

CONSULTING EARTH SCIENTISTS

**ENVIRONMENTAL MANAGEMENT PLAN
BICENTENNIAL RESERVE FORMER LANDFILL
SMALL STREET, WILLOUGHBY NSW 2068
PREPARED FOR WILLOUGHBY CITY COUNCIL
CES DOCUMENT REFERENCE: CES210306-WIL-AH-REV4**

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4	07/12/2023	Final

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LIST OF ABBREVIATIONS

ACM	Asbestos Containing Material
AHD	Australian Height Datum
ASS	Acid Sulfate Soil
BTEX	Benzene, Toluene, Ethylbenzene and Total Xylenes
CES	Consulting Earth Scientists Pty Ltd
CLM	Contaminated Land Management
COPC	Contaminants of Potential Concern
DECCW	Department of Environment and Climate Change and Water
DLWC	Department of Land and Water Conservation
DSI	Detailed Site Investigation
EPA	Environment Protection Authority
ESI	Environmental Site Investigation
km	Kilometre
LGA	Local Government Area
LPI	Land and Property Information Division
LEP	Local Environmental Plan
m	Metre
m bgl	metres Below Ground Level
NEPM	National Environment Protection Measure
NSW	New South Wales
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PSP	Project Safety Plan
TRH	Total Recoverable Hydrocarbons
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

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1 INTRODUCTION

Consulting Earth Scientists Pty Ltd (CES) was commissioned by Willoughby City Council (hereafter referred to as ‘Council’) to prepare an Environmental Management Plan (EMP) for Bicentennial Reserve, Small Street, Willoughby, NSW 2068 (herein referred to as ‘the site’).

Bicentennial Reserve comprises developed parkland, Hallstrom Park Playground, Bicentennial Oval, 17 district netball courts, the Flat Rock Internal Baseball Diamond, the Willoughby Leisure Centre, the former Griffin Incinerator Art Space, shared path, three car parks and bushland.

It is noted that the Flat Rock Gully bushland reserve, which is located to the east of Flat Rock Drive, is not covered by this EMP. This area was not considered as part of the Environmental Site Investigation (CES, 2022) and as such, has not been included in this EMP. It is understood that this area is covered by the *Urban Bushland Plan of Management 2014*.

The majority of the site comprises Lot 2 in DP 57586; Lot 869 in DP 752067; Lot 1 in DP 81035; Lot 3 in DP 522788; Lot 1 in DP 524253; Lot 1 in DP 334861; and Lot 7 in DP 666241. Further to this, however, approximately 18 additional smaller lots are included within the site area, based on advice received from the Council with reference to the site boundary. These additional lots are defined in Section 2.1.

The site location is presented as Figure 1. A Site Layout Plan is presented as Figure 2.

This EMP has been prepared with reference to the following key guidelines and previous reports:

- *Contaminated Land Guidelines: Consultants Reporting on Contaminated Land (NSW EPA, 2020)*;
- *Assessment and Management of Hazardous Ground Gases, NSW EPA, 2020*;
- *National Environmental Protection Measures (Assessment of Site Contamination) Measure 1999 – Schedule B2 (NEPC), updated 2013*);
- Consulting Earth Scientists (2022a), *Environmental Site Investigation, Bicentennial Reserve Former Landfill, Small Street, Willoughby, NSW 2068 (CES210306-WIL-AD, 5 April 2022)*;
- Consulting Earth Scientists (2022b), *Addendum to Environmental Site Investigation, Bicentennial Reserve Former Landfill, Small Street, Willoughby, NSW 2068 (CES210306-WIL-AG, 30 June 2022)*;

- Consulting Earth Scientists (2022c), *Addendum No. 2 to Environmental Site Investigation, Bicentennial Reserve Former Landfill, Small Street, Willoughby, NSW 2068* (CES210306-WIL-AG, 14 November 2022);
- EDP Consultants Pty Ltd, *Letter of Advice and Risk Assessment – Asbestos Contamination within Bicentennial Reserve Oval, Willoughby*. (Ref: S-04382.LOR.002, 21 June 2022);
- Willoughby City Council, *Bicentennial Reserve, Plan of Management, 8 February 2021*;
- *Environmental Guidelines, Solid Waste Landfills* (NSW EPA, 2016); and
- *Waste Classification Guidelines* (NSW EPA, 2014).
- Safe Work Australia (2019) *Workplace exposure standards for airborne contaminants*

Additional legislation, industry standards, best practice, and guidance documents are presented in Section 5.7.

2 PURPOSE

The purpose of this EMP is to:

- As a former landfill, identify key risk activities undertaken by Council staff, third parties accessing and operating on the site under existing easement access agreements, and leaseholders and identify mitigation measures for these activities, to manage contaminated landfill materials and potentially landfill gas underlying the site and minimise the risks to current and future site users from interaction with landfilled waste associated with historical use of the site.

2.1 TIMEFRAME OF EMP

This EMP will be relevant for the long term and be applied for the time that the site is owned by Willoughby City Council, operated by the various leaseholders, and is used for recreational use. This EMP will be relevant until it is superseded, or risk assessment indicates that it is no longer required.

If the land use changes in any portion of the site, for example, the netball courts are removed and soccer fields are constructed in their place, this EMP must be updated to re-assess the potential risks and identify mitigation measures.

2.2 HOW THE PLAN WILL BE MADE ENFORCEABLE

This EMP must be included in the overall management system for Bicentennial Reserve and be applied for all work that disturbs ground within the site boundary (extent of waste) (Refer to Figure 3).

2.3 THE PERSON(S) RESPONSIBLE FOR THE IMPLEMENTATION, REVIEW AND MAINTENANCE OF THE EMP

2.3.1 Stakeholders

The following stakeholders have relevance to the operation of this EMP:

- Property Owner - Willoughby City Council;
- Local Community;
- Willoughby City Council contractors and third parties accessing the site under existing easement agreements (e.g., Sydney Water);
- Environmental Consultants (including Consulting Earth Scientists);
- Licensed Asbestos Assessors (LAA) (including EDP Consultants Pty Ltd);
- Safe Work NSW; and
- NSW EPA.

2.3.2 Roles and Responsibilities

The following sections outline the roles and responsibilities of key personnel regarding the management of the underlying landfill waste materials, minor asbestos-impacted soils, groundwater contamination and landfill gas risks at the site.

2.3.2.1 Site Owner and/or Person Conducting a Business or Undertaking

In accordance with Safe Work NSW, a person conducting a business or undertaking (PCBU) is defined as:

“...an umbrella concept used to capture all types of working arrangements or structures. A PCBU can be a: company; unincorporated body or association; sole trader or self-employed person. Individuals who are in a partnership that is conducting a business will individually and collectively be a PCBU.

The EMP shall be adopted and implemented by Council and any future PCBUs. The Council/PCBU has the following responsibilities:

- Agree to adopt the EMP as the landowner and/or PCBU and relevant authority;
- Implement, control and maintain the EMP;
- Engage suitably qualified and experienced contractors to undertake any works triggering the use of this EMP;
- It is an offence, under Section 110A of the *Protection of the Environment Operations Legislation Amendment (Waste) Regulation 2018* to exhume waste from a current or former landfill. As a result, the Council (or instructed contractor) must notify the NSW EPA, of the works, at least 2 days prior to ground disturbance works, that there is the potential for exhumation of waste and to obtain written authorisation to proceed¹;
- Incorporate this EMP into relevant policies and procedures, including the owner’s management system, subcontractor agreements and lease contracts;
- Be responsible for promoting good environmental and WHS Management;
- Induct the site contractors and employees on the EMP and inform contractors or staff proposing to engage in intrusive works or site development works of the requirements of this EMP. (Intrusive works are described in Section 5.2.3).

¹ It is a defence in any proceedings for an offence against this clause if the defendant establishes that: (a) the waste was exhumed in an emergency to protect human health or the environment, or (b) the waste was exhumed in accordance with a written direction of the EPA.

- Maintain records of the site induction and maintenance records. These records are to be kept indefinitely and for as long as the EMP is in place;
- Appoint a site manager or Management Plan Controller;
- Understand the implementation of this EMP, allowing for auditing to be undertaken (if required);
- Ensure all appointed contractors understand and implement the controls of this EMP and that the site is operating according to the agreed principles of the EMP and without risk to human health or to the environment;
- Ensure that all changes to the EMP are communicated to all personnel working on the site, including sub-contractors;
- Conduct site inspections for conformance; and
- Respond to any WHS or environmental incident.

2.3.2.2 EMP Controller (Council Superintendent)

The EMP shall be managed, reviewed and updated by a suitably qualified EMP Controller (Council Superintendent) on a periodic basis (suggest annually) and after any change in land use or landowner. The EMP Controller (Council Superintendent) shall be appointed by the PCBU and has the following responsibilities:

- Develop protocols and procedures to ensure that the EMP is enforced;
- Ensure that the NSW EPA has been notified of all ground disturbance works (i.e. works that have the potential to encounter or exhume waste);
- Approve all intrusive works or site occupancy via the landowner/PCBU (Intrusive works are described in Section 5.2.3);
- Ensure risk assessments of ground disturbance activities (and landfill gas) are carried out by a competent person (i.e. a suitably trained employee, qualified Environmental Consultant and/or an LAA) on a regular basis as outlined in this EMP, appropriate management procedures are developed and safe work method statements;
- The risk assessment shall be conducted in accordance with the NSW WHS Regulation 2017, *Assessment and Management of Hazardous Ground Gases* (NSW EPA, 2020), Safe Work NSW guidelines and other applicable NSW EPA guidelines;
- Provide inductions to all relevant site personnel as detailed in this EMP;
- Ensure that all relevant site personnel are fully trained to identify waste and asbestos as detailed in this EMP;

-
- Provide or delegate supervision as required to ensure that the procedures documented in this EMP are implemented;
 - Establish a platform for consultation for all relevant site personnel to ensure responsibilities are understood and feedback can be provided;
 - Ensure waste exhumation related health and safety procedures, including permits to work are completed (for intrusive works) and Safe Work Method Statements (SWMS) are developed and updated on a regular basis;
 - Inform employees, contractors and subcontractors of the presence of underlying waste, the possibility of encountering asbestos in shallow soils, and the landfill gas risk, through the implementation of awareness training, as part of the induction process etc. Ensure related records are maintained in Appendix C of this EMP;
 - Ensure a copy of the EMP is made readily accessible for all relevant personnel and
 - Records such as the training records, incident reports, contractor licences, SWMS, air monitoring reports, clearance inspection certificates any landfill gas and/or groundwater monitoring records are also made readily accessible for all relevant personnel.

2.3.2.3 Employees and Contractors' Responsibility

Employees and contractors are responsible for:

- Not placing themselves or others at risk of exposure to landfilled waste, asbestos or landfill gas;
- Understanding and following the procedures outlined in this EMP;
- Ensure that the NSW EPA has been notified with regard to the ground disturbance works, at least 2 days prior to the works commencing;
- Follow instruction from the landowners and/or environmental consultants/LAAs regarding the implementation of this EMP;
- Understanding the landfilled waste, asbestos in soil, groundwater, surface water (culvert and drains) and landfill gas contamination issues at the site;
- Competency in the identification of asbestos and the control measures to be adopted when undertaking works at the site;
- Competency in the assessment of landfill gas – pits and excavation surface water (culverts and drains), groundwater contamination and the control measures to be adopted when undertaking works at the site;
- Abiding by the PCBU's health and safety procedures, including the development of SWMS and undertaking induction prior to commencement of any contractor works. No works shall commence until approval is received;

- An EMP induction register shall be prepared and signed by workers following completion of site induction; and
- Reporting hazards, including incidents and unsafe work practices to the EMP Controller (Council Superintendent).

2.3.2.4 Future Site Operator, Tenant and Site Manager

Any Future Site Operator, Tenant and Site Manager must become familiar to the EMP. The Future Site Operator, Tenant and Site Manager have the following responsibilities:

- Are inducted onto this EMP and familiarise themselves with the EMP and the requirements; and
- Liaise with the PCBU to provide relevant input to ensure the site is operated according to the agreed principles of the EMP and without risk to human health or the environment.

2.3.2.5 Environmental Consultant / Licensed Asbestos Assessor

The EMP Controller (Council Superintendent) may appoint an environmental consultant / LAA to assist in the following areas:

- Assess the risk involved with any proposed works where disturbance of asbestos-impacted soils or landfill gas is likely to occur prior to commencing proposed works;
- Develop 'scope of works' documentation for remediation and/or maintenance works;
- Provide asbestos hygiene services during general maintenance activities, asbestos abatement/remedial and/or removal and intrusive works (e.g., asbestos fibre air monitoring and clearance inspections);
- Provide awareness training for site owners and contractors involved with the management, maintenance of the site;
- Potentially assist in the review this EMP on a regular basis as part of the ongoing management of the site; and
- Maintain and update the asbestos register.

