All workers will be provided with and use the appropriate personal protective equipment (PPE) which will be required when entering exclusion zones.

To reduce short and long-term health risks associated with the potential exposure to asbestos within the soil, the minimum level of PPE required for personnel within the exclusion zone is listed below:

- Body Protection. Disposable coveralls (Tyvek suits) are to be worn during excavation activities. Disposable coveralls are to be considered as potentially contaminated with asbestos and will therefore need to be disposed as asbestos contaminated waste.
- Respiratory Protection. Respiratory protection (P2 mask) is required during excavation works, as bonded ACM has the potential to be broken during earthworks and compaction.

7.3.3 Air Monitoring

Air monitoring is required during all asbestos remediation works and will be supervised by a Licensed Asbestos Assessor (LAA). The purpose of the air monitoring will be to verify that the control measures in place are satisfactory and that there is no egress of fibres to adjacent occupied areas. The air monitoring device locations will be determined by a Licensed Asbestos Assessor. The air monitoring results will be reported on a daily basis to the Principal Contractor.

Sample collection and analysis will be conducted in accordance with the National Occupational Health and Safety Commission (NOHSC), *Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition, 3003 - 2005.* The analysis will be performed by a National Association of Testing Authorities (NATA) registered laboratory and reported on endorsed certificates. If reportable asbestos fibres are detected in the samples, appropriate contingency actions will be implemented onsite to address potential impacts to adjacent properties, including review of the appropriateness of controls and/or implementation of additional controls.

7.3.4 Decontamination Procedures

Machinery used for the excavation of asbestos impacted soil may become contaminated with asbestos and will need to be decontaminated by washing down prior to leaving the Site. Decontamination will involve hosing / removal of soil from the tracks and bucket as far as reasonably practicable by the Principal Contractor, or their nominated representative. Tools used shall be wiped clean with a damp cloth.

Upon completion of works decontamination will be undertaken in accordance with the *How to Safely Remove Asbestos Code of Practice* (Safe Work Australia, 2018) (e.g. boots and clothing will be wiped down with a damp cloth, disposable PPE will be disposed as asbestos waste).

7.4 Stockpiling of Contaminated Material

Under the remedial methodology, is it not expected that there will be a requirement to excavate and stockpile contaminated material. However, if unexpected contaminated material is identified during the works or if it is determined that contaminated material is required to be stockpiled, certain precautions will be taken to avoid any impacts on the environment, personnel safety or the efficiency of the Project. Further details on stockpiling is included below.

7.4.1 Separation of Stockpiles

In order to limit the volume of material which requires management as contaminated material and to avoid cross contamination of soils, material which is contaminated or is suspected to be contaminated will be separated. The contamination will be assessed by the Environmental Consultant based on both field observations and the available chemical data. The outcome of the assessment will be used to determine whether certain materials require separation. It is noted that if any stockpile requires offsite disposal (regardless of the initial determination of potential level of contamination) the material will be subject to classification as per Section 6.6.2.

7.4.2 Stockpile Management

At minimum, all “contaminated” stockpiled material will be placed on concrete hardstand or polyethylene sheeting. This control is designed to protect the underlying soils from cross contamination. However, if stockpiles are simply being transferred to an area prior to capping or trench backfill, then excess material will be excavated from underlying soils to ensure no contamination is remaining. Alternatively, this material will be temporarily stored within the proposed capping footprint to reduce cross-contamination.

Long-term stockpiles will be bunded by earth bunds underneath the polyethylene sheeting for the containment of silt and surface water runoff from the stockpile and also to divert run-on surface water from entering the bunded area. Stockpiles will be inspected following inclement weather to ensure that the integrity of the stockpile bunds has been maintained. If stockpiled material is suspected to be contaminated, then the stockpile will be covered by plastic sheeting until the classification process is complete and a determination can be made on the contamination of the material. This measure will further reduce the risk of mobilisation of contaminated materials during high winds and rainfall. Contaminated stockpiles will be removed from Site as soon as practicable following sampling and classification.

7.5 Erosion and Sediment Control

Erosion and sediment control measures to be implemented during the remediation program will be in accordance with *Managing Urban Stormwater, Soils and Construction, 4th edition* (Landcom 2004). A Site-specific erosion and sediment control plan will be developed by the Principal Contractor, or their authorised representative. The plan will show the location of sediment control devices as required based on remediation works to be undertaken.

7.6 Noise Controls

Noise producing machinery and equipment will only be operated during working hours as approved by local Council and/or NSW EPA. Australian Standard *AS2436-1981 Guide to noise control on construction, maintenance and demolition sites,* outlines guidelines for the minimisation of noise on construction and demolition sites which are to be followed at all times. No ‘offensive noise’ as defined under the POEO Act should be created during remediation works/activities.

Mechanical plant and equipment used during remediation works/activities will use practical and reasonable noise attenuating devices and measures to reduce noise being transmitted from the Site. All equipment and machinery must be properly maintained and operated in an efficient manner to minimise the emission of noise. Plant and equipment shall be switched off or throttled to a minimum when not in use.

7.7 Dust Control

In areas where contamination is present it will be particularly important to manage the works such the dust generation is controlled. Controls to minimise dust and odour emissions from the Site may include:

- Staging excavation works to minimise the disturbance of any contaminated soil surfaces as well as minimising the size of the excavation face open at any one time;
- Do not work during periods of high wind when dust generation cannot be controlled; and
- Covering contaminated excavation faces and/or stockpiles with synthetic barriers or wetting down during periods of high wind.

8. ROLES AND RESPONSIBILITIES

8.1 Principal Contractor

The Principal Contractor will retain overall responsibility for ensuring that the RAP is appropriately implemented. The Principal Contractor will be responsible for day-to-day environmental performance of the remediation works, including the implementation and maintenance of acceptable environmental controls and plans during all remediation works. Primary responsibilities of the Principal Contractor relating to the remediation works are as follows:

- Nomination of a Site Manager who will be responsible for initial response to any unexpected finds encountered during remediation works;
- Maintain records as outlined in this RAP to facilitate preparation of the Validation Report by the Environmental Consultant;
- Implementation of an inspection and maintenance program; and
- Provision of relevant information regarding Site environmental management to contractors and subcontractors working at the Site, and ensure that they are fulfilling the responsibilities for the work.

8.2 Sub-Contractors

Subcontractors will be advised of required work procedures through induction, training, and meetings provided by the Principal Contractor. Maintenance of subcontractor equipment will be the responsibility of the subcontractors. The subcontractor is responsible for ensuring that all works executed by the subcontractor complies with relevant WorkCover NSW requirements, as necessary.

8.3 Environmental Consultant / Licenced Asbestos Assessor

It is envisioned that the role of environmental consultant and Licenced Asbestos Assessor (LAA) will be undertaken simultaneously. Should these roles be occupied separately, the LAA will oversee:

- Daily airborne asbestos monitoring and reporting; and
- Conduct formal weekly inspections of the remedial progress and controls relating to the works.

The environmental consultant will:

- Require copies of all reports produced by the LAA;
- Provide advice and recommendations based on inspections and validation results;
- Undertake assessments for the characterisation, classification and disposal of wastes;
- Provide advice on issues under the POEO Act under the unexpected finds protocol and other issues as required; and
- Undertake validation reporting in accordance with the RAP.

9. CONCLUSIONS

This RAP identifies a remedial strategy which can be incorporated into the planned flood mitigation works at the Site to reduce the potential risk which identified contamination may present to future Site receptors. The impacts which have been identified as presenting a potential incidental contact risk at the Site are asbestos is fill material and localised benzo(a)pyrene is tar like material. Although the impacts may be appropriately managed through institutional controls, the flood mitigation works at the Site will present an opportunity to improve the overall condition of the Site.

ERM reviewed a number of potentially feasible options for consideration at the Site. A cap and contain strategy has been selected as the preferred remedial approach. The cap will provide a physical barrier between contamination and receptor and as such will reduce the likelihood of incidental exposure for Site receptors. This remedial strategy provides the most appropriate technical, environmental and economic approach to meet the objectives of the overall project.

It is considered that if this RAP is implemented appropriately (including implementation of contingency measures where appropriate) in conjunction with a long term Environmental Management Plan, the remediation goals for the Site can be reasonably achieved.

10. REFERENCES

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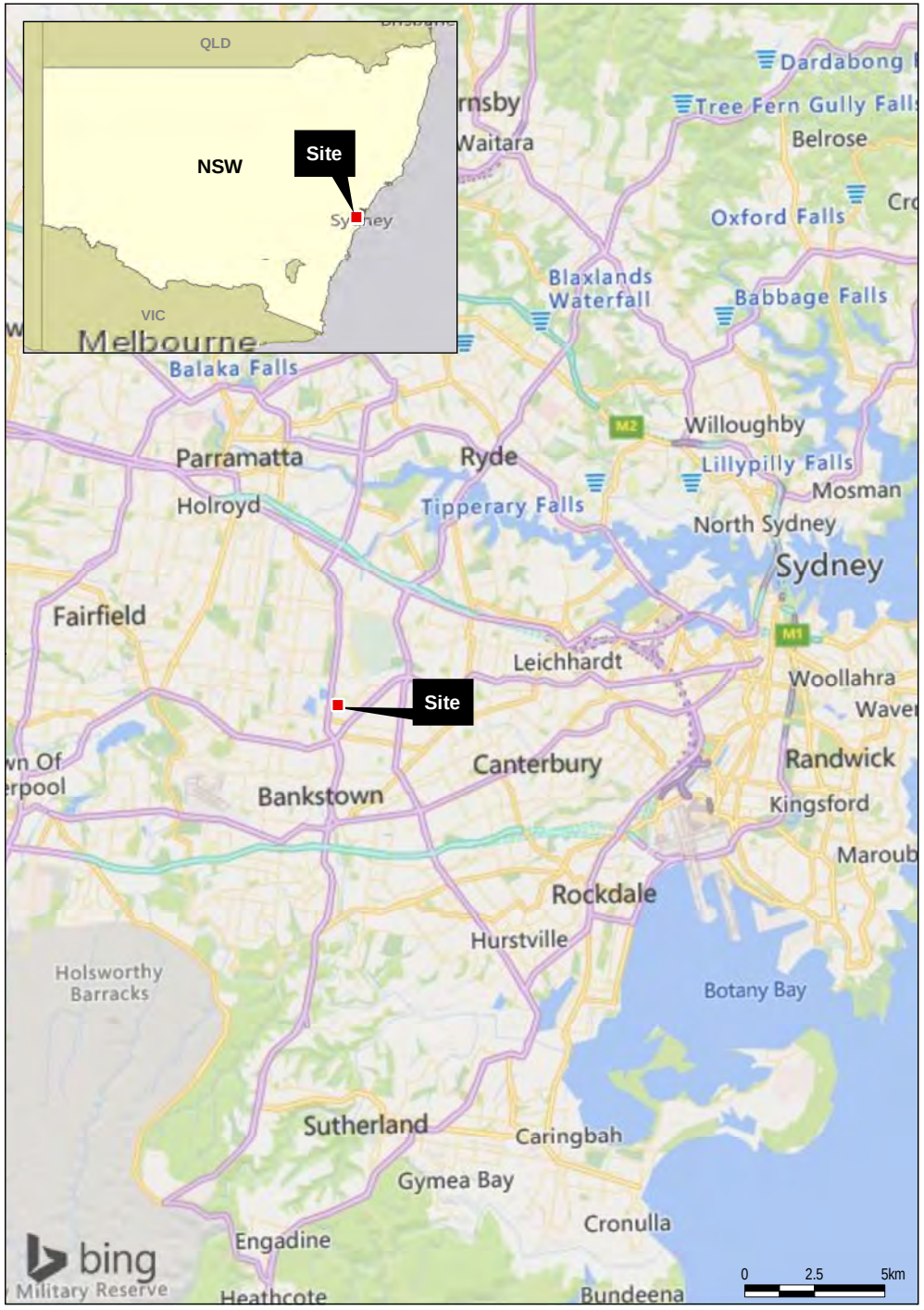
APPENDIX A FIGURES



Site Location

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Date:	03/12/2020	Drawing Size: A4	
Drawn By:	KV	Reviewed By: AK	Client: Suez Australia

Coordinate System: GDA 1994 MGA Zone 56

ERM

Site Layout

2

Drawing No:	0574561m_RAP_G002_R0.mxd		Remedial Action Plan 21 Muir Road, Chullora, NSW
Date:	03/12/2020	Drawing Size: A3	
Drawn By:	KV	Reviewed By: AK	Client: Suez Australia
Coordinate System: GDA 1994 MGA Zone 56			This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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ERM


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ANZAC STREET
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Lots
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Test Pit Location
Exceedances:
Asbestos
Benzo(a)pyrene
TRH F3
Source:
Imagery - Nearmap (02/10/2020)
GIS Base Data - DCDB/DTDB NSW
Exceedances
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Drawing No: 0574561m_RAP_G003_R0.mxd
Date: 03/12/2020
Drawing Size: A3
Drawn By: KV
Reviewed By: AK
Coordinate System: GDA 1994 MGA Zone 56
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Remedial Action Plan
21 Muir Road, Chullora, NSW
Client: Suez Australia
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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Cut and Fill Extent

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Drawing No:	0574561m_RAP_G004_R0.mxd		Remedial Action Plan 21 Muir Road, Chullora, NSW
Date:	03/12/2020	Drawing Size: A3	
Drawn By:	KV	Reviewed By: AK	Client: Suez Australia
Coordinate System: GDA 1994 MGA Zone 56		N	This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

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ERM

Extent of Capping

5

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APPENDIX B UNEXPECTED FINDS PROTOCOL

APPENDIX B

Due to the history of the site, there is potential for previously unidentified contamination to be present in soils. These materials may require additional assessment or management during remediation of the site.

TYPICAL FEATURES OF 'UNEXPECTED FINDS'

The main features to look for are:

- Material with an obvious unnatural odour, i.e. fuel, solvent, burnt odour;
- Material that is noticeably stained in colour;
- Unexpected quantities of asbestos or suspected asbestos containing material (e.g. multiple buried sheets ect);
- Asbestos material with bundles of fibres visible (i.e. friable asbestos);
- Non-aqueous phase liquid (NAPL) or sheen;
- Presence of underground infrastructure such as unexpected additional tanks, interceptor pits, sumps or drains; and
- Other unexpected materials which has evidently been dumped at the Site.

IMPLEMENTATION OF THE PROTOCOL

General

Prior to the commencement of any excavation or construction works on-site, an occupational health and safety induction should be attended by all site staff. The aim and importance of this Unexpected Finds Protocol (UFP) and how it is to be implemented should be discussed at this time. Responsibility for its implementation will be assigned to the Principal Contractor.

Monitoring of environmental issues will be undertaken on a daily basis. If an unexpected find is revealed during remedial works, the following protocol is to be followed.

Implementation Process

1. Cease disturbance of the affected portion of the site and evacuate the immediate area.
2. Contact the Principal Contractor.
3. Principal Contractor, or their appointed representative, will conduct an assessment of the location and extent of the unexpected find.
4. High risk areas will be isolated and secured against unintended access.
5. Temporary encapsulation (sealing) of the high risk area may be appropriate to minimise the likelihood for the release of airborne contamination. This may involve clean soil, plastic sheeting, etc.
6. Dust generation may need to be prevented by wetting the soil. Drainage controls will be arranged where there is a potential for runoff to occur (runoff should be minimised).
7. Warning signs will be placed in the vicinity.
8. If the Principal Contractor, or their appointed representative, considers that the material warrants further investigation, the area will be barricaded to provide an exclusion zone.
9. If necessary, environmental controls will be established to minimise the likelihood of migration of contaminants from the impacted area.

10. Further visual assessment and sample collection (soil and/or groundwater) and analysis will be undertaken by a qualified environmental consultant. If necessary, samples will be sent to a NATA registered laboratory.
11. Evaluation of analytical data with respect to site-specific screening levels will be undertaken, including an assessment as to whether the soils / groundwater:
    a. present a potential human health or ecological risk under the specified end land use;
    b. need to be remediated; or
    c. must be disposed of off-site to a suitably licensed facility.

    If all media are suitable to remain on-site and/or the area is found to be clean, a work instruction will be provided by the Principal Contractor, or their appointed representative, to this effect. A waste classification letter must be provided prior to any off-site disposal of contaminated material.
12. If greater than 10m^2 of bonded (non-friable) asbestos is encountered, an appropriately licensed contractor will be employed to remove it in accordance with an approved Asbestos Control Plan.
13. If friable asbestos is encountered, an appropriately licensed contractor will be employed to remove it in accordance with an approved Asbestos Control Plan.
14. Exclusion zones will be reopened for earthworks following clearance of the location and issuance of a report by the Principal Contractor, or their appointed representative.

Notes

1. Any suspected friable asbestos will be left in place and not disturbed. The Principal Contractor, or their appointed representative, will organise appropriate environmental professionals for further investigation purposes.
2. It is essential that material of differing compositions not be mixed.
3. All sampling for validation, waste classification or characterisation purposes will be carried out in accordance with the following documents:
    a. *Contaminated Sites: Sampling Design Guidelines* (NSW EPA, 1995);
    b. *National Environment Protection (Assessment of Site Contamination) Measure 2013* ('ASC NEPM', NEPC, 1999);
    c. *Waste Classification Guidelines* (NSW EPA, 2014); and
    d. *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy* (NHMRC/NRMMC, 2011).
4. Sampling associated with validation, waste classification and site characterisation will be carried out by suitably qualified and experienced environmental consultants in accordance with AS 4482.1-2005.
5. Any unexpected finds encountered will be documented on a UFP register, which includes the action taken and the status of the unexpected find. A suitable register is included in Section 1 of this UFP.
6. Once an unexpected find has been identified and a UFP form filled in, the Principal Contractor, or their appointed representative, will liaise with the client as to the appropriate means of managing the situation. This will include discussions around the handling, treatment and disposal of material, OH&S considerations and how the affected area will be validated and reopened for works.
7. Prior to closing out an unexpected find, it is important to ensure that appropriate documentation is obtained, such as: photographs, waste classification letter(s) and a validation report or letter.

UNEXPECTED FINDS REGISTER

UNEXPECTED FINDS REGISTER						
UFP No.	**Date Identified**	**Identified by (name)**	**Suspect Material**	**Description**	**Action Taken**	**Status**

APPENDIX C EARTHWORKS SPECIFICATION

15 Muir Road, Chullora, NSW

Bulk Earthworks Specification

PSM4113-003S 1 May 2020

PSM Consult Pty Limited ABN 47 134 739 496

Table of Contents

List of Appendices

1. Scope

This specification details the requirements for the bulk earthworks to be undertaken at 15 Muir Road, Chullora, NSW. The area where this specification is applicable is shown in Figure 1. This includes areas where material is filled or cut to bulk earthworks level (BEL) within the site. All proposed buildings will be located on fill.

Fill placed in accordance with this specification is denoted as Engineered Fill.

This specification does not address any environmental, contamination or erosion issues with respect to the fill material.

There is a **HOLD POINT** on placing fill in Clause 2.4 of this Specification.

2. Filling Works

2.1 Subgrade Preparation

The condition of the subgrade should be assessed immediately prior to the commencement of filling.

All Engineered Fill is to be placed on one of the following materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency.
3. Engineered compacted fill placed in accordance with this or other approved specifications for which the Geotechnical Inspection and Testing Authority (GITA) has a Level 1 certificate certifying compliance with that approved specification AND of at least stiff consistency.
4. EXISTING FILL as approved PSM. Where EXISTING FILL is encountered, the subgrade preparation shall be as follows:
    a. The exposed subgrade is to be proof rolled with a minimum 12 tonne smooth drum roller or other plant approved by PSM. The proof roll should be witnessed and approved by PSM.
    b. Any soft spots or other areas that would jeopardise the IGDA identified during proof-rolling will be boxed out and remediated by adopting a remove and replace method. The subgrade should be moisture conditioned and compacted in accordance with Clauses 2.5 and 2.6 of this specification.
5. Other materials as approved by PSM. This includes EXISTING FILL, existing pavement material and concrete slabs.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be moisture conditioned and compacted to be in accordance with Clauses 2.5 and 2.6 of this specification.

Engineered Fill shall be placed only on subgrade approved by the GITA as being in accordance with this specification.

PSM may also direct a bridging layer of Engineered Fill be placed and compacted to a Dry or Hilf Density Ratio (Standard Compaction) of between 95% and 102%. Any such layer shall be a Lot under Clause 5.3.

2.2 Base Geometry

The slope of any buried batter shall be less than 2H:1V unless otherwise directed by PSM.

The contractor shall remove or flatten any geometrical obstructions (e.g. protrusions or holes) such that subsequent Engineered Fill can be placed to achieve the requirements of this specification.

Engineered Fill shall be placed only on areas where the base geometry has been approved by the GITA.

2.3 Material

2.3.1 Imported Fill

Imported Engineered Fill is to conform to one of the following definitions:

1. "Virgin excavated natural material" (VENM) as defined by the Protection of the Environment Operations Act 1997 No 156, Schedule 1, on Page 209:

   "Virgin excavated natural material (e.g. clay, gravel, sand, soil and rock) that is not mixed with any other waste and that:

   a. has been excavated from areas that are not contaminated, as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and that does not contain sulphide ores or soils, or

   b. consists of excavated natural materials that meet such criteria as may be approved by the EPA".

2. "Excavated natural material" (ENM) as defined by the Protection of the Environment Operations (Waste) Regulation 2005 – General Exemption Under Part 6, Clause 51 and 51A, the excavated natural material exemption 2012:

   "Excavated natural material is 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.

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

and which meets the requirements of this exemption.

2.3.2 Site Won Material

Site Won material shall comprise material won from excavations on site including natural, and existing fill. They need to satisfy Clause 2.3.3.

2.3.3 All Fill

The Engineered Fill shall be approved by the GITA as suitable for use in a structural fill.

Engineered Fill shall not comprise unsuitable material as defined by Clause 4.3 of AS3798-2007 "Guidelines on earthworks for commercial and residential developments" as:

a. "organic soils, such as many topsoils, severely root-affected subsoils and peat;

b. materials contaminated through past site usage which may contain toxic substances or soluble compounds harmful to water supply or agriculture;

c. materials containing substances which can be dissolved or leached out in the presence of moisture (e.g.: gypsum), or which undergo volume change or loss of strength when disturbed and exposed to moisture (e.g.: some shales and sandstones), unless these matters are specifically addressed in the design;

d. silts, or materials that have the deleterious engineering properties of silt;

e. other materials with properties that are unsuitable for the forming of structural fill; and

f. fill that contains wood, metal, plastic, boulders or other deleterious material, in sufficient proportions to affect the required performance of the fill."

The GITA shall assess that the proportion of deleterious material in each Lot is not greater than 1% by weight. Deleterious material is defined by Table 3015.3 of the RTA QA Specification 3051 (Edition 5 June 1998) as:

"Type III: Rubber, Plastic, Bitumen, Paper, Cloth, Paint, Wood and Other Vegetable Matter."

If the GITA is not able to visually assess the above criterion, the GITA shall arrange appropriate testing.

All Engineered Fill particles shall be able to be incorporated within a single layer. Further, less than 30% of particles shall be retained on the 37.5 mm sieve.

Engineered Fill shall be able to be tested in accordance with the Standard Compaction method (AS1289.5.4.1) or Hilf test method (AS1289.5.7.1). These methods require less than 20% retained on the 37.5 mm sieve. Where between 20% and 30% of particles are retained on the 37.5 mm sieve the above test methods shall still be adopted and test reports annotated appropriately.

These requirements should be met by the material after placement and compaction.

Only material approved by the GITA shall be placed as Engineered Fill.

2.4 Fill Zoning and Placement

HOLD POINT

Process Held	Placing of Fill
Submission detail	The Contractor / GITA submit to PSM a Weekly Certificate as defined in Clause 6.2.1 of this specification for the earthworks completed to the previous Saturday no later than 5 pm of the subsequent Wednesday.
Release of Hold Point	PSM to confirm receipt of Weekly Certificate and recommend release of Hold Point if initial assessment of the Weekly Certificate indicates it complies with requirements of this specification. The contract superintendent should then release the Hold Point if it considers appropriate.

Engineered Fill shall be placed in accordance with the following requirements:

1. In near horizontal, laterally extensive layers of uniform material and thickness, deposited systematically across the work area as determined by the GITA.
2. The compacted thickness of each layer shall be equal to or less than 300 mm.

Engineered Fill shall only be placed on subgrade in accordance with this specification and approved by the GITA.

2.5 Compaction

Engineered Fill shall be placed and compacted to a Dry or Hilf Density Ratios (Standard Compaction) of between 98% and 102%.

The insitu density shall be measured over the full depth of each layer placed.

2.6 Moisture Control

The placement moisture variation or Hilf moisture variation shall be controlled to be between 2% dry of optimum and 2% wet of optimum.

Placement moisture content of the Engineered Fill shall be measured.

3. Cutting for the Storage Basin

3.1 Subgrade Cutting

The subgrade is to comprise one of the following materials:

1. Bedrock.
2. Natural insitu material of at least stiff consistency.
3. EXISTING FILL or other materials as approved by PSM.

Proof rolling shall only be undertaken under the direction of PSM.

The GITA should satisfy itself that the subgrade has not been desiccated, affected by rain or disturbed. If the GITA cannot so satisfy itself, then the subgrade should be excavated and filled to the BEL in accordance with this specification.

4. Survey

4.1 Filling Areas

The survey requirements are as follows:

1. Any approved subgrade shall be surveyed prior to first filling such that subgrade levels are established to within ± 0.1 m. The area subject to approval shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
2. The Lot boundaries shall be assessed and shown on a plan drawing to an accuracy of at least +/- 5 m in plan.
3. The location of the field density tests shall be assessed and shown on the Lot boundary plan drawing to an accuracy of at least +/-5 m in plan.
4. The elevation of the field density tests shall be surveyed to an accuracy of +/-0.05 m.