2.3.2.6 Licensed Asbestos Removal Contractor

If necessary, the EMP Controller (Council Superintendent) will engage a Licenced Asbestos Removal Contractor (LARC), as prescribed by NSW WHS Regulation 2017, to conduct intrusive works at the site. The contractor must perform all works in accordance with licensing requirements and standard industry practice for asbestos materials. The LARC must:

- Hold a Class A Asbestos Removal Licence;
- Develop a SWMS for the removal work;

- Develop an Asbestos Removal Control Plan (ARCP) and submit Safe Work NSW notification;
- Manage the removal of asbestos-impacted soil;
- Ensure asbestos work area is established;
- Set up a decontamination area;
- Decontaminate machinery and equipment as required; and
- Ensure concrete/hardstand cover or grass cover/mulch is re-established following intrusive or development works, as required (intrusive works are described in Section 5.2.3).

2.3.2.7 NSW Environment and Health and Safety Regulatory Bodies

The requirement to carry out an environmental site investigation was triggered by notification to the NSW EPA via the submission of a Contaminated Land Notification Form under Section 60 of the Contaminated Land Management Act 1997 by Council, following the Council becoming aware of possible migration of contaminants from the site via groundwater.

The Environmental Site Investigation (CES, 2022) was prepared to answer questions posed by the NSW EPA. Continuous liaison with the NSW EPA and review of the technical documents prepared by CES on behalf of Council has been conducted since the Section 60 notification. As a result, the NSW EPA is aware of the environmental issues associated with the site and has requested additional assessment (including landfill gas, assessment of the soccer field and baseball diamond and surface water monitoring). This EMP will also be submitted for NSW EPA review and approval prior to finalisation and implementation. If the land use changes – and the changes result in the potential increased exposure of site users to the landfilled waste materials - and the EMP is updated.

Safe Work NSW administers and enforces asbestos related legislation. The NSW WHS Regulation 2017 requires controllers of premises to identify, assess and control risks arising from asbestos at the workplace. The NSW WHS Act 2011 also details the overriding general obligation of various parties, including the Person Conducting Business or Undertaking (PCBU), officers, contractors, employers, self-employed persons and persons in control of workplaces to ensure the workplace health and safety of persons affected by their work activities.

2.3.3 Distribution

A copy of this EMP, and any revisions of the EMP must be provided to all organisations with the authority to approve and conduct ground disturbance/excavation works within the site.

3 BACKGROUND

3.1 SITE IDENTIFICATION

The site, as it is referred to in this EMP, consists of the Bicentennial Reserve former landfill located on Small Street Willoughby, NSW 2068 NSW and boundaries defined in Figure 2.

For the purposes of this EMP, the primary site address is the Willoughby Leisure Centre, 2 Small Street, Willoughby, NSW 2068 NSW.

With reference to the NSW EPA letter, the area of investigation was defined as Lot 2 in DP 57586, Lot 869 in DP 752067, Lot 1 in DP 81035, Lot 3 in DP 522788, Lot 1 in DP 524253, Lot 1 in DP 334861 and Lot 7 in DP 666241.

However, following discussion with the Council, a further 19 lots have been included in the investigation area (including the lots defined by the NSW EPA). The lots within the Investigation area are presented in Table 1 below.

Table 1. Investigation Area - Lot and Deposited Plan

ID	Lot and DP	Approximate Location
NSW EPA Defined Site		
1	Lot 2 in DP 57586	Central and northwest
2	Lot 869 in DP 752067	Western boundary
3	Lot 1 in DP 81035	North-eastern corner
4	Lot 3 in DP 522788	Central south
5	Lot 1 in DP 524253	Central south
6	Lot 1 in DP 334861	Central southeast
7	Lot 7 in DP 666241	Southeast
Additional Lots – Southern Boundary		
8	Lot 111 in DP129029	Southern Centre
9	Lot 112 in DP129029	Southern Centre
10	Lot 113 in DP129029	Southern Centre
11	Lot 2 in DP332680	Southern Centre
12	Lot 21 in DP1257434	Southern Centre
13	Lot 3 in DP506449	Southern Centre
14	Lot 1 in DP315723	Southern Centre
15	Lot 7 in DP524254	Southern Centre

ID	Lot and DP	Approximate Location
16	Lot C in DP316969	Southern Centre
17	Lot 2 in DP115622	Southern Centre
18	Lot 1 in DP115622	Southern Centre
19	Lot 1 in DP125619	Southern Centre
20	Lot 1 in DP725764	Southern Centre
21	Lot 1 in DP125620	Southwest
22	Lot 1 in DP115636	Southwest
23	Lot 2 in DP115624	Southwest
24	Lot 702 in DP778776	Southwest
25	Lot 1 in DP115624	Southwest
26	Lot 1 in DP5889	Southwest

The Site is located within the local government area (LGA) of Willoughby City Council and encompasses a land area of approximately 13.95 ha. Please note that this area does not include Lot 1 in DP5889, which is approximately 335 m².

The site location is presented in Figure 1 and the key features of the site are presented in Figure 2.

3.2 *SITE ZONING*

The current land use zoning is defined by the Land Zoning Map – (Willoughby Local Environmental Plan 2012) and is currently listed as Public Recreation – RE1.

The objectives of RE1 are to:

- Enable land to be used for public open space or recreational purposes;
- Provide a range of recreational settings and activities and compatible land uses;
- Protect and enhance the natural environment for recreational purposes;
- Protect and enhance areas of ecological, scientific, cultural or aesthetic value;
- Maintain and provide visual open space links to a diversity of public and private spaces and facilities as an integral part of the open space system; and
- Provide adequate open space areas to meet the existing and future needs of the residents of Willoughby.

3.3 ***SITE HISTORY***

Based on the review of historic aerial photographs, the site has undergone significant topographical modifications as a result of its former use as a landfill. Over the course of approximately 40 years (from 1930 to *circa* 1970), substantial landfilling and waste incineration on-site has resulted in the clearing and repurposing of almost the entire native bushland.

The extent of the former landfill is most clearly defined in the 1965, 1970 and 1978 historical aerial photographs, and is illustrated in Figure 3. It should be noted that the indicative extent of filling presented on Figure 4 extends beyond the southeastern boundary of the site, and outside of the scope of this EMP.

Following completion of the landfill operations the site was subject to extensive additional filling and landscaping/recontouring between 1985 and 1988, with an estimated 192,500 m³ of “clean fill” imported to the site. As such it is understood that there is likely to be considerable cover material overlying the filled waste (CES 2022c).

Selected historical aerial photographs of the site since *circa*. 1970 are enclosed in Appendix D.

3.4 ***LAND USE***

The site currently serves as a multipurpose sporting, community recreation and environmental management area. Situated in the north central portion of the site is the prominent Willoughby Leisure centre, which includes indoor sporting facilities (basketball and aerobics) and an indoor pool in the eastern and western wings, respectively. Adjoining south of the leisure centre are extensive tarmacked surfaces, purposed as netball courts to the south-west and mixed netball and basketball courts to the south-east. A level car park is situated adjacent west to the leisure centre, while secondary terraced parking is located along the drive-through loop, situated directly south of the netball courts.

Located in the south-eastern and western ends of the site are the Flat Rock International Baseball Diamond and the Bicentennial Oval, respectively. These playing fields are characterised by level grassy areas and open-air dugouts/shelters positioned along their boundaries. Hallstrom Park Playground is situated just north of Bicentennial Oval, encompassing the north-western corner of the site. The playground comprises a children’s bike track, picnic and barbeque facilities, level lawn areas, and three structures; one of which is understood to be a toilet block.

The former waste incinerator is situated in the north central portion of the site and is positioned between Hallstrom Park Playground to the west and Willoughby Leisure Centre to the east. The retrofitted structure currently acts as a café and art gallery.

Walkways and accessible bushland paths can be found extending across the southern and eastern boundaries of the site.

4 EXISTING CONTAMINATION

Further information on the existing/residual contamination can be obtained from the Environmental Site Investigation (and addenda, CES, 2022a-c). A summary of the contaminants of concern, the contaminated media, the concentrations, and locations are presented in the following sections.

4.1 *EXTENT OF THE WASTE*

The extent of the landfilled material is presented in Figure 3.

In summary, the area of landfilling occupies most of the site – as defined by the Council. In addition, an area of potential landfilling (or previous earthworks activity, such as stockpile storage area or road construction material laydown area) has been identified to the southeast of the site boundary which has not been investigated as part of this assessment. The *Flat Rock Gully and Bicentennial Reserve, Plan of Management* (Willoughby City Council, undated) which was provided by Council, has been reviewed by CES which appears to document the eastern extent of the landfill. The eastern extent of the landfill as documented in the plan appears to be consistent with vegetation colouring from aerial photographs and as such, is considered to identify the eastern extent of fill reasonably accurately.

Definition and further characterisation of the landfilled area to the southeast of the site may not lead to any changes in the environmental management of the site. However, since environmental characterisation of this parcel of land has not been undertaken and was excluded from the site, the south-eastern extent of the landfill remains an area of uncertainty.

4.2 *CONTAMINANTS OF CONCERN*

Based on a review of historical information and former environmental investigations, the key source of contamination at the site is landfilled waste and incinerator waste burial. It is also likely that historical off-site land use, to the west of the site and the upstream catchment of Flat Rock Creek may have historically resulted and currently result in additional sources of contamination, however, the contamination levels as per the results of investigations are considered low.

In summary, the contaminants identified during the ESI investigation comprised localised hydrocarbon impact, localised PCB impact in BH113 at depth, localised chromium (associated with metal shavings in GW105), heavy metal impact in groundwater in GW101 (the upgradient monitoring well location) and ammonia in groundwater and surface water. The concentrations are generally consistent with degraded (old) landfilled waste.

Landfilled waste is heterogeneous (highly variable laterally and vertically), and is a derivative of the waste materials (and in this case, the specific chemical characteristics of the incinerated waste as well as unincinerated landfilled materials, if present), the quantities and the timing of the

placement of the waste. Landfill contaminants may exist in small pockets, layers, blocks or may be diffuse through the waste materials.

In consideration of the above, contamination of the landfilled waste includes asbestos, hydrocarbons, PCBs, metals (including chromium) and nutrients (such as ammonia). However, it is also noted that other contaminants may be present in the waste materials, which have not been detected during the environmental site investigations.

Procedures for environmentally responsible and safe management of the site and working requirements are recommended in this EMP, including protocols for appropriate measures and actions to be followed in the event that unexpected materials are encountered.

4.3 *AFFECTED MEDIA*

4.3.1 Soil

The site features limited exposed soil surfaces, since the site is largely covered with grass, bushland areas, tarmacked sports fields, paved walkways, and re-engineered synthetic surfaces. The activities occurring within these areas are recreational – and as such use of the site by recreational users is typically short term and non-intrusive. Therefore, the probability of any significant and prolonged human exposure to potential contaminants in soil such as via ingestion, skin contact and inhalation are negligible.

In summary, although a number of theoretical exceedances of the screening criteria were identified, the soil concentrations detected were not considered to present an on-site or off-site human health or ecological risk, based on the depth of the samples and the specific contaminant fate and transport properties.

The cover layers comprising the playing fields at the western oval and eastern baseball diamond were found to extend from surface layer to a minimum of 0.6 m below ground level (*Addendum to Environmental Site Investigation*, June 2022).

- The vertical extent of the cover layers encountered at both playing fields was considered adequate in acting as a physical barrier between the recreational site users and members of the public and the potentially contaminated underlying landfill materials. CES notes that the assessment relies on the continued presence and maintenance of this cover material and recommends that the playing fields be upkept in accordance with an Environmental Management Plan (EMP) (i.e., this document).
- The limited analytical soil assessment of both cover layers showed that the identified contaminants of potential concern (including dioxins and furans) were detected below the adopted site-specific screening criteria and hence pose a low risk to human health or the environment.

Chrysotile asbestos fibres (0.0014g) were detected below the reporting limit for the AS4964-2004 testing method (0.1g/kg) between ground level and 0.1 m bgl in BH 201, located in the north-eastern quadrant of the western oval.

EDP (2022) determined that “*risk of airborne asbestos fibre exposure from utilising the field was deemed to be negligible*” based on the playing field being suitably encapsulated with good ground cover, no visual evidence of suspect Asbestos Containing Materials (ACM) on the field and the soil condition was wet and general activities on the field would not be expected to generate dust. However, if the soil dried out - or the grass cover thins, and soil is exposed - it was noted that the risk from asbestos to the users may change and further assessment may be required.

Due to the fibrous nature of the asbestos, CES recommended that further asbestos assessment was undertaken.

4.3.2 Groundwater

Groundwater was encountered at varying depths across the site, which, prior to development, was found to range from 4.74 m Below Top of Casing (mBTOC) (GW103) to 27.90 mBTOC (GW105). Following installation and development of groundwater monitoring wells, standing groundwater levels were found to range from 4.67 mBTOC (GW103) and 27.93 mBTOC (GW105).

The environmental site investigation identified heavy metal (cadmium, chromium, copper, lead, and zinc) concentrations above the adopted assessment criteria at a single sampling location within the north-western portion of the site (GW101), and below adopted criteria concentrations were detected in the downgradient monitoring wells, with the isolated exception of chromium which was detected above the adopted criterion in GW105.

4.3.3 Surface Water

The surface water monitoring in December 2021 indicated that most of the contaminants in Flat Rock Creek upstream (to the west of the site) were similar to, below the adopted screening criteria or lower than the concentrations detected in the downstream sampling location (east of the site), with the exception of ammonia, which increased between the upstream and downstream sampling locations and is marginally above the adopted (ANZG, 2018) screening criterion. It is noted that Flat Rock Creek flows within a culvert across the site.

4.3.4 Landfill Gas

The landfill is not formally capped or lined in accordance with appropriate current guidance, such as the *Solid Waste Landfills* (NSW EPA, 2016). However, a playing surface (*Addendum to the Environmental Site Investigation*, CES, 2022) and/or hardstanding is generally present across most

of the site. In addition, as noted by CES (2022c) up to 192,500 m³ of “clean fill” was imported to site for landscaping and recontouring between 1985 and 1988. As a result, most of the landfill gases generated during decomposition of the landfilled waste, which has occurred since the landfill was closed, are likely to have migrated vertically to atmosphere.

In consideration of the above, subsurface landfill gas monitoring of wells was not considered to be necessary since the primary landfill gas migration pathway would be vertical. However, ongoing monitoring and assessment of the landfill gas risks to the Leisure Centre should continue – since there are spaces in which landfill gas could accumulate.

Localised subsurface gas monitoring undertaken between September and October 2022 determined that there is a very low to low risk to the offsite receptors from lateral landfill gas migration from the site.

Surface gas emissions of landfill gas have not been detected above the relevant screening criteria and were generally two orders of magnitude lower than the screening criteria presented in the *Solid Waste Landfills* (NSW EPA, 2016) guidelines.

4.4 GEOLOGY AND HYDROGEOLOGY

The geology comprises landfilled waste materials underlain by Middle Triassic aged medium to coarse grained quartz sandstone (Hawkesbury Sandstone).

The hydrogeology comprises a localised perched aquifer within the landfilled materials (leachate) underlain by the main unconfined aquifer of the Hawkesbury Sandstone.

The regional groundwater flow is from the west towards the east. Localised flows at the site are towards Flat Rock Creek – i.e., in the northern portion of the site, the groundwater flows from north to south, in the southern portion of the site, the groundwater flows from south to north, and in the eastern portion of the site, the groundwater flows from north east to south west. It is noted that the groundwater/leachate will discharge on-site or off-site to Flat Rock Creek.

5 MANAGEMENT ACTIVITIES

5.1 PRINCIPLES, PROCEDURES AND PRE-WORKS

5.1.1 Principles of Management

Implementation of this EMP is the responsibility of the PCBU for the site. All site personnel including employees and contractors must be provided, clearly understand, and comply with the EMP. For all contractors undertaking site works, all site works must comply with relevant legislation and guidance.

Nothing contained within this EMP may be considered to alter or modify guidelines or the requirements laid down under all relevant NSW legislation (including the *NSW WHS Act 2011* and *NSW WHS Regulation 2017* or relevant legislation current at the time of works) and NSW EPA 2020 and other applicable NSW EPA guidelines. Relevant health and safety regulations in place for confined spaces and working in potentially explosive atmospheres must also be complied with.

The EMP is to be a dynamic document that is revised where necessary to reflect any changes to the site that may result in a change to the contaminants exposure risk factors and associated contaminants controls. As soon as reasonably practicable, after such a change is identified, the EMP shall be revised by a suitably experienced and qualified Environmental Consultant and/or LAA as nominated by the PCBU of the site. Whenever the EMP is amended, all site personnel including contractors shall be inducted to the revisions of the EMP and any associated revisions relating to their responsibilities. The EMP shall be maintained by the PCBU of the site.

5.1.2 Management Plan Procedures

To aid in the implementation and fulfil the objectives of the EMP, the following procedures have been developed for the site based on the management of the exhumation and possible encountering of waste, landfill gas and asbestos in soil. These include the following:

- Site maintenance, including vegetation maintenance and inspection requirements;
- Intrusive works procedure;
- Ongoing monitoring and additional assessments; and
- Incident and emergency response.

5.1.3 NSW EPA Notification Prior to Intrusive Works

It should be noted that under Section 110A of the *Protection of the Environment Operations Legislation Amendment (Waste) Regulation 2018*, it is an offence to exhume waste from a landfill site. As a result, the NSW EPA must be informed at least 2 days (or such greater period as may be specified in the written authorisation of the EPA) before the works commence.

An appropriate form (*EPA Assessment table for the approval for exhumation of waste*, presented in Appendix B) is completed, submitted, and approved by the NSW EPA for all intrusive works, since it is possible that waste may be encountered across the site.

It should be noted that this requirement to notify the NSW EPA and obtain written consent may not apply, if:

- a) the waste was exhumed in an emergency to protect human health or the environment;
- or
- b) the waste was exhumed in accordance with a written direction of the NSW EPA.

5.1.4 Safe Work Method Statement

Prior to the commencement of any works that may disturb the ground at the site, all employees or nominated contractors must have completed a SWMS, or other alternative, such as a Job Safety Analysis (SWMS/JSA) for the works. The document must include task-specific health and safety protocols for the works, including the exhumation or encountering of landfilled waste, the management of asbestos, surface water (culvert and drains), groundwater and landfill gas contamination.

5.1.5 Hot Works Permits for Work in Pits and Excavations

As ground gases and vapour can accumulate in voids, any open excavations or service pits these shall be examined by a qualified hot works assessor using appropriate monitoring equipment for explosive gases prior to and during works commencing or following breaks. During works an appropriately calibrated hand-held landfill gas monitor to measure landfill gases, a photo-ionisation detector (PID) to measure volatile organic vapours and a lower explosive limit (LEL) gas monitor to measure explosive vapours shall be used at regular intervals daily to alert staff if landfill gas is entering the work area.

Note that all monitoring equipment must be maintained and be appropriately calibrated as per manufacturer specifications.

5.1.6 Confined Space Entry Permits for Work in Pits and Excavations

As ground gases and vapour can accumulate in voids, any open excavations or service pits shall be considered potential confined spaces and cleared by a suitably qualified confined space expert prior to accessing them. During works, an appropriately calibrated hand-held landfill gas monitor, PID and LEL gas monitor shall be used at regular intervals daily to alert staff if landfill gas is entering the work area.

5.2 MANAGEMENT PLAN PROCEDURES FOR EXCAVATION WORKS ONLY

5.2.1 General

The measures described below only need to be implemented for excavation works. Some of the measures prescribed below are only relevant where asbestos fragments or fibre bundles are identified during the excavation works. The specific mitigation measures may be defined by competent, qualified and experienced licenced asbestos assessors and/or occupational hygienists.

The advice and precautions documented below may be revised subject to the proposed asbestos investigation of the western soccer field and eastern baseball diamond.

5.2.1.1 Site Security

Maintain security fencing and warning signage surrounding the excavation works areas to ensure neighbouring residents and the public cannot gain access to the works area. This is particularly important if waste is exhumed or when asbestos fragments or fibre bundles are encountered during maintenance or development works. These security measures are required to maintain isolation during the works.

5.2.1.2 Personal Hygiene

During any maintenance or intrusive works, personnel must be briefed on the requirements for personal site hygiene as part of the site induction. As with any work where contractors and maintenance staff are accessing soil, staff should be encouraged to avoid hand to mouth and hand to face contact until they have washed (e.g., prior to eating or drinking etc). Smoking must be prohibited in the vicinity of open excavations or maintenance of pits given the risk of landfill gas.

5.2.2 Maintaining the Site

5.2.2.1 General

Maintaining the site is understood to include vegetation maintenance works that could include mechanical plant such as mowing the sports fields, edge trimmer and hand tools. The contractor completing the works should be a suitably trained 'competent person' appointed by the PCBU having completed the induction and competency requirements detailed in Section 5.5.

5.2.2.2 Management Protocols for Maintaining the Site

As a minimum when conducting general maintenance works at the site, appropriate soil management protocols shall be maintained to ensure exposure to landfilled waste, asbestos, surface water (culvert and drains), groundwater contamination (interaction with groundwater is considered unlikely) and landfill gas is minimised:

- Concrete or grass surface cover must be maintained at all times in a good condition;

- Where applicable and where exposed soils occur, surface cover (such as mulch) shall be placed, which inhibits the disturbance of the surface soils and minimises human contact with the underlying soil;
- If surface cover is found to be damaged (e.g., the concrete slab is damaged or removed compromising the integrity of the cover layer, or the grass cover is patching (thinning), resulting in the potential for soils to become exposed), the PCBU shall be contacted, and the surface cover will be re-instated;
- If soil becomes exposed and waste materials or asbestos materials are identified, refer to the Incident and Emergency Response Procedure for the steps to be followed; and
- Intrusive maintenance works involving the disturbance of soils, surface water (including culvert or drains) or groundwater, such as emergency works or development works involving excavation, trenching, potholing etc; shall be conducted by a competent and experienced contractor. Where friable asbestos is encountered these works must be conducted by Class A (friable) LARC under suitable asbestos controls.

5.2.3 Intrusive Works Procedure

5.2.3.1 General

Intrusive Works are considered in this EMP to be any work that is anticipated to:

- Disturb the soil to depths greater than 0.6 m; this depth may be revised once additional information or further investigation to demonstrate change becomes available.
- Encounter surface water (such as in culverts and drains);
- Encounter groundwater;
- Has the potential to increase the risk of landfill gas accumulation in the work zone or increase the risk of landfill gas migration to an indoor air environment,

Shall be assessed as part of the SWMS/JSA process to be undertaken by the relevant parties (Council, contractors or third party acting under easement access agreement). The work will require management in accordance with this EMP. Examples of common intrusive works include (but are not limited to):

- Trenching/excavation;
- Underground services (such as drainage, sewer and potable water pipe, gas pipe, and electricity cable or other cabling) maintenance or installation;
- Remedial/abatement works, where ground will be penetrated more than 0.6m in depth; and;

- Construction works.

Any intrusive works at the site shall be carried out by an appropriately experienced and competent contractor and will be subject to appropriate assessment and controls identified during the SWMS/JSA process, which will be determined by the scale of the works, and for example, whether waste will be exhumed or disturbed and/or by the presence of asbestos.

5.2.4 Asbestos Management

If friable asbestos is encountered and requires off-site disposal, these works must be conducted by an LARC holding a Class A (friable) asbestos removal licence issued by Safe Work NSW under all applicable asbestos controls and procedures.

Prior to commencement of intrusive works at the site, workers undertaking the works shall be inducted in accordance with this EMP having completed the induction and competency requirements detailed in Section 5.5, and all works shall be undertaken in line with this EMP.

5.2.4.1 Regulator Notification

The works must be notified to the NSW EPA, at least 2 days prior to the work commencing, as detailed in Section 5.1.3.

If the works include the disturbance or removal of asbestos, the appointed LARC shall submit a 5-day notification (usually waived in emergency situations) and ARCP prior to the commencement of intrusive works to Safe Work NSW in accordance with the *NSW Code of Practice: How to Safely Remove Asbestos 2019*.

5.2.4.2 Neighbour Notification

If the works include asbestos disturbance, the LARC shall draft the required notification for adjacent properties and submit this to the PCBU for review and approval. The LARC must notify neighbouring properties (if relevant) of the intrusive works in accordance with the *NSW Code of Practice: How to Safely Remove Asbestos 2019*. This should be undertaken at least 1 day in advance of the works to ensure adjacent properties are aware of the upcoming works.

5.2.4.3 Site Setup

Fencing and Signage

If the works include asbestos disturbance, the LARC shall establish an asbestos work area at the site to be secure and signed appropriately (e.g. 'Authorised Persons Only' or 'Specialised Work Zone') this shall include the establishment of a physical barrier and an exclusion zone surrounding the asbestos work area.

For the purposes of this EMP, the asbestos work area during intrusive works shall be designated as the zone where earthworks are to be undertaken, including the excavation and decontamination areas. The asbestos work zone shall be established prior to disturbing the soil within the work area. This boundary shall be maintained throughout the duration of the works.

Erosion, Sediment and Runoff Control

The LARC shall establish erosion, sediment and runoff controls prior to commencement of work, especially in areas of highly erodible soil and areas which may cause runoff.

5.2.4.4 Personal Protective and Respiratory Protective Equipment

Depending on the nature and extent of the asbestos find, all personnel within the works area are required to be wearing appropriate PPE in line with the PCBU's requirements.

In the event that asbestos is identified during excavation works, a SWMS/JSA must be completed and the specific PPE requirements, which will be determined by the nature and extent of asbestos impact, clearly documented.