The plan drawing shall show at the boundaries of the site and other identifiable site features, so as to allow the location of the lots and the test to be recoverable.

4.2 Cutting Areas

Any approved subgrade for cut areas shall be surveyed such that subgrade levels are established to within ± 0.1 m.

5. Inspection and Testing

5.1 Role of the GITA

The Geotechnical Inspection and Testing Authority (GITA) shall be contracted to document and certify that the works undertaken by the contractor has been completed in accordance with the relevant design and specifications.

5.2 Level 1 Control

The GITA shall adopt Level 1 responsibility as described in Section 8.2 of AS 3798-2007 "Guidelines on earthworks for commercial and residential developments":

“The primary objective of Level 1 Inspection and Testing is for the geotechnical inspection and testing authority (GITA) to be able to express an opinion on the compliance of the work. The GITA is responsible for ensuring that the inspection and testing are sufficient for this purpose.

The geotechnical inspection and testing authority always need to have competent personnel on site while earthwork operations are undertaken. Such operations include:

- Completion of removal of topsoil
- Placing of imported or cut material
- Compaction and adding/removal of moisture
- Trenching and backfilling
- Test rolling
- Testing.

The superintendent should agree a suitable inspection and testing plan prior to commencement of the works.

On completion of the earthworks, the GITA will usually be required to provide a report setting out the inspections, sampling and testing it has carried out, and the locations and results thereof. Unless very unusual conditions apply,

the GITA should also be able to express an opinion that the works (as far as it has been able to determine) comply with the requirements of the specification and drawings."

For this particular contract, Level 1 responsibility includes:

1. Lot testing as per Clause 5.3 of this specification.
2. A frequency of compaction testing not less than that specified in Clause 5.4 of this specification.
3. The GITA documenting and reporting its activity in the terms required by Clause 6 of this specification.
4. The GITA undertaking adequate inspections and testing to comply with the above requirements and to be able to certify the fill in the terms required by Clause 6 of this specification.

5.3 Lot Testing

This specification requires lot testing to be undertaken.

A Lot is defined as a single layer of Engineered Fill consisting of uniform material which has undergone similar treatment.

Lot testing comprises the following:

1. A Lot shall be identified by the Contractor or the GITA with a Lot Number and presented for testing.
2. A Lot shall be deemed to be in accordance with the specification if all the tests undertaken within the Lot are in accordance with the specification, i.e. "a none to fail basis".
3. If any one test undertaken within a Lot fails, the whole of the Lot shall be reworked and retested.

Any portion of the placed Engineered Fill must be part of a single lot and all Lots will require approval by the GITA.

5.4 Testing Frequency (Compaction Testing)

The frequency of compaction testing for each lot shall be the greater of:

1. For lot less than 50 m^3
   a. 1 test per lot located randomly across the Lot.
2. For lot between 50 m^3 and 100 m^3
   a. 2 tests per lot located randomly across the Lot.
3. For lot greater than 100 m^3
   a. 1 test per 500 m^3 of material placed
   b. 3 tests per lot located randomly across the Lot.

A laboratory moisture content test shall be undertaken for each field density test.

5.5 Proof Rolling and Plate Load Testing

Proof rolling, together with minor boxing out and refilling, of the upper surface of the bulk earthworks will be undertaken as directed by PSM. The plant to be adopted depends upon the design loads adopted by the structural engineers for each section of the site.

Plate load testing shall be undertaken at the direction of PSM at final bulk earthworks level (BEL) prior to placement of road base or capping material. Expected test frequency is approximately a day of testing for the building pad.

The contractor is to make a suitable reaction (e.g. 20 tonne excavator) available for the tests.

5.6 Inspection, Testing and Survey

The GITA shall at least undertake the following tasks:

<u>Cut areas</u>

1. Identify the subgrade as one of the three (3) subgrade types listed in Clause 3.1 of this specification and assess that the subgrade condition of cut areas is in accordance with the subgrade condition requirements of Clause 3.1 of this specification.

2. Should Engineered Fill be required to fill overcut areas, assess that filling has been placed in accordance with this specification.

Fill areas

3. Identify the subgrade as one of the five (5) subgrade types listed in Clause 2.1 of this specification and assess that the subgrade condition of any area prior to placement of fill material is in accordance with the subgrade preparation requirements of Clause 2.1 of this specification. The GITA needs to include / refer to PSM approval in its weekly report for subgrade comprising existing fill and other materials as approved by PSM
4. Assess that the base geometry of any area prior to placement of fill material is in accordance with the base geometry requirements of Clause 2.2 of this specification.
5. Assess that the material placed is in accordance with the fill material requirements of Clause 2.3 of this specification.
6. Assess that the Engineered Fill has been placed in accordance with the requirements for fill zonation and placement of Clause 2.4 of this specification.
7. Assess that each Lot as presented for approval by the contractor is in accordance with the requirements for Lot definition of Clause 5.3 of this specification.
8. Ensure that the survey requirements in Clause 4 of this specification have been completed.
9. Estimate the approximate volume of Engineered Fill placed in each Lot presented for approval.
10. Conduct Lot testing in accordance with the construction control testing requirements of Clauses 5.3 and 5.4 of this specification.
11. Assess that the compaction of each Lot is in accordance with the requirements of Clause 2.5 of this specification. The GITA shall select a depth of insitu density tests that allows the density of the full layer to be assessed.
12. Assess that the moisture variation of each Lot is in accordance with the requirements for moisture control in Clause 2.6 of this specification.
13. Conduct material property testing in accordance with the material testing requirements in this specification.

6. Reporting and Certification

6.1 Reporting

The GITA shall produce at least the following reports:

1. *Subgrade Approval Reports* (a sample is attached). Such a report shall:

- Document assessments undertaken for tasks 1 and task 3 of Clause 5.6 including reporting the subgrade type
- Document the subgrade survey that has been undertaken
- Approve or reject the subgrade condition and base geometry for filling, based on tasks 3 and 4 of Clause 5.6
- Approve or reject the subgrade condition for cut areas based on task 1.

2. *Lot Approval Reports* (a sample is attached). Such a report shall:

- Document assessments, testing and survey undertaken for tasks 3 to 13 of Clause 5.6
- Report the results of testing undertaken for task 10 of Clause 5.6
- Approve or reject lots based on tasks 11 and 12 of Clause 5.6.

3. Material Testing Reports. Such a report shall:

- Report the results of material property testing undertaken for task 13 of Clause 5.6.

4. *Daily Reports* (a sample is attached). Such a report shall be completed daily and shall:

- Document time spent on site by the GITA personnel

- List subgrade assessments and approvals undertaken each day with reference to relevant Subgrade Approval Report(s)
- List Lots presented, accepted and approved or rejected each day, with reference to relevant Lot Approval Report(s)
- List survey undertaken each day as for task 8 of Clause 5.6 and not already documented in the Subgrade or Lot Approval Reports
- Document other relevant activities undertaken on site that day (site instructions, breakdowns, compaction equipment used, etc).

6.2 Certification

6.2.1 Weekly Certificates

The GITA shall produce a Weekly Certificate for any week in which earthworks are undertaken in accordance with this specification. The Weekly Certificate will cover all works from the previous Weekly Certificate until the end of work on a Saturday.

The Weekly Certificate shall transmit the following:

- Copy or reference to the complete specification document(s).
- Subgrade Approval Reports
- Lot Approval Reports
- Material property testing reports
- Daily Reports
- Survey of subgrade geometry prior to filling or in cut areas
- Plan survey drawing showing lot boundaries and location of density tests
- Survey documenting filling undertaken to date and showing location of testing
- VENM/ENM validation reports
- Chain of custody certificates.

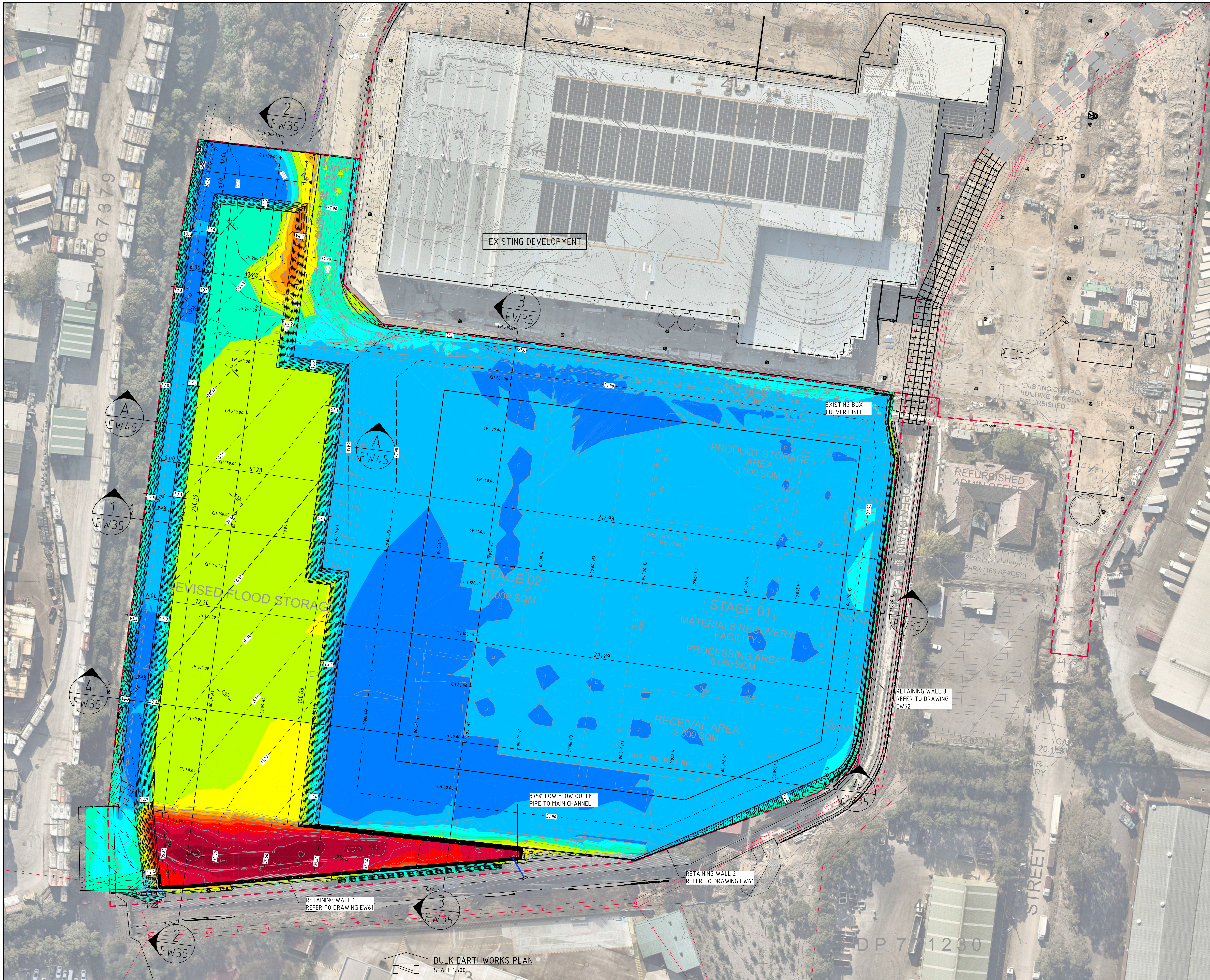
And certify that:

> *"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM4113-003S Rev XX dated XXXX)."*

6.2.2 Interim or Final Filling Certificate

At the completion of the bulk earthworks, or as requested by the Client, the GITA shall provide an Interim or Final Filling Certificate which shall:

5. Transmit a reference list of the Weekly Certificates.
6. Provide an Excel spreadsheet presenting the results of all the acceptance testing completed by the GITA.
7. Certify that *"All the earthworks undertaken and the subgrade condition in the cut areas [in the stated period] are documented in the above reports and have been undertaken in accordance with the Specification (Ref. PSM4113-003S Rev XX dated XXXX)."*



LEGEND

LEVELS DATUM IS AHD.

- EXISTING CONTOUR
- B.E.L. CONTOUR (MAJOR 0.5m)
- B.E.L. CONTOUR (MINOR 0.1m)

CUT/FILL DEPTH (m)

No.	From Depth	To Depth	Colour
1	-5.000	-4.500	
2	-4.500	-4.000	
3	-4.000	-3.500	
4	-3.500	-3.000	
5	-3.000	-2.500	
6	-2.500	-2.000	
7	-2.000	-1.500	
8	-1.500	-1.000	

CUT/FILL DEPTH (m)

No.	From Depth	To Depth	Colour
9	-1.000	-0.500	
10	-0.500	0.000	
11	0.000	0.500	
12	0.500	1.000	
13	1.000	1.500	
14	1.500	2.000	
15	2.000	2.500	

EARTHWORKS VOLUMES

VOLUMES:

CUT	= -12 500m³
FILL	= +60 700 m³
BALANCE	= +48 200 m³ (IMPORT TO SITE)

EARTHWORK VOLUMES ARE APPROXIMATE ONLY & ARE CALCULATED ASSUMING A MINIMAL DELETERIOUS MATERIAL STRIP. NO ALLOWANCE HAS BEEN MADE FOR EROSION AND SEDIMENT CONTROL, BULKING, COMPACTION OF FILLED SOILS.

REFER TO DRAWING EW20 FOR EROSION AND SEDIMENT CONTROL PLAN.

THE EXISTING SURFACE IS BASED ON SURVEY & DESIGN INFORMATION PROVIDED. THIS SURVEY IS MOST CURRENT HOWEVER IT MAY NOT ACCURATELY REFLECT ACTUAL GROUND LEVELS OR STOCKPILES ETC ON SITE. IT IS THE CONTRACTORS RESPONSIBILITY TO CONFIRM VOLUMES AND ALLOWANCES FOR EARTHWORKS.

SCALE 1:100 AT A0 SIZE SHEET

SCALE 1:500 AT A0 SIZE SHEET

FOR APPROVAL

ISSUE	DATE	AMENDMENTS
B	17.04.20	ISSUED FOR APPROVAL
A	09.04.20	ISSUED FOR INFORMATION ONLY

ARCHITECT

CLIENT: suez

PROJECT: SUEZ STAGE 2
15 MUIR CHULLORA NSW

DESIGNED: MC | DRAWN: MC | DATE: 17.02.20 | CHECKED: MW | SIZE: A0 | SCALE: AS SHOWN | CAD REF: C013058.03-EW30

Costin Roe Consulting Pty Ltd.
Consulting Engineers
Level 1, 8 Windmill Street
Walsh Bay, Sydney NSW 2000
Tel: (02) 9251-7699 Fax: (02) 9241-3731
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Costin Roe Consulting

PRECISION | COMMUNICATION | ACCOUNTABILITY

DRAWING TITLE: BULK EARTHWORKS PLAN

DRAWING No: C013058.03-EW30 | ISSUE: B

Appendix A
Subgrade Approval Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

SUBGRADE APPROVAL REPORT

Client:	Contractor:
Job number:	Report number:
Project:	Technician:

Subgrade areas assessed:

Area ID	Date	Approximate extent	Subgrade description	Geometry summary	Specification reference	Compliance (Pass/Fail)	Survey reference	Approved (Yes/No)

COMMENTS:

Signed: Date:

Appendix B
Lot Approval Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

LOT APPROVAL REPORT

Client:	Report number:
Job number:	Report date:
Project:	Technician:
Contractor:	Test methods:

LOT ID:			**Sheet**	**of**
Retest (Yes/No)			Original test report number:	
Specification reference				
Location:				
Lot boundary survey reference/location:				
Materials description:	*(MATERIAL TYPE, colour, minor components, maximum particle size)*			
Material identification:	*(Identify the material as defined in Clause 2.3.1, Clause 2.3.2 or Clause 2.3.3 of the Specification)*			
Deleterious material assessment:	*(Report proportion of deleterious material)*			
Layer thickness:				
Accepted as Lot: (Yes/No)			Date:	
Approximate volume (m3)			Number of tests required:	

Test ID No.				
Test soil description				
Date tested:				
Grid reference				
Surveyed test locations (RL,E,N)				
Test depth (mm)				
Max size (mm)				
% Oversize material (wet)				
Field wet density (t/m^3)				
Field moisture content (%)				
PWCD (t/m^3)				
Compactive effort				
Moisture variation (%)				
HILF density ratio (%)				
TEST (Pass/Fail)				

LOT APPROVAL	(Pass/Fail)	Signed:	Date:

Appendix C
Daily Report

GEOTECHNICAL INSPECTION AND TESTING AUTHORITY

NATA accreditation number

DAILY REPORT

Client:	Report number:
Job number:	Report date:
Project:	
Location:	Level of testing: Level 1
Contractor	Technician:
Time on site:	
Time off site:	

1. Subgrade Approval

Areas ID	Subgrade Approval Report No:	Comments

2. Lot Approval

Lot ID	Lot Approval Report No:	Comments

3. Survey

Type of survey	Survey undertaken by:	Reference

4. Instructions received on site

5. Instructions given on site

COMMENTS:

Signed:	Date:

Appendix D
Sample Interim Letter

Our Ref:

Date:

Addressed to: Earthwork Contractor

Attention: Earthwork Contractor Representative

Dear

RE: SAMPLE INTERIM (OR FINAL) FILLING CERTIFICATE
INDUSTRIAL DEVELOPMENT, BULK EARTHWORKS
CERTIFICATION OF EARTHWORKS
BETWEEN [DATE OF COMMENCEMENT] AND [DATE OF COMPLETION]

In the period between [date start] and [date finish] the contractor has undertaken earthworks in areas XXX and XXX.

During the above period:

- The GITA has prepared the following Subgrade Approval Reports:

1. Subgrade Approval Report No 1
2. ……

- The GITA has prepared the following Lot Approval Reports:

1. Lot Approval Report No 1
2. ……

- The GITA has prepared the following Daily Reports:

1. Daily Report No 1……
2. ……

- The following subgrade survey was undertaken:

1. Subgrade Survey reference……
2. ……

- The following weekly survey was undertaken:

1. Weekly survey of week ending …….reference……..
2. ……

Copies of all the above documents are attached.

The GITA certifies that all the earthworks undertaken in the above stated period are documented in the above reports and have been undertaken in accordance with the Specifications (ref. PSM4113-003S, dated XXX) a copy of which is attached, with the exception of:

1. List outstanding issues (not approved subgrade, lots, unsuitable material, failed tests etc.)
2. ……..

Signed

GITA

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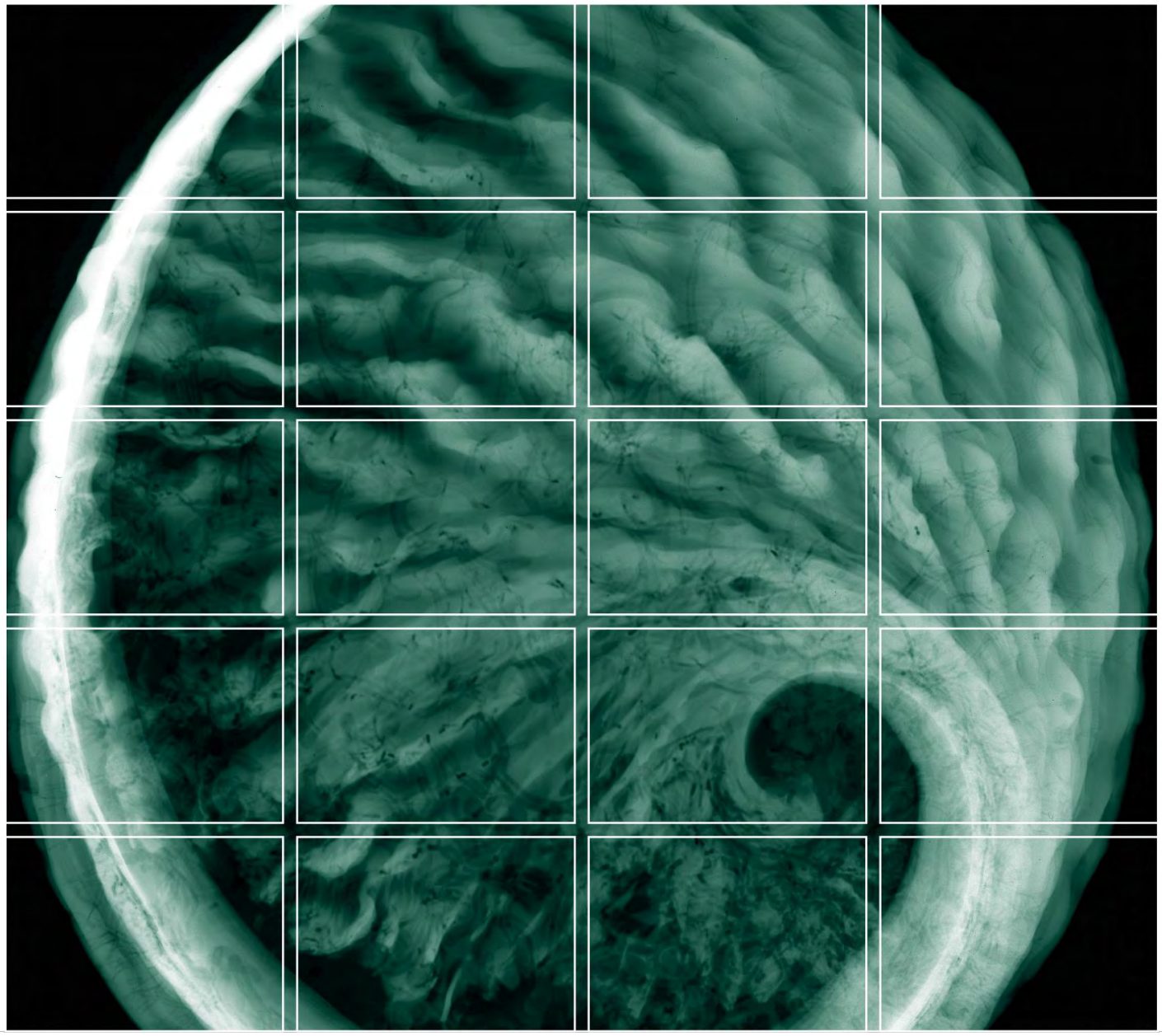

Stage 2 Contamination Assessment

15 Muir Road, Chullora NSW 2190

Frasers Property Australia

January 2019

Project No.: 0449164

The business of sustainability

ERM

Project name: Stage 2 Contamination Assessment – 15 Muir Road, Chullora

Document control number: S009244

Prepared for: Frasers Property Australia

Document history

				ERM approval to issue		
Version	**Revision**	**Author**	**Reviewed by**	**Name**	**Date**	**Comments**
1	0	Sally King	Michael Gaggin	Michael Gaggin	18/1/2019	

Abbreviations

A list of abbreviations used throughout the report is provided below:

ACM	Asbestos Containing Material
AS	Australian Standard
ASS	Acid Sulfate Soil
BGL	Below Ground Level
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
COPC	Contaminant of Potential Concern
CRC CARE	Co-operative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DQI	Data Quality Indicator
DQO	Data Quality Objective
EPA	Environment Protection Authority (NSW)
ERM	ERM Services Australia Pty Ltd
GIL	Groundwater Investigation Level
HIL	Health-Based Investigation Level
HSL	Health Screening Level
LNAPL	Light Non-aqueous Phase Liquid
LOR	Limit of Reporting
NA	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NL	Not Limiting
NSW	New South Wales
OC/OP	Organochlorine and Organophosphorus Pesticides
OEH	Office of Environment and Heritage
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PFAS	Per- and Poly-fluoroalkyl Substances
PID	Photoionisation Detector
POEO	Protection of the Environment Operations
QA/QC	Quality Assurance and Quality Control
RPD	Relative Percentage Difference
TEQ	Toxicity Equivalence Quotient
TRH	Total Recoverable Hydrocarbons
UCL	Upper Confidence Limit
VEDD	Vendor Environmental Due Diligence
VOC	Volatile Organic Compound
WTS	Waste Transfer Station

Executive Summary

ERM Services Australia Pty Ltd was commissioned by Frasers Property Australia to undertake a Stage 2 Contamination Assessment of the property located at 15 Muir Road, Chullora NSW 2190 (the site).

It is understood that the site formed the southern half of a larger property formerly used as a resource recovery centre, including a waste management centre. Prior to this, the site was the location of the Electric Car workshops operated by State Rail NSW. Demolition of two large industrial buildings occupying the central portion of the site occurred in 2017, and the site has since been used for storage of garbage bins, and maintenance and parking of garbage trucks.

The objectives of the assessment were to evaluate the presence of soil contamination across the site, and assess the suitability of the site for use as a resource recovery centre.

In particular, this Stage 2 assessment provides conclusions regarding the suitability of the site for future use as a resource recovery centre consistent with the definition of 'Commercial / Industrial D' land use provided in the *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)* (NEPC, 2013).Intrusive field investigations encountered highly variable fill material across the site comprising ash and slag, clay, sandy clay, silty clay, gravel and sandstone cobbles. Foreign materials observed throughout the fill included fragments of brick, concrete, plastic, metal, glass, ceramic, bitumen and tile. In addition, fragments of asbestos containing material and intermitted layers of black solid tarry material were also noted in several test pits.

Laboratory analysis of soil samples collected from the site reported chemical contaminants of concern at concentrations below the adopted assessment criteria with the exception of benzo(a)pyrene TEQ in test pit TP33 located in the central portion of the site which exceeded the human health investigation levels, and petroleum hydrocarbons in test pit TP3 located in the eastern-most portion of the site which exceeded the management limit.

Statistical analysis indicates that the benzo(a)pyrene TEQ impact identified in test pit TP33 is considered to represent a contamination 'hotspot' potentially related to the tar like material identified in solid form in this area of the site.

The elevated hydrocarbon concentration in test pit TP3 is not considered to present a risk under the proposed land use scenario given the absence of shallow groundwater, the absence of a fire or explosion risk, and the absence of buried infrastructure in this area of the site.