5.2.4.5 Dust Suppression

Where asbestos has been identified, dust suppression techniques shall be adopted by the LARC to minimise the generation and dispersal of dusts during soil disturbance.

These techniques will include:

- Fine water spraying;
- Use of gravel or fabric barriers on the surface of trafficked areas;
- Minimising traffic movements across the working area;
- Ensuring exposed soil surfaces are kept wet during the works;
- Covering stockpiles and excavations with High Density Polyethylene (HDPE) sheeting or geotextile at the conclusion of each shift;
- Erecting shade cloth along boundary fences to act as a wind break; and
- Ceasing works if environmental conditions result in visible dust being generated from the site.

5.2.4.6 Decontamination of Personnel and Hand Tools

The LARC shall design, supply, install and maintain a suitable decontamination area, as required by the *NSW Code of Practice: How to Safely Remove Asbestos 2019* with the use of the area outlined as follows:

- The decontamination area should be immediately adjacent to the asbestos work area. It should be located as far away as practicable from workplace facilities such as a lunchroom.

- The decontamination area shall have access to fresh water and soap and cloths/wet wipes to allow workers to appropriately decontaminate themselves.
- All workers, PPE, tools and equipment within the asbestos work area must be decontaminated before they exit or are removed from the asbestos work area.
- Tools and equipment which cannot be decontaminated in the asbestos work area or decontamination area must be dedicated to asbestos removal work and double bagged in asbestos waste bags before being removed from the asbestos work area.
- Non-disposable PPE including respirators shall be inspected and wet wiped prior to removing these items from the work area.
- Disposable PPE and all waste generated during the works shall be either wrapped with HDPE sheeting or double bagged in asbestos waste bags, suitably sealed and disposed offsite as Special Waste (asbestos waste) to a licensed landfill.

5.2.4.7 Decontamination of Plant and Equipment

A plant decontamination area shall be designated and maintained at the site during intrusive works which is to remain until completion of the works. Plant and equipment decontamination procedures shall include:

- Placing HDPE sheeting or geotextile on the surface of the designated plant and equipment wash bay prior to commencing decontamination;
- Installing silt fencing or bunding if necessary, to prevent water and/or contaminated soil from leaving the site;
- Using a water truck with hose pipe, or mains water fitted with hose pipe and hand tools for the purpose of decontaminating plant such as excavators, paying particular attention to the undercarriage, track and bucket;
- LAA shall conduct clearance inspection and air monitoring of decontaminated plant and equipment prior to moving offsite; and
- All waste generated during the process shall be either wrapped with HDPE sheeting or double bagged in asbestos waste bags, suitably sealed and disposed offsite as Special Waste (asbestos) to a licensed landfill.

5.2.4.8 Stockpile Management

If the works, such as those identified in Section 5.2.3.1, include the exhumation or stockpiling of soil or landfill waste material, specific precautions must be taken to avoid contamination of the surface layer (e.g., playing surface). This shall include the following stockpile management procedures:

- An HDPE or geotextile liner must be deployed under all stockpiles of soil (and exhumed landfill waste), which shall be shaped to minimise leachate egress and sediment erosion through the construction of underlying earth bunding;
- All stockpiles must be located on gentle (flat) slopes, especially for unstable soils;
- Stockpiles should be designed and shaped to avoid steep sides and that have sharp changes in shape;
- Divert stormwater away from any temporary stockpiles using a catch drain or earth bank;
- Cover stockpiles with mulch, hessian, tarpaulins, geotextile, or stabilisation matting. Use suitable anchors or surcharge to prevent the matting from blowing away.
- Stockpiles of waste materials should be retained on-site for the shortest time possible – that is to say, the stockpiles should be removed off-site as soon as practicable (especially if the soils may contain asbestos fibres);
- If the stockpiles are to remain on-site for a long period of time, inactive soil stockpiles shall be stabilised by establishing vegetation or grass (for example hydroseeding). Landfill waste stockpiles may need an outer layer of topsoil to help establish grass.
- Surround stockpiles with sediment control fences to minimise run-off of material. Inspect the sediment control fence on a regular basis and remove sediment when it is halfway up the sediment control fence, return the material to the stockpile and consider implementing additional controls for effective management.
- Erect fences, screens with shade cloth or use other windbreaks such as trees, hedges and earth-banks of similar height and size to the stockpile.
- Use machinery to contour or scarify across the slope of the surface of the stockpiles to reduce surface water run-off velocity and erosion.
- Suppress dust from small stockpiles using water or chemical dust suppressants (if the chemical selected has been demonstrated to be environmentally benign), apply using a water truck or hand-held hose.
- Exhumation of waste may lead to foul odours being emitted from the site, it is the responsibility of the PCBU to have appropriate controls to minimise or mitigate odour emissions and to inform the relevant authorities of the nature of the work being conducted.

Monitoring controls must be put in place to ensure the measures above operate effectively and as planned. To manage stockpiles, the following measures should be considered:

- Measure and monitor the size and geometry of the stockpiles. Adjust the height and dimensions of stockpiles to control the stability, dust and amenity impacts.

-
- Monitor stormwater catchment diversion controls. Ensure catch drains and earth banks are adequately diverting stormwater.
 - Remove accumulated stockpile material adjacent to sediment control fences and reinforce fences as required.
 - Regularly clean and maintain wind barriers.
 - Where practicable use “real time” downwind dust measurement or boundary video to assess effectiveness of dust management activities.
 - Where necessary be prepared to increase level of dust mitigation if measures are not effective.

5.2.4.9 Asbestos Hygiene

Asbestos-Fibre Air Monitoring

If asbestos is identified, NATA accredited asbestos fibre air monitoring shall be undertaken during the intrusive works by an LAA. Air monitoring must be undertaken in accordance with NOHSC: 3003 (2005) and ISO/IEC 17025 *General requirements for the competence of testing and calibration laboratories 2017*.

Air monitoring results shall be obtained daily. Works shall cease if the air monitoring results are found to be above the reporting limit of 0.01 fibres per millilitre of air (f/ml). Additionally, clearance air monitoring shall be conducted within any closed plant or equipment following decontamination prior to the plant/equipment leaving site.

Emergency procedures shall be followed when air monitoring control levels are exceeded as outlined in Section 5.9.2.

Clearances

Following the completion of daily works, a site walkover shall be undertaken by a LAA to confirm that no visible asbestos materials are present outside the asbestos work area. Prior to any plant/equipment leaving site, a LAA shall conduct a clearance inspection following decontamination. Clearance certificates shall be provided and issued for the site following clearance inspections and at appropriate milestones throughout the removal works.

At the conclusion of works in a specific area, the LAA shall undertake a walkover of the area to confirm that visible asbestos materials in the area have been sufficiently removed and the area has been sufficiently stabilised.

As air monitoring certificates are issued for the site, an accompanying daily update summarising the asbestos-related activities undertaken at the site shall be provided to Council.

5.2.4.10 Transport and Waste Disposal

If the soils require offsite disposal, the material must be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014). If the soil contains asbestos, then the soil will be classified as Special Waste (asbestos waste) with routine chemical characterisation required in accordance with the guidelines prior to disposal offsite to an appropriately licensed landfill facility.

Asbestos materials shall be double bagged in asbestos waste bags and tied in a goose-neck position prior to disposal.

Special Waste (asbestos waste) soils must be directly placed into awaiting trucks, double lined and be leak proof. Asbestos waste shall be tracked for quantities greater than for an area of 10 m² or volumes greater than 100 kg using NSW EPA's Waste Locate <https://wastelocate.epa.nsw.gov.au/>.

5.2.5 Vapours, Landfill Gas and Odour Measures

5.2.5.1 Odour Controls

Work should be completed in a manner that minimises emissions of smoke, fumes and vapour into the atmosphere and malodour emissions.

In the event that deeper excavations are planned and waste is likely to be encountered or disturbed and/or landfill odours are encountered or expected (based on a review of previous investigation data), odour controls should be implemented. This includes odour controls on excavations and stockpiles, particular attention should be paid when excavating and stockpiling soil and materials with a high organic matter content.

The ambient air levels should be monitored and site workers should use appropriate masks and respirators, if required. Odour management procedures may include (but not limited to):

- Covering of stockpiles with an adequately secured low gas permeability covering material such as tarpaulin, builder's plastic or HDPE sheeting.
- Mist sprays containing deodorising or odour suppressing agents.
- Hydrocarbon or any other odour suppressants;
- Maintenance of site works/construction equipment so that exhaust emissions comply with the Clean Air Regulations issued under the POEO Act 1997; and
- Demolition materials and other combustible waste must not be burnt on site.

If volatile organic odours are detected at areas around the site during the site works, PID measurements shall be obtained by the onsite environmental consultant. If PID readings of >30 ppm are recorded, respiratory protection should be worn by the workers in the vicinity of the odour and if readings of >300 ppm are recorded, odour suppressants should be applied.

All practicable measures should be taken to reduce fugitive emissions emanating from the site so that associated odours do not constitute a nuisance and that the ambient air quality is not adversely impacted.

5.2.5.2 Managing Vapour and Landfill Gas Risks

During any intrusive works at the site, the following should be implemented to manage risks to workers from vapours and landfill gas;

- A records sheet is to be set up and completed for each excavator, including area of excavation, date/s of excavation, gas readings (PID and ground gas) and actions;
- Personal gas alarms should be considered as part of the SWMS/JSA process;
- Gas readings should be taken using a gas meter and PID at the surface of any excavation progressively through the entire excavation process. Readings should be taken and recorded twice daily (minimum) during the excavation process. Concentrations of methane, carbon dioxide, hydrogen sulfide, carbon monoxide and oxygen are to be measured using the ground gas meter;
- If any readings exceed the Action Levels specified below, the excavation should cease until the readings fall below the specified action levels. At this point, a water spray should be used ahead of the excavator to minimise the opportunity for sparks to develop; and
- If the gas reading persists at greater than the action levels, the excavation should be abandoned in that area and the Environmental Consultant should be contacted to assess the significance and advice on further actions.

5.2.5.3 Landfill Gas Action Levels

The landfill gas monitoring action levels to be applied during intrusive works have been adopted from the Time Weighted Average (TWA) [and Short Term Exposure Limit (STEL), if available] from the *Safe Work Australia Workplace Exposure Standards for Airborne Contaminants 2019* and confined space criteria outlined in the *NSW WHS Regulation 2017*, which includes the following:

- Methane – equal to or >5 %LEL (in confined spaces as per NSW WHS Regulation 2017)
- Carbon dioxide – equal to or >5,000 ppm (workplace exposure standard - TWA) or 30,000 ppm (STEL)
- Hydrogen sulfide – equal to or >10 ppm (workplace exposure standard – TWA) or 15 ppm (STEL)
- Carbon monoxide – equal to or >30 ppm (workplace exposure standard - TWA)

- Oxygen – equal to or <19.5 %v/v (in confined spaces as per NSW WHS Regulation 2017)

5.3 INSPECTIONS AND ONGOING MONITORING/ASSESSMENTS

5.3.1 General

In order to monitor the effectiveness of the waste exhumation or disturbance, disturbance of asbestos in soils and landfill gas management controls at the site, it is essential that regular inspections are conducted by a suitably trained competent person appointed by the PCBU. Regular visual inspections of the site shall be carried out to ensure that ground cover is maintained and no observed landfill waste and/or asbestos materials are present. Examples of when routine inspections for asbestos materials should be carried out include:

- At monthly intervals (e.g. a walkover of site to ensure that the applications of mulch and/or grass cover, etc. have been maintained and surface landfill waste or asbestos has not become exposed);
- After a period of prolonged heavy rain (e.g. a walkover of site to ensure that the applications of mulch and/or grass cover, etc. have not been damaged or disturbed by heavy rain or surface asbestos has not become exposed);
- Whenever damage or disturbance has been reported; and
- Prior to and following any works that involves soil disturbance.

If landfill waste or asbestos materials become exposed, or areas identified where ground cover appears to be damaged or are no longer effective, these areas should be remediated as soon as practicable.

Based on the assessment of landfill gas (CES 2022a and c), further investigation landfill gas is not considered to be required, with the exception of ongoing building gas accumulation monitoring as described in Section 5.3.3.

NSW EPA 2020 provides detailed discussion of protection methods to be considered for buildings being proposed and in areas at risk from ground gases. Depending on the proposed site works or development of the site, ground gases may have potential to impact built structures or human health. The gas protection measures, to interrupt the pathway between the source and the receptor outside building footprints or at the building, include passive protection measures, active protection measures and management controls and/or monitoring. The most appropriate measures must be selected for the site by a qualified and experienced professional on the basis of the ground gas regime identified by site investigations, the nature of the development on the site and the assessed risks. For developments on the site a project specific landfill gas risk assessment should be undertaken.

Any landfill gas mitigation or management measures applied at the site should also be designed to account for variations (potential increases) in gas flux because of mass loading of any future proposed construction activity.

5.3.2 Site Inspection Checklist

The site inspection checklist shall be completed by suitably trained competent person appointed by the PCBU during the site inspections and records kept within this EMP. Photographs of issues identified at the site, such as exposed soil sections, landfill waste or asbestos material being uncovered across the exposed ground surface, shall be documented, and recorded to help establish whether further remedial/management measures are required.

Issues identified during the site inspection that require corrective action shall be recorded and resolved as soon as practicable and reported to the Management Plan Controller. Relevant documentation regarding site inspections shall be maintained by the PCBU. A site inspection checklist is included in Appendix A of this EMP.

5.3.3 Additional/Ongoing Monitoring (Gas)

A monitoring program or additional assessment rounds of landfill gas should be undertaken. Vapour and landfill gas monitoring should also be undertaken for all open voids being accessed by site workers, including any future surface structures associated with any construction works or storage purposes such as sheds, site offices, amenities blocks and similar. Details of existing landfill gas protection measures and monitoring requirements are presented in the following sub-sections.

Existing landfill gas protection measures

Landfill gas protection measures were included as part of the development of the existing Willoughby Leisure Centre (constructed in 1990). The landfill gas protection measures put in place historically were described in the Hazardous Ground Gas Risk Assessment (Willoughby City Council, May 2022) and summarised as follows:

- Passive ventilation of the subsurface via construction of an accessible void space beneath permanent buildings with permeable walls on the south and sub-floor vents.
- Active gas extraction system.

It is understood that the passive ventilation beneath permanent buildings was achieved by adopting a ‘slab-on piles’ construction such that void spaces are present beneath the slab. These piles are inferred to extend through the entire landfill surface and likely into bedrock. It is also understood that during the construction process capping material appeared to have been removed in some areas and therefore potential exists for exposure to waste materials. The areas beneath the pool

deck and indoor courts could be accessed with access controlled by staff at the leisure centre and secured behind locked gates/ doors.

In addition, a passive sub-floor ventilation is located immediately adjacent the netball courts on the south of the leisure centre buildings. The depth and lateral extent of the passive ventilation network is unknown but low concentrations of bulk landfill gas were recorded with handheld instrumentation (Environmental Earth Sciences, 2019).

The active gas extraction system had two large concrete circular surface ventilation points and it is controlled from within the leisure centre although generally runs in autonomous mode. It had previously been indicated by Council that routine maintenance was completed regularly including calibration of the systems gas sensors. However, the exact design specifications of the active gas extraction systems are not known. Based on a schematic plan noted in the control room which suggested that there were seven vents connected to the active extraction systems across all sub-floor areas and the two external vent points. Although the vent points have been monitored previously, due to their design atmospheric influence on monitoring cannot be discounted.

Recommendations for Additional Landfill Gas Monitoring

The surface structures i.e. concrete slab and service pits, and any indoor areas of surface structures e.g. Willoughby Leisure Centre, future sheds, site offices, amenities buildings and any other new or existing buildings should be monitored for landfill gas on a periodic basis.

If the site is unoccupied, the structures such as the concrete slab and service pits/grates should be monitored on a 3-monthly basis in conjunction with the initial landfill gas monitoring period of 3 months. Landfill gas monitoring should also be undertaken prior to any maintenance works being undertaken. The service pits and similar should also be assessed for landfill gas levels prior to entering or undertaking any works within or near them. Monitoring for indoor areas of surface structures is to be undertaken fortnightly. The procedure for the works is as follows;

- Surface structures and indoor and enclosed space monitoring is to be undertaken by an appropriately qualified person. All site structures are to be monitored during the event;
- When undertaking monitoring of the surface structure or indoor air monitoring, the monitoring equipment inlet should be kept as close as possible to the ground surface and within 200 mm, to detect small fluctuations in gas venting from the subsurface. The field personnel should be appropriately qualified persons and should focus on areas where gas can accumulate such as enclosed spaces, ceiling spaces etc;
- Monitoring should be undertaken using the calibrated gas meter and PID and assessed as per the action levels specified in Section 5.2.5.2;
- Atmospheric data collected from the nearest Bureau of Meteorology weather station for the monitoring period and the week prior should be collected for comparison against

monitoring results. Relevant atmospheric parameters include temperature, rainfall, barometric pressure and wind speed/direction;

- The time of monitoring (start and finish time) should be recorded for comparison against atmospheric data;
- If any readings for gases exceed the action levels, the site and the buildings are to be evacuated immediately and remain so until the reading falls below the action levels. At this point a review of potential entry points to these structures should be investigated and a daily monitoring protocol should be implemented to ensure that levels do not continue to exceed action levels; and
- If the gas reading persists at greater than the action levels, the site or structure should remain evacuated, and the Environmental Consultant contacted to assess the significance and advise on further action.

5.3.4 Ammonia Monitoring in Creek and Groundwater

An ammonia monitoring program, which includes six (6) monthly monitoring events over a period of 3 years of Rock Flat Creek at three locations (two downstream (DS and DSS) and one upstream (US)) and two existing groundwater wells (GW107-downgradient and GW101-upgradient).

The monitoring will include testing for field parameters (pH, EC, temperature, Dissolved Oxygen and Redox Potential) and laboratory testing of collected water samples by a NATA accredited laboratory for ammonia.

The objective of the programme of ammonia monitoring is to establish fluctuations in ambient ammonia concentrations and responses to seasonal changes and climatic events and to ascertain if natural attenuation of ammonia is occurring at the site. The monitoring will provide information to ascertain whether an Ecological Risk assessment of Flat Rock Creek is warranted.

The results of the ammonia monitoring program will be communicated via EMP Inductions and tool box talks for work that may potentially encounter contaminated groundwater.

5.4 MANAGEMENT STRUCTURE AND RESPONSIBILITIES

These are documented in Section 2.4 of this EMP.

5.5 INDUCTIONS, TRAINING AND HEALTH MONITORING

5.5.1 Toolbox Talks

When conducting any works at the site with the potential for soil disturbance or exposure to landfill gas, all relevant site personnel shall undertake a toolbox talk to ensure that employees and

contractors are adequately trained to recognise environmental and work, health and safety issues on a regular basis.

The toolbox talk should incorporate details and instructions on how to identify landfilled waste materials, manage asbestos-impacted soils or landfill risk that may be encountered whilst undertaking works at the site, in accordance with this EMP.

5.5.2 Inductions

The EMP Controller (Council Superintendent) shall provide induction training with regard to the requirements of this EMP. Induction to this EMP for all new employees and contractors working at the site should be undertaken prior to the commencement of work and on a regular basis thereafter and as and when deemed necessary.

As part of the induction, the EMP Controller (Council Superintendent) must examine the works to be performed, determine whether the works will exhume or encounter landfilled waste or impact on asbestos-impacted soils or has potential landfill gas risk and advise what activities should and should not be undertaken. The induction shall include information such as (but not limited to):

- The known extent of landfilled waste and characteristics and describe the potential for encountering asbestos and landfill gas;
- Provide an indication of the type of asbestos materials potentially present within site soils;
- Provide an indication of the potential for encountering surface water (culvert and drain) and groundwater contamination and landfill gas;
- Detail the necessary permits that are required (e.g. SWMS/ARCP/hot works) and prescribe the control measures to be adopted and appropriate personal protective equipment (PPE) and decontamination procedures to be undertaken; and
- Explain the Unexpected Finds Protocol.

Records of contractors and personnel who have attended the EMP induction(s) should be maintained in Appendix C of this EMP.

5.5.3 Asbestos Awareness Training

In accordance with Section 6.3 of the *NSW Code of Practice: How to Manage and Control Asbestos in the Workplace 2019*, all employees, contractors and subcontractors whose normal work duties present a reasonable likelihood of disturbing or coming into contact with asbestos must be provided with asbestos awareness training. This shall include vegetation maintenance contractors, other contractors involved in soil disturbance, and any contractors and employees involved in the management of the site.

It is the responsibility of the EMP Controller (Council Superintendent) to ensure personnel have been provided with appropriate information and instruction about the risks and controls necessary to do their work safely with regards to asbestos related health risks at the site.

Regular reinforcement of the asbestos related health risks and control measures shall be provided during toolbox talks, with supervision provided for inexperienced workers, when conducting routine maintenance works and completing site inspections at the site.

The information in the asbestos training shall address the following aspects:

- Background information on asbestos;
- The health risks of exposure to asbestos;
- How to identify asbestos and the different asbestos products;
- Legislative requirements and roles and responsibilities of personnel;
- Sources and general locations of asbestos at the site (as noted on a site plan);
- Safe work procedures to be followed with examples to prevent exposure;
- The correct use of PPE including respiratory protective equipment (RPE);
- How to implement control measures and safe work methods at the site to eliminate or minimise the risk or exposure to workers and occupants of the site;
- When licenced asbestos removal works are required (i.e., for any intrusive works); and
- Air monitoring requirements and exposure standard for airborne asbestos.

The LARC must ensure their personnel who are involved in asbestos remedial works are trained in accordance with the code of practice and regulatory requirements.

The PCBU shall ensure appointed competent persons involved in general maintenance activities or minor asbestos remedial works at the site have completed asbestos awareness training (as a minimum). For the definition of minor asbestos remedial works refer to Section 5.10.1

A record of asbestos awareness training attendees and the date the training was undertaken shall be maintained by the EMP Controller (Council Superintendent).

5.5.4 Landfill Gas Awareness

Landfill gas and vapour have the potential to be present on site, landfill gas has the potential to pose an explosive and/or asphyxiant risk above certain concentrations. Surface emissions of landfill gas and vapour also has the potential to accumulate in temporary site offices and other structures and buildings on site.

Service pits and excavations should be considered confined spaces and potentially hazardous work areas unless cleared under a hot-work and confined space permit to work system.

All employees, contractors and subcontractors whose normal work duties presents a reasonable risk of encountering landfill gas or vapours should be provided with environmental landfill gas awareness training.

This shall include workers involved in excavation work or maintenance of service pits and other enclosed areas and confined spaces on site. Landfill gas awareness training should also be given to gardeners, grounds persons, vegetation maintenance contractors, subsurface services maintenance contractors and any other contractor or personnel whose work activity involves disturbance to the soil or service pit maintenance. Landfill Gas Awareness Training should also be given to Council employees responsible for the management of the site.

5.5.5 Health Monitoring

As per Clause 435 of the *WHS Regulation 2017*, the appropriate PCBU has a duty to provide health monitoring to a worker carrying out ongoing asbestos-related work and is at risk of exposure to asbestos when carrying out the work.

Based on the results of the *Addendum to the Environmental Site Investigation* (CES, 2022) for the site, minor concentrations of asbestos were identified within the soils, with a low likelihood of generating airborne respirable fibres during soil disturbance (based on the saturated ground conditions encountered during the assessment). As such, health monitoring is not considered to be mandatory for workers involved in the management and maintenance of the site. However, if site conditions change, such as the ground dries out or the grass thins, this risk may change, and health monitoring may be required.

Exposure air monitoring shall be conducted during routine maintenance works that may disturb soils at the site by an LAA to ensure that airborne asbestos fibre concentrations are maintained at concentrations representative of background levels. If concentrations indicate potential for exposure to exist, this will trigger the need for mandatory health monitoring for workers.

5.6 LEGISLATIVE REQUIREMENTS

The EMP has been developed in general accordance with the following legislation, industry standards, codes of practice and guidance documents and other reference documents stated throughout this document:

- Australian Standard (AS) 4964 Method for the qualitative identification of asbestos in bulk samples 2004;
- AS2985 Workplace atmospheres - Method for sampling and gravimetric determination of respirable dust 2009;

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- AS 3640 Workplace atmospheres - Method for sampling and gravimetric determination of inhalable dust 2009;
 - AS1319 Safety signs for the Occupational Environment 1994;
 - Australian/New Zealand Standard (AS/NZS) 1716 Respiratory Protective Devices 2012;
 - AS/NZS 1715 Selection, use and maintenance of respiratory equipment 2009;
 - Contaminated Land Management Act 1997;
 - Contaminated Land Management Act Amendment 2008;
 - Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition [NOHSC:3003(2005)];
 - NSW Work, Health and Safety Act 2011;
 - NSW Work, Health and Safety Regulation 2017;
 - NSW Government (2019) *Code of Practice Confined Spaces*
 - NSW Code of Practice: How to Manage and Control Asbestos in the Workplace 2019;
 - NSW Code of Practice: How to Safely Remove Asbestos 2019;
 - National Environmental Protection (Assessment of Site Contamination) Measure (NEPM), Amendment No. 1, April 2013 (NEPM 2013);
 - NSW EPA Contaminated Land Guidelines, Consultants reporting on contaminated land 2020;
 - NSW EPA Waste Classification Guidelines: Part 1 – Classifying Waste 2014 (NSW EPA 2014);
 - NSW EPA Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, September 2015 (NSW EPA 2015);
 - NSW EPA Assessment and Management of Hazardous Ground Gases Contaminated Land Guidelines 2019, amended 2020 (NSW EPA 2020);
 - NSW EPA Environmental Guidelines: Solid Waste Landfills, 2nd Edition 2016;
 - NSW Government (2019 Code of Practice Managing the Risk of Falls at Workplaces
 - NSW Government (2019) Code of Practice Managing the Work Environment and Facilities
 - NSW Government (2019) Code of Practice Managing Risks of Hazardous Chemicals in the Workplace
 - NSW Government: Managing asbestos in or on soil (catalogue no. WC01253) 2014;

- Protection of the Environment Operations (POEO) Act 1997;
- POEO (Waste) Regulation 2014;
- Safe Work Australia, Code of Practice – Construction Work 2014; and
- Safe Work Australia, Code of Practice – Excavation Work 2015.
- Safe Work NSW (2004) Code of Practice Moving Plant on Construction Sites
- Safe Work Australia (2018) Code of Practice Work Health and Safety Consultation Cooperation and Coordination
- WA Department of Health Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia 2021 (WA DOH 2021);

5.7 **REPORTING REQUIREMENTS**

The reporting requirements are documented in Section 2.3 of this EMP.