Laboratory analysis of soil samples also reported asbestos at concentrations above the adopted assessment criteria in fill material in test pits TP61, TP62, TP74, TP80 and TP82. The asbestos impacts were noted to be scattered across the site at varying depths within the subsurface.

With respect to the benzo(a)pyrene exceedance in test pit TP33, and associated observations of a solid state tarry material encountered in the eastern part of the central portion of the site, these conditions are not considered to present a current risk to human health or the environment under the established land use scenario.

While the identified asbestos exceedances represent a potential exposure pathway should soil disturbance occur in these locations, the risk of exposure can be managed through the implementation of an appropriate management plan.

ERM concluded that, based on the conceptual site model established for the site, it is not considered that these impacts do not preclude the ongoing or future use of the site as a resource recovery centre, or land use consistent with ‘Commercial / Industrial D’ scenarios. However, institutional controls such as the implementation of an asbestos or environmental management plan may be required in order to prevent potentially complete exposure pathways under certain site conditions or activities such as soil disturbance.

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Appendices

1 Introduction

1.1 General

ERM Services Australia Pty Ltd (ERM) was commissioned by Frasers Property Australia (the Client) to undertake a Stage 2 Contamination Assessment of the property located at 15 Muir Road, Chullora NSW 2190 (the site), refer to **Figure 1**.

This Stage 2 assessment report provides detailed information on the characterisation and environmental status of the site, and assesses the effects of any potential identified contamination on human health and the environment. Field observations and laboratory results derived from previous investigations undertaken on-site (DLA, 2016) have been used to supplement the data collected as part of the current assessment.

The report has been prepared utilising information obtained as part of the assessment process, and from experience, knowledge, and current industry practice in the assessment of similar sites.

1.2 Objectives

The objectives of the assessment were to evaluate the presence of soil contamination across the site, and assess the suitability of the site for use as a resource recovery centre.

In particular, this Stage 2 assessment provides conclusions regarding the suitability of the site for future land use consistent with 'Commercial / Industrial D' as defined in the *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)* ('NEPM', NEPC, 2013).

1.3 Scope of Works

To achieve the project objectives, ERM carried out the following works:

- Desktop review of readily available documentation pertaining to the site including online databases and previous environmental investigation reports;
- Review of the environmental condition of the site and surrounding area including topography, geology and hydrogeology;
- Identification of past and current land uses on-site, and potential contamination issues, if any;
- Systematic and targeted soil sampling based on representative site coverage and identified contamination issues, if any;
- Laboratory testing of soil samples for a suite of potential organic and inorganic contaminants;
- Interpretation of the results of laboratory testing in the context of the adopted assessment criteria, field observations, local geology and hydrogeology, and site history;
- Development and documentation of a site-specific Conceptual Site Model (CSM) based on the available information; and

- Preparation of this report which provides an assessment of the soil contamination, and discusses the suitability of the site for its intended land use.

1.4 Limitations

The findings of this report are based on the scope of work summarised in Section 1.3. ERM performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties, express or implied, are made.

Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials on the subject site should not be interpreted as a guarantee that such materials do not exist on the site.

This assessment is based on site inspections conducted by ERM personnel, sampling and analyses described in the report, and information provided by people with knowledge of site conditions.

All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved with the project and, while normal checking of the accuracy of data has been conducted, ERM assumes no responsibility or liability for errors in data obtained from regulatory agencies or any other external sources, nor from occurrences outside the scope of this project.

ERM is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The client acknowledges that this report is for the exclusive use of the client, its representatives and advisors and any investors, lenders, underwriters and financiers who agree to execute a reliance letter, and the client agrees that ERM's report or correspondences will not be, except as set forth herein, used or reproduced in full or in parts for such promotional purposes, and may not be used or relied upon in any prospectus or offering circular.

2 Site Setting

2.1 Site Location, Identification and Description

The site is an irregular-shaped parcel of land bound by Muir Road to the north, industrial land use to the east and west, and Cooks River to the south. At the time of investigation, the site was being used for the storage of 'wheelie bins', and the servicing, maintenance and overnight parking of garbage trucks.

Table 1. Site Identification

ITEMS	DESCRIPTION
Site Address	15 Muir Road, Chullora NSW 2190
Legal Identification	Lot 2 Deposited Plan 1227526
Local Government Authority	Canterbury-Bankstown
Current Zoning	IN1 – General Industrial under Bankstown Local Environmental Plan 2015
Site Area	9.2 hectares

The central portion of the site to the west of the Cooks River was previously the location of two large industrial buildings that were demolished between February 2017 and January 2018. At the time of the site walkover, the eastern half of the central area was sealed with concrete pavements and used for the storage of miscellaneous equipment and materials including 'wheelie bins'. This area included an old weighbridge that is no longer in use, immediately west of the Cooks River. The western half of the central area comprised vacant unsealed ground and was the location of a large stockpile of crushed aggregate. The aggregate comprised concrete waste generated from the demolition of the former industrial buildings.

The central portion of the site to the east of the Cooks River is the location of a single storey building, used for administration purposes and an adjacent bitumen sealed car park.

The south-western portion of the site lying immediately north of the Cooks River comprises a combination of hardstand and unsealed areas and is used for the storage of large box carts and miscellaneous mechanical equipment. A narrow corridor of vegetation lies between these areas and the Cooks River. This corridor was landscaped between May and August 2018 and included clearing of silt and vegetation from the banks of the Cooks River to better manage the stormwater runoff from the site.

The south-eastern portion of the site is sealed with concrete pavements and is the location of a number of buildings used for truck servicing and repairs. An above ground storage tank used for the containment of diesel and underground trade waste tanks are present in this portion of the site. In addition, two large decommissioned fire suppression (above ground) tanks are located in this portion of the site.

Redundant train tracks were encountered across most of the central portion of the site, particularly around the perimeter of the former industrial buildings.

The north-western 'arm' of the site comprises uncleared bushland that was identified by the Client as an area of 'protected vegetation'. An area of unsealed cleared land used as a car park and storage area lies immediately to the south of the bushland.

The south-eastern 'arm' of the site lies to the south of the Cooks River and comprises unsealed land that was revegetated mid-2017.

No visible evidence of significant surface staining was noted on-site at the time of the site walkover.

Refer to **Figure 2** - Site Layout.

2.2 Proposed Site Use

ERM understands that the site is to be used as a resource recovery centre, which is consistent with the definition of 'Commercial / Industrial D' land use presented in the NEPM (NEPC, 2013).

2.3 Environmental Setting

The following sub-sections provide an overview of the environmental conditions surrounding and underlying the site.

2.3.1 Surrounding Land Use

Land use features surrounding the site are summarised below:

North: Recently constructed commercial building with Muir Road and commercial / industrial land use beyond.

East: Anzac Street with commercial / industrial land use beyond.

South: Cooks River with commercial / industrial land use beyond.

West: Narrow corridor of vegetation with commercial / industrial land use beyond.

2.3.2 Topography and Local Hydrology

Reference to Google Earth indicates that the site lies at elevations between approximately 36 m and 46 m Australian Height Datum and exhibits undulating topography with a gradient down towards the west / south-west.

The Cooks River forms the southern boundary of the western and central parts of the site. The river then extends through the northern end of the south-eastern 'arm' of the site and continues in a northerly direction through the eastern portion of the site, parallel to the eastern site boundary. The Cooks River in the vicinity of the site flows in a broadly north-easterly direction, however regionally flows in a south-easterly direction, ultimately discharging to Botany Bay.

The surface of the site comprises a combination of pavements and unsealed surfaces. In unsealed areas of the site, it is expected that runoff water generated from rainfall would largely infiltrate into the surface, with the rate of infiltration dependent upon the permeability of the subsurface. In the case that the subsurface became waterlogged (i.e. following heavy or prolonged rainfall), it is expected that runoff water would form overland flow and follow the gradient of the land towards the west / south-west. Similarly, in areas where impervious pavements are present, runoff water is expected to flow in a west / south-westerly direction.

2.3.3 Geology and Soils

Review of the 1:100,000 'Sydney Geological Series' Sheet 9130 indicates that the site is underlain by Triassic-aged Bringelly Shale of the Wianamatta Group. This formation comprises shale, carbonaceous claystone, laminate, fine to medium grained lithic sandstone, and rare coal derived from alluvial and estuarine environments.

Review of the 1:100,000 'Sydney Soil Landscape Map' indicates that the site lies within the Blacktown Landscape Group. The soils within this group comprise shallow to moderately deep red and brown podzolic soils on crests, upper slopes, and well-drained areas; and deep yellow podzolic soils and soloths on lower slopes and in areas of poor drainage. The soils are characterised by moderately reactive highly plastic subsoil, low soil fertility and poor soil drainage.

Review of the 1:25,000 'Liverpool Acid Sulfate Soil Map' indicates that there are no known occurrences of acid sulfate soils (ASS) in the vicinity of the site. Further, no evidence of suspected ASS was observed on-site during fieldwork.

Previous investigations undertaken on-site (DLA, 2016) indicate that the subsurface of the site in the areas subject to investigation comprised fill materials (ranging from crushed sandstone, gravelly road base and clayey sand) to a maximum depth of 1.2 m below ground level (bgl) overlying reddish brown / brown and grey residual Silty CLAYS. Other investigations (AECOM, 2015) indicated that fill also included scattered foreign materials (concrete, glass and ash) extending to depths of up to 3.9 m bgl.

2.3.4 Hydrogeology

A search of the New South Wales (NSW) Office of Water groundwater database indicates that there are no registered bores located within a 500 m radius of the site boundaries.

Historical gauging recorded groundwater at depths of up to 5.42 m below top of casing and was typically present at shallow depths in the vicinity of Cooks River (e.g. MW01, MW02, MW13 and MW15) and at greater depths away from the river (e.g. MW20) (AECOM, 2015).

Based on the topography of the site and regional hydrology, the inferred groundwater flow direction was towards the north-east (AECOM, 2015).

3 Site History Summary

Historically, the site formed the southern half of a larger property formerly used as a resource recovery centre, including a waste management centre. Previous works undertaken on-site (i.e. within Lot 2) identified that the eastern building formerly located on-site was used for the processing of recoverable resources of high calorific value (e.g. fabrics, paper, cardboard, etc) into 'Processed Engineered Fuel'[1], while the western building was used for the storage or waste materials (e.g. concrete, plastic, and other inert materials). The remainder of the site was used for storage purposes (AECOM, 2015).

Previous investigations carried out on-site (DLA, 2016) included a review of historical information pertaining to the site. The historical review identified that the site has been used for industrial purposes since at least 1930. Specifically, the site was the location of the Electric Car (ELCAR) workshops (main workshop covering the footprint of the industrial buildings that were demolished in 2017, paint shop located along the northern boundary of the site, and compressor building and fuel storage facilities both located in the vicinity of the existing weighbridge) until 1994.

Following demolition, the surface of the site within the footprint of the former eastern building remained sealed with concrete pavements and was used for the storage of miscellaneous equipment and materials. Conversely, the surface within the footprint of the former western building comprised disturbed bare ground that was used for the storage of stockpiled crushed aggregate (i.e. concrete waste generated from the demolition of the former industrial buildings).

Most of the vegetation within the south-eastern 'arm' of the site was cleared mid-2017. In addition, the bridge across the Cooks River connecting the south-eastern 'arm' to the main body of the site was removed in 2018.

A search of records pertaining to Section 58 of the *Contaminated Land Management Act 1997* revealed that the site and immediately surrounding properties have not been issued with any notices by the NSW Environment Protection Authority (EPA) with regards to contaminated land.

A search of the NSW EPA *Protection of the Environment Operations (POEO) Act 1997* public register indicated that Suez Recycling & Recovery Pty Ltd[2] was issued with a Section 91 Clean-up Notice (reference: 1550265) pertaining to the site on 16 March 2017. The following is an excerpt from the Notice:

> *"C. On 23 February 2017, the licensee notified the EPA via the Environment Line that a fire was occurring at the premises. The fire is ongoing and Fire and Rescue NSW are continuing to undertake fire-fighting actions at the premises.*
>
> *D. The fire was contained within a Materials Recycling Facility building at the premises that contained dry, non-putrescible waste products including, but not limited to, paper, cardboard, plastic and carpet.*
>
> *E. EPA officers attended the premises in relation to the incident on 23 February 2017, 24 February 2017, 7 March 2017, 9 March 2017, 10 March 2017, 12 March*

[1] The process typical comprises sorting of landfill-bound waste materials, followed by shredding, screening and separation of materials. Inert content with no energy value is extracted and disposed to landfill, while the balance of the content (i.e. combustible materials) is converted into a dry solid fuel product.

[2] Suez Recycling & Recovery Pty Ltd was the registered owner/operator of the site in 2017.

2017, 13 March 2017 and 14 March 2017. On all dates, the EPA advised SUEZ representatives that efforts need to be made to contain fire waters and prevent pollution of waters. On each of these dates fire water was observed discharging from the premises into the Cooks River.

F. On 24 February 2017, EPA authorised officers observed uncontrolled fire water discharging from the premises into the Cooks River. That same day, a fish kill was observed downstream."

In November 2017, two penalty notices were issued for the following offence - "Contravene condition of licence".

At the time of reporting, no further notices had been issued to Suez Recycling & Recovery Pty Ltd by NSW EPA.

4 Previous Investigations Summary

A number of investigations have been commissioned and undertaken on the site, however not all aspects of the reports have focused on the area subject to this assessment. The reports summarised below are relevant to the area of assessment (i.e. Lot 2), or relate directly to the contamination potential of the site.

4.1 Environmental Site Assessment (ADI, 1994)

At the time of assessment, the site formed part of a facility occupied by The State Rail Authority and used as a depot for the maintenance of electric train carriages. Intrusive investigations comprised the collection and laboratory analysis of soil samples within the landfill to the north of Muir Road, and within operational areas immediately north of the site (i.e. outside Lot 2) and within the site itself, including carriage parking area in the southern portion of the site. In addition, three groundwater monitoring wells were installed and sampled.

Soil samples collected as part of the assessment targeted the landfill, and operational areas of the site including the main workshop, paint shop, steam cleaning area and caustic tanks, compressor house, blacksmith shop, fuel storage area, paint and poison stores, and the carriage parking area.

The results of the laboratory analysis indicated that all soil samples collected from within the site boundaries reported contaminant concentrations below the current and applicable guidelines (NEPC, 2013), with the exception of lead in sample EL28 at a depth of 0.3-0.8 m bgl. This sample was collected from within the footprint of the ELCAR workshop building which corresponds to the footprint of the eastern industrial building formerly located on-site.

Groundwater samples reported contaminant concentrations below the current and applicable Groundwater Investigation Levels (GIL) (NEPC, 2013) with the exception of copper and zinc in each of the three monitoring wells. Exceedances of cadmium, lead and mercury were not able to be assessed as the laboratory detection limit was above the GIL.

4.2 Vendor Environmental Due Diligence (ERM, 2010)

The Vendor Environmental Due Diligence (VEDD) report was prepared as part of the proposed sale of the site. The primary objective of the assessment was to evaluate current and past activities and related practices at the site to establish known or potential sources of soil and groundwater contamination.

At the time of assessment, the site comprised a materials recycling facility (eastern industrial building), a glass beneficiation plant, maintenance sheds, weighbridge and gatehouse, areas of vacant hardstand, and areas of undeveloped land.

A summary of the site history confirmed that the ELCAR facility was constructed on-site in the 1920s. Rail related activities ceased on-site in 1994, then ownership of the site was transferred to WSN.

The report concluded that, based on the site history, soil and groundwater issues were likely to be an issue at the site, particularly associated with contaminants related to rail maintenance activities. Although site wide investigations had not been carried out on-site at the time of

reporting, investigations completed to date did not indicate extensive contamination of soils at depth. The report stated that further assessment of the site was necessary to ascertain the significance of contamination and regulatory requirements for remediation. Finally, the report noted that ERM was not aware of any triggers for investigation or remediation of the site, or of any information to suggest that the site could not support the existing land use.

The VEDD report also provided a summary of five previous contamination reports including the ADI report (1994), as summarised in Section 4.1 of this document. The four other reports were:

- **Douglas Partners (1996)**: whereby a soil investigation was completed in the vicinity of the Waste Transfer Station (WTS) prior to its construction. No significant soil contamination was identified. The area included the landfill, a paint shop and the main workshop;
- **Rust PPK (1996)**: comprised a health and safety plan for remediation of the WTS area. The plan suggested that the proposed remediation works were to include the excavation of contaminated fill to a depth of 0.3 to 0.5 m bgl, relocation of the excavated material to another portion of the site, and capping of the relocated fill[3];
- **Environmental Investigation Services (1996)**: a memo was prepared indicating that fill material imported to the site was suitable for use on-site and that, based on limited sampling, stripping of the upper layer of the playing field appears to have removed surficial metal contamination. It was inferred that partial remediation of the WTS area was conducted as outlined by Rust PPK (1996); and
- **Douglas Partners (1997)**: the context and purpose of the works were unclear, however no significant soil contamination was reported.

4.3 Limited Phase II ESA (AECOM, 2015)

The assessment included the drilling of 20 boreholes and installation of five groundwater monitoring wells, and the collection and laboratory analysis of soil and groundwater samples. The following conclusions were provided in relation to soils and groundwater assessment:

- Ten of the 20 boreholes were drilled within the site (i.e. Lot 2) boundaries;
- Of these, eight soil bores encountered fill material;
- Soil samples collected from the boreholes drilled within the site reported contaminants at concentrations below the current and applicable guidelines (NEPC, 2013); and
- Contaminant concentrations in groundwater samples indicated there was a low potential for groundwater contamination-related risk to future site development in the locations tested.

4.4 Detailed Site Investigation (DLA, 2016)

The investigation included the collection of soil samples from 21 boreholes drilled on-site (i.e. within Lot 2), and reported chemical contaminants and asbestos at concentrations below the current and applicable guidelines (NEPC, 2013).

[3] No further information was provided regarding the proposed remediation strategy. ERM has not been provided with any documentation or evidence that remediation of the site was carried out.

Groundwater samples collected from existing on-site and off-site monitoring wells reported elevated concentrations of nickel and zinc, however the concentrations were not considered to present a significant and widespread risk to receptors at the site due to the highly saline nature of groundwater and the low risk of interaction with groundwater under a continued commercial / industrial land use scenario. Further, given that the property is located down-gradient of an adjacent galvanising plant, the identified groundwater impacts are expected to be associated with off-site activities.

The report concluded that there was a low likelihood of unacceptable contamination present on-site as a result of past and present land use activities.

The data obtained as part of the DLA (2016) investigation has been used to supplement the data obtained from the current assessment.

5 Conceptual Site Model

5.1 Overview

A Conceptual Site Model (CSM) is a representation of an environmental system and the processes that determine the transport of contaminants from sources through environmental media to environmental receptors. The development of a CSM comprises an iterative process of characterising site contamination on the basis of historical, anecdotal, previous and current environmental data.

A CSM, as used herein, is the qualitative description of plausible mechanisms by which receptors may be exposed to contamination at a given site. For exposure to be considered possible, some mechanism ('pathway') must exist by which contamination from a given source can reach a given receptor. Such complete 'source-pathway-receptor' exposure mechanisms are commonly termed 'SPR linkages'. Potential exposure pathways are evaluated based on the existence of:

- a source of contamination/impact;
- a mechanism for release of contaminants from identified sources;
- a contaminant retention or transport medium (e.g. soil, air, groundwater, etc.);
- potential receptors of contamination; and
- a mechanism for chemical intake by the receptors at the point of exposure (ingestion, dermal contact or inhalation or a combination of these).

Contaminant sources, exposure mechanisms and receptors at the site are discussed in the following sections, with a thorough understanding of the relationships between each considered fundamental in assessing potential risk.

5.2 Potential Contaminants

Based on the information summarised within previous sections of this report, the principal potential contamination sources and associated Contaminants of Potential Concern (COPC) within the site are summarised in Table 2.

Table 2. Sources of Contamination and COPC

POTENTIAL SOURCE	COPC	PERCEIVED RISK
Fill material or unknown origin and quality (i.e. generated on-site and imported to the site)	Heavy metals, TRH, BTEX, PAH, OC/OP, PCB, asbestos	Moderate
Demolition of former buildings potentially containing hazardous materials	Asbestos, lead	Moderate
Former rail related workshop activities	Heavy metals, TRH, BTEX, PAH, PCB	Moderate

POTENTIAL SOURCE	COPC	PERCEIVED RISK
Railway sidings	Asbestos, heavy metals	Moderate
Fuel storage	TRH, BTEX, lead	Moderate
Former resource recovery activities (i.e. processing)	Heavy metals, TRH, BTEX, PAH	Low to moderate

Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn); TRH: Total Recoverable Hydrocarbons; BTEX: Benzene, Toluene, Ethylbenzene, Xylene; PAH: Polycyclic Aromatic Hydrocarbons; OC/OP: Organochlorine / Organophosphorus Pesticides; PCB: Polychlorinated Biphenyls.

Based on the Section 91 Clean-up Notice issued by NSW EPA (refer to Section 3 of this document), ERM notes that there is the potential for the presence of PFAS (Per- and Poly-fluoroalkyl Substances) contamination within the soil and groundwater underlying the site, and within the surface water and sediments of the Cooks River, associated with the release of fire-fighting foams (refer to Appendix B of HEPA, 2018). Appendix B of HEPA (2018) also identifies waste storage as an activity that may be associated with PFAS contamination.

Similarly, the presence of fire suppression tanks on-site suggests the potential for ground contamination associated with the storage and application of firefighting foams.

Inclusion of PFAS as a COPC was not undertaken as part of this assessment. The rationale and implications of this non-inclusion are discussed in Section 10.1 of this document.

5.3 Release and Transport Mechanisms

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

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

Given the results of previous investigations undertaken on-site, and the location of the site in proximity to up-gradient potentially contaminating activities, investigation of the contamination status of groundwater has not been carried out as part of the current assessment.

5.4 Identified Potential Pathways

Site-specific potential pathways identified within the site include:

a) Inhalation of vapours or free asbestos fibres; and

b) Potential dermal and oral contact with impacted soils.

5.5 Sensitive Receptors

The potentially sensitive receptors of environmental impacts present within the site include:

- Current and future construction and maintenance workers conducting activities at the site;
- Current and future users of the site; and
- Nearby ecological receptors.

6 Sampling and Analysis Plan

6.1 Data Quality Objectives

Data Quality Objectives (DQOs) have been developed to define the type and quality of data required to achieve the project objectives outlined in Section 1.2 of this document. DQOs have been selected with reference to relevant guidelines published by the NSW EPA and National Environment Protection Council (NEPC), which define minimum data requirements and quality control procedures. The DQOs have been prepared in line with the process outlined in *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme 3rd Edition* (NSW EPA, 2017) and NEPM (NEPC, 2013). The proposed application of the seven-step DQO approach to this project is described in the following sections.

Step 1: State the Problem

The site has been used historically for a range of industrial related activities that may have resulted in soil and groundwater contamination. Greater certainty is required on the suitability of the site for ongoing and future land use consistent with 'Commercial / Industrial D' as defined in the NEPM (NEPC, 2013).

Step 2: Identify the Decisions

Decisions include:

- Do contaminant concentrations in soil comply with the adopted assessment criteria?
- Have the previous land uses affected the environmental quality of the site?
- Does soil pose an unacceptable risk to human health or the on-site environment?

Step 3: Identify the Inputs to the Decision

The inputs required to make the above decisions are as follows:

- Information gathered from the desktop review of available current and historical documentation pertaining to the site, as well as the environmental context of the site;
- Information gathered from a site walkover;
- Results of the field investigations and laboratory analysis; and
- Relevant legislation and regulatory guidelines.

Step 4: Identify the Study Boundaries

The spatial boundary of the assessment is defined by the boundary of the site, as shown in **Figure 2**.

As data from previous environmental reports will be used as part of the assessment, the temporal boundary for this assessment is from 1994 to the date of this report.

Step 5: Develop a Decision Rule

The site will be considered suitable for its intended land use if contaminant concentrations within the soil comply with the adopted assessment criteria, as determined by the following decision rules being applied to the data:

- The 95 % Upper Confidence Limit (UCL) of the arithmetic mean for each contaminant of concern must comply with the respective assessment criteria;
- The individual contaminant concentration should not exceed the adopted assessment criteria by more than 250 %; and
- The standard deviation of individual contaminants should not exceed 50 % of the adopted assessment criteria.

The site will be deemed to contain contamination "hotspots" if any of the above criteria are unfulfilled.

Step 6: Specify Performance Criteria

A site is assumed to be contaminated until statistically proven otherwise (e.g.: Analyte 95 % UCL exceeds the assessment criteria), therefore two types of error are possible:

- Type 1 error (α or false negative), where the site is assessed to be uncontaminated when it is actually is; and
- Type 2 error (β or false positive), when the site is assessed to be contaminated though is actually not.

The more severe consequence is with Type 1 errors (α) since the risk of jeopardising human or environmental health outweighs the consequences of additional remediation costs.

The acceptable limits on decision errors applied during the review of the results will be based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness in accordance with Schedule B (3) - Guidelines on Laboratory Analysis of the NEPM (NEPC, 2013).

The potential for significant decision errors will be minimised by:

- completing a robust Quality Assurance/Quality Control (QA/QC) assessment of the assessment data and application of the probability that 95% of data will satisfy the DQIs, therefore a limit on the decision error would be 5% that a conclusive statement may be incorrect;
- assessing whether appropriate sampling and analytical density has been achieved; and
- ensuring that the criteria set are appropriate for current and future land use scenarios (i.e. residential).

Step 7: Optimise the Plan for Completion of Works

The DQOs were developed based on a review of existing data, and discussions with the relevant project stakeholders. If information gathered during the assessment process indicates that the objectives of the works are not being met, then this will be communicated to the Client to enable the appropriate steps to be made to rectify the issue before the completion of the project.