5.8 **COMMUNICATION PROTOCOLS**

The communication protocols are documented in Section 2.3 of this EMP.

5.9 **INCIDENT AND EMERGENCY RESPONSE**

In the event that an activity causes soil disturbance to expose asbestos materials or cause disturbance to asbestos materials, or if air monitoring detects an exceedance in regards to respirable airborne fibres above the action levels; or if landfill gas concentrations exceeds the prescribed action levels, the following section outlines the steps which shall be followed:

Table 2: Incident Response Procedure

Step	Responsible Person	Action
1	Occupant / Worker / Contractor	<ul style="list-style-type: none"> • Stop work and immediately notify the Site Supervisor and EMP Controller (Council Superintendent).
2	EMP Controller (Council Superintendent) [or authorised delegate of the EMP Controller]	<ul style="list-style-type: none"> • Remove personnel from the area who are potentially at risk of exposure. • Restrict access to the area with barricading and signage and contain the impacted area.
3	EMP Controller (Council Superintendent)	<ul style="list-style-type: none"> • If a competent person has deemed any asbestos contamination to be minor surface contamination (i.e. bonded ACM and <1 m²) then the competent person may proceed to conduct minor asbestos remedial method, as detailed in Section 5.9.1. • If asbestos contamination is identified >1 m² or friable or if there is a landfill gas exposure risk, the PCBU shall contact Environmental Consultant / LAA to conduct a risk assessment to determine appropriate course of action.
4	EMP Controller (Council Superintendent) / Environmental Consultant / LAA	<ul style="list-style-type: none"> • Environmental Consultant / LAA shall conduct a risk assessment and (if required) sampling and analysis in accordance with relevant NSW codes of practice and guidelines.

Step	Responsible Person	Action
		<ul style="list-style-type: none"> If deemed required by the risk assessment, the PCBU shall engage LARC to conduct emergency remedial works.
5	LARC / Environmental Consultant / LAA	<ul style="list-style-type: none"> LARC should perform emergency remedial works. Environmental Consultant / LAA shall perform asbestos air monitoring or landfill gas monitoring during remedial works (as required).
6	Environmental Consultant / LAA	<ul style="list-style-type: none"> LAA shall perform clearance inspection and asbestos air monitoring within removal works area (if required) to ensure the area is suitable for reoccupation. Environmental Consultant / LAA to provide validation report and/or asbestos clearance certificate based on satisfactory clearance inspection / validation of remedial works (where required). All asbestos air monitoring results must be below the lowest detectable limit of <0.01 fibres/ml in accordance with the NOHSC:3003(2005).
7	EMP Controller (Council Superintendent) / LARC / Environmental Consultant / LAA	<ul style="list-style-type: none"> Remove barricades and environmental controls. Environmental Consultant / LAA should submit validation report / clearance to EMP Controller (Council Superintendent) for distribution to PCBU and appropriate regulatory authorities (as required).

5.9.1 Minor Asbestos Remedial Works Procedure

For the purpose of this EMP, minor asbestos remedial works at the site are defined as the following:

- Minor quantity of surface ACM removal, such as less than 5 small pieces of fibre cement fragments; and/or
- Minor area of exposed soil surface (<10 m²) requires surface cover re-instatement.

If minor asbestos remedial works are required, the following requirements/procedure may be undertaken by a suitably trained competent person appointed by the PCBU, who has undertaken the induction and training requirements described in Section 5.5:

- The competent person should wear the following PPE when undertaking minor asbestos remedial works:
 - A half face respirator with P3 particulate filter. The respirator should adequately fit and maintain an airtight seal. Where this is not able to be provided, for example due to the presence of facial hair, a full face respirator or hood type powered air purifying respirators (PAPR) fitted with P3 filters should be worn;
 - Disposable Type 5/6 coveralls;
 - Disposable gloves;
 - Disposable boot covers or footwear that can be easily decontaminated;

- The competent person should collect the fragment(s) and place them in a 200 µm thick asbestos waste bag, double bag the collected material and tie in a ‘goose neck’ position for disposal offsite as Special Waste (asbestos waste) at a suitably licensed waste disposal facility;
- If suspected ACM continues to be identified, or a large amount of ACM is identified (>5 small fragments per 1 m²); or it is suspected that the uncovered material may contain friable asbestos, works shall immediately cease in the area.

The area should be contained and isolated, for example using barricades and securely covering with geotextile and/or HDPE sheets. The area should be made secure until such time that an assessment can be undertaken by a LAA and an appropriate course of action determined (which may include engaging a LARC to conduct emergency asbestos remedial works); and

- All personnel involved with the minor asbestos remedial works procedure shall ensure thorough personal decontamination is conducted following the works and all waste generated during the process is disposed offsite as Special Waste (asbestos waste).

5.9.2 Elevated Asbestos Fibre Air Monitoring Results

If during asbestos related/asbestos removal work, air monitoring results exceed the method detection limit of 0.01 fibres/ml of air, the existing controls will need to be reviewed and improved before work can continue.

The following table provides the procedure to be followed depending on the air monitoring result.

Table 3: Elevated Asbestos Fibre Air Monitoring Results Procedure

Action Level	Responsible Person	Control / Action
>0.02 fibres/ml (i.e. ≥0.03 fibres/ml)	LAA	<ul style="list-style-type: none"> • Notify LARC of results as soon as practicable.
	LARC	<ul style="list-style-type: none"> • Stop work immediately. • Notify the regulator by phone or in writing with air monitoring result and that removal works have ceased.
	LARC	<ul style="list-style-type: none"> • Erect signage and barricades around asbestos work area to restrict access.
	LAA / LARC	<ul style="list-style-type: none"> • Investigate the cause for the exceedance. This is to be performed by visual inspection of the work area and equipment in consultation with workers. • Once suspected cause is identified existing controls to be reviewed and new and/or improved controls to be implemented.
	LAA	<ul style="list-style-type: none"> • Conduct additional air monitoring around the asbestos work area once new controls have been implemented. • Works must not recommence until air monitoring results are <0.01 fibres/ml.

Action Level	Responsible Person	Control / Action
≥0.01 fibres/ml but ≤0.02 fibres/ml	LAA	<ul style="list-style-type: none"> Notify LARC and PCBU of results as soon as practicable.
	LAA / LARC	<ul style="list-style-type: none"> Investigate potential cause for the exceedance. Existing controls to be reviewed and new and/or improved controls to be implemented where applicable.
<0.01 fibres/ml	LARC	<ul style="list-style-type: none"> Continue with existing control measures.

6 MONITORING AND REVIEW OF THE EMP

6.1 DOCUMENT REVIEW

Due to the anticipated long-term implementation of this EMP, periodic review, revision and re-issue of the EMP will be necessary to respond to such circumstances as changes in land use, project objectives, amendments to planning and/or statutory requirements and identified improvements to the EMP as a results of non-compliance incidents or EMP audit findings etc. It is recommended that this EMP is reviewed at least on an annual basis.

When revision of the EMP is undertaken, the following procedure should be followed:

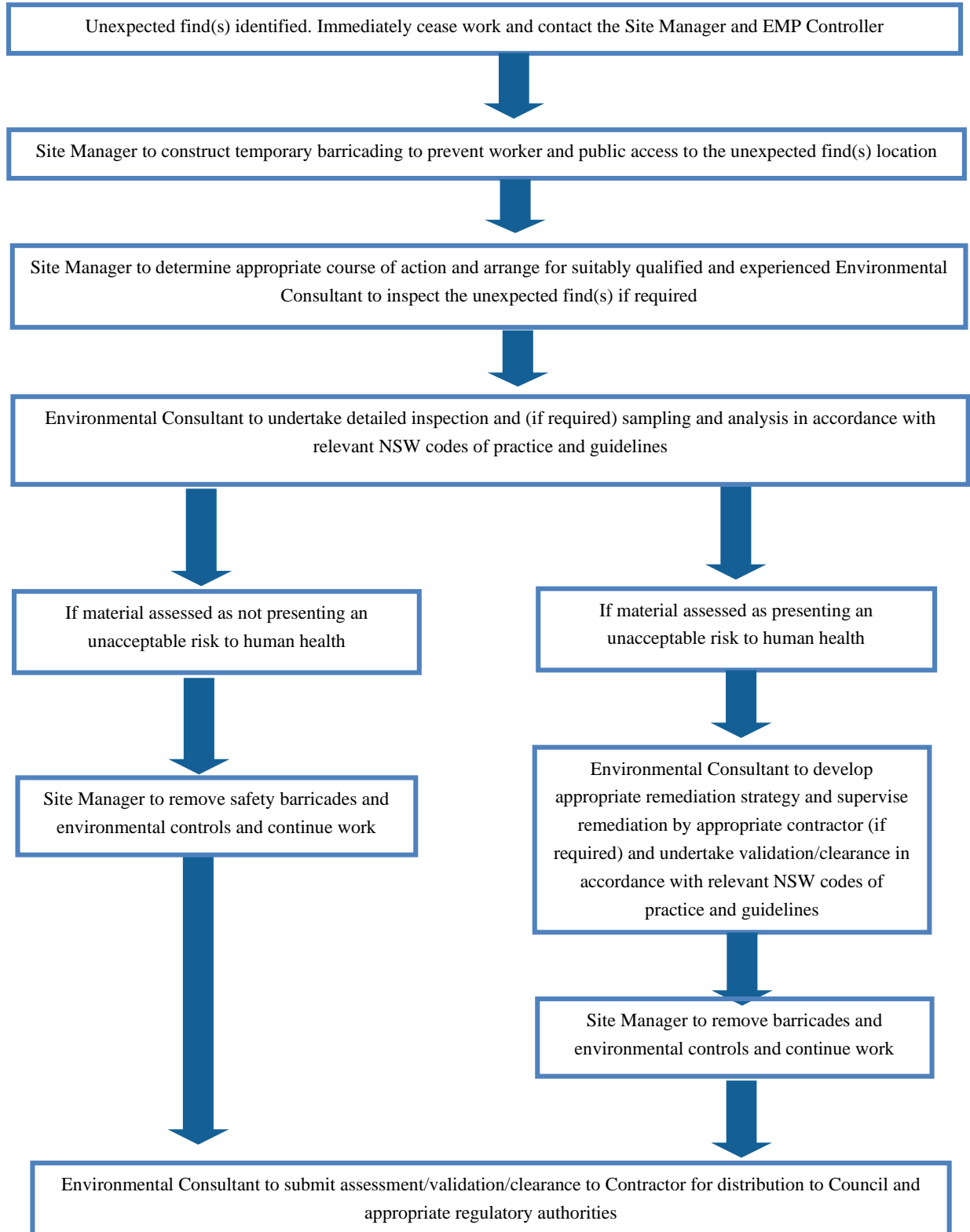
- Review of the EMP should be undertaken by an appropriately qualified and experienced environmental practitioner;
- The EMP should be amended to consider the recommendations of the environmental practitioners review;
- Any changes to the EMP should be clearly documented and identified, including reasons for the review and amendment; and details, records and responses to audits and non-compliances and identify where the environmental practitioners recommended updates have been implemented.;
- The EMP should be re-issued and relevant workers, contractors and Council staff and management made aware of the update and updated requirements of the EMP.

6.2 RECORD KEEPING

The EMP review report should be retained for a minimum of five years.

7 UNEXPECTED FINDS PROTOCOL

The procedure below details the actions to be taken should any unexpected finds be encountered at the site. For a broad definition of Unexpected Finds, please see Note 1 below.



Note 1: Bicentennial Reserve is the site of a former and as such excavations and other works into materials at the site may encounter unexpected materials or objects. As the term suggest, definition of unexpected materials is difficult to define, however unexpected materials would typically be considered to include:

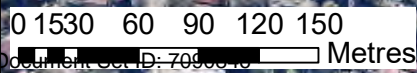
- Buried objects and structures, such as buried drums, large block of concrete, automotive components and engine bodies, tyres, vehicle batteries, mattresses, abandoned shopping trolleys and discarded domestic appliances (refrigerators, televisions, cookers, computers etc.)
- Malodorous putrescible materials such as household garbage, buried vegetation and ‘green’ waste which may be a concern if buried in significant quantities.
- Sharp objects such as sharp metal fragments, glass fragments and broken bottles.
- Hazardous, flammable or toxic substances such as tins of paints and varnishes, oils, fluorescent light bulbs, batteries, discarded gas bottles, discarded household cleaning agents (bleaches, detergents, pesticides, swimming pool chemicals etc.)
- Contaminants not previously identified and described in the below listed reports (as summarised in Section 4 of this EMP) or identified in any project management plans (and sub-plans) or identified during site work specific investigations.
 - Consulting Earth Scientists (2022a), *Environmental Site Investigation, Bicentennial Reserve Former Landfill, Small Street, Willoughby, NSW 2068* (CES210306-WIL-AD, 5 April 2022);
 - Consulting Earth Scientists (2022b), *Addendum to Environmental Site Investigation, Bicentennial Reserve Former Landfill, Small Street, Willoughby, NSW 2068* (CES210306-WIL-AG, 30 June 2022);
 - Consulting Earth Scientists (2022c), *Addendum No. 2 to Environmental Site Investigation, Bicentennial Reserve Former Landfill, Small Street, Willoughby, NSW 2068* (CES210306-WIL-AG, 14 November 2022);
 - EDP Consultants Pty Ltd, *Letter of Advice and Risk Assessment – Asbestos Contamination within Bicentennial Reserve Oval, Willoughby. (Ref: S-04382.LOR.002, 21 June 2022)*;
- Any materials or objects that an experienced and qualified contractor or tradesperson having reviewed the available reports and documentation would not expect to encounter and which is not addressed in the contractor/tradespersons relevant work method statements, SWMS/JSA, working procedures and documentation etc.

Figures



Legend

Approximate Site Boundary



Source: NearMap



Former Walter Burley Griffin Incinerator

Willoughby Leisure Centre

Hallstrom Park

Bicentennial Reserve Oval

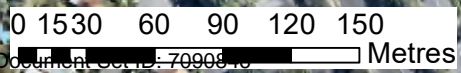
Flat Rock Baseball Diamond

Legend

- Approximate Site Boundary
- Flat Rock Creek

Sample Locations

- Existing
- Soil
- Surface Water
- Groundwater

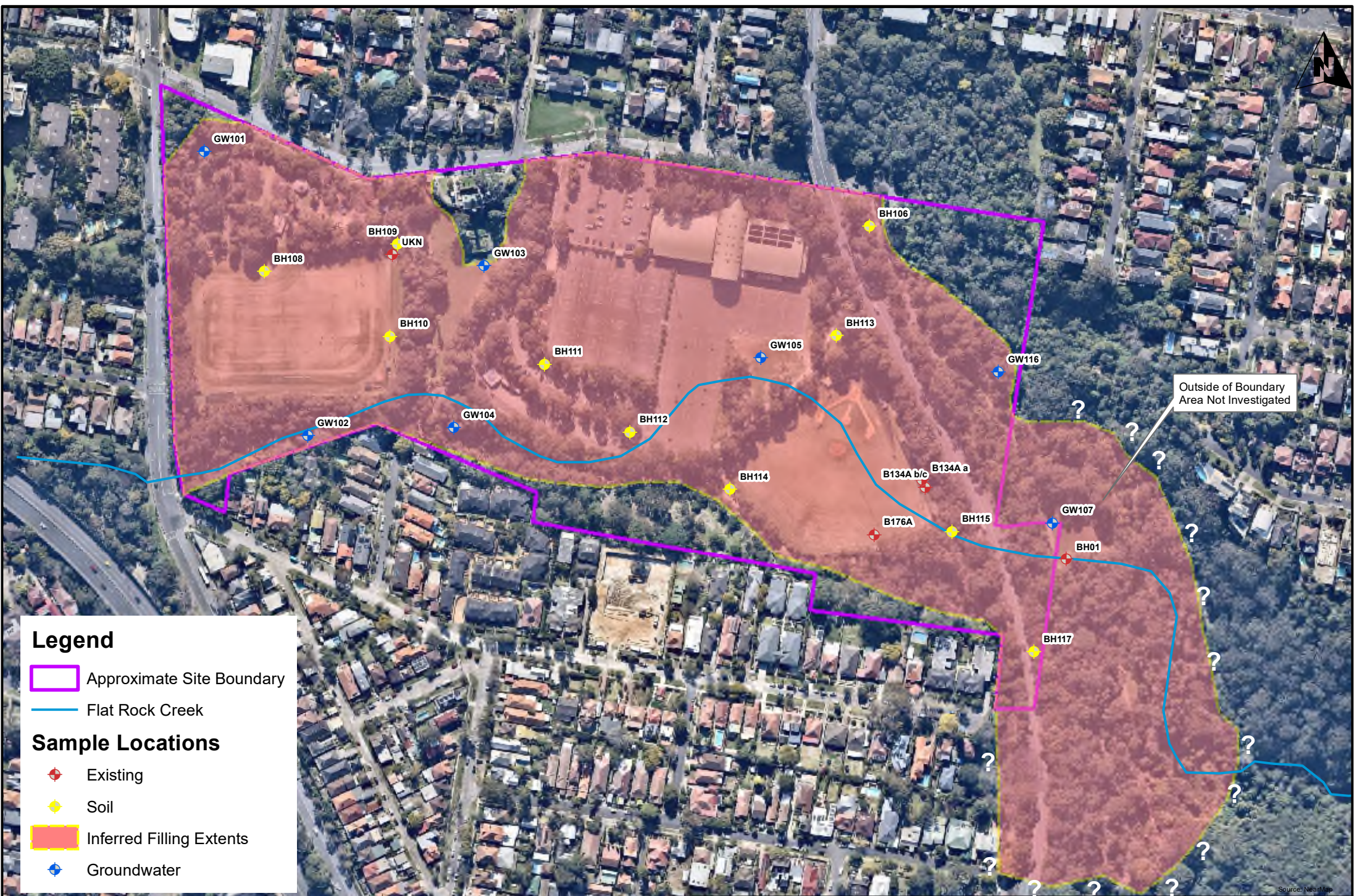


CONSULTING EARTH SCIENTISTS
 Suite 3, Level 1
 55 Grandview Street, Pyrmont, NSW, 2073
 ph 8569 2200 fax 9953 0582

Title: **Figure 2: Site Layout Plan**

CES Project ID: CES210306-WIL	Date: 15/12/2021
Prepared By: T. Goodbody	Checked By: M. Challoner





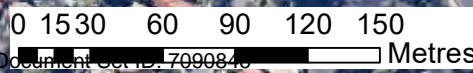
Outside of Boundary Area Not Investigated

Legend

- Approximate Site Boundary
- Flat Rock Creek

Sample Locations

- ◆ Existing
- ◆ Soil
- Inferred Filling Extents
- ◆ Groundwater



CONSULTING EARTH SCIENTISTS
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Title: **Figure 3: Inferred Filling Extents Plan**

CES Project ID: CES210306-WIL	Date: 15/12/2021
Prepared By: T. Goodbody	Checked By: M. Challoner



1.9 to 2.0 m
EIL
Benzo(a)pyrene 0.91 mg/kg

1.9 to 2.0 m
EIL
Benzo(a)pyrene 1.9 mg/kg

2.9 to 3.0 m
HIL
Benzo(a)pyrene TEQ 6.6 mg/kg

5.9 to 6.0 m
HIL
Benzo(a)pyrene TEQ 5.4 mg/kg

1.9 to 2.0 m
HIL
Benzo(a)pyrene TEQ 3.2 mg/kg
EIL
Benzo(a)pyrene 2.2 mg/kg

14.9 to 15.0 m
TRH Management Limits
TRH Fraction 2 1,000 mg/kg
TRH Fraction 3 21,000 mg/kg
HIL
Benzo(a)pyrene TEQ 7.7 mg/kg
Chromium 18,000 mg/kg
Nickel 5,600 mg/kg

4.9 to 5.0 m
HIL
Total PCBs 3.3 mg/kg

2.0 3.0 m
HIL
Benzo(a)pyrene TEQ 6.5 mg/kg

Legend

Approximate Site Boundary

Flat Rock Creek

Sample Locations

Existing

Soil

Groundwater

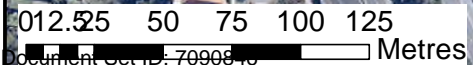


Figure 4: Soil Exceedance Plan

CES Project ID: CES210306-WIL	Date: 24/02/2022
Prepared By: T. Goodbody	Checked By: M. Challoner

Appendix A

Site Inspection Checklist

Site Inspection Records

Date of Inspection	Name (print)	Position	Area Inspected		
I confirm that the site has been inspected on the above-mentioned date. Actions identified will be tracked and monitored until all are implemented.					
Signature					
Item Description	Y/N/ NA	Location	Action Required	Name of person responsible for action	Date to be implemented
Is the surface cover adequate?					
Is suspected ACM visible?					
Is there evidence of significant erosion at the site? (i.e. weathering of surface soils, with bare soils evident etc.)					
Is the contamination considered to represent minor contamination? Can in-house minor asbestos remedial method be conducted or LARC required?					

Site Inspection Records

Item Description	Y/N/ NA	Location	Action Required	Name of person responsible for action	Date to be implemented
Is there any risk of exposure to landfill gas, surface water (culvert or drains) or groundwater?					
Further observations/ comments:					

Appendix B

NSW EPA Exhumation of Waste Form

Assessment Table for the approval for exhumation of waste from landfill

The below table is to be completed in the review of any application for the proposed exhumation of waste from a current or former landfill by the EPA, unless the works have already been approved in the EPA.

1. Prerequisite for Approval

Approval should only be granted where the works are necessary for one of the following reasons:

- part of managing normal or day-to-day operations at an operating landfill e.g. maintenance work
- a project or upgrades to ensure that former landfill sites are maintained and operate safely and do not harm the environment or human health
- necessary road, rail or other transport or utilities infrastructure work

The application must also demonstrate that risk of harm to human health and the environment have been appropriately identified, assessed and appropriate measures have been implemented to mitigate those risks.

These prerequisites need to be considered in completing the assessment table below.

2. Complete assessment table

Requirement	Proponent Response	Review Comments			
Project name					
Project Manager					
Contact					
Contractor carrying out works					
<ul style="list-style-type: none"> • Contact 					
Approvals					
<ul style="list-style-type: none"> • Land owner • Planning approval 					
Landfill information					
<ul style="list-style-type: none"> • Current or previous Environment Protection Licence number • Waste type in landfill e.g. hazardous, putrescible etc • If no longer operating, the closure date 					
Purpose of exhumation					
i.e. geotechnical investigations, repair to [insert type] equipment					
Specific activities and locations					
<ul style="list-style-type: none"> ▪ Provide details to demonstrate risks identified e.g. drilling, excavation of [insert m2] area ▪ Has any impact to known landfill infrastructure been identified? i.e. cap and cover, liners, leachate and gas management ▪ What are the controls to address these impacts? ▪ Evidence of development consent and landowner consent for proposed exhumation 					
Waste management information					
<ul style="list-style-type: none"> ▪ How much waste will be exhumed (total and per activity) ▪ What types of waste will be exhumed? (Asbestos? Etc.) ▪ What is the handling and disposal plan? ▪ Leachate and rain water management plan? 					
Environmental risks					
Air quality					
<ul style="list-style-type: none"> ▪ What are the expected odours, dust or other impacts? ▪ What are the controls to manage these impacts? 					
Operational plans					
<ul style="list-style-type: none"> ▪ When does exhuming start (date and time) ▪ For how long will exhumation continue? 					