6.2 Field Investigation Procedure

Prior to the commencement of intrusive investigations, a visual survey of the accessible areas of the site was carried out in order to identify the presence of any physical evidence of potential surface contamination, waste or aesthetically unacceptable material. The grid spacing adopted

for the visual survey was considered sufficient to allow documentation of site features and waste materials, and included the areas occupied by bushland.

For a site covering an area of 9.2 hectares, the *Contaminated Sites: Sampling Design Guidelines* (NSW EPA, 1995) recommends that a minimum of 107 sample locations be targeted for investigation purposes. Given that previous investigations undertaken on-site (DLA, 2016) targeted 21 boreholes, an additional 86 test locations were investigated to achieve the minimum recommended sampling density[4].

Prior to excavation, the subsurface of the site was screened for the presence of underground services by a qualified and experienced cable locator in consultation with Dial-Before-You-Dig service plans.

A total of 86 test locations (TP1 to TP86) were arranged on a systematic grid (approximately 25 m by 25 m) allowing for the presence of underground services and infrastructure, operational areas and equipment storage areas. Targeted sampling was not carried out as no localised AECs were identified during the site walkover.

Refer to **Figure 3** – Test Pit and Borehole Locations.

A total of 70 test pits (TP1 to TP70) were excavated using an excavator to depths between 0.3 m and 3.0 m bgl. Where surface pavements were present, a road saw was used to cut an approximately 2 m long by 1 m wide hole to allow access to the underlying subsurface. The cut pavement was removed and placed adjacent to the test location.

A total of 16 boreholes (TP71 to TP86) were drilled within areas of the site where pavements were not present, specifically the vegetated area comprising the north-western ‘arm’ of the site and the partially vegetated area comprising the south-eastern ‘arm’ of the site. Boreholes were drilled using a hand auger to depths between 0.4 m and 1.5 m bgl.

Where possible, test pits and boreholes were advanced to depths sufficient to intercept natural ground.

Soil samples were collected from each test location in general accordance with the NEPM (NEPC, 2013) and AS4482.1-2005 *Guide to the Investigation and Sampling of Sites with Potentially Contaminated Soil Part 1: Non-Volatile and Semi-Volatile Compounds*. Samples were collected at regular depth intervals from both fill material and natural in-situ soils.

In order to reduce the potential for cross contamination, soil samples from test pits were collected directly from the centre of the excavator bucket, while soil samples from boreholes were collected directly from the auger.

In order to minimise the potential for the loss of volatiles during sample collection, where possible, test pit sampling targeted larger soil clods within the excavator bucket rather than loose material, and retained the material structure as far as possible.

The lithology at each test location was recorded and a photographic record of the subsurface was maintained.

[4] Although five boreholes were drilled on-site as part of the AECOM (2015) investigation, given the limited data set, these were not used to supplement the current data set. Further, data obtained from investigations carried out during, or prior to, 2010 was not considered applicable for inclusion as part of the current data set.

Refer to **Appendix A** – Test Pit and Borehole Logs, and **Appendix B** – Site Photographs[5].

A portion of each soil sample collected from fill material was placed inside a sealed plastic bag for field headspace screening for the presence of Volatile Organic Compounds (VOCs) using a Photoionisation Detector (PID). The PID was calibrated prior to the commencement of fieldwork to 100 ppm isobutylene calibration gas. The calibration certificate is presented in **Appendix C**. The PID readings, together with other field observations, were used to assess which samples were to be analysed for volatile contaminants. The field screening results are recorded on the test pit and borehole logs (**Appendix A**).

Samples were immediately transferred to appropriate laboratory prepared and supplied glass jars with Teflon lined caps for chemical analysis, and zip-lock plastic bags for asbestos detection. Job number; sample identification number; sampler's initials and date of sampling were recorded on sample labels affixed to the sample containers.

Samples for chemical analysis were immediately placed into a chilled cooler to reduce the likelihood for the loss of volatile components, if any. Chemical samples were stored and transported in coolers with ice present.

Samples were transported under standard ERM chain-of-custody protocols to the NATA accredited laboratories – Envirolab Services Pty Ltd, SGS Australia and Australian Safer Environment & Technology Pty Ltd.

Asbestos Quantification

Where asbestos was detected in discrete samples, further analysis was carried out to allow asbestos quantification and comparison against the screening values presented in the NEPM (NEPC, 2013). Asbestos concentration calculations are based on the amount of asbestos equivalent in a measured amount of soil expressed as a % weight for weight (w/w) and estimated using the formula:

$$\%w/w \text{ asbestos in soil} = \frac{\%\text{Asbestos Content X Bonded ACM Weight (kg)}}{\text{Soil Volume (L) X Soil Density (kg/L)}}$$

A bulk density of 1.7 kg/L was used during the assessment process.

6.3 Analytical Strategy

Soil samples were selected for laboratory analysis on the basis of the likely presence of contamination based on material type, visual or olfactory evidence of potential contamination (e.g. staining, filling or presence of building rubble and other anthropogenic wastes and fibre-cement sheeting), field screening, and the representativeness of varying soil conditions.

Soil samples were selectively submitted for laboratory analysis for contaminants of potential concern as summarised in Table 3.

[5] The photographs presented in Appendix B are representative of the typical subsurface conditions encountered on-site. Not all test pits are included in the photographic record provided.

Table 3. Analytical Strategy

ANALYTE	NO. OF PRIMARY SAMPLES	
	Test Pits	Boreholes
Asbestos (fill samples only)	68	16
Total Recoverable Hydrocarbons (TRH)	72	16
Benzene, Toluene, Ethylbenzene, Xylene (BTEX)	72	16
Polycyclic Aromatic Hydrocarbons (PAH)	72	16
Organochlorine / Organophosphorus Pesticides (OC/OP)	17	3
Polychlorinated Biphenyls (PCB)	17	3
Heavy Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	72	16

In summary, one soil sample from each test pit and borehole was submitted for analysis, with the exception of test pits TP26 and TP64 from which two samples were submitted for analysis.

7 Assessment Criteria

7.1 General

Assessment criteria was obtained from the following publications:

- *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No.1)* (NEPC, 2013); and
- *Health screening levels for petroleum hydrocarbons in soil and groundwater, Part 2: Application document, CRC CARE Technical Report no. 10*. (Friebel, E and Nadebaum, P, 2011).

7.2 Health Investigation Levels

The Health Investigation Levels (HILs) are scientifically based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential risks to human health from chronic exposure to contaminants. They are intentionally conservative and are based on a reasonable worst case scenario for four generic land use scenarios. Considering the proposed land use, the following HIL has been adopted:

- HIL D – Commercial / Industrial.

The adopted HILs from Table 1A(1) and Table 7, Schedule B1 of NEPM (NEPC, 2013) are shown in Table 4.

Table 4. Health Investigation Levels (mg/kg)

ANALYTES	HIL-D
HEAVY METALS	
Arsenic	3,000
Cadmium	900
Chromium	3,600
Copper	240,000
Lead	1,500
Mercury	730
Nickel	6,000
Zinc	400,000
PAH	
Carcinogenic PAH as Benzo(a)pyrene TEQ	40
Total PAHs	4,000
PCB	
Total PCB	7
PESTICIDES	
DDT+DDE+DDD	3,600
Aldrin and Dieldrin	45
Chlordane	530
Endosulfan	2,000

ANALYTES	HIL-D
Endrin	100
Heptachlor	50
HCB	80
Methoxychlor	2,500
Mirex	100
Toxaphene	160
ASBESTOS	
Bonded Asbestos Containing Material	0.05 % w/w
Asbestos Fines / Friable Asbestos	0.001 % w/w
Surface Asbestos (0.1 m)	No visible

Health Investigation Levels soured from NEPM (NEPC, 2013) Table 1A(1)
Toxic Equivalence Quotient (TEQ) expresses an aggregate measure of toxicity based on a number of contributing PAH compounds.
Asbestos Health Screening Levels sourced from NEPM (NEPC, 2013) Table 7.

7.3 Health Screening Levels

Health Screening Levels (HSLs) are used to assess selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact with affected soils. The HSLs were developed by the Co-operative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) and were derived through the consideration of health effects only, with particular emphasis on the vapour exposure pathway. Other considerations such as ecological risk, aesthetics, the presence of free phase product and explosive / fire risk are not addressed by the HSLs.

In order to determine whether the HSLs tabulated in Schedule B1 of NEPC (2013) are applicable or whether a site-specific determination is required, CRC CARE provide an application checklist which should be completed prior to using the HSLs. The following parameters were considered in completing the checklist:

- Potential Contaminants – Petroleum Hydrocarbons;
- Land use – HSL D;
- Potential Pathways – soil vapour intrusion, direct contact;
- Media – soil;
- Soil Types – given that the subsurface was observed to comprise a mix of sand, silt and clay, sand has been adopted as the dominant sub-surface profile as it represents a conservative approach; and
- Depth to Contamination – all data will be compared with the HSLs.

On the basis of these considerations, the following HSL has been adopted:

- HSL D – Commercial / Industrial for ‘sand’ (or ‘coarse’).

The adopted soil HSLs for vapour intrusion from Table 1A(3), Schedule B1 of NEPM (NEPC, 2013) are shown in Table 5.

Table 5. Health Screening Levels (mg/kg)

ANALYTES	HSL-D (Sand) 0 to <1m	HSL-D (Sand) 1 to <2m	HSL-D (Sand) 2 to <4m	HSL-D Direct Contact	HSL Maintenance Workers Direct Contact
Benzene	3	3	3	430	1,100
Toluene	NL	NL	NL	99,000	120,000
Ethylbenzene	NL	NL	NL	27,000	85,000
Xylene	230	NL	NL	81,000	130,000
Naphthalene	NL	NL	NL	11,000	29,000
F1: C_6-C_{10}	260	370	630	26,000	82,000
F2: C_{10}-C_{16}	NL	NL	NL	20,000	62,000
F3: C_{16}-C_{34}	NA	NA	NA	27,000	85,000
F4: C_{34}-C_{40}	NA	NA	NA	38,000	120,000

NL = Not Limiting (i.e. the soil vapour concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for the given scenario).
NA = Not Applicable (i.e. NEPM (NEPC, 2013) does not provide HSLs for the F3 and F4 hydrocarbon fractions).
Vapour Intrusion Criteria sourced from NEPM (NEPC, 2013) Table 1A(3).
Direct Contact Criteria sourced from Friebel and Nadebaum 2011, Health Screening Levels for petroleum Hydrocarbons in Soil and Groundwater, Part 1: Technical Development Document, Table A4.

7.4 Management Limits

In addition to appropriate consideration and application of the HSLs, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

Management limits to avoid or minimise these potential effects have been adopted in NEPM (NEPC, 2013) as interim Tier 1 guidance.

The adopted management limits from Table 1B(7), Schedule B1 of NEPM (NEPC, 2013) are shown in Table 6.

Table 6. Management Limits (mg/kg)

ANALYTES	MANAGEMENT LIMIT (Coarse) Commercial / Industrial space
F1: C_6-C_{10}	700
F2: C_{10}-C_{16}	1,000
F3: C_{16}-C_{34}	3,500
F4: C_{34}-C_{40}	10,000

Management Limits soured from NEPM (NEPC, 2013) Table 1B(7)

7.5 Ecological Criteria

Assessment of contaminant concentrations against the ecological investigation and screening levels provided in the NEPM (NEPC, 2013) is not considered necessary as the site is to be

redeveloped for commercial/industrial purposes with extensive paved areas and limited landscaping.

8 Field and Laboratory Quality Control

An assessment of field and laboratory quality control is provided in **Appendix D** and is summarised as follows.

8.1 Field QC Results

Field duplicates provide an indication of the whole validation process, including the sampling process, sample preparation and analysis.

The Relative Percent Difference (RPDs) between the parent, intra-laboratory and inter-laboratory duplicate samples reported significant variability attributed to the heterogeneity of the soil sample matrix rather than poor field or laboratory techniques.

Tri blank and trip spike samples reported results within the acceptable range.

8.2 Laboratory QC Results

The analytical methods implemented and reported by the laboratories were performed in accordance with their scope of NATA accreditation and consistent with Schedule B(3) of the NEPM (NEPC, 2013).

Laboratory QA/QC data was generally reported within acceptable limits. Any outliers are discussed within the QA/QC assessment presented in **Appendix D**.

8.3 QC Summary

Overall, ERM considers that the field and laboratory data obtained is representative of subsurface conditions at the sampling locations, and therefore the results are acceptable for the purposes of this assessment.

9 Results

9.1 Field Observations

Fragments of suspected asbestos containing material (ACM) were observed on the surface of the site in the vicinity of test pits TP26, TP41, TP43, TP60 and TP70.

Surface pavements types encountered during test pitting included the following:

- Asphalt (TP1 – TP5, TP27, TP28, TP30, TP31, TP33);
- Pavers (TP6 – TP10, TP23, TP24); and
- Concrete (TP11 – TP16, TP18 – TP21, TP29, TP32, TP34, TP35, TP51 – TP55, TP66, TP67).

Fill material was encountered at the surface, or immediately underling pavements, in all test pit and borehole locations, except for test pit TP51, to depths between 0.1 m and 2.8 m bgl. Fill material encountered on-site was highly varied and comprised a combination of the following primary materials:

- ash and slag;
- clay, sandy clay, silty clay, with gravel and sandstone cobbles;
- sand and gravel; and
- crushed orange sandstone.

Occasional intermittent layers of solid black tarry material were identified in test pits TP11, TP13 to TP15, TP18, TP19, and TP33 to TP35.

Foreign materials were encountered throughout the fill and generally comprised fragments of brick, concrete, plastic, metal, glass, ceramic, bitumen and tile. In addition, fragments of suspected ACM were also observed within the fill material in test pits TP17, TP25, TP62 and TP64, and a redundant asbestos pipe was encountered in test pit TP57 at a depth of 0.8 m bgl.

Buried concrete slabs (i.e. ‘second slabs’) were encountered within the fill material in 19 test pits excavated within the eastern half of the central area of the site at depths, and within the fill in three test pits excavated immediately south of the bushland area within the north-western ‘arm’ of the site. The ‘second slabs’ indicate that fill material was historically placed directly on top of existing concrete slabs in these areas of the site.

The fill material was underlain by residual CLAY or Silty CLAY soils that were typically grey and red mottled to brown in colour.

Weathered SHALE was encountered at the base of test pits TP38, TP40, TP68 and TP70 from depths between 0.2 m and 1.2 m bgl.

Strong hydrocarbon odours were noted in test pits TP33, TP34 and TP35 associated with solid black tarry material. A strong hydrocarbon odour was also noted in the fill material in test pit TP27.

Screening of soil samples for the presence of VOCs reported PID readings between 0.1 ppm and 3.6 ppm. The readings are not considered indicative of the likely presence of elevated concentrations of volatile hydrocarbons within the fill materials subject to screening.

No evidence of contamination in the form of staining was noted within the fill material or natural soils comprising the subsurface across the remaining site area.

Regional groundwater was not encountered during test pitting and drilling works, however seepage water was observed at the base of test pits TP37, TP47 (adjacent to a concrete footing), and TP69 and TP70 (adjacent to a potential culvert). Water was also observed to be leaking into test pit TP53 from beneath the overlying concrete pavement.

9.2 Laboratory Results

The results of the laboratory analysis of soil samples collected from the site are summarised below.

Refer to **Appendix E** – Data Summary Tables and **Appendix F** – NATA Certified Laboratory Reports.

9.2.1 Asbestos

The results of the laboratory analysis detected asbestos in the following soil samples:

- TP3_0.2
- TP5_0.1
- TP27_0.5
- TP60_0.5
- TP61_0.5
- TP62_1.0
- TP63_0.5
- TP64_0.5
- TP69_0.8
- TP74_0.1
- TP80_0.5
- TP82_0.4

Further analysis of the samples indicate that asbestos concentrations exceed the adopted assessment criteria in the following soil samples only:

- TP61_0.5 with an asbestos concentration of 0.0014 % w/w;
- TP62_1.0 with an asbestos concentration of 0.0020 % w/w;
- TP74_0.1 with an asbestos concentration of 0.0953 % w/w;
- TP80_0.5 with an asbestos concentration of 0.0015 % w/w; and
- TP82-0.4 with an asbestos concentration of 0.0904 % w/w.

A copy of the asbestos calculation sheet is provided in **Appendix E**.

9.2.2 Total Recoverable Hydrocarbons and Monocyclic Aromatic Hydrocarbons

The results of the laboratory analysis reported TRH and BTEX in soil at concentrations below the adopted assessment criteria with the exception of the following:

- TP3_0.2 reported TRH >C_{16}-C_{34} (F3) at a concentration of 3,900 mg/kg which marginally exceeds the adopted Management Limit (3,500 mg/kg).

9.2.3 Polycyclic Aromatic Hydrocarbons

The results of the laboratory analysis reported PAH in soil at concentrations below the adopted assessment criteria with the exception of the following:

- TP33_0.3 reported benzo(a)pyrene TEQ at a concentration of 210 mg/kg which exceeds the adopted HIL (40 mg/kg).

9.2.4 Pesticides and Polychlorinated Biphenyls

The results of the laboratory analysis reported pesticides and PCBs in soil at concentrations below the adopted assessment criteria.

9.2.5 Heavy Metals

The results of the laboratory analysis reported heavy metals in soil at concentrations below the adopted assessment criteria.

10 Discussion

10.1 Soil Contamination

The objectives of the assessment was to evaluate the presence of contamination across the site, and assess the suitability of the site for its intended land use.

The site comprises a combination of sealed and unsealed surfaces used for the storage of miscellaneous equipment and materials, with isolated areas of vegetation.

Surface pavements were present across operational areas of the site and were observed to comprise asphalt, pavers and concrete. Fill materials comprising the upper subsurface of the site typically consisted of a combination of ash and slag, clay, sand, and gravel to depths between 0.1 m and 2.8 m bgl. Natural soils typically comprised CLAY and Silty CLAY overlying weathered shale bedrock.

Foreign materials were widespread throughout the fill and included fragments of suspected ACM in test pits TP17, TP25, TP57, TP62 and TP64. Fragments of suspected ACM were also observed on the surface of the site in the vicinity of test pits TP26, TP41, TP43, TP60 and TP70. The presence of 'second slabs' in the central northern portion of the site indicate that fill material was historically placed directly on top of existing concrete slabs.

Intermittent layers of solid black tarry material were also identified within the fill in test pits excavated in, and adjacent to, the eastern half of the central portion of the site. The material was encountered at depths between approximately 0.2 m and 0.4m bgl. At each location, the solid tarry material was present immediately overlying a 'second slab'. As such, should the material be leachable, vertical migration of contamination through the subsurface would be obstructed by the underlying concrete pavements.

In addition to the fragments of ACM identified on the surface of the site and within the fill material during test pitting, laboratory analysis of soil samples collected from the site reported asbestos at concentrations above the adopted assessment criteria in fill material in test pits TP61, TP62, TP74, TP80 and TP82.

Soil samples collected from the site reported chemical contaminants at concentrations below the adopted investigation and screening criteria with the exception of benzo(a)pyrene TEQ in sample TP33_0.3 collected from a depth of 0.3 m bgl in the central portion of the site, and TRH F3 in sample TP3_0.2 collected from a depth of 0.2 m bgl in the eastern-most portion of the site.

Statistical analysis of the benzo(a)pyrene TEQ impact within fill materials was carried out in accordance with Step 5 of the DQOs presented in Section 6.1 of this document in order to assess whether the material is suitable to be retained on-site under the intended land use scenario. The results of the statistical analysis indicate the following:

- The 95 % UCL of the arithmetic mean benzo(a)pyrene TEQ in fill material at depths between 0 m and 0.4 m bgl was calculated to be 25.23 mg/kg which is less than the adopted investigation criteria (refer to the calculation sheet provided in **Appendix E**);
- The concentration of benzo(a)pyrene TEQ in sample TP33_0.3 was greater than 250 % of the adopted investigation criteria; and

- The standard deviation of benzo(a)pyrene TEQ in fill material at depths between 0 m and 0.4 m bgl, and throughout the entire soil profile, was calculated to be greater than 50 % of the adopted investigation criteria.

Based on the results of the statistical analysis, the benzo(a)pyrene TEQ impact identified in test pit TP33 is considered to represent a contamination 'hotspot' potentially related to the tar like material identified in solid form in this area of the site.

Although TRH F3 was reported to exceed the management limit in test pit TP3 at a depth of 0.2 m bgl, the impact is not considered to present a risk under the proposed land use scenario given that:

a. groundwater was not encountered at shallow depths beneath the site, therefore the generation of LNAPL is not considered likely;

b. the impact is localised both vertically and laterally (based on visual observations and analytical results from adjacent test locations) and only marginally exceeds the criteria, therefore is not expected to present an explosive or fire risk; and

c. no buried infrastructure which may be affected by the presence of hydrocarbons was encountered within this part of the site.

Further, given the nature of the proposed land use and the fact that the reported TRH concentration remains below the adopted human health criteria, remediation and/or management of the soil in the vicinity of TP3 is not considered necessary.

Refer to **Figure 4** – Contamination Summary.

As stated in Section 5.2 of this document, there is the potential for the presence of PFAS contamination within soil and groundwater associated with the release of fire-fighting foams, the presence of fire suppression tanks, and the on-site storage of waste.

It is expected that firefighting activities carried out on-site in 2017 by NSW Fire and Rescue would not utilise PFAS-containing foams due to the state-wide phase-out of such materials.

No record of previous fires requiring the use of the fire suppression tanks located on-site are present within the public record held by NSW EPA. Further, based on the size of the tanks, it is considered unlikely that these would contain PFAS-based product as firefighting foam concentrate (i.e. the PFAS containing product) is typically stored within smaller vessels, and mixed with water upon release. No evidence of smaller vessels containing firefighting foam was noted on-site during previous investigations or the current assessment.

Given that the waste previously stored on-site typically comprised inert materials (i.e. dry, non-putrescible waste products), together with the transient nature of the waste storage, it is considered unlikely that the waste storage activities occurring on-site present a PFAS contamination risk.

It should also be noted that industrial processes occurring within nearby properties also have the potential to cause PFAS contamination of both land and water, specifically the galvanising activities occurring up-gradient of the site. As such, investigation of the presence, extent and human and ecological health implications would need to consider a wider investigation area, which is beyond the scope of the current assessment.

As such, inclusion of PFAS as a contaminant of concern was not considered for the purposes of this assessment.

It is also noted that previous investigations carried out on-site (DLA, 2016) reported chemical contaminants and asbestos at concentrations below the adopted assessment criteria. This data has been used to supplement the results of the current assessment and is provided in **Appendix E**.

10.2 Conceptual Site Model

The CSM presented in Section 5 of this document has been updated using the results of the sampling and laboratory analysis undertaken as part of this investigation to reflect the actual conditions known to exist on-site.

The results of the field investigations and laboratory analysis undertaken to date identified contamination in soil in the form of asbestos and benzo(a)pyrene in fill.

As stated in Section 5.3, given the results of previous site investigations and the location of the site in proximity to up-gradient potentially contaminating activities, investigation of the contamination status of groundwater has not been carried out as part of the current assessment.

The updated CSM is presented in Table 7.

Table 7. Updated Conceptual Site Model

COPC	MEDIA	RECEPTOR	POTENTIAL EXPOSURE PATHWAY
Asbestos	Soil	Site users, construction workers	Inhalation of loose fibres
Benzo(a)pyrene TEQ	Soil	Site users, construction workers ~~Groundwater~~	Dermal Contact Ingestion

With respect to the observed Tier 1 exceedance of benzo(a)pyrene identified in test pit TP33, and associated observations of a solid state tarry material encountered in the eastern part of the central portion of the site, these conditions are not considered likely to present a current risk to human health or the environment under the established land use scenario. This is based on:

a. the depth of the tarry material within the subsurface profile which minimises the likelihood for exposure of, and contact by, site users (i.e. the tarry material is located beneath concrete or asphalt pavements at depths greater than 0.2 m bgl);

b. the isolated nature of the identified benzo(a)pyrene criteria exceedance in soil in TP33; and

c. the low likelihood for generation of vapours given the presence of overlying pavements.

Additionally, groundwater results previously collected from the site have not identified contamination (via leaching) attributable to the tarry material and associated benzo(a)pyrene impact which suggests that these sources are unlikely to currently present a risk to human

health by groundwater or surface water contact, or a risk to the ecosystems within the Cooks River.

Concentrations of asbestos exceeding adopted assessment criteria have been observed at a small number of locations across the site. While these exceedances represent a potential exposure pathway should soil disturbance occur in these locations, it is considered that the risk of exposure can be managed via appropriate site institutional controls (such as the preparation and implementation of an asbestos or environmental management plan) such that the existing conditions do not prevent ongoing use of the site under the current land use scenario.

Should the site be redeveloped for a more sensitive land use scenario in the future, appropriate reassessment of the source / pathway / receptor linkages should be undertaken in the context of the observed site conditions and proposed land use.

11 Conclusions

In consideration of the results of the assessment works completed for the site and presented in this report, the overall objectives are considered to have been met and an understanding of potential sources of contamination, receptors and potential exposure pathways has been established.

Reporting has been undertaken in general accordance with the *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011) and the *Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme* (NSW EPA, 3rd ed., 2017).

Through the development of a conceptual site model, ERM have concluded that contamination does exist at concentrations exceeding adopted Tier 1 screening criteria for benzo(a)pyrene at an isolated location on site, and asbestos is present in fill in multiple locations. Based on the CSM established, it is considered that these impacts do not preclude the ongoing or future use of the site as a resource recovery centre, or land use consistent with 'Commercial / Industrial D' scenarios. However, institutional controls such as the implementation of an asbestos or environmental management plan may be required to manage site conditions to prevent potentially complete exposure pathways under certain site conditions or activities (such as soil disturbance), particularly associated with redevelopment of the site).

12 References

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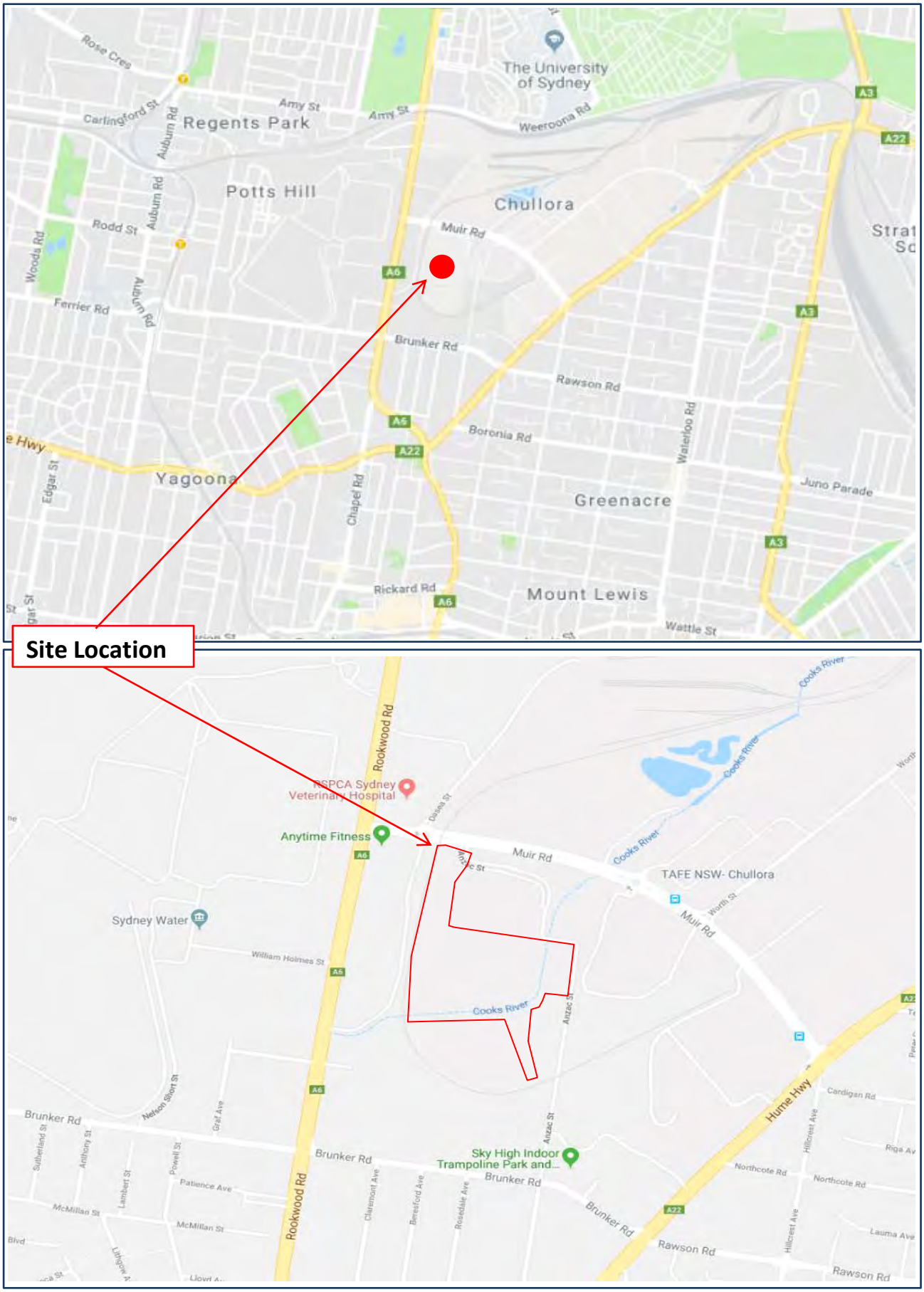
Figure 1

Site Location



ERM Unit 11, 277 Lane Cove Road Macquarie Park NSW 2113	**DESIGNED:** ERM **COMPILED:** SK **PROJ. No.** 0449164	**FIGURE TITLE:**	SITE LOCATION	
		PROJECT TITLE:	15 Muir Road, Chullora	**DATE:** 18/12/2018
		CLIENT:	Frasers Property Australia	**FIGURE:** 1

Figure 2

Site Layout

ERM

Compiled
AD/SK

Legend

Site Boundary

Approximate Scale

0m 50m 100m

Figure Title
Site Layout

Project Title
15 Muir Rd, Chullora

Client
Frasers Property

Project No.	Date	Scale	Figure No.	Revision
0449164	12/12/2018	As Shown	2	Version 1.0

Figure 3

Test Pit and Borehole Locations

ERM

Compiled
AD/SK

Legend

- Site Boundary
- Hand Auger Locations
- Testpit locations

Approximate Scale

0m 50m 100m

Figure Title
Test Pit and Borehole Locations

Project Title
15 Muir Rd, Chullora

Client
Frasers Property

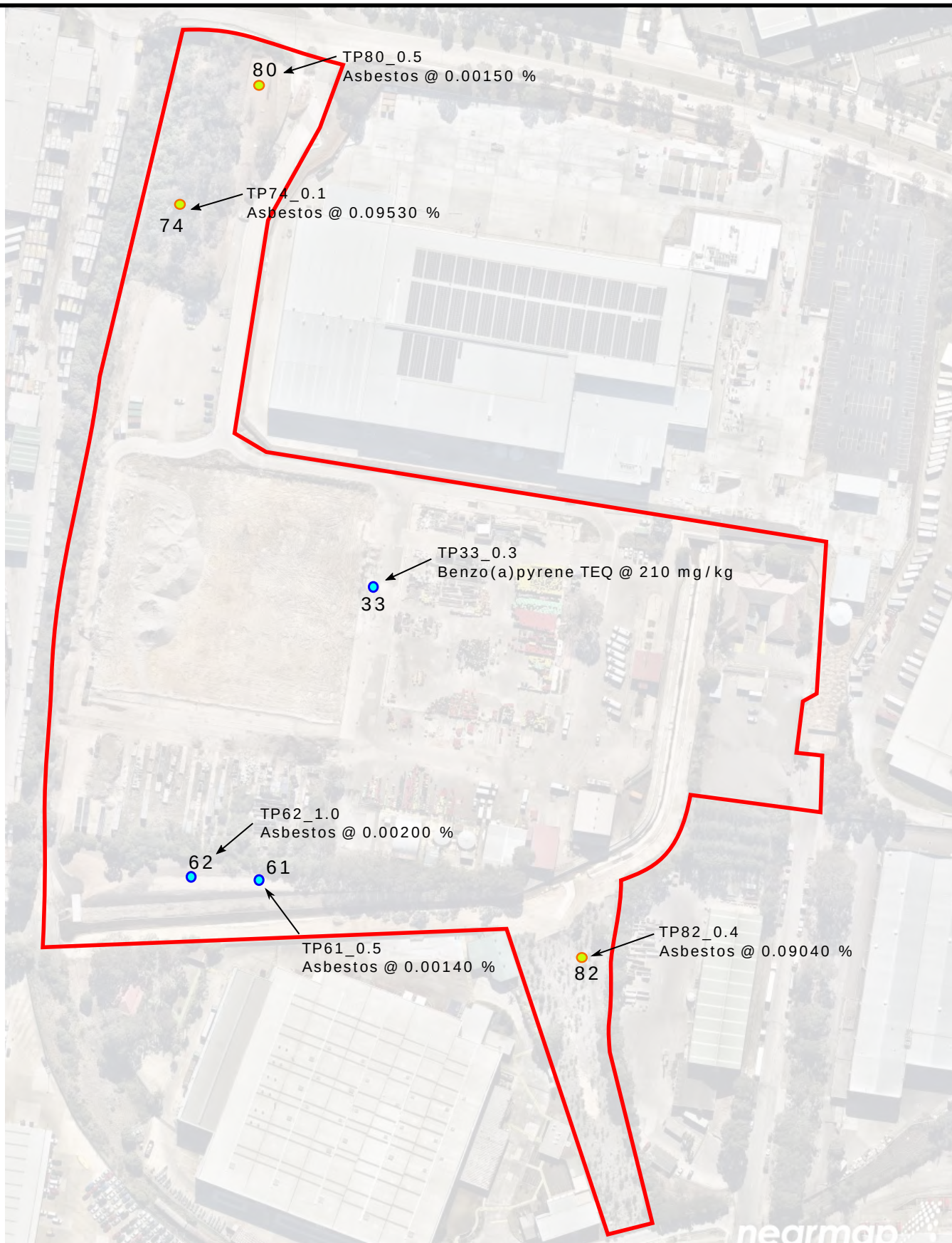
Project No.	Date	Scale	Figure No.	Revision
0449164	12/12/2018	As Shown	3	Version 1.0

Figure 4

Contamination Summary

ERM

Compiled
AD/SK



Legend

- Site Boundary
- Hand Auger Locations
- Testpit locations

Approximate Scale

0m 50m 100m

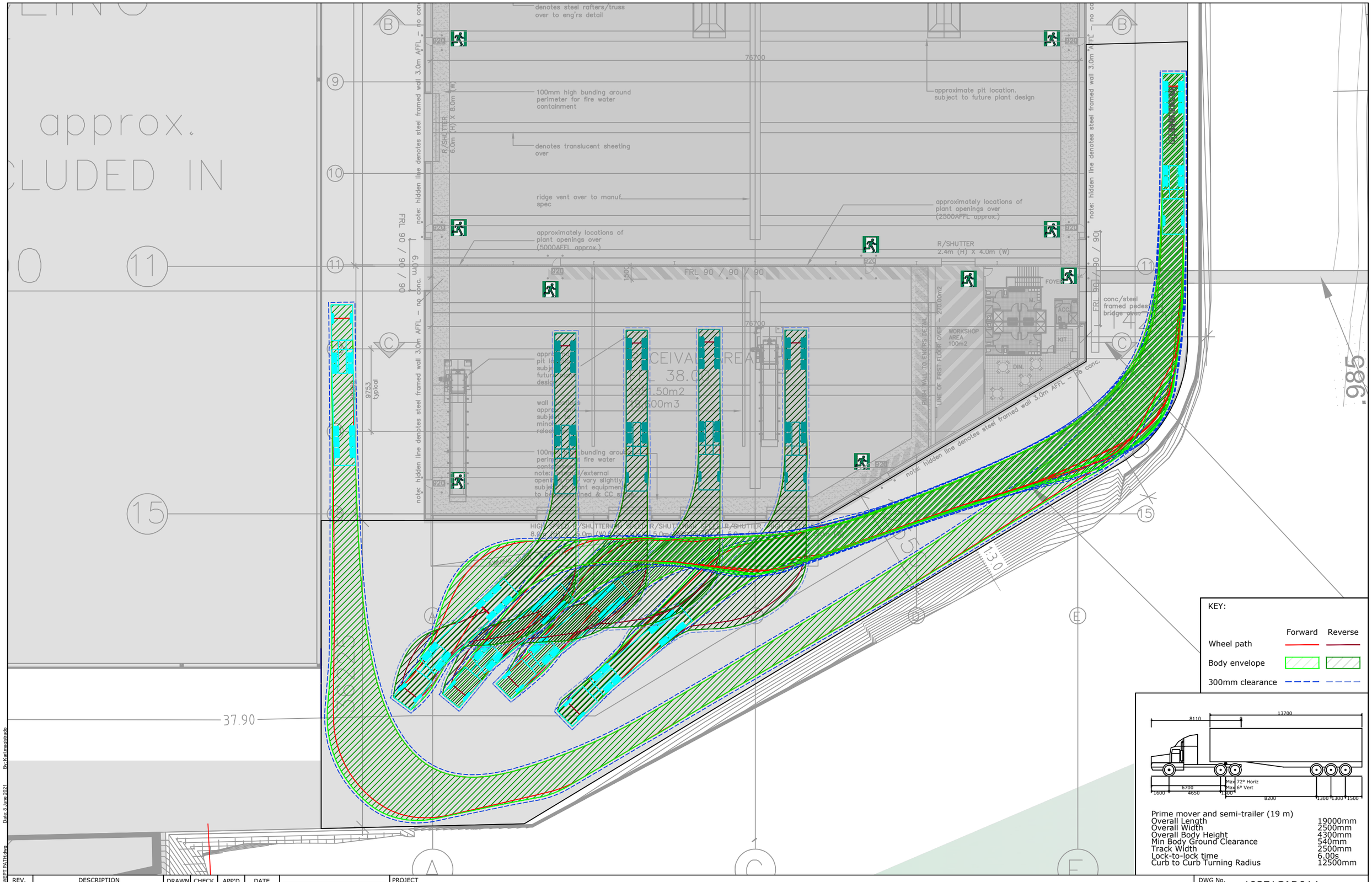
Figure Title
Contamination Summary

Project Title
15 Muir Rd, Chullora

Client
Frasers Property

Project No.	Date	Scale	Figure No.	Revision
0449164	18/12/2018	As Shown	4	Version 1.0

APPENDIX B REVISED SWEPT PATH ANALYSIS



KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		

Prime mover and semi-trailer (19 m)

Overall Length	19000mm
Overall Width	2500mm
Overall Body Height	4300mm
Min Body Ground Clearance	540mm
Track Width	2500mm
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12500mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

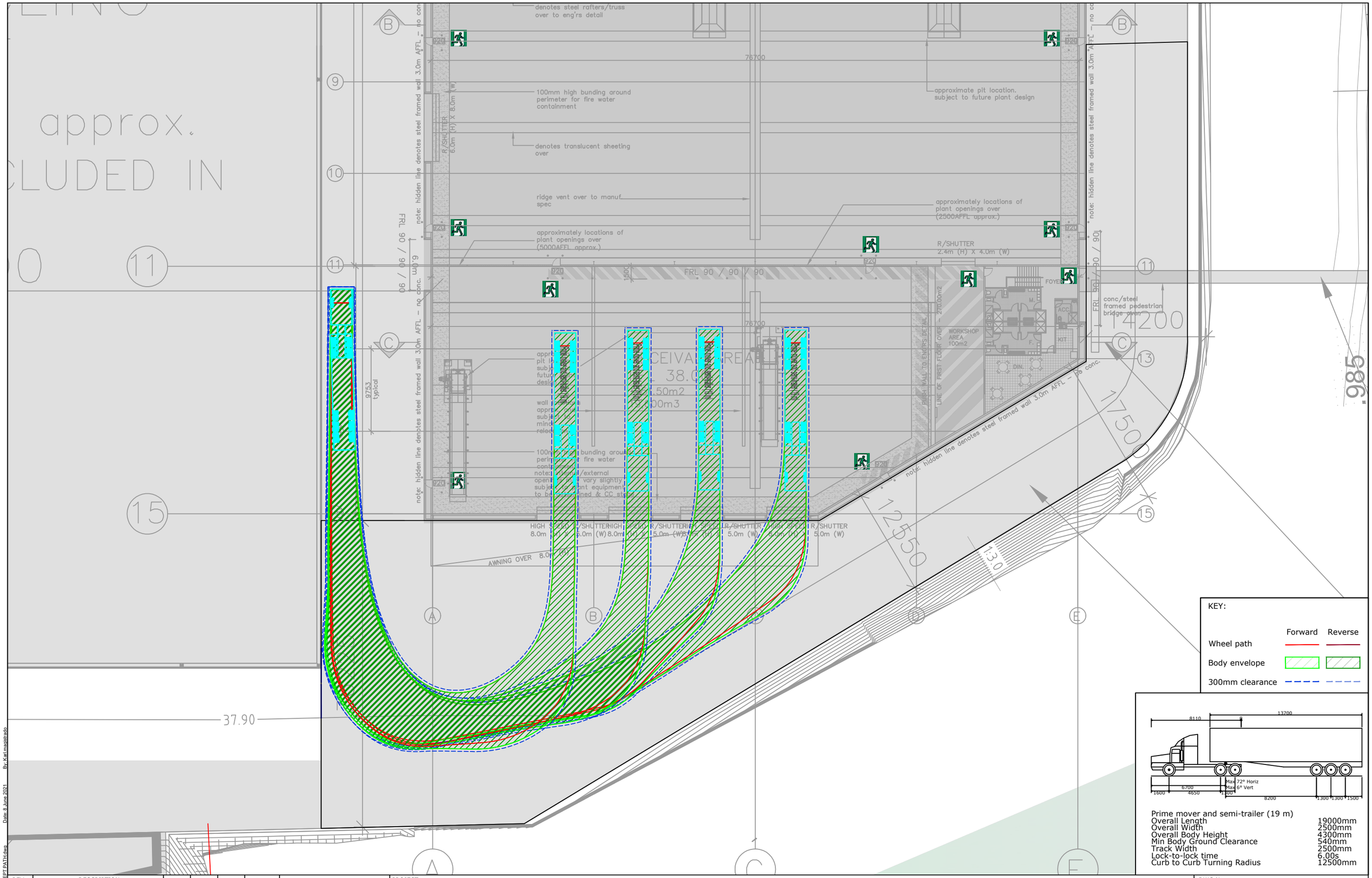
TITLE: SWEPT PATH ANALYSIS - TRUCKS ENTERING
19m PRIME MOVER & SEMI-TRAILER

DWG No. 19371CAD014
FIGURE 1

DATE STAMP: 08 JUNE 2021

PROJECT No.	SCALE	REV.
19371	1:400 @A3	A

Filename: 19371CAD014-210608-SWEPT PATH.dwg
Date: 8 June 2021
By: Karl Inglestrado



KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		

Prime mover and semi-trailer (19 m)

Overall Length	19000mm
Overall Width	2500mm
Overall Body Height	4300mm
Min Body Ground Clearance	540mm
Track Width	2500mm
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	12500mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

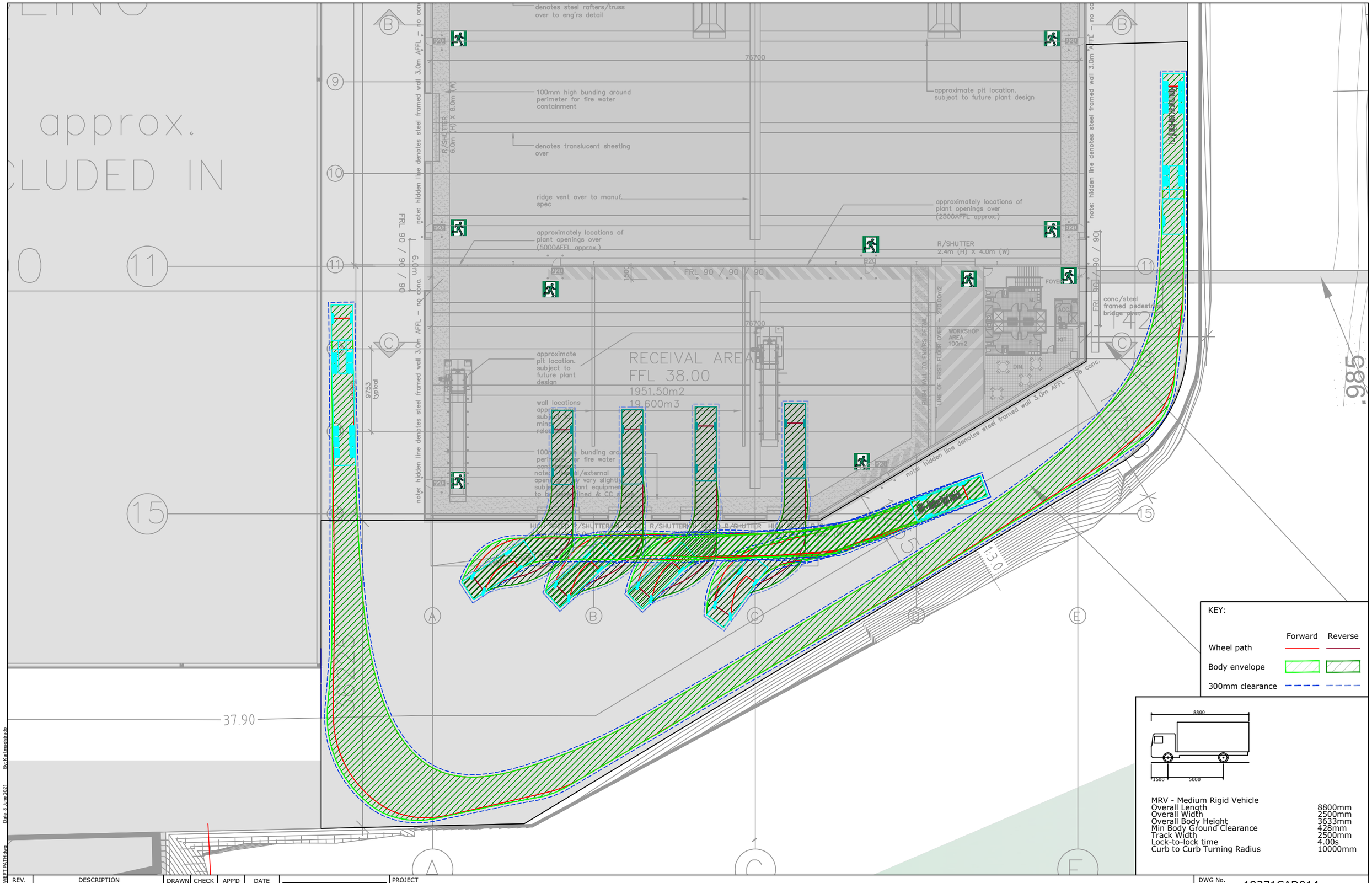
TITLE: SWEPT PATH ANALYSIS - TRUCKS EXITING
19m PRIME MOVER & SEMI-TRAILER

DWG No. 19371CAD014
FIGURE 2

DATE STAMP 08 JUNE 2021

PROJECT No.	SCALE	REV.
19371	1:400 @A3	A

Filename: 19371CAD014-210608-SWEPT PATH.dwg
Date: 8 June 2021
By: Karl Magistrado



REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT

SUEZ CHULLORA

TITLE

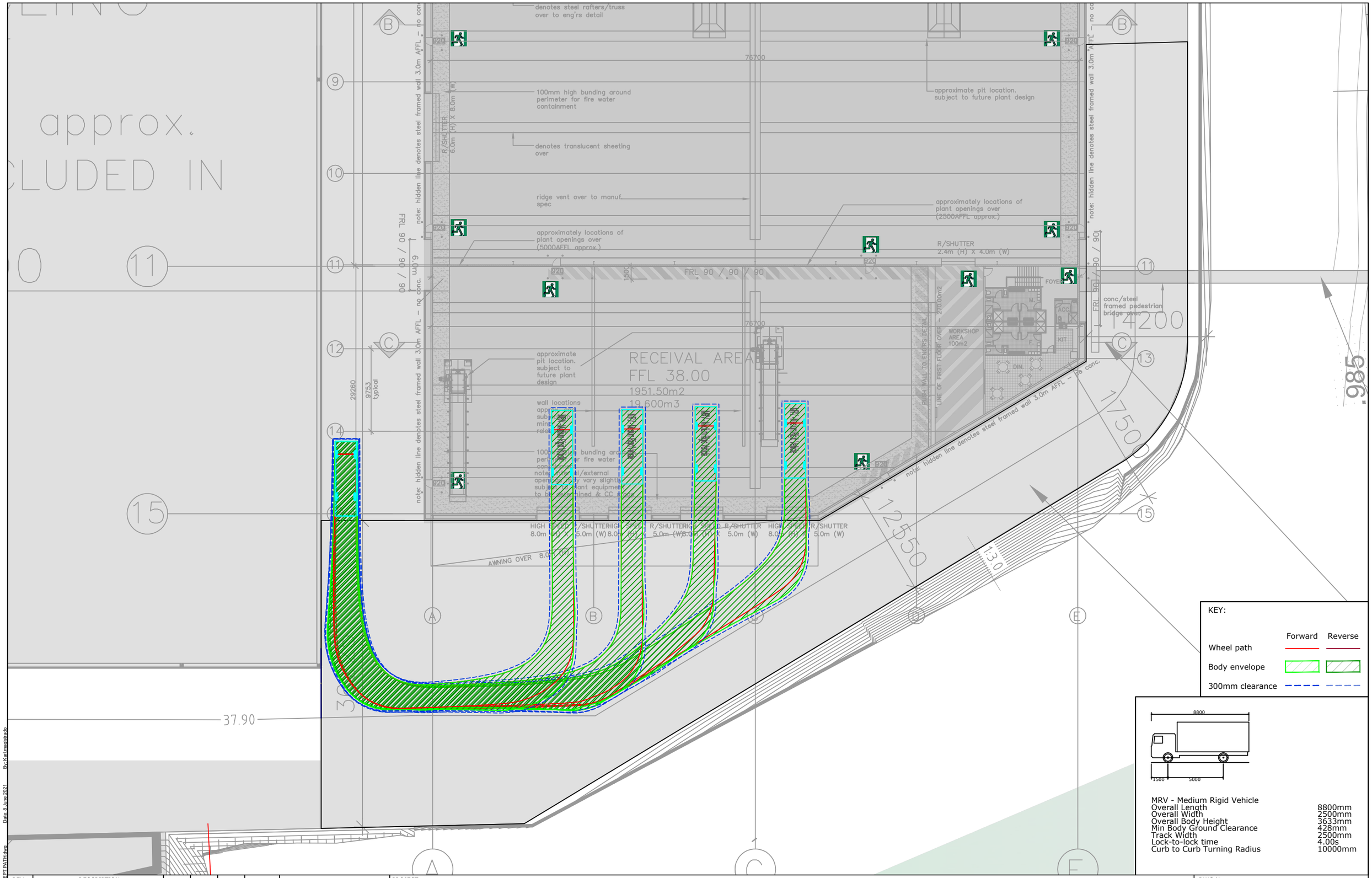
SWEPT PATH ANALYSIS - TRUCKS ENTERING
AS2890.2 8.8m MEDIUM RIGID VEHICLE

DWG No. 19371CAD014
FIGURE 3

DATE STAMP 08 JUNE 2021

PROJECT No.	SCALE	REV.
19371	1:400 @A3	A

Filename: 19371CAD014-210608-SWEPT PATH.dwg
Date: 8 June 2021
By: K.ef.mastrado



KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		

MRV - Medium Rigid Vehicle

Overall Length	8800mm
Overall Width	2500mm
Overall Body Height	3633mm
Min Body Ground Clearance	428mm
Track Width	2500mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	10000mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

TITLE: SWEPT PATH ANALYSIS - TRUCKS EXITING
AS2890.2 8.8m MEDIUM RIGID VEHICLE

DWG No. 19371CAD014
FIGURE 4

DATE STAMP 08 JUNE 2021

PROJECT No.	SCALE	REV.
19371	1:400 @A3	A

Filename: 19371CAD014-210608-SWEPT PATH.dwg
Date: 8 June 2021
By: Karl Imagistrado

approximate locations of plant openings over (5000AFFL approx.)

R/SHUTTER 2.4m (H) X 4.0m (W

FRL 90 / 90 / 90

76700

RECEIVAL AREA
FFL 38.00
1951.50m2
19,600m3

approximate pit location. subject to future plant design

WORKSHOP AREA 100m2

PUSH WALL TO ENGRS DETAIL

LINE OF FIRST FLOOR OVER - 270.00m2

06 / 06 / 06 w0.9

note: hidden line denotes steel framed wall 3.0m AFFL - no conc.

note: hidden line denotes steel fra

29260

9753 typical

1500

920

966 GC Wheel Loader

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

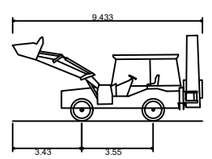
HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

AWNING OVER 8.0m (H)

12500

KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		



966 GC Wheel Loader	
Overall Length	9433mm
Overall Width	3154mm
Overall Body Height	4256mm
Min Body Ground Clearance	574mm
Track Width	3154mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6675mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

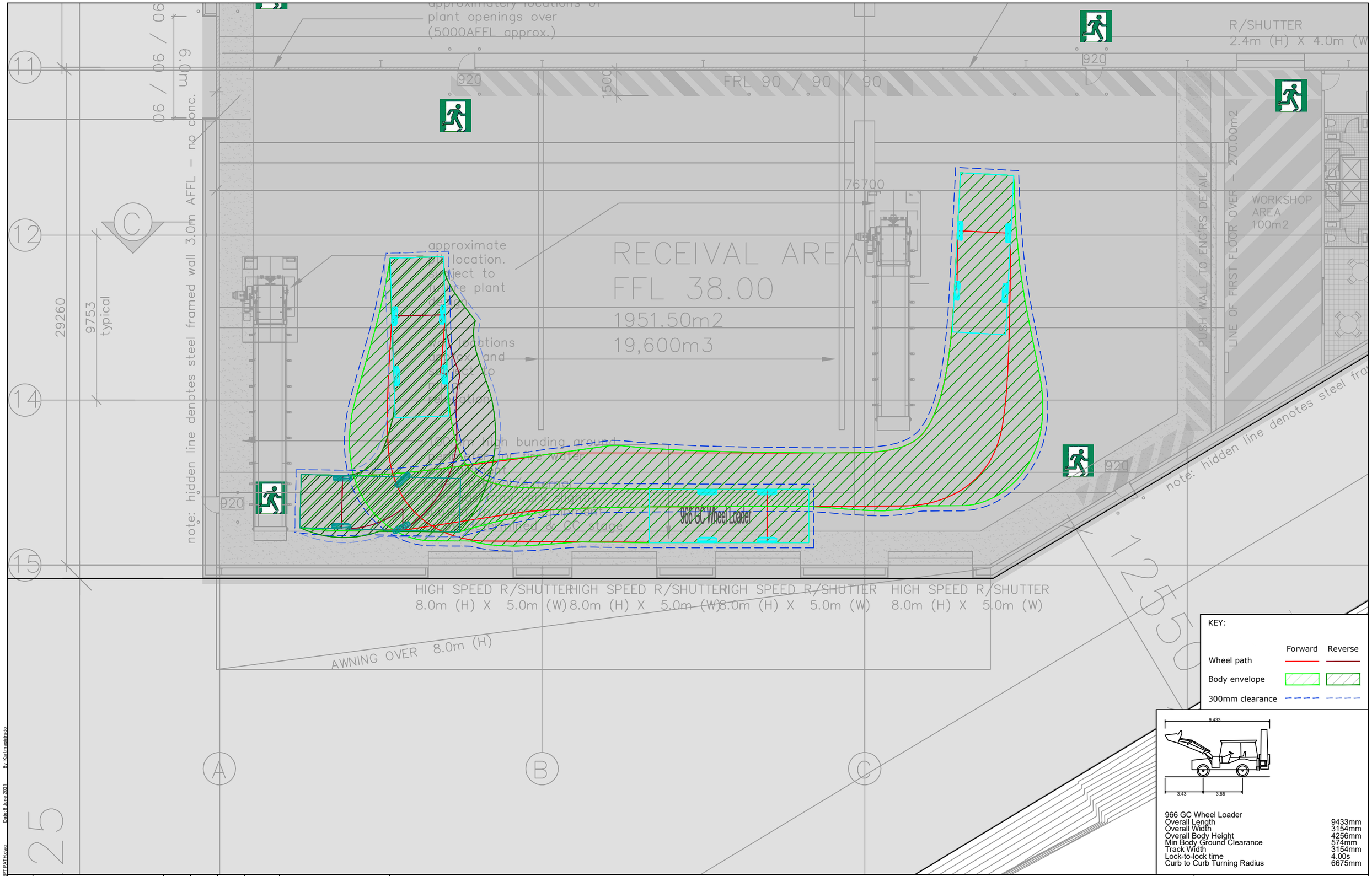
TITLE: SWEPT PATH ANALYSIS
9.433m 966 GC WHEEL LOADER

DWG No. 19371CAD014 FIGURE 5

DATE STAMP 08 JUNE 2021

PROJECT No. 19371 | SCALE 1:200 @A3 | REV. A

Filename: 19371CAD014-210608-SWEPT PATH.dwg Date: 8 June 2021 By: Karl.maestrado



KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		

966 GC Wheel Loader

Overall Length	9433mm
Overall Width	3154mm
Overall Body Height	4256mm
Min Body Ground Clearance	574mm
Track Width	3154mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6675mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

TITLE: SWEPT PATH ANALYSIS
9.433m 966 GC WHEEL LOADER

DWG No. 19371CAD014 FIGURE 6

DATE STAMP: 08 JUNE 2021

PROJECT No.	SCALE	REV.
19371	1:200 @A3	A

Filename: 19371CAD014-210608-SWEPT PATH.dwg Date: 8 June 2021 By: Karl.magistrale

approximately locations of plant openings over (5000AFFL approx.)

R/SHUTTER 2.4m (H) X 4.0m (W

920

1500

FRL 90 / 90 / 90

76700

RECEIVAL AREA
FFL 38.00
1951.50m2
19,600m3

approximate pit location. subject to future plant design

wall locations approx. and subject to minor relocation

8000mm

4000mm

100mm high bunding around perimeter for fire water containment
note: internal/external openings may vary slightly subject to plant equipment to be determined & CC stage

note: hidden line denotes steel framed wall 3.0m AFFL – no conc.

06 / 06 / 06

W0·9

9753 typical

9000

WORKSHOP AREA 100m2

LINE OF FIRST FLOOR OVER – 270.00m2

PUSH WALL TO ENG'RS DETAIL

note: hidden line denotes steel fra

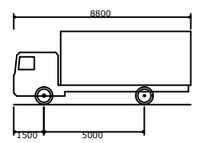
HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

MRV - Medium Rigid Vehicle

AWNING OVER 8.0m

KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		



MRV - Medium Rigid Vehicle	
Overall Length	8800mm
Overall Width	2500mm
Overall Body Height	3633mm
Min Body Ground Clearance	428mm
Track Width	2500mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	10000mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

TITLE: SWEPT PATH ANALYSIS
AS2890.2 8.8m MEDIUM RIGID VEHICLE

DWG No. 19371CAD014 FIGURE 7

DATE STAMP 08 JUNE 2021

PROJECT No. 19371 | SCALE 1:200 @A3 | REV. A

Filename: 19371CAD014-210608-SWEPT PATH.dwg Date: 8 June 2021 By: K.ert.maistrado

VEHICLE WOULD REQUIRE UP TO 5 MANOEUVRES TO DO TURN .

RECEIVAL AREA
EFL 38.00
951.50m2
9,600m3

MRV - Medium Rigid Vehicle

MRV - Medium Rigid Vehicle

R/SHUTTER
2.4m (H) X 4.0m (W

FRL 90 / 90 / 90

WORKSHOP AREA 100m2

LINE OF FIRST FLOOR OVER - 270.00m2

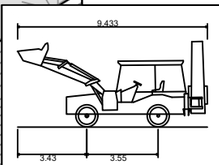
PUSH WALL TO ENGRS DETAIL

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

AWNING OVER 8.0m (H)

KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		



966 GC Wheel Loader

Overall Length	9433mm
Overall Width	3154mm
Overall Body Height	4256mm
Min Body Ground Clearance	574mm
Track Width	3154mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6675mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

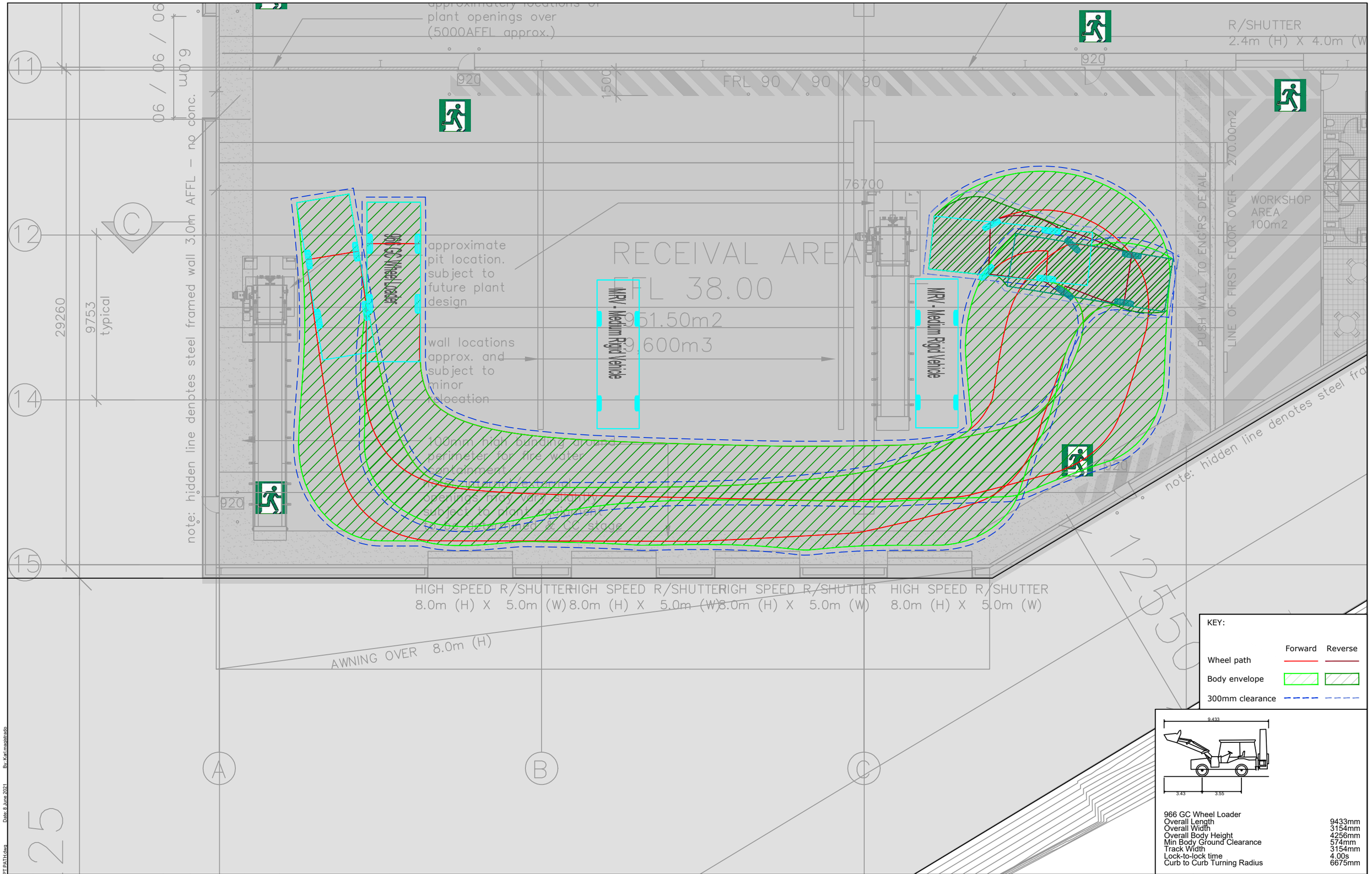
TITLE: SWEPT PATH ANALYSIS - CASE 1
9.433m 966 GC WHEEL LOADER

DWG No. 19371CAD014
FIGURE 8

DATE STAMP: 08 JUNE 2021

PROJECT No.	SCALE	REV.
19371	1:200 @A3	A

Filename: 19371CAD014-210608-SWEPT PATH.dwg Date: 8 June 2021 By: Karl.magistrale



REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

TITLE: SWEPT PATH ANALYSIS - CASE 1
9.433m 966 GC WHEEL LOADER

DWG No. 19371CAD014 FIGURE 9

DATE STAMP: 08 JUNE 2021

PROJECT No. 19371 | SCALE 1:200 @A3 | REV. A

Filename: 19371CAD014-210608-SWEPT PATH.dwg Date: 8 June 2021 By: K.erf.maistrado

approximately locations of plant openings over (5000AFFL approx.)

R/SHUTTER 2.4m (H) X 4.0m (W

FRL 90 / 90 / 90

920

1500

06 / 06 / 06

900

note: hidden line denotes steel framed wall 3.0m AFFL – no conc.

9753 typical

9250

approximate pit location. subject to future plant design

Prime mover and semi-trailer (19 m)

76700

RECEIVAL AREA

FL 30.000

1951.50m²

19,600m³

wall locations approx. and subject to minor relocation

966 GC Wheel Loader

100mm high bunding around perimeter for fire water containment

note: internal/external openings may vary slightly subject to plant equipment to be determined & CC stage

PUSH WALL TO ENG'RS DETAIL

LINE OF FIRST FLOOR OVER – 270.00m2

WORKSHOP AREA 100m2

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

HIGH SPEED R/SHUTTER 8.0m (H) X 5.0m (W)

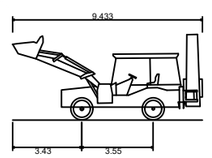
AWNING OVER 8.0m (H)

note: hidden line denotes steel fra

1253

KEY:

	Forward	Reverse
Wheel path		
Body envelope		
300mm clearance		



966 GC Wheel Loader	
Overall Length	9433mm
Overall Width	3154mm
Overall Body Height	4256mm
Min Body Ground Clearance	574mm
Track Width	3154mm
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	6675mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

TITLE: SWEPT PATH ANALYSIS - CASE 1
9.433m 966 GC WHEEL LOADER

DWG No. 19371CAD014 FIGURE 10

DATE STAMP 08 JUNE 2021

PROJECT No. 19371 | SCALE 1:200 @A3 | REV. A

Filename: 19371CAD014-210608-SWEPT PATH.dwg Date: 8 June 2021 By: K.ef.maistrado

ENTRY

PROPOSED FLOOD STORAGE AREA. REFER TO DESIGN & FLOOD REPORT PREPARED BY COSTIN ROE CONSULTING PTY LTD

PROPOSED 6.0M WIDE GATE FOR FIRE BRIGADE ACCESS

PROPOSED ROADWAY AND KERB

EXTENT OF PROPOSED ROADWAY/HARDSTAND AREA

PROPOSED BYPASS ROADWAY/RAMP VIA FLOOD STORAGE AREA. INDICATIVE & TO FUTURE ENGINEERING DETAILS.
NOTE: ACCESS TO BE CUT IN TO BATTER AND AT BASIN LEVEL AND WILL NOT IMPACT STORAGE CAPACITY

LANDSCAPING AREA - REFER TO CONCEPT LANDSCAPE PLAN PREPARED BY ARCADIS

FUTURE STAGE 2 MATERIALS RECYCLING PLANT 8,000m2 approx. (NOT INCLUDED IN THIS DA APPLICATION)

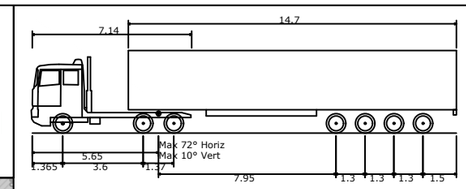
PRODUCT STORAGE FFL 38.00 2980.30m2 26,750m3

PROCESSING AREA FFL 38.00 4951.40m2 55,400m3

RECEIVAL AREA FFL 38.00 1951.50m2 19,600m3

KEY:

	Forward	Reverse
Wheel path		
Body envelope		
500mm clearance		



19m Quad-Axle Semi-trailer

Overall Length	19000mm
Overall Width	2500mm
Overall Body Height	3695mm
Min Body Ground Clearance	332mm
Track Width	2500mm
Lock-to-lock time	6.00s
Curb to Curb Turning Radius	7550mm

REV.	DESCRIPTION	DRAWN	CHECK	APP'D	DATE
A	ISSUE FOR DISCUSSION	KM	SB	JR	08/06/21

ttpp transport planning

PROJECT: SUEZ CHULLORA

TITLE: SWEPT PATH ANALYSIS
19m QUAD-AXLE SEMI-TRAILER

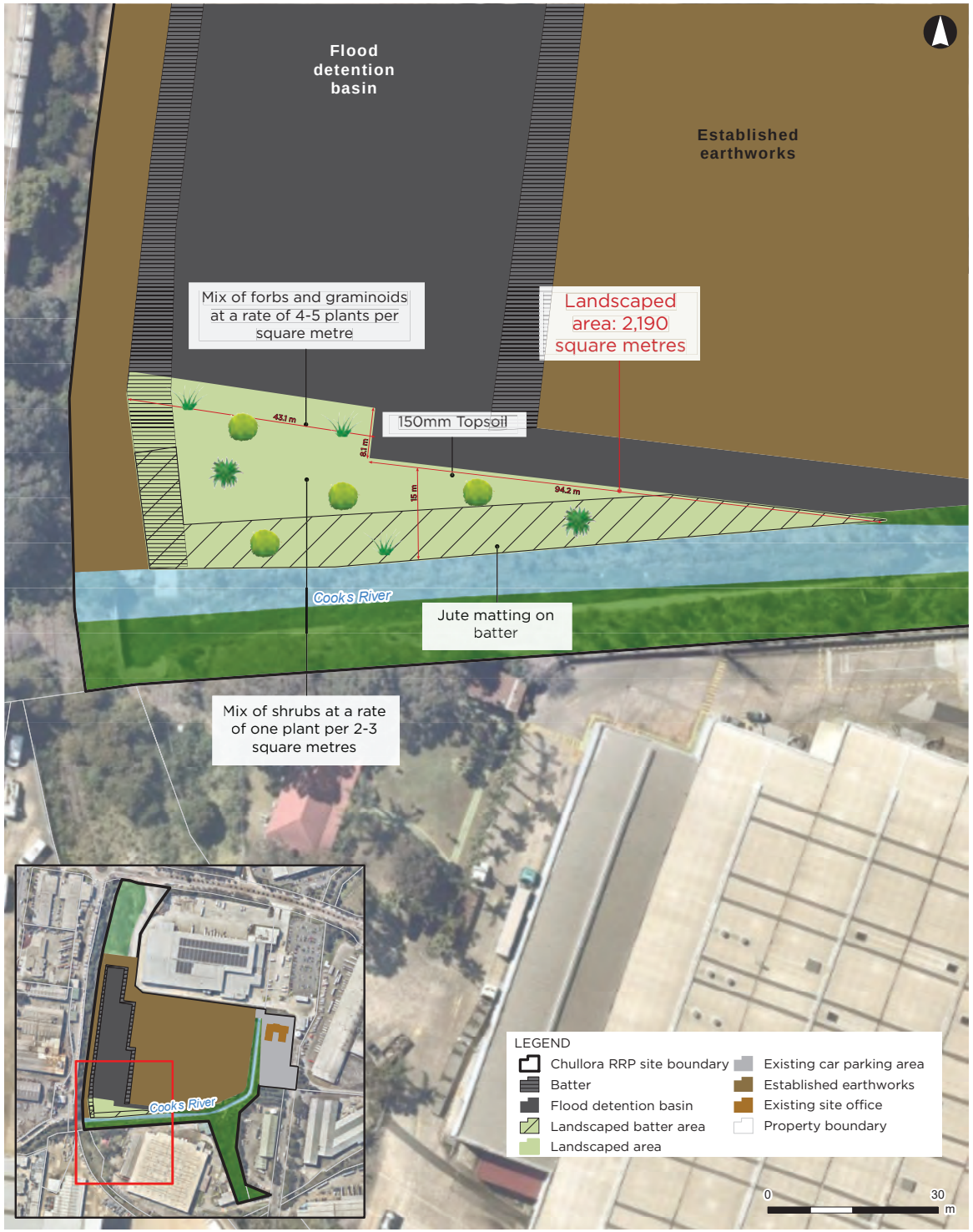
DWG No. 19371CAD014
FIGURE 11

DATE STAMP 08 JUNE 2021

PROJECT No. 19371 | SCALE 1:800 @A3 | REV. A

Filename: 19371CAD014-210608-SWEPT PATH.dwg
Date: 8 June 2021
By: K.el.magistrado

APPENDIX C CONCEPT LANDSCAPE PLAN



Forbs and graminoids

Spacing	4-5 plants per square metre
Installation	Plants must be of local provenance and hardened off prior to installation
Species list	• *Austrostipa ramosissima* • *Cayratia clematidea* • *Centella asiatica* • *Commelina cyanea* • *Cymbopogon refractus* • *Dichelachne micrantha* • *Dichondra repens* • *Echinopogon caespitosus var. caespitosus* • *Einadia hastata* • *Entolasia marginata* • *Eustrephus latifolius* • *Geranium solanderi* • *Imperata cylindrica var. major* • *Lomandra longifolia* • *Lomandra multiflora subsp. multiflora* • *Microlaena stipoides* • *Oplismenus aemulus* • *Persicaria decipiens* • *Pratia purpurascens* • *Solanum prinophyllum* • *Themeda australis* • *Viola hederacea*


Austrostipa ramosissima


Dichonda repens


Imperata cylindrica


Lomanda longfolia

Shrubs

Spacing	One plant per 2-3 square metres
Installation	Plants must be of local provenance and hardened off prior to installation
Species list	• *Acacia floribunda* • *Acacia parramattensis* • *Breynia oblongifolia* • *Bursaria spinosa* • *Melaleuca decora* • *Melaleuca linariifolia* • *Melaleuca styphelioides* • *Ozothamnus diosmifolius* • *Plectranthus parviflorus* • *Trema aspera*


Acacia floribunda

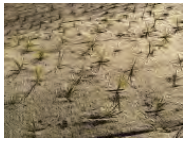

Bursaria spinosa


Melaleuca decora


Plectranthus parviflorus

Jute Matting

Installation	Install jute matting on batters steeper than 1H:3V and secure with 150mm steel pins at a rate of 2 per square metre


Jute Matting

Topsoil

Installation	Minimum 150mm of topsoil to be present for planting. Any imported topsoil must conform with AS4419: Soils for Landscaping and Garden Use.

Concept Landscape Plan

Version	2.0
Document	Proposed Works for Flood Mitigation 21 Muir Road, Chullora Lot 2 DP1227526

ARCADIS AUSTRALIA PACIFIC PTY LTD
ABN 76 104 485 289
Level 16, 580 George St | Sydney NSW 2000
P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001

Coordinate System: GDA 1994 MGA Zone 56
Date issued: November 18, 2020
Aerial imagery source: nearmap Jan 2020

1:1,000 at A4

ARCADIS

APPENDIX D RWDI NOISE MEMO

RWDI Australia Pty Ltd (RWDI)
272 Pacific Highway – Level 4
Crows Nest, NSW, Australia, 2065
Tel: +61.2.9437.4611
E-mail: solutions@rwdi.com
ABN: 86 641 303 871

WILKINSON MURRAY

MEMORANDUM

DATE:	2021-02-01	**RWDI REFERENCE #:** 21010300
TO:	Claire Hodgson	**EMAIL:** claire.hodgson@arcadis.com
	CC: Matt Filmer	**EMAIL:** matthew.filmer@arcadis.com
FROM:	John Wassermann	**Email:** john.wassermann@rwdi.com
RE:	**Chullora noise RTS**	

Dear Claire,

As requested, RWDI (formerly Wilkinson Murray) have responded to the Chullora noise queries below:

Query 1 Piling to support the construction of the substation – Quantitative noise assessment

As part of the design development, it has been identified that some bored piling works will be needed to construct the slab for the substation. The piers will be a minimum of 1.5m deep from the existing ground level. There will be 4 piers with approx. diameter of 300mm. The construction of the bored piles is likely to be less than 2 weeks.

Response:

The location of the proposed substation can be seen in Figure 1.

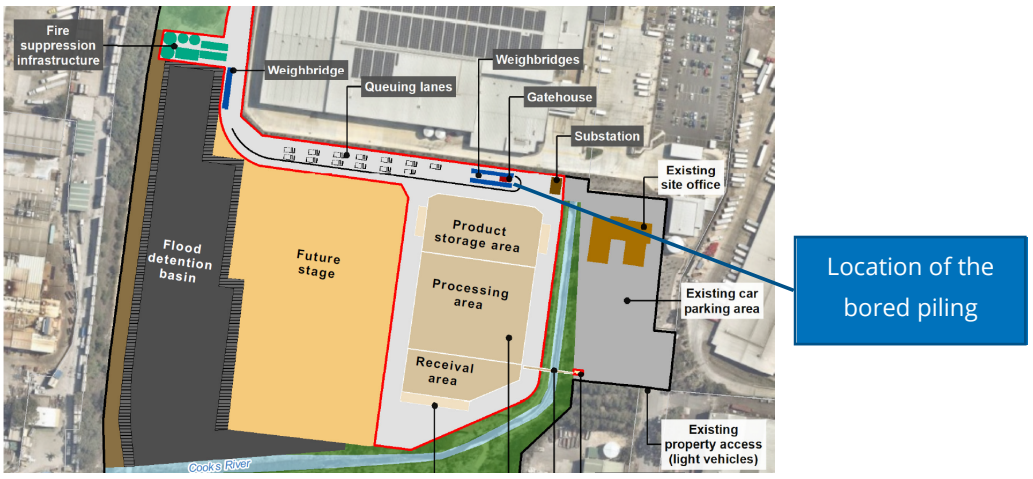


Figure 1 Site layout showing the location of the bored piling.

The land use immediately surrounding the location of the proposed bored piling is industrial, specially I1- 15 Muir Road, Chullora (PFD Foods) and I2- 9 Muir Road, Chullora (TipTop). I1 buildings are approximately 20metres from the proposed bored piling and I2 being approximately 140metres. The nearest residential receivers are located in the nearby suburbs of Yagoona, Greenacre, Lidcombe and Regents Park with the closed being approximately 600 metres from the proposed bored piling location.

The construction noise management levels (NML) for the project were developed in the EIS and are presented in Table 1.

Table 1 Project-specific construction NML

Receiver	Acceptable $L_{Aeq,15min}$ Noise Level (Standard daytime construction hours)	Highly Affected Noise Level (dBA)
Closet Residential Receiver	48	75
I1 and I2	75	-

The sound power level of a bored piling rigg is 110dBA $L_{Aeq,15min}$. It is likely that the bored piling would occur during the construction of the hardstand area Stage 0c or during the construction of the MRF Stage 1a. As such, the bored piling predicted levels were added to the highest predicted level in the EIS from either Stage 0c or Stage 1a. The predicted total construction noise level for the piling including the highest construction noise level from the EIS (Stage 0c or Stage 1a) at the closest receivers are presented in Table 2.

Table 2 Predicted Construction noise levels including bored piling.

Location	Bored piling $L_{Aeq,15min}$	Highest predicted construction noise level from EIS (Stage 0c or Stage 1a) $L_{Aeq,15min}$	Total worst case construction noise levels $L_{Aeq,15min}$	Construction Noise Criteria	Complies (Yes/No)
I1	<70	69	73	75	Yes
I2	<53	62	62	75	Yes
Closest Residential Receiver	<40	48	48	48	Yes

As can be seen in Table 2 the predicted noise levels from bored piling do not change the predicted noise levels within the EIS significantly. The recommendation in the EIS to manage construction noise levels would still apply.

The recommended safe working distances for vibration intensive plant suggested in the Transport for NSW Construction Noise Strategy (TNSW, 2020) have been adopted in this assessment to evaluate the potential for vibration impacts from the proposed pilling works. Table 3 sets out the recommended safe working distances for bored piling works.

Table 3 Recommended Safe Working Distances for Vibration Intensive Plant

Item	Description	Safe Working Distance	
		Cosmetic Damage	Human Response
Piling Rig – Bored	≤ 800 mm	2 m (nominal)	N/A

Source: Construction Noise Strategy, 2020, TNSW

Reviewing the safe working distances for cosmetic damage and human responses (presented Table 3) indicates that the safe working distances for building damage and human comfort applicable to bored piling is 2 metres. During construction of the Proposal, it is considered unlikely

that bored piling would be operated within 2 metres of a building. Therefore, vibration impacts from piling are considered unlikely.

Query 2 Building design changes to the MRF

SUEZ are proposing minor amendments to the receival area and configuration of the tipping floor and conveyors. In addition, the four roller shutter doors on the southern side of the MRF and/or the two doors on each on either side of the processing area may shift in location marginally by approximately 5-10m.

Response:

RWDI have reviewed the implications of the proposed changes. The reconfiguration of the receival area would not changes the internal noise levels significantly from which the operational noise predictions are based. Therefore, the predicted noise levels in the EIS are still appropriate.

The potential movement of the roller shutter doors by approximately 5 to 10metres when considering the location of the residential areas being greater than 400metres is unlikely to change predicted noise levels in the EIS. The change in noise level would be less than plus or minus 0.2dB. Regarding the industrial neighbours, the movement of the doors would not change the predicted noise level magnitude in the EIS, however may move the spatial location of the impact marginally, which would not be noticeable.

Regards,

John Wassermann
Senior Technical Director
1/2/21

APPENDIX E REVISED CIV REPORT

Street Smart. World Wise.

Altus Group

COST PLAN 1.1 at DA Stage

SUEZ Australia & New Zealand

Stage 1 - Chullora Resource Recovery

Project No.:	71130.103746.000
Reviewed by:	Nick Connaire
Issue Date:	7 June 2021

Research, Valuation & Advisory | Cost Consulting & Project Management | Realty Tax Consulting | Geomatics

Altus Group

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Ref.	Description	Quantity	Unit	Rate	Total
1	GENERAL NOTES				0
2	**STAGE 1 - MRF**				
3	MRF FACILITY	10,243	m2	855	8,760,324
4	**SUBTOTAL 1 - MRF**				**8,760,324**
5					
6	**STAGE 1 - EXTERNAL WORKS**				
7	WEIGH BRIDGES AND ASSOCIATED CIVIL WORKS	3	No.	150,100	450,300
8	GATE HOUSE	50	m2	4,181	209,049
9	REMOVABLE PEDESTRIAN BRIDGE AND PASSENGER LIFT	81	m2	4,445	360,065
10	EXTERNAL PAVING	12,120	m2	114	1,382,349
11	EXTERNAL SERVICES	12,120	m2	176	2,138,450
12	LANDSCAPING				75,000
13	EXTERNAL WORKS				140,500
14	**SUBTOTAL 2 - EXTERNAL WORKS**				**4,755,713**
15					
16	**SUBTOTAL 1+2 (STAGE 1 INCL. MRF & EXTERNAL WORKS)**				**13,516,037**
17					
18	**STAGE 1 - PRELIMINARIES & FEES**				
19	PRELIMINARIES, OVERHEADS & PROFIT (9%)				1,216,443
20	**SUBTOTAL 3 (STAGE 1 - PRELIMINARIES & FEES)**				**1,216,443**
21					
22	**STAGE 1 - TOTAL FOR MRF BUILDING (EXCL. GST)**				**14,732,481**
23					
24	**MRF PLANT & EQUIPMENT**				
25	SUPPLY & INSTALLATION OF SPECIALIST MRF PROCESSING EQUIPMENT	1	item	22,000,000	22,000,000
26					
27	**STAGE 1 - TOTAL INCL. MRF EQUIPMENT (EXCL. GST)**				**36,732,481**
28					
29	GST				3,673,248
30					
31	**STAGE 1 - TOTAL INCL. MRF EQUIPMENT (INCL. GST)**				**40,405,729**

Ref.	Description	Quantity	Unit	Rate	Total
1	**GENERAL NOTES**				
1.1	**Basis of Estimate**				
1.2	Draft DA (Architectural) drawings prepared by BDAA dated 08.05.2020				
1.3	MRF Framing plans (16232-LD-XX-ZZ-SK-S-0008.1 to 4) Rev. P03 prepared by Lindsay Dynan dated 14.05.2020				
1.4	MRF footing plan (16232-LD-XX-ZZ-SK-S-0009) Rev. P01 prepared by Lindsay Dynan dated 14.05.2020				
1.5	External paving plan (16232-LD-XX-ZZ-SK-S-0010) Rev. P01 prepared by Lindsay Dynan dated 14.05.2020				
1.6	Stormwater drawings (CO13058.03-DA10 to DA-70) Rev. A prepared by Costin Roe dated 22.04.2020				
1.7	Reference fire specification prepared by Cardno dated 23.05.2016				
1.8	Reference survey prepared by Agent Consulting dated 21.12.2016				
1.9	Reference lighting specification prepared by GHD dated 26.08.2019				
1.10	Reference weight bridge layout prepared by Cardno dated 23.05.2016				
1.11	"Item 6. Some typical details for pricing" received on 15.05.2020				
1.12	Budget proposal of a weighbridge provided by SSS dated 18.05.2020				
1.13	FUNCTIONAL SPECIFICATIONS Electrical and Hydraulic Services provided by Suez dated 04.05.2020				
1.14	20064_FSK-01 [2] (1) and 20064_FSK-06 [2] (1) prepared by Sparks received on 11.05.2017				
1.15	Interim pyrotechnical design advice prepared by PSM dated 01.05.2020				
1.16	Geo technical investigation report prepared by PSM dated 11.07.2018				
1.17	Annual Production Report produced by Frank Demarche dated 07.04.2020				
1.18	Email correspondence from Chandra Mohan (SUEZ Australia) in regard Power Requirement dated 18.05.2020				
1.19	Extra fire sprinklers allowed to specialist equipment				
1.20	**Assumptions**				
1.21	Gatehouse building design based on Cardno Building Services report, outlining typical details of existing weighbridge/ gate house building				
1.22	Assume that existing stormwater / internal drainage will be disconnect and cap off, not required to be removed. It will be replaced by a new drainage system				
1.23	Assume new stormwater facilities and treatment drains would be required to support this development				
1.24	Allow for precast concrete panel 7.0m height and 5.0m light weight cladding above for external, assumed this will be typical to the facades of all building / warehouse as advised by SUEZ				
1.25	Allow for perimeter mesh fences to the south and west boundaries. All the other boundaries should have existing fences				
1.26	Allow for CCTV cameras, security and swipe access as advised by Suez				
1.27	Allow mezzanine floor to workshop area				
1.28	1 new substation; 1No. in Stage 1				
1.29	**Exclusions**				
1.30	Photovoltaics				
1.31	Mechanical services to MRF				

Ref.	Description	Quantity	Unit	Rate	Total
1.32	Bored piers - assumes that Stage 0 can hand over certified compaction levels for fill and that no extra work to achieve compaction levels is required. (structural engineers to confirm that this is reasonable)				
1.33	Fire detection in Fire tank pits				
1.34	Cost escalation beyond September 2021				
1.35	FF & E (Loose Furniture)				
1.36	Audio visual cost to office				
1.37	Reduce noise and odour impacts				
1.38	The greywater treatment equipment, wash bay pumps, filtration, overhead crane to workshop and other specialised equipment to waste facility services, has not been included in this costplan as these one categorized as special equipment costs				
1.39	Miscellaneous external fitment, fittings & equipment not documented in drawings				
1.40	Outdoor seating and furniture				
1.41	Contribution to associated infrastructure works outside site boundaries				
1.42	Major Upgrade or Diversions of Existing Services Mains				
1.43	Phasing/Staging of the works beyond the allowance in this estimate				
1.44	External works / road works outside of site boundary (beyond agreed scope)				
1.45	Finance costs				
1.46	Diversion of existing services				
1.47	Items noted " Excl. " in cost plan				
				GENERAL NOTES TOTAL	**0**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
3	**MRF FACILITY**				
3.1	SUBSTRUCTURE	10,244	m2	151	1,544,811
3.2	COLUMNS	10,244	m2	26	263,700
3.3	UPPER FLOORS	10,244	m2	7	70,489
3.4	STAIRS	10,244	m2	1	14,000
3.5	ROOF	10,244	m2	233	2,388,264
3.6	EXTERNAL WALLS	10,244	m2	66	679,311
3.7	WINDOWS	10,244	m2	2	17,034
3.8	EXTERNAL DOORS	10,244	m2	29	300,000
3.9	INTERNAL WALLS & SCREENS	10,244	m2	65	661,921
3.10	INTERNAL DOORS	10,244	m2	9	87,650
3.11	WALL FINISHES	10,244	m2	6	57,804
3.12	FLOOR FINISHES	10,244	m2	32	331,047
3.13	CEILING FINISHES	10,244	m2	7	68,638
3.14	FITMENTS	10,244	m2	12	124,230
3.15	SPECIAL EQUIPMENT	10,244	m2	0	excluded
3.16	HYDRAULIC SERVICES	10,244	m2	12	124,411
3.17	MECHANICAL SERVICES	10,244	m2	20	200,089
3.18	FIRE SERVICES	10,244	m2	104	1,065,296
3.19	ELECTRICAL SERVICES	10,244	m2	65	661,879
3.20	SOLAR POWER				Excluded
3.21	SECURITY SYSTEMS	10,244	m2	10	99,750
3.22				855	
			MRF FACILITY TOTAL		**8,760,324**

Ref.	Description	Quantity	Unit	Rate	Total
3.1	**SUBSTRUCTURE**				
3.1.1	**SUBSTRUCTURE**				
3.1.2	Final geotechnical advice to be provided to confirm all footing details		note		
3.1.3	**Pad Footings**				
3.1.4	Pad footings to be centred under column and positioned 300mm below finished pavement level to allow slab to be poured over footing		note		
3.1.5	3000 x 3000 x 500D reinforced concrete pad footing, reinforcement ratio 130kg/m3.	18	no.	3,877.50	69,795
3.1.6	2500 x 2500 x 500D reinforced concrete pad footing, reinforcement ratio 130kg/m3.	17	no.	2,734.00	46,478
3.1.7	2000 x 2000 x 400D reinforced concrete pad footing, reinforcement ratio 130kg/m3.	20	no.	1,750.00	35,000
3.1.8	**Strip Footing**				
3.1.9	Strip footings to be at same height as connecting pad footings		note		
3.1.10	600 x 600D reinforced concrete strip footing, reinforcement ratio 110kg/m3.	199	m	304.00	60,627
3.1.11	**Sundries**				
3.1.12	Allow provision for extra footings/plinths for machinery		Item		5,000
3.1.13	**Excavation/Fill**				
3.1.14	Allowance for detailed excavation removal/ filling; to footings and the like	9,882	m2	1.00	9,882
3.1.15	**Ground slab**				
3.1.16	225mm thick 32MPa concrete internal slab, with 150mm cement stabilised crushed rock subbase, SL92 mesh top.	4,614	m2	117.00	539,887
3.1.17	210mm thick 32MPa concrete internal slab, with 200mm DGS20 subbase, SL92 mesh top.	4,933	m2	112.00	552,447
3.1.18	150mm thick 32MPa concrete internal slab, with 200mm DGS20 subbase, SL82 mesh top	334	m2	93.00	31,075
3.1.19	**Column Pedestal**				
3.1.20	C1 - 800L x 350W x 500H reinforced concrete column pedestal, reinforcement ratio 120kg/m3.	18	no.	210.00	3,780
3.1.21	C2/C3 - 700L x 350W x 500H reinforced concrete column pedestal, reinforcement ratio 120kg/m3.	37	no.	190.00	7,030
3.1.22	**Design Joints**				
3.1.23	Allowance for dowel joint spacing 10-12m in each direction	9,881	m2	10.00	98,810
3.1.24	**Cost Escalation**				
3.1.25	Allow for anticipated cost escalation to concrete and reinforcement due in July 2021	1	Item	85,000.00	85,000
				SUBSTRUCTURE TOTAL	**1,544,811**

Ref.	Description	Quantity	Unit	Rate	Total
3.2	**COLUMNS**				
3.2.1	**COLUMNS**				
3.2.2	**MRF Facility**				
3.2.3	C1 Columns - 610UB	39.60	t	3,750.00	148,500
3.2.4	C2 Columns - 530UB	26.16	t	3,750.00	98,100
3.2.5	**Office & Amenities**				
3.2.6	Allowance for columns; Office & amenities	342	m2	50.00	17,100
				COLUMNS TOTAL	**263,700**
3.3	**UPPER FLOORS**				
3.3.1	**UPPER FLOORS**				
3.3.2	Allowance for mezzanine floor; Office & plant platform		Note		
3.3.3	Allowance for suspended concrete floors; Offices	267	m2	264.00	70,489
				UPPER FLOORS TOTAL	**70,489**
3.4	**STAIRS**				
3.4.1	**STAIRS**				
3.4.2	Staircases allowance to mezzanine floor		Note		
3.4.3	Stairs to Mezzanine including handrails	4	mrise	4,000.00	14,000
				STAIRS TOTAL	**14,000**

Ref.	Description	Quantity	Unit	Rate	Total
3.5	**ROOF**				
3.5.1	**ROOF AND AWNINGS**				
3.5.2	**Roof Structure**				
3.5.3	Rafters				
3.5.4	R1 - 250UC89.5 Rafter	48.05	t	3,400.00	163,370
3.5.5	R2 - 310UC158 Rafter	34.19	t	3,400.00	116,246
3.5.6	R3 - 310UC158 Rafter	46.05	t	3,400.00	156,570
3.5.7	R2b/R3b - 250UB37.3	5.69	t	3,400.00	19,346
3.5.8	R4 - 460UB82.1	5.74	t	3,400.00	19,516
3.5.9	Trusses				
3.5.10	T1 - (Top Chord) 310UC158	70.83	t	3,400.00	240,822
3.5.11	T1 - (Bottom Chored) 310UC158	70.83	t	3,400.00	240,822
3.5.12	T1 - (Web) 250UB37.3	2.60	t	3,400.00	8,840
3.5.13	T1/T2/T3 Struts 150UB18.0	0.24	t	3,400.00	816
3.5.14	T2 - (Top Chord) 310UC96.8	7.72	t	3,400.00	26,248
3.5.15	T2 - (Bottom Chord) 250UC72.9	7.72	t	3,400.00	26,248
3.5.16	T2 - (Web) 200UB29.8	0.76	t	3,400.00	2,584
3.5.17	T3 - (Top Chord) 310UC96.8	11.53	t	3,400.00	39,202
3.5.18	T3 - (Bottom Chord) 310UC96.8	11.53	t	3,400.00	39,202
3.5.19	T3 - (Web) 200UB29.8	0.60	t	3,400.00	2,040
3.5.20	Bracing				
3.5.21	BR1 - 273.1 x 9.3 CHS	19.71	t	3,400.00	67,014
3.5.22	BR2 - 323.9 x 12.7 CHS	32.51	t	3,400.00	110,534
3.5.23	BR3 - 150 x 150 x 10 EA	0.51	t	3,400.00	1,734
3.5.24	WB - 273.1 x 9.3 CHS (Included in other elements)		t	3,400.00	EXCL
3.5.25	Other				
3.5.26	S1 - 219.1 x 6.4 CHS	17.63	t	3,400.00	59,942
3.5.27	S2 - 250UB31.4	3.47	t	3,400.00	11,798
3.5.28	WS - 250UB37.3	4.74	t	3,400.00	16,116
3.5.29	Allowance for connections and fittings (10% allowance)	40	t	3,400.00	137,020
3.5.30		10,361	m2	145.36	1,506,030
3.5.31	**Metal Deck Roof**				
3.5.32	Allowance for colorbond zincalume metal deck roof including including awnings(assume 3% for pitch)	10,361	m2	45.00	466,245
3.5.33	Extra Over the above for translucent sheeting (assumed 20% of roof cover)	2,072	m2	15.00	31,083
3.5.34	Extra over for insulation complete with wire mesh	10,361	m2	15.00	155,415
3.5.35	Ride vent (pending details)	133	m	500.00	66,320
3.5.36	Access Ladders including roof hatch (Allowed for 6)	6	no.	5,000.00	30,000

Ref.	Description	Quantity	Unit	Rate	Total
3.5.37	Walkway including balustrades both sides to facilitate Photovoltaic maintenance	1	item	26,000.00	26,000
3.5.38	Equipment Platforms (Provisional allowance)	1	item	10,000.00	10,000
3.5.39	Sound Attenuators (Provisional allowance)	1	item	10,000.00	10,000
3.5.40	**Metal Deck Roof**				
3.5.41	Hydraulic services to roof; including gutters and downpipes	10,361	m2	6.00	62,171
3.5.42	**Roof Safety System**				
3.5.43	Provision for roof access and safety system including balustrades	1	item	25,000.00	25,000
				ROOF TOTAL	**2,388,264**
3.6	**EXTERNAL WALLS**				
3.6.1	**Precast Concrete Panel/Tilt-up Walls**				
3.6.2	180mm thick precast concrete/toilt-up panels; complete with proprietary finish to Recycle Facility	1,119	m2	280.00	313,454
3.6.3	**Fire Rated Precast Concrete Panel/Tilt-up Walls**				
3.6.4	Allowance for fire rated walls (approx. 9.0m height)	262	m2	290.00	75,980
3.6.5	**Metal Wall Cladding**				
3.6.6	Unit rate for colorbond wall cladding including framing	2,351	m2	70.00	164,570
3.6.7	Extra over for louvre to wall cladding (allow 5% area)	118	m2	200.00	23,510
3.6.8	Unit rate for colorbond fascia cladding	402	m	50.00	20,100
3.6.9	Extra over for insulation complete with wire mesh, sarking, foil and insulation	2,233	m2	15.00	33,502
3.6.10	**Structural Steel Wall Bracing**				
3.6.11	WB - 273.1 x 9.3 CHS	13.77	t	3,500.00	48,195
				EXTERNAL WALLS TOTAL	**679,311**
3.7	**WINDOWS**				
3.7.1	**WINDOWS**				
3.7.2	External (West Elevation)				
3.7.3	Allowance for windows to external facade	11	m2	600.00	6,834
3.7.4	Internal				
3.7.5	Allowance for windows to office area	17	m2	600.00	10,200
				WINDOWS TOTAL	**17,034**

Ref.	Description	Quantity	Unit	Rate	Total
3.8	**EXTERNAL DOORS**				
3.8.1	**EXTERNAL DOORS**				
3.8.2	*Roller Shutter Doors*				
3.8.3	8000 wide x 6000 high galvanised steel roller shutters; including motorised electric opening mechanism to Workshop	8	no.	23,000.00	184,000
3.8.4	5000 wide x 8000 high galvanised steel roller shutters; including motorised eletric opening mechanism to Workshop	4	no.	20,000.00	80,000
3.8.5	*Fire Doors*				
3.8.6	Fire rated single solid core door including all frames and hardware complete	16	no	2,250.00	36,000
				EXTERNAL DOORS TOTAL	**300,000**
3.9	**INTERNAL WALLS & SCREENS**				
3.9.1	**Warehouse**				
3.9.2	Allowance for 140mm fire rated blockwork (approx. 12.0m height)	1,832	m2	183	336,168
3.9.3	Allow for expansion joints	1,832	m2	8	13,742
3.9.4	Allow for additional stiffeners	1,832	m2	15	27,484
3.9.5	Allow for fire sealant	305	m	35	10,688
3.9.6	Allowance for 140mm blockwork to Electrical Room (FRL90/90/90) (approx. 3.0m height)	49	m2	195	9,477
3.9.7					397,560
3.9.8	**Concrete push walls 5m high with 6mm mild steel plate 2.4m high including footings**				
3.9.9	Extra over Concrete strip footing	131	m	100	13,097
3.9.10	Tilt-up walls	655	m2	200	130,970
3.9.11	6mm steel plate	314	m2	300	excluded
3.9.12	**Total Push walls**	131	m	1,100	144,067
3.9.13	**Office**				
3.9.14	Allowance for 190mm blockwork to store / facility / office (approx. 7.0m height)	118	m2	220	26,011
3.9.15	Allow for metal stud wall with plasterboard	744	m2	120	89,284
3.9.16	Allowance for shower screens	5	no.	1,000	5,000
				INTERNAL WALLS & SCREENS TOTAL	**661,921**

Ref.	Description	Quantity	Unit	Rate	Total
3.10	**INTERNAL DOORS**				
3.10.1	**INTERNAL DOORS**				
3.10.2	*Roller Shutter Doors*				
3.10.3	5000 wide x 5000 high galvanised steel roller shutters; including motorised electric opening mechanism	2	no.	14,000.00	28,000
3.10.4	4000 wide x 2400 high galvanised steel roller shutters; including motorised electric opening mechanism	1	no.	7,850.00	7,850
3.10.5	3000 wide x 5000 high galvanised steel roller shutters; including motorised electric opening mechanism	1	no.	10,000.00	10,000
3.10.6	*Fire Doors*				
3.10.7	Fire rated 920 wide single solid core door including all frames and hardware	4	no	2,200.00	8,800
3.10.8	*Office Doors*				
3.10.9	Allowance for aluminium framed single doors	14	no	1,250.00	17,500
3.10.10	Allowance for aluminium framed double doors	2	no	1,750.00	3,500
3.10.11	Allowance for toilet cubicles	8	no.	1,500.00	12,000
				INTERNAL DOORS TOTAL	**87,650**
3.11	**WALL FINISHES**				
3.11.1	Warehouse / Workshop				
3.11.2	Wall finishes included in internal / external walls		Note		
3.11.3	Office / Amenities				
3.11.4	Internal wall lining to external wall; Office (Included in Internal walls)		m2	45.00	EXCL
3.11.5	Paint finish to wall linings; Office	1,118	m2	15.00	16,767
3.11.6	E/O Tiling to toilets / showers (PC Supply $20)	202	m2	105.00	21,222
3.11.7	Tiling to kitchens (PC supply $20)	57	m2	120.00	6,854
3.11.8	Waterproofing to wet areas	259	m2	50.00	12,962
3.11.9	Paint to block walls	4,407	m2	15.00	excl
				WALL FINISHES TOTAL	**57,804**
3.12	**FLOOR FINISHES**				
3.12.1	Warehouse / Workshop				
3.12.2	Epoxy sealer to concrete slab	9,882	m2	15.00	148,232
3.12.3	Line marking	9,882	m2	15.00	148,232
3.12.4	Office / Amenities		head2		
3.12.5	Carpet to office areas	285	m2	50.00	14,252
3.12.6	Tiling to toilets / showers (PC Supply $20)	79	m2	120.00	9,461
3.12.7	Tiling to kitchens (PC supply $20)	58	m2	120.00	6,929
3.12.8	Waterproofing to wet areas	79	m2	50.00	3,942
				FLOOR FINISHES TOTAL	**331,047**

Ref.	Description	Quantity	Unit	Rate	Total
3.13	**CEILING FINISHES**				
3.13.1	Warehouse / Workshop				
3.13.2	No allowance for ceiling finishes to warehouse / workshop area		Note		
3.13.3	Electrical Room				
3.13.4	200mm reinforced concrete roof to electrical room (FRL 90/90/90)	48	m2	400.00	19,368
3.13.5	Office / Amenities				
3.13.6	Unit rate for office ceiling	422	m2	105.00	44,270
3.13.7	Allowance for bulkheads etc	1	item	5,000.00	5,000
			CEILING FINISHES TOTAL		**68,638**
3.14	**FITMENTS**				
3.14.1	Warehouse Metalwork				
3.14.2	Allowance for pipework protection (Provisional only)	1	item	10,000.00	10,000
3.14.3	Steel bollards (internal & external)	75	no.	800.00	60,000
3.14.4	450mm height Steel guardrail to perimeter of new waste drop off area (Assumed required)	166	m	115.00	0.00
3.14.5	Amenities / Office				
3.14.6	Locker Bench	4	m	500.00	1,830
3.14.7	Half Height Lockers	14	no.	600.00	8,400
3.14.8	Toilets / Showers				
3.14.9	Vanity bench to toilets / showers	4	no	750.00	3,000
3.14.10	Shower fitments	5	no	500.00	2,500
3.14.11	Allowance for bathroom fittings	9	no	1,300.00	11,700
3.14.12	Allow for bathroom accessories	9	no.	300.00	2,700
3.14.13	Kitchen / Tea Room				
3.14.14	Allowance for kitchen & tea room fittings	1	item	8,000.00	8,000
3.14.15	Sundry Fitout				
3.14.16	Allowance for manual roller blinds to offices	17	m2	300.00	5,100
3.14.17	General signage	1	item	7,500.00	7,500
3.14.18	Statutory signage	1	item	3,500.00	3,500
				FITMENTS TOTAL	**124,230**
3.15	**SPECIAL EQUIPMENT**				
3.15.1	Budget allowance for supply and installation of equipment. Not included in this cost estimate.	1	item		EXCL
				SPECIAL EQUIPMENT TOTAL	**excluded**

Ref.	Description	Quantity	Unit	Rate	Total
3.16	**HYDRAULIC SERVICES**				
3.16.1	Hydraulic Installation Works as below :				
3.16.2	Allowance for hydraulic services; to Warehouse / Workshop	9,882	m2	5.00	49,411
3.16.3	Allowance for hydraulic services; to Office / Amenities	25	no	3,000.00	75,000
				HYDRAULIC SERVICES TOTAL	**124,411**
3.17	**MECHANICAL SERVICES**				
3.17.1	Mechanical Installation Works as below :				
3.17.2	Allowance for mechanical services; to Warehouse / Workshop	9,882	m2		Excluded
3.17.3	Allowance for AC to Office	422	m2	275.00	116,050
3.17.4	Allowance for AC to Electrical Room	48	m2	275.00	13,316
3.17.5	Allowance for mechanical exhaust to toilets	79	m2	150.00	11,826
3.17.6	Dust suppression system to processing area - Misters	4,114	m2	12.00	49,369
3.17.7	Builders Work In Connection with Services (5%)	1	item	9,528	9,528
				MECHANICAL SERVICES TOTAL	**200,089**

Ref.	Description	Quantity	Unit	Rate	Total
3.18	**FIRE SERVICES**				
3.18.1	Fire Protection Installation Works as below :				
3.18.2	Allowance for fire services; to Warehouse / Workshop	9,882	m2	15.00	148,232
3.18.3	Allowance for fire services; to Office	422	m2	15.00	6,330
3.18.4	High hazard early response fast response (ESFR) fire sprinkler system to all ceilings, under conveyors and at openings through fire walls	10,138	m2	35.00	354,834
3.18.5	High hazard early response fast response (ESFR) fire sprinkler system over specialist equipment	3,000	m2	65.00	195,000
3.18.6	Fire detection surveillance system aimed at the stockpiles (thermal imaging system with 8 cameras)	1	item	35,000.00	35,000
3.18.7	Visual warnings both sides of automatic fire shutters and at Hydrant Booster Assembly externally (Provisional allowance)	1	item	10,000.00	10,000
3.18.8	Automatic shut down of machinery and automatic close of shutters at door and conveyor openings (Provisional allowance)	1	item	10,000.00	10,000
3.18.9	VESDA system over the processing area	1	item	20,500.00	20,500
3.18.10	VESDA system over the product storage	1	item	14,500.00	14,500
3.18.11	Gas supression system to Main Switch Room / Electrical Room	1	item	15,000.00	15,000
3.18.12	Automatic smoke exhaust system	1	item	25,000.00	25,000
3.18.13	**Two Fire Tanks (20m x 5m x 3m) + Associated - INTERNALLY**				
3.18.14	Bulk excavation for 2 x Fire Tanks	650	m3	30.00	19,500
3.18.15	Allowance for detailed excavation / filling; to footings and the like	50	m3	100.00	5,000
3.18.16	Allow to dispose engineered fill off site (provisional allowance)	700	m3	25.00	17,500
3.18.17	Allowance for pad foundations to Fire Tanks	200	m2	15.00	3,000
3.18.18	Allow for 600 x 600mm deep strip footings	100	m	259.00	25,900
3.18.19	225mm thick 32MPa concrete internal slab, with 150mm cement stabilised crushed rock subbase, SL92 mesh top.	200	m2	105.00	21,000
3.18.20	200mm thick 32Mpa concrete wall slab with SL92 mesh	300	m2	190.00	57,000
3.18.21	Extra over for 300mm thick 32Mpa reinforced concrete roof slab with SL92 mesh	200	m2	90.00	18,000
3.18.22	Access covers and access ladders		Item		5,000
3.18.23	Internal hydraulic reticulation included in hydraulic services	1	item		EXCL
3.18.24	Additional pit included in external works	1	item		EXCL
3.18.25	**Sub-total for FireTanks**	2	No.	85,950	171,900
3.18.26	Fire Water reticulation Works as below :				
3.18.27	Stormwater reticulation for two below ground fire tanks; including manholes and pits	1	item	19,000.00	19,000
3.18.28	Fire water treatment and filtration	1	item	20,000.00	excluded
3.18.29	UV treatment for external rainater tanks	1	item	5,000.00	5,000
3.18.30	Allowance for rainwater harvesting for WC first flush irrigation and to provide 83% of waste usage to warehouse	1	item	30,000.00	30,000
3.18.31	Hydraulic pumps (Provisional allowance)	1	item	5,000.00	5,000
3.18.32	**Sub-total**	2	No.	29,500	59,000
				FIRE SERVICES TOTAL	**1,065,296**

Ref.	Description	Quantity	Unit	Rate	Total
3.19	**ELECTRICAL SERVICES**				
3.19.1	Electrical Installation Works as below :				
3.19.2	Allowance for electrical & comms services; to Warehouse / Workshop	9,882	m2	50.00	494,106
3.19.3	Extra allowance for mainswitch board being sized to accommodate stage 2		Item		50,000
3.19.4	Allowance for electrical & comms services; to Office	422	m2	150.00	63,300
3.19.5	Allowance for power & lighting; to Awning	479	m2	80.00	38,330
3.19.6	Builders Work In Connection with Services (2.5%)	1	item	16,143	16,143
			ELECTRICAL SERVICES TOTAL		**661,879**
3.21	**SECURITY SYSTEMS**				
3.21.1	Security System Installation Works as below :				
3.21.2	The following scope of works measured have been assumed from the information provided by Suez as there is no detail documentation at the moment.		Note		
3.21.3	Allow for associated works with security systems; approx. 10 no. CCTV - supply and install	1	item	40,000.00	40,000
3.21.4	Allow for associated works with security systems; approx. 14 no. doors with swipe access and 1 No. electric gate & control - supply and install	1	item	55,000.00	55,000
3.21.5	Builders Work In Connection with Services (5%)	1	item	4,750.00	4,750
			SECURITY SYSTEMS TOTAL		**99,750**

Ref.	Description	Quantity	Unit	Rate	Total
7	**WEIGH BRIDGES AND ASSOCIATED CIVIL WORKS**				
7.1	**Ultrahawke In-Ground Digital Quad Deck Weighbridge**				
7.2	Supply delivery of Ultrahawke In- GroundFull Load Cell Motor Truck Quad Deck Weighbridge Model 9630/ 4 xGedge GS600	3	no	85,900.00	257,700
7.3	Civil Works, Including Weighbridge Foundations, Deck,	3	no	55,000.00	165,000
7.4	Installation, Testing and Verification	3	no	9,200.00	27,600
	WEIGH BRIDGES AND ASSOCIATED CIVIL WORKS TOTAL				**450,300**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
8	**GATE HOUSE**				
8.1	**Basis of Estimate**				
8.2	Aecom Architectural dwgs; (6 sheets)		Note		
8.3	Structural dwgs; Cardno; (4 sheets)		Note		
8.4	**Assumptions**				
8.5	Mechanical - split AC system		Note		
8.6	External services works; only allowed services 5m outside of external wall face of building		Note		
8.7	Bored piers; P1-1000mm deep and including reinforcement		Note		
8.8	Bored piers; P2-1100mm deep and including reinforcement		Note		
8.9	Stormwater / Sewer; assume connection to existing pit		Note		
8.10	**Exclusions**				
8.11	All associated weigh station electrical equipment		Note		
8.12	Loose furniture		Note		
8.13	AV equipment		Note		
8.14	Contaminated materials		Note		
8.15	Fire services		Note		
8.16	Computers and communication live gear		Note		
8.17	Consultants Fees		Note		
8.18	GST		Note		
8.19	Demolition		Note		
8.20	**GATE HOUSE**				
8.21	**SUBSTRUCTURE**				
8.22	BORED PIERS				
8.23	Allow for rig establishment	1	lItem		excluded
8.24	P1; 750mm Dia bored RC piles assumed 1000mm deep	2	m	1,066	excluded
8.25	P2; 450mm Dia bored RC piles assumed 1100mm deep	9	m	390	excluded
8.26	EDGE BEAMS				excluded
8.27	ET - 300mm W x 800mm D	32	m	330	10,560
8.28	SLAB ON GROUND				
8.29	200mm thick concrete slab on ground; 32MPa concrete reinforced at 80kg/m3;sand; SL82 T&B	50	m2	125	6,250
8.30	Extra over allowance for compacted engineering backfill. Assume an average thickness of 600mm as per St-1017	30	m3	90	2,700
8.31	CONCRETE STAIR & LANDING				
8.32	Concrete entry steps	1	m	2,200	2,200
8.33	Landing slab; 100mm thick	4	m2	120	480
8.34	Subtotal	50	m2	444	22,190
8.35	**COLUMNS**				
8.36	STRUCTURAL STEEL				
8.37	SC1 - 250 UC 73	1.4	t	6,500	9,100
8.38	SC2 - 89x89x4 SHS	0.20	t	6,500	1,300
8.39	OR1 - SHS 89x89x4	0.10	t	6,500	650

Ref.	Description	Quantity	Unit	Rate	Total
8.40	Allow for all connections etc @ 5%	1	item	560	560
8.41	Subtotal				11,610
8.42	**ROOF**				
8.43	STRUCTURAL STEEL				
8.44	EB1 - 250 PFC	2.20	t	6,500	14,300
8.45	R1 - 250 UB 31	1.86	t	6,500	12,090
8.46	Allow for all connections etc @ 5%	1	item	1,320	1,320
8.47	BRACING				
8.48	RT1 - CHS tie	0.3	t	6,500	1,950
8.49	RT2 - CHS tie	0.2	t	6,500	1,300
8.50	FB - Fly Bracing	6	no	110	660
8.51	Allow for all connections etc @ 5%	1	item	200	200
8.52	PURLINS				
8.53	P1 - Z15019	105	m	25	2,625
8.54	EP1 - Purlin - C15019	24	m	25	600
8.55	FP1 - Purlin - FP230	9	m	75	675
8.56	GP1 - Purlin - C15019	12	m	25	300
8.57	BP1 - Purlin - C15019	29	m	25	725
8.58	EB2 - C200019	12	m	35	420
8.59	**Sub-total**	154	m2	241	37,165
8.60	ROOFING / ROOF PLUMBING				
8.61	Colorbond metal roofing; trimdek; incl battens; exposed underside	154	m2	60	9,240
8.62	Gutter; box gutter; 300x150x125mm	16	m	90	1,440
8.63	Downpipes	2	no	190	380
8.64	Subtotal				48,225
8.65	**EXTERNAL WALLS AND WINDOWS**				
8.66	BLOCKWORK				
8.67	CB1 - concrete block wall; paint; 190mm thick; corefilled; insul; furring; 13mm pb	83	m2	200	16,600
8.68	LIGHTWEIGHT WALLS				
8.69	CD1 - Metal cladding; colorbond; insul; 13mm PB	41	m2	145	5,953
8.70	STRUCTURAL STEEL				
8.71	HB1 - 200x100x5 RHS	0.69	t	7,750	5,348
8.72	G1 - Girts; C15019	80	m	35	2,800
8.73	WINDOWS				
8.74	Awning				
8.75	W1 - awning window	1	m2	550	300
8.76	Fixed				
8.77	W3 - fixed window	3	m2	450	1,544
8.78	W5 - fixed	3	m2	450	1,134
8.79	Fixed / part sliding				
8.80	W2 - fixed / sliding window	7	m2	700	5,194

Ref.	Description	Quantity	Unit	Rate	Total
8.81	W4 - fixed / sliding	2	m2	700	1,666
8.82	GENERAL				
8.83	Impact protective device	16	m	45	720
8.84	Handrail to entry steps	5	m	350	1,750
8.85	Subtotal				43,009
8.86	**EXTERNAL DOORS**				
8.87	GLAZED DOORS				
8.88	Glazed door; 820mm W x 2040mm H; incl hardware	1	no	1,800	1,800
8.89	SOLID CORE DOOR				
8.90	Solid Core Door, Single Leaf, 820mm x 2040mm	1	no	1,200	1,200
8.91	Subtotal				3,000
8.92	**INTERNAL WALLS**				
8.93	STUD WALL				
8.94	92mm steel stud; insul; 13mm moisture pb x1 side; 13mm pb x1 side	6	m2	160	960
8.95	Subtotal				960
8.96	**INTERNAL DOORS**				
8.97	TIMBER DOOR				
8.98	Solid core dore; cavity slider 820x2010mm H; incl hardware	1	no	1,400	1,400
8.99	Subtotal				1,400
8.100	**WALL FINISHES**				
8.101	TILING				
8.102	Splashback wall tiles; 100mm H	3	m	135	405
8.103	PAINT				
8.104	Allow to paint all exposed plasterboard and Moisture plasterboard linings	79	m2	15	1,185
8.105	Subtotal				1,590
8.106	**FLOOR FINISHES**				0
8.107	VINYL FLOORING				
8.108	FL-1 - vinyl flooring	32	m2	80	2,560
8.109	Vinyl skirting	35	m	25	875
8.110	ENTRY STEPS				
8.111	Tactiles	1	m2	1,200	1,200
8.112	Anti-slip nosing to steps	3	no	130	390
8.113	Subtotal				5,025
8.114	**CEILING FINISHES**				
8.115	SUSPENDED CEILINGS				
8.116	Plasterboard ceiling set flush and painted	16	m2	110	1,760
8.117	Moisture resistant plasterboard ceiling set flush and painted	2	m2	120	240
8.118	Subtotal				2,000
8.119	**FITMENTS / JOINERY**				
8.120	JOINERY				
8.121	J01 -Kitchen benchtop; laminate; incl cabinets under	3	m	600	1,800

Ref.	Description		Quantity	Unit	Rate	Total
8.122	J03 - Benchtop; 600mm W		2	m	275	550
8.123	J02 - Benchtop; 800mm W		2	m	345	690
8.124	JF2 - Overhead cabinet; 450mm W		1	no	250	250
8.125	FITMENTS					
8.126	Toilet Area					
8.127	Soap dispenser		1	no	150	150
8.128	Roll holder		1	no	75	75
8.129	Paper towel dispenser & waste		1	no	780	780
8.130	Mirror		1	no	350	350
8.131	SIGNAGE					
8.132	Bathroom signage		1	no	200	200
8.133		Subtotal				4,845
8.134	**SECURITY SYSTEM**		50	m2		EXCLUDED
8.135	**HYDRAULIC SERVICES**					
8.136	HYDRAULIC FITTINGS					
8.137	Toilet suite		1	no	1,129	1,129
8.138	Basin incl tap		1	no	1,238	1,238
8.139	Kitchen sink; single bowl; incl mixer tap		1	no	1,355	1,355
8.140	Wall mounted water boiling unit		1	no	1,219	1,219
8.141	Floor waste		1	no	1,100	1,100
8.142	BWICS		1	Item		604
8.143		Subtotal				6,645
8.144	**MECHANICAL SERVICES**					
8.145	Split system AC		1	no	3,500	3,500
8.146	BWICS			Item		320
8.147		Subtotal				3,820
8.148	**ELECTRICAL**					
8.149	Electrical & power					
8.150	MSB		1	no	1,800	1,800
8.151	Lighting / switches		3	no	210	630
8.152	Outlets		5	no	180	900
8.153	Wiring		1	item	720	720
8.154	Smoke detector; battery operated		1	item	250	250
8.155	BWICS			Item		430
8.156	All associated weighting electrical equipment is excluded					
8.157		Subtotal				4,730
8.158	**Sundries**			item		50,000
8.159	**FIRE SERVICES**		50	m2		EXCLUDED
8.160	**EXTERNAL SERVICES**		50	m2		EXCLUDED
8.161	**TOTAL**		50	m2	4,181	209,049
8.162	FECA		50	m2		

Ref.	Description	Quantity	Unit	Rate	Total
8.163	UCA	50	m2		
8.164	**GFA**	**153**	**m2**		
			GATE HOUSE TOTAL		**209,049**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
9	**REMOVABLE PEDESTRIAN BRIDGE AND PASSENGER LIFT**				
9.1	The following scope of works measured have been assumed from the information provided by Suez as there is no detail documentation at the moment.		Note		
9.2	Pedestrian Bridge				
9.3	Pedestrian bridge connecting to admin carpark; approx. 37m length x 1.50m wide allow for steel frame; 4.60m high clearance	81	m2	3,500.80	283,565
9.4	Allow for steel framed stairs toAS1428.1-2009; 4600mm high	5	m/rise	3,880.00	19,400
9.5	Allow for tactile	2	m2	1,000.00	2,000
9.6	Allow for passenger lift	1	item	55,100.00	55,100
9.7	Allowance for approach works, abutment and pilingif required		item		Incl.
9.8	Allowance for balustrade / guard rails to bridge		item		Incl.
	REMOVABLE PEDESTRIAN BRIDGE AND PASSENGER LIFT TOTAL				**360,065**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
10	**EXTERNAL PAVING**				
10.1	The following scope of works measured have been assumed from the similiar type of project as there is no detail documentation at the moment.		Note		
10.2	General Hardstand				
10.3	Concrete paving	9,960	m2	103.48	1,030,621
10.4	Ditto; for the areas to the fire services water tanks and entry gate	1,460	m2	115.00	167,900
10.5	Demolish existing road and rebuild ay higher level	700	m2	130.00	91,000
10.6	Concrete kerb	1,747	m	50.00	87,339
10.7	Allowance for line marking	1	Item	5,489.01	5,489
			EXTERNAL PAVING TOTAL		**1,382,349**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
11	**EXTERNAL SERVICES**				
11.1	The following scope of works measured have been assumed from the information provided by Suez as there is no detail documentation at the moment.		Note		
11.2	Treatment Drains				
11.3	Allow for a stormwater facilities and treatment drains system and associated builders works as required	1	item	30,000.00	30,000
11.4	Allow for 300mm RCP grade 4 storm pipe including excavation ave. 1.6m deep, removal of soil and backfill with approved fill	94	m	196.00	18,424
11.5	Ditto; 375mm	194	m	236.00	45,784
11.6	Ditto; 450mm	225	m	296.00	66,600
11.7	Ditto; 525mm	128	m	340.00	43,520
11.8	Ditto; 600mm	293	m	250.00	73,250
11.9	Ditto; 675mm	65	m	460.00	29,900
11.10	Ditto; 750mm	182	m	540.00	98,280
11.11	Ditto; 900mm	206	m	615.00	126,690
11.12	Allow for 900 x 900mm stormwater pit with heavy duty grate / cover Class 'D'	26	no	1,500.00	39,000
11.13	Allow for 1200 x 1200mm stormwater pit with heavy duty grate / cover Class 'D'	8	no	2,000.00	16,000
11.14	Allow for 1500 x 1500mm stormwater pit with heavy duty grate / cover Class 'D'	2	no	2,500.00	5,000
11.15	Allow for proprietary gross pollutant trap	1	no	15,000.00	15,000
11.16	Sub-total				607,448
11.17	Hydrant Booster				
11.18	Electric motor driven fire sprinkler system jacking pump including all ancillary pipe work and valves to serve the fire sprinkler control valves	1	set	20,000.00	20,000
11.19	Diesel Combined Sprinkler and Hydrant Booster Pump. Automatic Jockey Pump Fire Pump; Combined Sprinkler Hydrant Diesel Booster Pump 4650l/m @ 850 KPa & 6970.5l/m @ 555kPa.	4	set	20,000.00	80,000
11.20	Allow for pipework from the pumps to the facilities	1	item	75,000.00	75,000
11.21	Plant room and sundries	1	item	40,000.00	40,000
11.22	Allowance for fire sprinkler tank; 1 no. capacity 1,104,000 litres including pumping systems (FWP)	1	item	65,000.00	65,000
11.23	Allowance for fire hydrant tank; 2 no. capacity 216,000 litres each including pumping systems	1	item	30,000.00	30,000
11.24	Sub-total				310,000
11.25	Fire Mains reticulation				
11.26	150mm dia fire hydrant ring mains and trench	772.00		100.00	77,200
11.27	200mm sprinkler mains in trench	220.78		140.00	30,909
11.28	50mm conduit for dry fire control	220.78		20.00	4,416
11.29	Dual fire hydrants	14	No.	3,250.00	45,500
11.30	Valves		Item		10,000
11.31	Trust blocks		Item		5,000
11.32	Sub-total				173,025

Ref.	Description	Quantity	Unit	Rate	Total
11.33	Allow for miscellaneous items				
11.34	Allow for services connections to water and sewer	1	item	100,000.00	100,000
11.35	Allow for services connections to power reticulation	1	item	25,000.00	25,000
11.36	Allow for services connections to communication reticulation	1	item	25,000.00	25,000
11.37	Allow for security cameras & conduits for stage 2	1	item	25,000.00	25,000
11.38	Allow for cold water services / potable water supply around site; 32mm diameter	279	m	97.50	27,203
11.39	Allow for communications / electrical mains around site	1,318	m	300.00	395,400
11.40	Sub-total				597,603
11.41	External Lighting				
11.42	Allow for external lighting generally including all associated reticulation (scope to be defined) - say $7.5k/pole; P1; 39W LED pole mounted luminance, 4000k; neutral white, 4600LM	15	no	3,500.00	52,500
11.43	Allow for reticulation of electrical lighting	1	item		Incl.
11.44	Substation				
11.45	Ausgrid Kiosk Substation (1no in Stage 1)	1	item	200,000.00	200,000
11.46	Allow for high volage cables	50	m	370.00	18,500
11.47	Allow for LV cables	225	m	175.00	39,375
11.48	Sub-total				257,875
11.49	Rainwater tank				
11.50	Allow for 2 x 50,000 litre rainwater storage above ground tanks	1	item	25,000.00	25,000
11.51	Allow for reticulation from roof to tanks to site to MRF		item		20,000
11.52	Filtration system allowed in MRF				note
11.53	Sub-total				45,000
11.54	1 No. Fire Tank Pit Externally				
11.55	Allow for 1 No. Fire Tank Pit Externally as per MRF building		item		50,000
11.56	Reticulation for two below ground fire tanks; including manholes and pits		item		15,000
11.57	Fire water treatment and filtration		item		excluded
11.58	**Sub-total**				65,000
11.59	CCTV and Security				
11.60	Allow for cameras, boom gates, intercoms and monitoring		item		30,000
				EXTERNAL SERVICES TOTAL	**2,138,450**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
12	**LANDSCAPING**				
12.1	**Soft Landscape**				
12.2	Allow for landscaping works including irrigation system		Item		75,000
			LANDSCAPING TOTAL		**75,000**

Ref.	Description	Quantity	Unit	Rate	Total

Ref.	Description	Quantity	Unit	Rate	Total
13	**EXTERNAL WORKS**				
13.1	The following scope of works measured have been assumed from the similar type of project as there is no detail documentation at the moment.		Note		
13.2	Fencing & Gates				
13.3	All the other boundaries measured in stage 2		Note		
13.4	Allow for security fence to the north entry	14	m	150.00	2,100
13.5	Allow for slit fence and security fence	1,088	m	50.00	54,400
13.6	Allow for a boom gates to truck entry	4	no	18,000.00	72,000
13.7	Allow for pedestrian entry gates	2	no	1,500.00	3,000
13.8	Allow for 6m wide gate for fire brigade access	1	no	9,000.00	9,000
13.9	Existing Road				
13.10	No allowance for general works associated with the modification to existing road leading to new facility / car park		item		Excl.
			EXTERNAL WORKS TOTAL		**140,500**

Ref.	Description	Quantity	Unit	Rate	Total

ARCADIS Design & Consultancy for natural and built assets