<ul style="list-style-type: none"> • If not continuous please describe intermittent program ▪ Actions following exhumation to reseal openings? ▪ Any expected issues? 					
<p>Community and receivers/Human health risks</p> <ul style="list-style-type: none"> ▪ What and how many nearby receivers are there? ▪ How are receivers/community been advised of potential impacts? Provide details 					

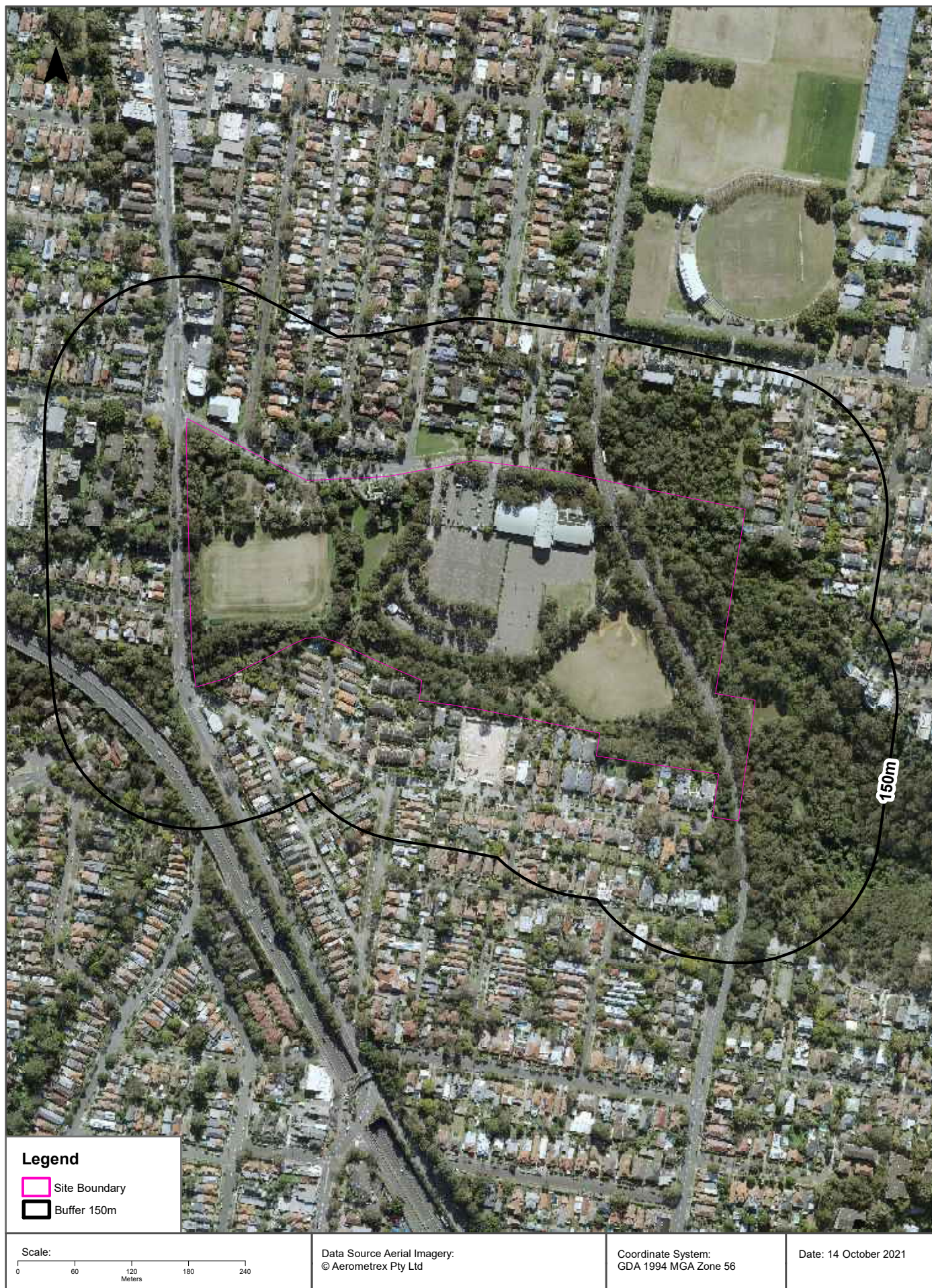
Appendix C

Site Induction and Training Register

Appendix D
Selected Historical Aerial Photographs of the Site
Since *circa.* 1955, 1956

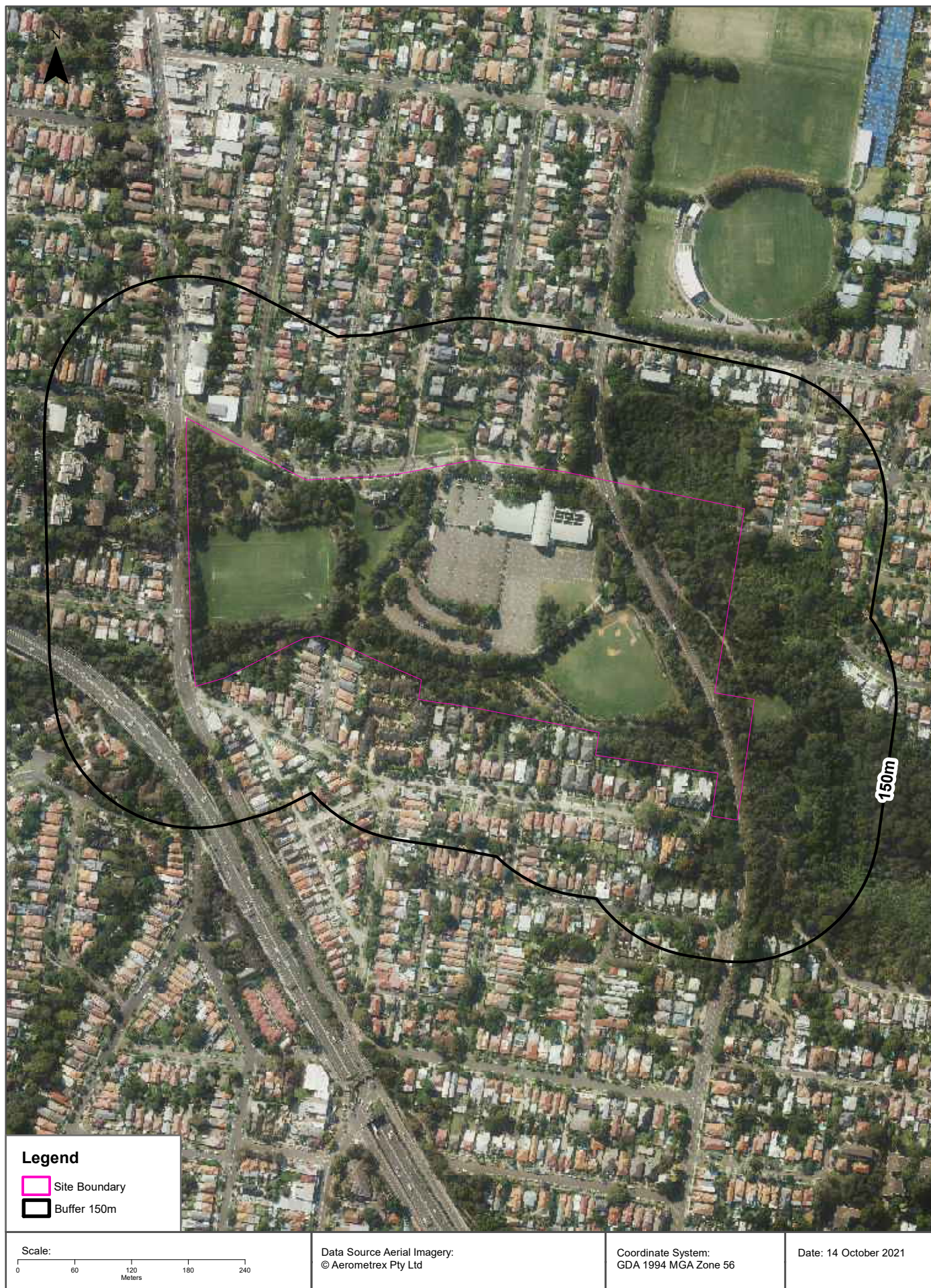
Aerial Imagery 2021

2-4 Small Street, Willoughby, NSW 2065



Aerial Imagery 2016

2-4 Small Street, Willoughby, NSW 2065



Aerial Imagery 2011

2-4 Small Street, Willoughby, NSW 2065



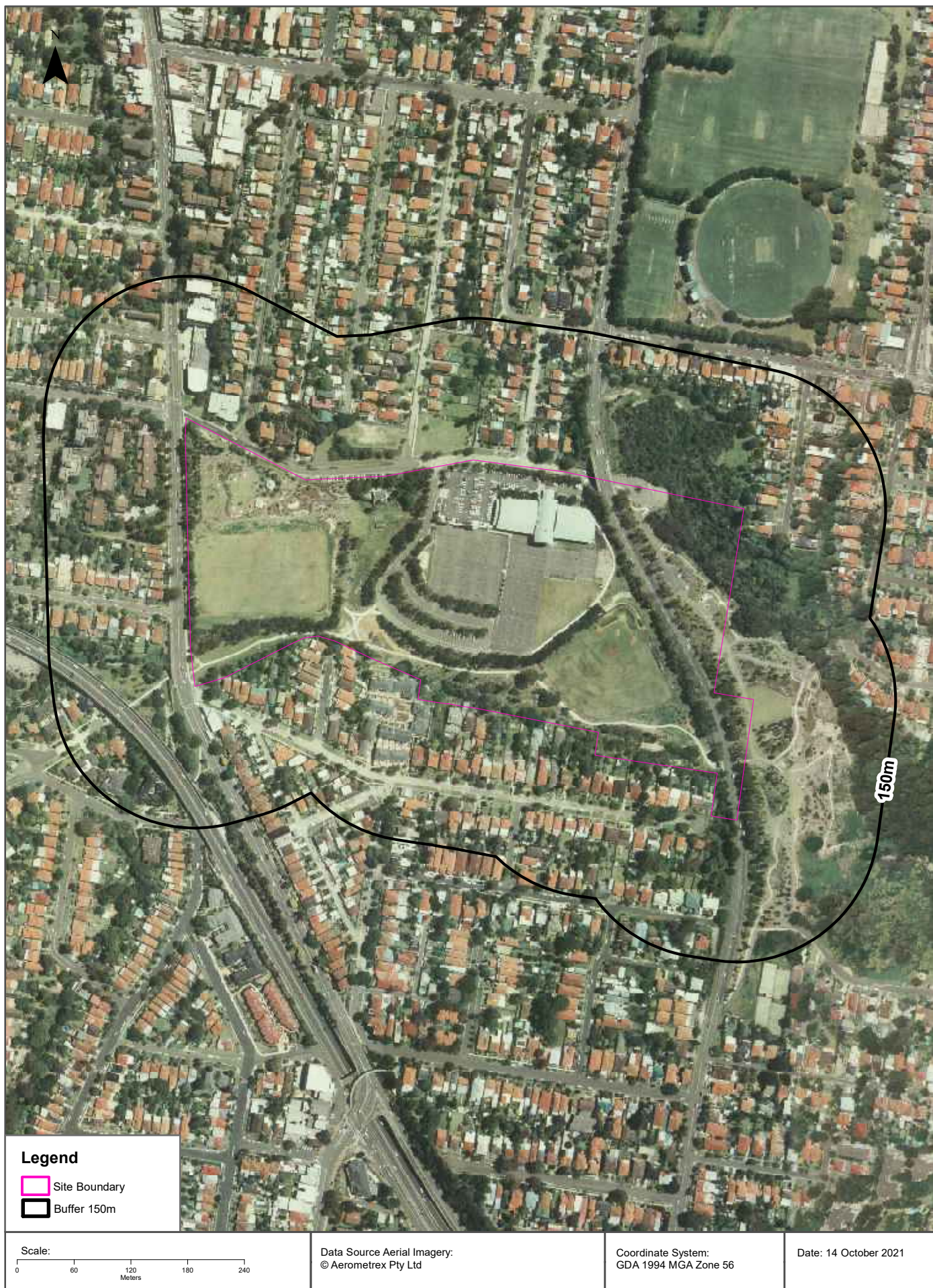
Aerial Imagery 2005

2-4 Small Street, Willoughby, NSW 2065



Aerial Imagery 2000

2-4 Small Street, Willoughby, NSW 2065



Aerial Imagery 1994

2-4 Small Street, Willoughby, NSW 2065



Aerial Imagery 1991

2-4 Small Street, Willoughby, NSW 2065



Aerial Imagery 1986

2-4 Small Street, Willoughby, NSW 2065





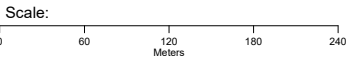
Aerial Imagery 1982

2-4 Small Street, Willoughby, NSW 2065



Legend

-  Site Boundary
-  Buffer 150m



Data Sources: Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 56

Date: 14 October 2021

Aerial Imagery 1978

2-4 Small Street, Willoughby, NSW 2065



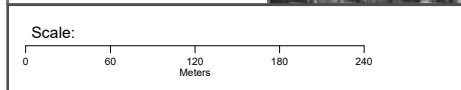
Aerial Imagery 1970

2-4 Small Street, Willoughby, NSW 2065



Legend

- Site Boundary
- Buffer 150m



Data Sources: Aerial Imagery:
© NSW Department of Customer Service

Coordinate System:
GDA 1994 MGA Zone 56

Date: 14 October 2021

Aerial Imagery 1955, 1956

2-4 Small Street, Willoughby, NSW 2065



Appendix E

Flow Diagram for Contractors Intrusive Works Procedure

The procedure below details the actions to be taken by contractors when carrying intrusive works on the site as follows:

