



Light Rail Stage 2A

Environmental Assessment – Contamination

15th December 2022

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Light Rail Stage 2A

Environmental Assessment – Contamination



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Acronyms and Abbreviations

Name	Description
ACM	Asbestos Containing Material
ACT EPA	Australian Capital Territory (ACT) Environment Protection Authority
AHD	Australian Height Datum
AMG	Australian Map Grid
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013)
ASS	Acid Sulfate Soils
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CoPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DP	Deposited Plan
DPI	Department of Primary Industries
DSI	Detailed Site Investigation
EPA	Environment Protection Authorisation
EPP	ACT EPA (2017) Contaminated Sites Environment Protection Policy (December 2017)
ESA	Environmental Site Assessment
LRS2A	Light Rail Stage 2A
m	Metre
m AHD	Metres Above Australian Height Datum
m bgl	Metres Below Ground Level
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NPI	National Pollutant Inventory
OCP	Organochlorine Pesticides
OPP	Organophosphorus Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PFAS	Per and Polyfluoroalkyl Substances
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulphonate
PSI	Preliminary Site Investigation
RAP	Remedial Action Plan
RCIP	Regional Contamination Investigation Program
SAQP	Sampling and Analysis Quality Plan
TRH	Total Recoverable Hydrocarbons

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by Major Projects Canberra (MPC) to undertake an assessment of potential contamination issues that may require consideration during completion of the project identified as Light Rail Stage 2A (LRS2A) Canberra, ACT (the Site).

The LRS2A alignment extends the current alignment from the Alinga Stop 1.7 km south to Commonwealth Park on the north side of Lake Burley Griffin (LBG). It also includes three new Light Rail Stops: Edinburgh Avenue, City South and Commonwealth Park.

- ERM notes that potential contamination associated with the RLC project has been reported within the ERM (2021) Raising London Circuit, Environmental Assessment – Contamination, 29 September 2021 Rev 3 Ref No 052711; and
- The Site location is illustrated on Figure 1 and the current layout is illustrated on Figure 2.

1.1 Objective

The objective of these works was to undertake a review of site conditions to inform the Environmental Assessment being prepared by AECOM Australia Pty Ltd (AECOM) and facilitate the appropriate consideration and management of contamination issues that may arise during future stages of the approvals and development process.

1.2 Scope of Works

To meet the project objectives, ERM completed the following scope of works:

- Review of background information relating to the Site, including:
 - Previous investigations relating to site contamination;
 - The ACT EPA contaminated land database;
 - Historical aerial photographs;
 - Groundwater bore information;
 - Relevant government databases; and
 - Published soil, geology and topographic maps.
- Development of a preliminary Conceptual Site Model (CSM);
- Assessment of potential risks to construction in consideration of proposed construction works; and
- Preparation of this report.

This report was developed with consideration of the relevant parts of the following guidelines:

- *National Environment Protection (Assessment of Site Contamination) Measure 1999* (ASC NEPM (1999)) (as amended May 2013) - herein referred to as the ASC NEPM (2013);
- Australian Capital Territory (1997) *Environment Protection Act 1997* – herein referred to as the Act; and
- ACT EPA (2017) *Contaminated Sites Environment Protection Policy (December 2017)* – herein referred to as the Contaminated Sites EPP.

2. PROJECT DESCRIPTION

As outlined within the AECOM (2022) Environmental Assessment Project Description (2nd December 2022), the Project is needed as part of a coordinated and holistic delivery of a series of major projects in Canberra City and surrounds, to realise the strategic planning and development for Canberra City presented in the Territory Plan, the Transport for Canberra Plan and the National Capital Plan (NCP).

- The AECOM (2022) project description is provided in Appendix B

The Project also supports the ACT Government's vision for a compact and efficient city and reaching net zero by 2045. Furthermore, the Project is a specific directive identified as a key strategy for developing and delivering an efficient, compact and sustainable Canberra City within the Moving Canberra Plan, The Light Rail Network Plan and The ACT Planning Strategy.

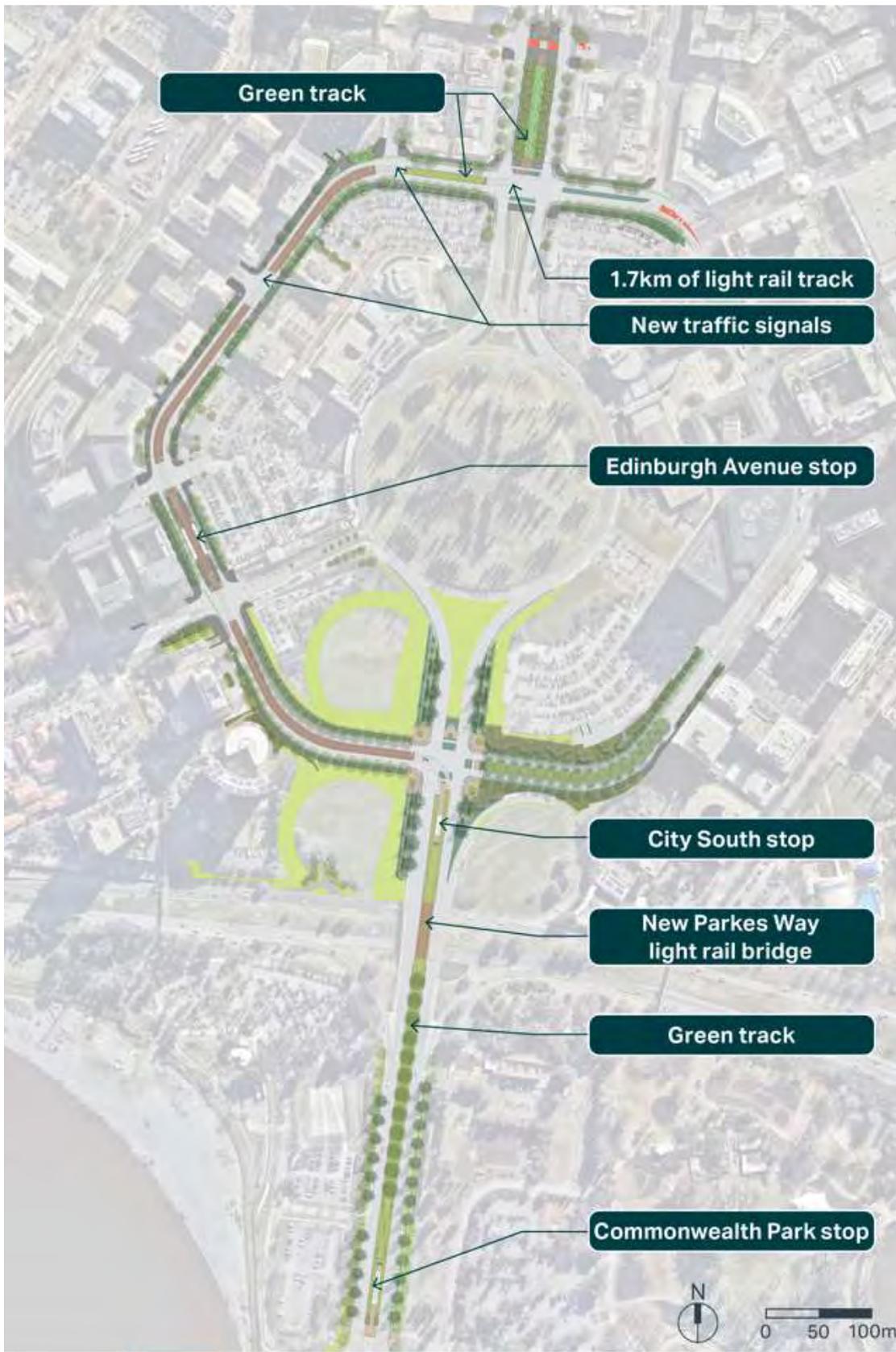
The Project would involve extending the light rail network from the current southern terminus at Alinga Street to a proposed stop at Commonwealth Park. A full project description for the Project is provided in Chapter 3.0 of the Environmental Assessment.

The Project would include the following key elements:

- An extension of approximately 1.7 km of track, extending southbound via the western side of London Circuit before continuing on Commonwealth Avenue
- A new bridge across Parkes Way
- Three stops are proposed to be located at key points along the alignment to provide access to the light rail where there is expected to be high demand: Edinburgh Avenue Stop, City South Stop and Commonwealth Park Stop.
- One scissor crossover (crossover of railway tracks) to allow LRVs to reverse direction
- Utility, stormwater drainage and street lighting adjustments, relocations and provisions
- Landscaping features sympathetic with Canberra's design as envisioned by the Griffins' along with requirements set out in other Territory and Australian Government policy
- 'Green tracks' running along Commonwealth Avenue and Northbourne Place that involve planting grass or shrubs between and besides the alignment
- Intersection layout, traffic signal phasing and road traffic speed changes along the alignment, including new intersections and modifications to existing intersections
- Pedestrian footpaths and crossing modifications
- Road widening and verge and kerb line changes.

The completed Project, including its key features and elements, is shown on **Figure 1** below.

Figure 1 – The Project and Key Features



2.1 Construction Strategy

Initial project planning indicates that the construction of LRS2A will be undertaken as per the summary provided within below. ERM notes that risks to the project from potential contamination issues have been assessed in consideration of the project specific development requirements.

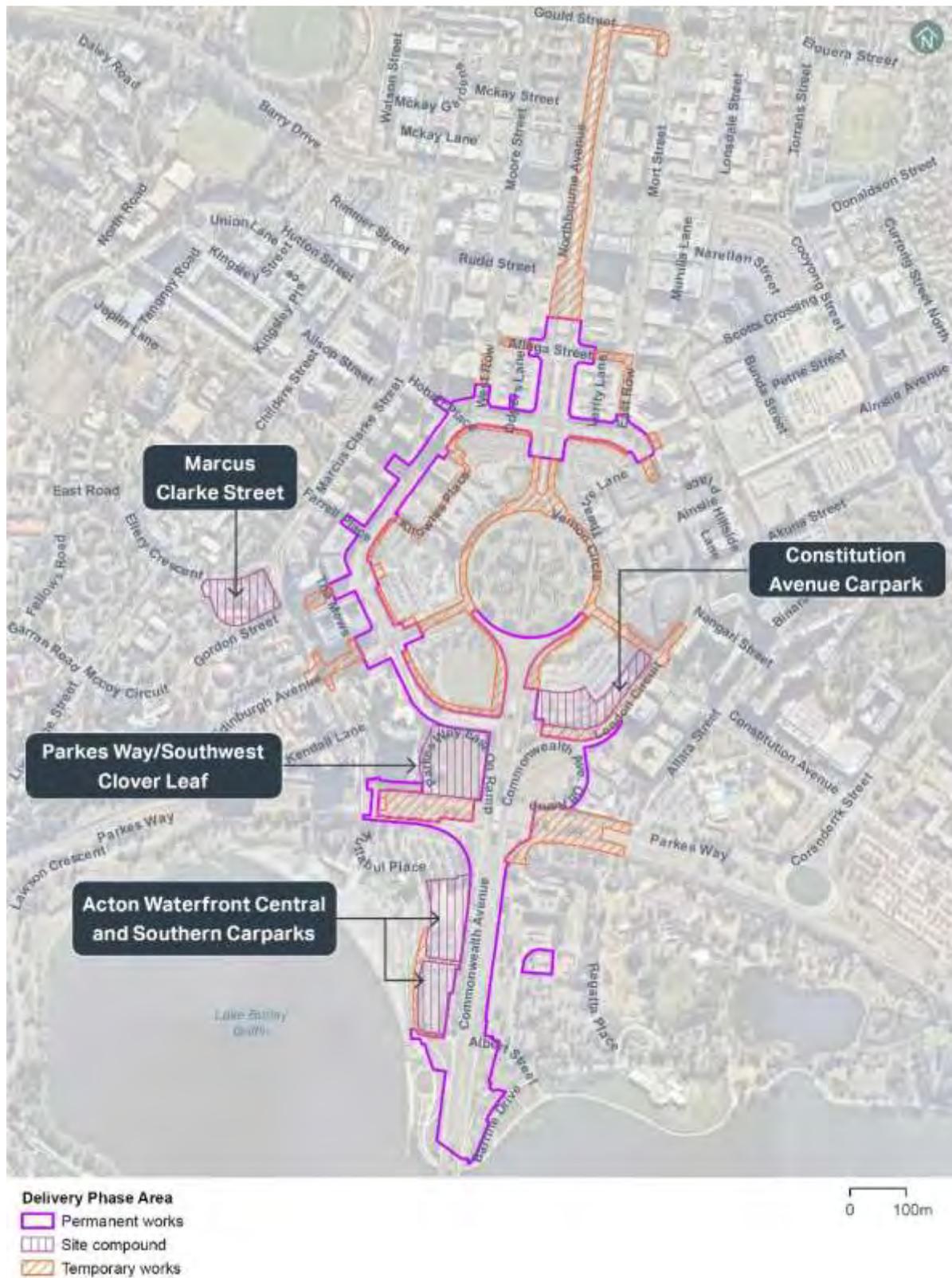
- Temporary site facilities and traffic management set-up;
- Detailed survey and existing services investigation & locating;
- Site preparation, demolition of affected existing infrastructure and vegetation clearing;
- Stormwater and utility work for new and existing assets;
- Construction of approximately 1.7 km of light rail track and associated infrastructure;
- Construction of 2 new signalised intersections (at West Row & University Avenue) and upgrade integration of existing signalised intersections along the LRS2A alignment;
- Construction of 3 new light rail stops at Edinburgh Avenue, City South, and Commonwealth Park;
- Construction of 1 new light rail bridge across Parkes Way;
- Construction & re-sheeting of new and existing sections of carriageway/roads;
- Irrigation system, landscape and hardscape works; and
- Testing and commissioning of the light rail system.

Construction activities associated with the Project would occur within a footprint referred to as the 'delivery phase area'. The operation of the Project would occur within a subset of the delivery phase area. The delivery phase area includes both Designated Land and Territory land.

Construction of the Project is anticipated to commence in 2024 with completion of construction planned in 2026. However, the duration of the construction would be dependent on final construction methodology and staging selected by the delivery contractor, as well as any efficiencies identified during the program.

Testing and commissioning would commence in the latter stages of construction and continue for a period of up to nine months following the conclusion of main works. Successful completion of the testing and commissioning programme would allow the Project Contractor to obtain accreditation from the Office of the National Rail Safety Regulator (ONRSR). Once complete, the system would be ready to be handed over for operation.

Figure 2 Delivery Phase Area



3. SITE IDENTIFICATION AND SETTING

The Site identification information is presented within the table below:

Table 1: Site Identification and Setting

Item	Description
Site	Proposed Canberra Light Rail, Stage 2A, Canberra ACT
Geographical Co-Ordinates	35°17'5.26"S 149°7'41.60"E (approximate centre of the Site)
Site Location and Site Layout	Figure 1 and Figure 2 (above)
Surrounding Land Use	<p>The land uses surrounding the Northern Portion of the Site include:</p> <ul style="list-style-type: none"> ■ North: Northbourne Avenue (vehicle and light rail transport corridor) and a range of commercial buildings (offices, restaurants, hotels etc.) and high-density residential dwellings. ■ South: Parkes Way and a range of commercial buildings (offices, restaurants, hotels etc.) followed by recreational open space then Lake Burley Griffin ■ East: Vernon Circle, followed by Commonwealth Avenue followed by range of commercial buildings (offices, restaurants, hotels etc.). ■ West: Canberra Law Courts, public parking areas followed by and a range of commercial buildings (university buildings, offices, restaurants, hotels etc.) and high-density residential dwellings. <p>The land uses surrounding the Southern Portion of the Site include:</p> <ul style="list-style-type: none"> ■ North: Parkes Way then undeveloped land, Vernon Circle, public car parking then Northbourne Avenue (vehicle and light rail transport corridor) and a range of commercial buildings (offices, restaurants, hotels etc.) and high-density residential dwellings ■ South: Public open space / recreational areas then Lake Burley Griffin. ■ East: Public open space / recreational parklands (Commonwealth Park) and Lake Burley Griffin. ■ West: Public open space / recreational parklands, public car parking then Lake Burley Griffin.
Site Elevation	<ul style="list-style-type: none"> ■ The site elevation ranges from approximately 570 m Australian Height Datum (AHD) at Alinga Street to approximately 560 m AHD on Commonwealth Avenue with a slight slope towards the south east.
Topography	<ul style="list-style-type: none"> ■ Regional topography is generally flat with a slight slope to the southeast ■ The site is also primarily flat with a slight slope towards the south east in the direction of Lake Burley Griffin
Hydrology	<p>At the time of the Site inspection no surface water was observed on the Site surface within the proposed light rail alignment.</p> <ul style="list-style-type: none"> ■ During periods of rainfall surface waters are likely to be directed to stormwater infrastructure located within Alinga Street and London Circuit or infiltrate through the ground surface within adjacent unsealed open space. During periods of heavy rainfall it is expected that surface waters would flow towards Lake Burley Griffin located on the southern boundary of the Site. ■ The nearest surface water body is Lake Burley Griffin located on the southern boundary of the Site.

Item	Description
<p>Geology and Acid Sulfate Soils</p>	<ul style="list-style-type: none"> ■ Geology mapping indicates that both the 0-1 km and 1-2 km portion of the proposed alignment are underlain by the Canberra formation comprising Palaeozoic aged mudstone, siltstone dacitic ignimbrite and volcanoclastic sediments. ■ Soils were described as moderately deep, moderately well-drained Yellow Chromosols (Yellow Podzolic Soils) on Red and Brown Kandosols (Red and Yellow Earths) on upper rises and fan elements. Moderately to very deep, poorly to imperfectly drained Sodosols (Solodic Soils and Solodized Solonetz Soils) on lower rises and fan elements. ■ Mapping within the Atlas of Australian Acid Sulfate Soil and Salinity indicates the both the 0-1 km and 1- 2 km portion of the proposed alignment have an “Extremely low probability” of the occurrence of acid sulfate soils.
<p>Hydrogeology</p>	<p>A search of registered groundwater bores within the vicinity of the Site (0-1 and 1-2 km portions of the Site) indicated the following:</p> <ul style="list-style-type: none"> ■ One groundwater bore (bore ID 473) was located within the search buffer. Results of the search indicated the bore was drilled to a final depth of 15.1 m bgl. ERM notes that the authorised purpose for the bore was not recorded. ■ Drillers logs indicate that moderately – highly weather mudstone and shales were present from 1.8 m bgl to the maximum depth of drilling. ■ It is considered that groundwater is likely to be present within shallow perched aquifers, at the clay / bedrock interface or within deeper aquifers located within underlying fractured bedrock.

4. SITE HISTORY

4.1 Aerial Photographs

Historical aerial photographs (Appendix C) were reviewed to assess potential historical land use practices undertaken within both the northern and southern portions of the Site and surrounding area. A summary of information obtained from the review is presented within the table below.

Table 2: Historical Aerial Photography

Year	Description
1951 – Black and White	<ul style="list-style-type: none"> ■ Site Area: Alinga Street and London Circuit are present within their current alignment. Two commercial / office buildings are present on the southern boundary of London Circuit at the commencement of Commonwealth Avenue within the current “clover leaf” portion of the Site. Commonwealth Avenue is present in its current alignment with ornamental garden beds located within the centre of the road. ■ Surrounding Area: The surrounding area is comprised of undeveloped / cleared land with several unsealed tracks and scattered vegetation. Roadways within the surrounding area indicate the surrounding area has been subdivided for future development to occur. Unsealed roads in the current alignment of University Avenue extend northwest from London Circuit. Low density residential buildings are located to the west and southwest of Commonwealth Avenue and several commercial buildings are located to the east. A military barracks is located to the east of the Site within the vicinity of Parkes Way.
1955 – Black and White	<ul style="list-style-type: none"> ■ Site Area: The northern portion of London circuit appears to have been cleared to enable development of the adjacent Sydney and Melbourne Buildings. An unsealed road intersects the Site in the northern portion of Commonwealth Avenue. A bridge has been constructed on Commonwealth Avenue at the southernmost extent of the Site. ■ Surrounding Area: The majority of buildings on either side of Commonwealth Avenue have been demolished with the exception of the Archbishop’s Residence which comprises a large rectangular shaped building. The construction of Parkes Way appears to have commenced to the east of Commonwealth Avenue. Commercial development is observed to the north and east and west of London Circuit. Unsealed roads along the current alignments of Gordon Street and Edinburgh Avenue have been constructed. Additional roadways have also been developed to the northeast of the Site.
1961 – Black and White	<ul style="list-style-type: none"> ■ Site Area: The Site appears generally consistent with previous aerial photography with the exception of the construction of an unsealed road bisecting Commonwealth Avenue in the current alignment of Parks Way. ■ Surrounding Area: Canberra Hospital is visible to the southwest of the Site. Roadways in the current alignment of Vernon Circuit and Northbourne Ave have been constructed with Commonwealth Avenue extended to the north to join Vernon Circuit. Commercial development has occurred in a small portion southwest of the Site. The remaining surrounding area is still generally comprised of commercial development to the north, northeast and northwest as well as vacant/cleared land to the south of the Site. Land clearing / construction works appear to be occurring under the bridge in the southern portion of Commonwealth Avenue.
1968- Black and White	<ul style="list-style-type: none"> ■ Site Area: The Site appears generally consistent with previous aerial photography with the exception of London Circuit and Commonwealth Avenue which appear to have been re-sealed. ■ Surrounding Area: Lake Burley Griffin has been created to the south and southwest of the Site. Car parking areas appear to have been constructed on the northern portion of London Circuit consistent with their current alignment. Commercial development has continued to occur to the north, east and west of the Site. Additional roadways have also been constructed to the east and south (beneath the Commonwealth Avenue Bridge) of the Site. The Barracks located to the east of the Site has been demolished and replaced with the eastern portion of Parkes Way.

Year	Description
1975 – Colour	<ul style="list-style-type: none"> ■ Site Area: The central portion of Commonwealth Avenue has been elevated with the construction of a bridge over Parkes Way. The “clover leaf” on / off ramps have been constructed within the central portion of Commonwealth Avenue to enable access to Parkes Way. The remainder of the Site appears consistent with previous aerial imagery. ■ Surrounding Area: Parkes Way has been expanded and includes an underpass beneath Commonwealth Avenue. Recreational areas within West Basin and the adjacent parklands to the west of the Site have been developed. Additional commercial development has occurred to the west of London Circuit and expansion of the university to the east of the Site has also occurred.
1978 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: The area to the west of the Site has been cleared for construction of the current Parkes Way alignment. The area to the east and west of Commonwealth Avenue (within the location of the current Commonwealth Park and Henry Rolland Park) appears to have been cleared.
1980 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: The construction of Parkes Way has been completed and is consistent with its current alignment.
1986 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: The area surrounding London Circuit has been developed for primarily car parking purposes. The remainder of the surrounding areas appear generally consistent with previous aerial photography.
1993 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: Commercial construction has occurred to the south west of the Site and within the area surrounding City Hill. Construction of a high rise building immediately west of the Site can also be observed. Commonwealth Park appears to be consistent with the current layout including a car park to the North of Henry Rolland Park.
1998 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: Additional commercial development to the west and north east of the Site. Regatta Point and Nerang Pool now appear to have been constructed consistent with their current layout.
2008 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: Additional commercial development to the northeast (Canberra Centre) and west of the Site. A large car park area has been constructed to the immediate west of Commonwealth Avenue.
2010 - Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: No significant changes since previous aerial photography
2013 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: No significant changes observable since previous aerial photography
2016 – Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: No significant changes observable since previous aerial photography
2019- Colour	<ul style="list-style-type: none"> ■ Site Area: No significant changes observable since previous aerial photography ■ Surrounding Area: No significant changes observable since previous aerial photography aside from the construction of a jetty west of the Site extending into Lake Burley Griffin.

4.1.1 Historical Business Records

A search of historical business records for the Site and surrounding area (200 m buffer) was undertaken from the 1970s to the 1990s. The results of the search area summarised below, and a copy of historical business records is provided within **Appendix C**.

Table 3: Historical Business Records

Year	Registered Business Types
1971	<ul style="list-style-type: none"> ■ Air services and agents ■ Carpets & Linoleum manufacturers ■ Chemists and pharmaceuticals ■ Dry cleaners ■ Rubber &/or Metal Stamp Makers ■ Grocers ■ Schooling ■ Aircraft manufacturers ■ Chemists ■ Electronic equipment manufacturers ■ Engineering ■ Builders & Contractors
1981	<ul style="list-style-type: none"> ■ Electroplating / Silver plating ■ Clothing manufacturing ■ Laundries ■ Retail ■ Fire Protection Equipment ■ Chemists ■ Builders & Contractors ■ Aircraft manufacturers ■ Electronic equipment manufacturers ■ Air services
1991	<ul style="list-style-type: none"> ■ Electronic equipment manufacturers ■ Computer Equipment Services ■ Chemists ■ Builders & Contractors ■ Photographic Equipment & Supplies / Processing ■ Motor Service Stations & Garages ■ Advertising ■ Chemists and pharmaceuticals ■ Printers

4.1.2 PFAS Investigations

A search for PFAS Investigations undertaken within the search area indicated that no sites within the report buffer area have undertaken a PFAS Investigation.

4.1.3 EPA Register of Contaminated Sites

A search of the EPA register of contaminated sites undertaken for the Site and a 1 km buffer area identified the following:

Table 4: ACT EPA Register of Contaminated Sites

District	Location	Notified Under Section	Description	Distance from site	Direction
Canberra Central	-	76A(1)	Capital Metro Audit area - Northbourne Ave within the District of Canberra Central	Not mapped	-

4.1.4 ACT EPA Contaminated Sites Register

A search of records held by the ACT EPA contaminated sites unit indicated the following sites were located within the buffer area:

Table 5: ACT EPA Contaminated Sites Register

ID Number	Block / Section	Address	Details
HCP393	Block 12 Section 3 Canberra Central	Tamar House London Circuit	Potential hydrocarbon contamination associated with fuel storage
HCP88	Block 1 Section 18 Canberra Central	20- 22 London Circuit (Reserve Bank)	Potential hydrocarbon contamination associated with fuel storage
OTP226	Block 1 Section 5 Canberra Central	Unit 3 University Avenue	Dry cleaning chemicals TCE, PCE etc.

4.1.5 EPA Public Register – EPA Authorisations

The EPA Authorisations were recorded within the EPA public register within the 200 m search buffer for both sections of the Site.

Table 6: ACT EPA Public Register – EPA Authorisations

ID Number	Business Name	Suburb	Location	Activity	Status	Distance (m)	Direction
1128	Director General, ACT Government	Canberra City ACT	Various locations within Australian Capital Territory	Commercial use of chemicals (Activity 29)	Current	Not mapped	-
1165	City Pest Control Service Pty Ltd	Canberra City ACT	Various locations within Australian Capital Territory	Commercial use of chemicals (Activity 29)	Current	Not mapped	-

4.1.6 ACT Asbestos Response Taskforce List

A search of the ACT Asbestos Response taskforce List within the Site indicated that there were no recorded asbestos responses within the search area.

4.1.7 NPI Industrial Facilities

A search for NPI Industrial facilities within the site and a 2 km buffer area Site indicated that no NPI industrial facilities were located within the search area.

4.1.8 Other Contamination Issues - Defence Sites

A search for other contamination issues identified within the Department of Defence Regional Contamination Investigation program (RCIP) undertaken for the search area identified the following:

Table 7: Other Contamination Issues – Defence Sites

Site Name	Address	Description	RCIP Code	Distance (m)	Direction
Werriwa Depot	Civic, Australian Capital Territory	<ul style="list-style-type: none"> ■ There are no known contamination issues at the depot. ■ A disused underground fuel storage tank (associated with heating oil) was removed from the Site in 2006, with no contamination evident in surrounding soils. 	0250	150	Southeast

4.1.9 Other Current Potentially Contaminating Activities

A search for other current potentially contaminating activities undertaken for the search area identified the following:

Table 8: Other Potentially Contaminating Land uses

Site Name	Category	Location	Status	Distance (m)	Direction
Canberra City Police Station	Police Station	16-18 London Cct, Canberra ACT 2601	Operating	27	East

5. PREVIOUS INVESTIGATIONS

In undertaking this assessment, ERM undertook a review of the following previous reports relevant to the Site and immediately adjacent RLC site area:

- RPS Australia West Pty Ltd (2017): *Limited Phase 2 Contaminated Site Assessment Report, Canberra Light Rail Stage 2*. Report number: EWS72591, 1 December 2017 (RPS 2017);
- Environmental Resources Management (2019) Preliminary Site Investigation, Canberra Light Rail Stage 2A, 19 December 2019 Ref No 0527116 (ERM 2019);
- AECOM Australia Pty Ltd (2020) S200-ASJ-LTR-ENV-VN-0001 – Contaminated Soil Classification Letter for an Augmented Proposal 21 May 2020 (AECOM 2020);
- Environmental Resources Management (2019) Preliminary Site Investigation, Canberra Light Rail Stage 2A, 19 December 2019 Ref No 0527116 (ERM 2019); and
- Environmental Resources Management (2022) Raising London Circuit and Canberra Light Rail Stage 2A In-Situ Soil Assessment, 22 April 2022 Ref No 0527116 (ERM 2022).

A summary of the above reports is provided below:

- Sampling locations and the location of identified exceedances of the adopted assessment criteria are illustrated on **Figures 3 and 4 in Appendix A**.

Table 9: Summary of Previous Investigations

Previous Report	Detail
RPS 2017	<p>RPS undertook a Limited Phase 2 Contaminated Site Assessment to assess the potential for contamination associated with past and present land uses and to assess the potential for contamination to impact human health and / or the environment during or after development.</p> <p>The assessment was undertaken across 6 various proposed stages / options of the Canberra Light Rail including the proposed Stage 2A alignment and included a site visit, observation of test pits and/or boreholes and the collection / analysis of soil samples for relevant Contaminants of Potential Concern (CoPCs).</p> <p>Desktop information presented within RPS 2017 indicated that the following 3 sites located within the PSI investigation area (but outside the RLC footprint) were recorded within the ACT EPA contaminated land database:</p> <ul style="list-style-type: none"> ■ Acton Section 22/23 - Authorisation Agreement for acceptance of soil on land associated with construction of a boardwalk. The volume of material imported is noted as being greater than 100 m³. The source of this material is unknown. ■ 20-22 London Circuit - Contaminated Sites Database suggests history of hydrocarbon storage. ■ 25 London Circuit - Contaminated Sites Database suggests history of hydrocarbon storage. <p>Results of the limited field investigation indicated that all areas with exception of TP63 (located on a triangular mound between Capital and State Circuits bounded by the on and off ramps for Canberra Avenue) were suitable for use as part of the proposed alignment of Stage 2 of the Canberra Light Rail. Test pit TP63 contained small fragments of asbestos containing material in surface soil.</p> <p>RPS advised that interim waste classification of soils from in the vicinity of these sampling locations indicated that excavated soils would be classified as solid or industrial waste.</p>
ERM 2019	<p>ERM was engaged by MPC to undertake a PSI at the Site identified as proposed Canberra Light Rail Stage 2A alignment, Canberra, ACT (the Site). The objective of these works was to undertake a PSI that refined the understanding of the Site and to aid MPC in assessing potential liabilities associated with site contamination that may require consideration during future development works.</p> <p>Based on information reviewed as part of the PSI, ERM noted that there may be a potential risk to human health / ecological receptors during construction due to the following potentially complete pollutant linkages identified at the Site:</p> <ul style="list-style-type: none"> ■ Disturbance of potential uncontrolled fill materials associated with historical land uses or construction of the existing roadways; and ■ Disturbance of potential contamination associated with former building structures located within the “clover leaf” portion of the Site. <p>The PSI concluded that whilst the risk of harm to human health / ecological receptors was generally low, the completion of a targeted Detailed Site Investigation (DSI) would quantitatively assess the potential for soil contamination to be present that may require management / remediation to facilitate development of the Stage 2A Light Rail alignment.</p>
AECOM 2020	<p>AECOM was engaged by Canberra Metro Construction (CMC) to undertake a Targeted Detailed Site Investigation (T-DSI) of the proposed southern extension of the stage 2A portion of the Canberra Light Rail project. The T-DSI was undertaken to assess potential CoPCs within soil samples and assess the suitability of soils for onsite re-use or offsite disposal. A review of information within the AECOM report indicated that a total of 59 locations were sampled in total.</p> <p>ERM notes that while samples were collected from the adjacent RLC site, due to the general consistency of initial development / construction timing and general surrounding site conditions, the results are considered indicative of potential fill conditions within the LRS2A site.</p> <p>Laboratory analysis of collected samples indicated that:</p> <ul style="list-style-type: none"> ■ All samples met the NEPM HIL-D criteria with the exception of one sample within the RLC footprint located to the south of the LRS2A site which exceeded the adopted criteria for benzo[a]pyrene toxicity equivalent quotient (B[a]P TEQ); ■ A total of five samples located within the RLC footprint exceeded the solid waste criteria and 4 exceeded industrial waste criteria due to elevated polycyclic aromatic hydrocarbons (PAHs). ERM notes that no leachate analysis (ASLP / TCLP) appears to have been undertaken. ■ Three samples within the RLC footprint exceeded the beneficial re-use criteria due to elevated Total Recoverable Hydrocarbons (TRH) in the C10 – C36 fraction; and ■ Three samples exceeded the ACT Beneficial Reuse criteria due to elevated chromium and two samples due to elevated Nickel.
ERM 2022	<p>ERM was engaged by MPC to undertake an assessment of potential contamination within soil materials that may require excavation during completion of the project identified as Canberra Light Rail Stage 2A, Canberra, ACT (the Site). The objective of these works was to assess the condition of fill and natural soil materials within the proposed construction footprint to assist future construction contractors develop appropriate soil management strategies to be implemented during construction works.</p> <ul style="list-style-type: none"> ■ ERM noted that soil sampling works were undertaken in conjunction within onsite geotechnical assessment of the Site and as such locations / sampling methods were selected to enable completion of both scopes of works. ■ Intrusive soil investigation works were undertaken between the 8th and 18th of November 2021 and involved the excavation of fifty two (52) soil bores advanced via hand auguring to a maximum depth of 1.5 m bgl. <p>During investigation works the following soil conditions were observed throughout the Site.</p> <ul style="list-style-type: none"> ■ Fill materials comprising gravelly sands and silty clays were observed to extend to a maximum depth of 1.5 metres below ground level (m bgl). <ul style="list-style-type: none"> – During investigation works, no evidence of staining / odours or significant anthropogenic inclusions such as bricks, rubble, potential Asbestos Containing Material (ACM) etc. was noted within fill materials. – ERM notes that due to the sampling methodology undertaken as part of this investigation (use of bores rather than test pits) and the observation of anthropogenic material within fill material, the potential for ACM may require further consideration during works. The potential for ACM in fill material would be managed through the implementation of an Unexpected Finds Plan (UFP). – ERM further notes that due to investigation methods, several boreholes were terminated in fill materials. ■ Natural materials were encountered underlying fill materials at variable depths up to a maximum of 1.5 m bgl and comprised clayey silt. During works no visual and or olfactory indicators of contamination such as staining / odours was noted within natural materials. <p>A total of 166 primary samples were collected from the 52 investigation locations. All collected samples were analysed for Asbestos, TRH, BTEX, Phenols, SVOCs, VOCs, heavy metals (8), TCLP metals and OCP/OPP.</p> <ul style="list-style-type: none"> ■ Concentrations of CoPCs were less than the adopted commercial / industrial land use screening criteria within all collected samples with one exception being benzo(a)pyrene which exceeded the adopted criteria within fill materials within AE-PC04 at a depth of between 0.1 and 0.5 m bgl located offsite within the northern portion of the Stage 2 A site boundary. <ul style="list-style-type: none"> – Due to the isolated nature of this exceedance, it was considered that this was unlikely to pose a risk of harm to identified receptors and could be managed during construction through the implementation of a Construction Environmental Management Plan (CEMP) during development of the Stage 2A works. ■ Analytical results of all collected samples located to the east of the Site returned concentrations less than the adopted assessment criteria. Based on the nature of potential contamination associated with historical land uses, it is the opinion of ERM that these locations are suitable for providing an indication of the potential for significant or widespread contamination that may affect the future suitability of the Site ■ Asbestos was not encountered during investigation works undertaken by ERM. <ul style="list-style-type: none"> – ERM noted that while no asbestos was identified within collected soil samples, due to the sampling methodology adopted for this investigation (soil bores rather than test pits) and the fact that anthropogenic material was identified within fill materials, an Unexpected Finds Plan (UFP) should be adopted during all future excavation works to outline the processes and procedures to be implemented where potential ACM is identified.

Previous Report	Detail
	<ul style="list-style-type: none"> ■ Laboratory analysis of all collected samples returned concentrations of CoPCs less than the adopted SCC threshold criteria for General Solid Waste with the exception of: <ul style="list-style-type: none"> - Nickel within samples collected from fill materials located throughout the Site. Based on the nature and distribution of Nickel exceedances, it is the opinion of ERM that these are likely to be associated with natural background conditions and unlikely to be indicative of anthropogenic contamination. - Lead within several samples collected from fill materials located within the northern portion of the Site. Based on the nature and distribution of lead exceedances it is the opinion of ERM that these are likely to be associated with natural background conditions and unlikely to be indicative of anthropogenic contamination with the exception of AE-PC04 which may require further assessment to finalise disposal requirements. - Cadmium within one sample collected from fill materials located within the northern portion of the Site (AE-PC04) at a depth of between 0.1 and 0.5 m bgl located within the northern portion of the Stage 2 A site boundary. - Benzo(a)Pyrene within samples from several isolated locations throughout the Site. ERM notes that due to the isolated nature of B(a)P exceedances throughout the Site and that samples were collected from bitumen roadways it is likely that elevated B(a)P is associated with residual road base within samples are unlikely to be associated with anthropogenic contamination sources such as ash / slag or other significant / widespread contamination. ■ Laboratory analysis of all Toxicity Characterisation Leaching Procedure (TCLP) analysis for samples with identified concentrations exceeding CT1 criteria returned leachable concentrations less than the adopted TCLP threshold values for General Soil Waste. <ul style="list-style-type: none"> - ERM noted that total concentrations of lead within AE-PC04 and B(a)P within AE-PC14 exceed the allowable total concentration for classification under SCC1 and would require disposal as restricted solid waste. ERM further noted that given the isolated nature of these exceedances the soil material may be reanalysed during construction to assess potential extent of material requiring disposal as RSW.

5.1 Summary of Contamination Identified in Previous Investigations

Samples from a total of 111 locations have been collected from within LRS2A area:

- Sampling locations and the location of identified exceedances of the adopted assessment criteria are illustrated on **Figures 3 and 4 in Appendix A**; and
- ERM notes that assessment has not been undertaken potential construction staging areas associated with the project however these will be subject to “entry and exit” assessments that will be used to demonstrate the potential risk of contamination prior to site entry and the subsequent suitability of the Site following completion of works.

The following table summarises the occurrence and extent of contamination identified within the previous investigations reviewed by ERM.

Table 10: Summary of Identified Contamination

CoPC	Comment
Petroleum Hydrocarbons	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples returned concentrations of petroleum hydrocarbons less than the adopted assessment criteria and / or LOR within all collected samples.
BTEX	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples returned concentrations of BTEX less than the adopted assessment criteria and / or LOR within all collected samples.
Phenols	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples returned concentrations of BTEX less than the adopted assessment criteria and / or LOR within all collected samples.
SVOCs / VOCs	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples returned concentrations of SVOCs / VOCs less than the adopted assessment criteria and / or LOR within all collected samples.
PAHs	<ul style="list-style-type: none"> ■ AECOM (2020) - Concentrations of CoPCs were less than the adopted commercial / industrial land use screening criteria with the exception of one sample (AH01_0.3_200415) which exceeded the adopted criteria for benzo[a]pyrene toxicity equivalent quotient (B[a]P TEQ); and ■ ERM (2020) - Concentrations of CoPCs were less than the adopted commercial / industrial land use screening criteria with all samples with the exception of Benzo(a)pyrene which exceeded the adopted assessment criteria within fill materials within AE-PC04 at a depth of between 0.1 and 0.5 m bgl located within the northern portion of the Stage 2 A site area.
Heavy Metals	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples returned concentrations of heavy metals less than the adopted assessment criteria and / or LOR within all collected samples
OCP/OPP	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples returned concentrations of heavy metals less than the adopted assessment criteria and / or LOR within all collected samples
Asbestos	<ul style="list-style-type: none"> ■ Laboratory analysis of collected samples did not identify asbestos within all collected samples. ■ Asbestos has been detected during previous works within the surrounding area as unexpected finds within fill materials and within service / utility pits. ■ ERM notes that due to the presence of fill material and limitations associated with sampling methods (soil bores as opposed to test pits) the potential for unexpected finds of asbestos should be considered during future construction works.

6. CONCEPTUAL SITE MODEL

6.1 Potential Sources of Contamination

Based on the Site history, background data, results from previous investigations and ERMs professional experience, the Contaminants of Potential Concern (CoPC) associated with current and historical land uses undertaken in the general area were considered to include the following:

Table 11: Potential Sources of Contamination

Potential Source	CoPC	Comment
Uncontrolled fill	<ul style="list-style-type: none"> Asbestos, total recoverable hydrocarbons (TRH); benzene, toluene, ethylbenzene and xylenes (BTEX); semi-volatile organic compounds (SVOCs), Volatile Organic Compounds (VOCs), heavy metals, polycyclic aromatic hydrocarbons (PAHs), phenols, OCP / OPP 	<ul style="list-style-type: none"> Potential for uncontrolled fill materials to have been imported to the site for raising various portions of the Site such as existing roadways etc.
Current and historical onsite and surrounding land uses	<ul style="list-style-type: none"> Trichloroethylene (TCE), tetrachloroethene (PCE), Asbestos, total recoverable hydrocarbons (TRH); benzene, toluene, ethylbenzene and xylenes (BTEX); semi-volatile organic compounds (SVOCs), Volatile Organic Compounds (VOCs), heavy metals, polycyclic aromatic hydrocarbons (PAHs), phenols, OCP / OPP 	<ul style="list-style-type: none"> Fuel / chemical storage infrastructure located within adjacent building structures within London Circuit. Dry cleaning chemicals used within adjacent sites located within University Avenue. Leaks and spills from vehicles on roadways and adjacent car parking areas. Pesticides / herbicides and other products used within adjacent recreational parklands and former agricultural land-uses. Potential building waste from demolition of former building structures located within the Site and adjacent area. Potential for asbestos / hazardous materials within onsite service pits / conduits

6.2 Potential Pathways

The primary potential exposure pathways of concern at the Site are:

- Inhalation of vapour (from soil and/or groundwater) and contaminated dust (from soils);
- Dermal contact and / or incidental ingestion with contaminated surface water and soils / sediments;
- Transport of contamination through surface water flows;
- Transport of contamination to underlying groundwater aquifers; and
- Transport of contaminants via mechanical transport / windblown dust.

6.3 Potential Receptors

Key receptors have been identified as:

- Current site users (commercial / industrial);
- Future site users (commercial / industrial);
- Potential future users of groundwater;
- Workers carrying out installation or maintenance works within the Site;
- Groundwater beneath the Site; and
- Adjacent sensitive receptors e.g. adjacent residents, sensitive ecological receptors (e.g. Golden Sun Moth (GSM) habitat) and surface water bodies.

6.4 Conceptual Site Model

Based on the results of the desktop assessment and review of previous investigations and the potential sources, pathways and receptors identified above ERM developed the below Conceptual Site Model (CSM).

Table 12: Conceptual Site Model

Potential Sources	Pathways	Potential Receptors	Comment	Potentially Complete SPR Linkages	
				Human Health	Ecological
Uncontrolled fill	Dermal contact and / or incidental ingestion with contaminated surface waters / soils.	<ul style="list-style-type: none"> Current and future site users; and Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> ERM notes that based on results of the desktop review, former building structures were identified within the Clover Leaf portion of the Site. It is the opinion of ERM that while laboratory analysis of collected samples did not identify asbestos within collected samples, potentially unexpected finds of contamination associated with former building structures / uncontrolled fill should be considered and should be managed under a Contaminant Management Plan / Construction Environmental Management Plan including an Unexpected Finds Plan. During the AECOM (2020) investigations, all samples met the NEPM HIL-D criteria with the exception of one sample (AH01_0.3_200415) which exceeded the adopted criteria for benzo[a]pyrene toxicity equivalent quotient (B[a]P TEQ). PAH and heavy metals exceeding the adopted ACT EPA beneficial reuse and inert waste criteria were identified within the adjacent RLC footprint. ERM notes further assessment of these areas was undertaken as part of the ERM (2022) investigation works included sample locations immediately adjacent to previously identified elevated concentrations. Results from the ERM (2022) investigation indicates that the exceedances identified within AECOM (2022) are likely to be isolated and do not indicate significant or widespread contamination. ERM notes that further assessment of potential leachability of identified exceedances to refine waste classification requirements. During ERM (2022) investigation works, no evidence of staining / odours or significant anthropogenic inclusions such as bricks, rubble, potential Asbestos Containing Material (ACM) etc. was noted within fill materials. Concentrations of CoPCs were less than the adopted commercial / industrial land use screening criteria with all samples collected with the exception of Benzo(a)pyrene which exceeded the adopted assessment criteria within fill materials within AE-PC04 at a depth of between 0.1 and 0.5 m bgl located within the northern portion of the LRS2A site area ERM notes that as roadways within the Site were operational, no sampling was undertaken from within roadway footprints. Based on the of potential contamination within the Site and the results from surrounding sampling and analysis, it is the opinion of ERM that migration of CoPCs to areas underlying roadways is unlikely. The primary risk of contamination underlying existing roadways is likely to be associated with asbestos impacted uncontrolled fill, however as the review of historical aerial photography indicated that roadways are consistent with the initial layout. It is the opinion of ERM that there is a low risk of significant or widespread asbestos impacted fill being present under existing road alignments. Potential contamination within these portions of the Site can be managed under a Contamination / Construction Environmental Management Plan during future works. It is therefore considered that the risk of contamination from significant uncontrolled fill materials underlying the LRS2A Site is low and can be managed under a Contamination / Construction Environmental Management Plan. Based on the nature of potential contamination identified within the desktop review and results of soil sampling works, it is the opinion of ERM that the nature and extent of potential contamination has been adequately characterised to enable development of the required Construction Environmental 	<ul style="list-style-type: none"> No potential linkage identified, however it is the opinion of ERM that all works should be undertaken in accordance with a Site Auditor Approved CEMP / CMMP to manage potential unexpected finds of contaminated fill material. 	<ul style="list-style-type: none"> NA

Potential Sources	Pathways	Potential Receptors	Comment	Potentially Complete SPR Linkages	
				Human Health	Ecological
			<p>Management Plan (CEMP) and Contamination and Materials Management Plan (CMMP).</p> <ul style="list-style-type: none"> ERM notes that assessment has not been undertaken within the potential construction staging areas associated with the project however these will be subject to “entry and exit” assessments that will be used to establish baseline conditions and demonstrate the suitability of the Site following completion of works. 		
Transport of contamination through surface water flows.	<ul style="list-style-type: none"> Adjacent sensitive receptors; Current and future site users; and Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> Adjacent sensitive receptors; Future potential users of groundwater. 	<ul style="list-style-type: none"> A review of the Site and surrounding land uses undertaken as part of the ERM PSI did not identify any onsite or surrounding land uses that would pose a high risk from impacted surface waters that could result in site contamination. Laboratory analysis of collected samples returned concentrations of CoPCs within the Site were less than the adopted assessment criteria and / or LOR and as such the risk of onsite contamination impacting surface water is considered to be low. While the Site in its current form is likely to pose a low risk of harm to surrounding receptors from surface water flows, where construction works are undertaken, all works should be undertaken in accordance with an approved CEMP to mitigate the risk of potential surface water migration of impacted water/ sediment. 	<ul style="list-style-type: none"> NA 	<ul style="list-style-type: none"> NA
Transport of contamination to underlying groundwater aquifers	<ul style="list-style-type: none"> Adjacent sensitive receptors; and Future potential users of groundwater. 	<ul style="list-style-type: none"> Adjacent sensitive receptors; and Future potential users of groundwater. 	<ul style="list-style-type: none"> Laboratory analysis of collected samples returned concentrations of CoPCs less than the adopted assessment criteria and / or LOR with the exception of two samples collected during the ERM (2022) investigation with slightly elevated PAHs and as such the risk of onsite contamination impacting underlying groundwater aquifers is considered to be low. ERM further notes that TCLP analysis undertaken (for preliminary waste classification purposes) returned concentrations less than the adopted leachability criteria. Contact with potentially contaminated groundwater is considered a low risk due to the depth to groundwater (i.e. low risk of contact during construction) and the low likelihood of groundwater being beneficially re-used. 	<ul style="list-style-type: none"> NA 	<ul style="list-style-type: none"> NA
Transport of contaminants through mechanical transport / construction activities	<ul style="list-style-type: none"> Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> ERM notes that based on results of the desktop review, former building structures were identified within the Clover Leaf portion of the Site. It is the opinion of ERM that while laboratory analysis of collected samples did not identify asbestos within collected samples, potentially unexpected finds of contamination associated with former building structures / uncontrolled fill should be considered and managed under a Contaminant Management Plan / Construction Environmental Management Plan including an Unexpected Finds Plan. During the AECOM (2020) investigation works all samples met the NEPM HIL-D criteria with the exception of one sample located within the northern portion of the LRS2A footprint which exceeded the adopted criteria for benzo[a]pyrene toxicity equivalent quotient (B[a]P TEQ); During ERM (2022) investigation works, no evidence of staining / odours or significant anthropogenic inclusions such as bricks, rubble, potential Asbestos Containing Material (ACM) etc. was noted within fill materials. Concentrations of CoPCs were less than the adopted commercial / industrial land use screening criteria with the exception of Benzo(a)pyrene which exceeded the adopted criteria within fill materials within AE-PC04 at a depth of between 0.1 and 0.5 m bgl located within the northern portion of the Site. Potential contamination within the Site is largely associated with potentially impacted fill materials. During all construction works within the Site a construction environmental management plan 	<ul style="list-style-type: none"> No potential linkage identified, however it is the opinion of ERM that all works should be undertaken in accordance with a Site Auditor Approved CEMP / CMMP to manage potential unexpected finds of contaminated fill material. 	<ul style="list-style-type: none"> NA

Potential Sources	Pathways	Potential Receptors	Comment	Potentially Complete SPR Linkages	
				Human Health	Ecological
			and unexpected finds plan will be required to manage the potential for contaminated fill.		
Current and historical onsite and surrounding land uses	Dermal contact and / or incidental ingestion with contaminated surface waters / soils.	<ul style="list-style-type: none"> Current and future site users; and Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> A review of current and historical land uses undertaken within the Site and surrounding area did not identify any potential significant sources of contamination that posed a high risk of significant or widespread chemical contamination that would be likely to impact the suitability of the Site for the proposed development. ERM notes that based on results of the desktop review, former building structures were identified within the Clover Leaf portion of the Site. It is the opinion of ERM that while laboratory analysis of collected samples did not identify asbestos within collected samples, potentially unexpected finds of contamination associated with former building structures / uncontrolled fill should be considered and managed under a Contaminant Management Plan / Construction Environmental Management Plan including an Unexpected Finds Plan. Laboratory analysis of collected samples from previous investigations returned concentrations of CoPCs less than the adopted assessment criteria with the exception of one sample collected during the AECOM (2020) and one sample collected within the northern portion of the Stage 2 A site boundary collected during the ERM (2022) assessment. Due to the isolated nature of these minor exceedances, it is the opinion of ERM that this is unlikely to pose a risk of harm to identified receptors and can be managed during construction through the implementation of a Construction Environmental Management Plan (CEMP) during construction works. While ERM notes that the sampling density within the northern and eastern portions of the Site is limited, due to the nature of land uses identified within the desktop searches and result of collected samples from throughout previous investigations indicating that no significant / widespread contamination of potentially mobile CoPCs has occurred, the risk of contamination within these portions of the Site is considered to be low and can be managed under an Unexpected Finds Plan / Construction Environmental Management Plan. 	<ul style="list-style-type: none"> No potential linkage identified, however it is the opinion of ERM that all works should be undertaken in accordance with a Site Auditor Approved CEMP / CMMP to manage potential unexpected finds of contaminated fill material. 	<ul style="list-style-type: none"> NA
	Transport of contamination through surface water flows.	<ul style="list-style-type: none"> Adjacent sensitive receptors; Current and future site users; and Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> A review of the Site and surrounding land uses undertaken as part of the ERM PSI did not identify any onsite or surrounding land uses that would pose a high risk from impacted surface waters that could result in site contamination. Laboratory analysis of collected samples returned concentrations of CoPCs less than the adopted assessment criteria and / or LOR with the exception of two samples with slightly elevated PAHs and as such the risk of onsite contamination impacting surface water is considered to be low. While the Site in its current form is likely to pose a low risk of harm to surrounding receptors from surface water flows, where construction works are undertaken, all works should be undertaken in accordance with an approved CEMP to mitigate the risk of potential surface water migration of impacted water / sediment. 	<ul style="list-style-type: none"> NA 	<ul style="list-style-type: none"> NA

Potential Sources	Pathways	Potential Receptors	Comment	Potentially Complete SPR Linkages	
				Human Health	Ecological
Transport of contamination to underlying groundwater aquifers		<ul style="list-style-type: none"> ■ Adjacent sensitive receptors; and ■ Future potential on-site users of groundwater. 	<ul style="list-style-type: none"> ■ A review of potential CoPCs indicates a low risk of harm to underlying groundwater aquifers from potential contamination within the Site. ■ Contact with potentially contaminated groundwater is considered a low risk due to the depth to groundwater (i.e. low risk of contact during construction) and the low likelihood of groundwater being beneficially re-used. ■ Laboratory analysis of collected samples returned concentrations of CoPCs less than the adopted assessment criteria and / or LOR with the exception of two samples with slightly elevated PAHs and as such the risk of onsite contamination impacting underlying groundwater aquifers is considered to be low. 	<ul style="list-style-type: none"> ■ NA 	<ul style="list-style-type: none"> ■ NA
Transport of contaminants through mechanical transport / construction activities		<ul style="list-style-type: none"> ■ Workers carrying out development, installation or maintenance works within the Site. 	<ul style="list-style-type: none"> ■ During the AECOM (2020) investigation works all samples met the NEPM HIL-D criteria with the exception of one sample within the northern portion of the LRS2A footprint which exceeded the adopted criteria for benzo[a]pyrene toxicity equivalent quotient (B[a]P TEQ); ■ During ERM (2022) investigation works, no evidence of staining / odours or significant anthropogenic inclusions such as bricks, rubble, potential Asbestos Containing Material (ACM) etc. was noted within fill materials. Concentrations of CoPCs were less than the adopted commercial / industrial land use screening criteria with the exception of Benzo(a)pyrene which exceeded the adopted criteria within fill materials within AE-PC04 at a depth of between 0.1 and 0.5 m bgl located within the northern portion of the Site. ■ Potential contamination within the Site is largely associated with potentially impacted fill materials. During all construction works within the Site a construction environmental management plan and unexpected finds plan will be required to manage the potential for contaminated fill. 	<ul style="list-style-type: none"> ■ No potential linkage identified, however it is the opinion of ERM that all works should be undertaken in accordance with a Site Auditor Approved CEMP / CMMP to manage potential unexpected finds of contaminated fill material. 	<ul style="list-style-type: none"> ■ NA

7. QUALITATIVE EVALUATION OF ENVIRONMENTAL RISK AND MITIGATIONS

Based on information obtained during the desktop review, results from previous investigations including the results of collected soil samples and site inspections undertaken by ERM and as outlined within the CSM presented above, ERM generally considers that the Site poses a low risk of harm to current human health / ecological receptors, however notes the following:

- While groundwater has not been assessed within the Site, based on the results of the desktop assessment and soil sampling works ERM considers there to be a low risk of potential chemical contamination associated with onsite or surrounding land uses (fuel storage, dry cleaners etc.) that would pose a risk to identified human health or ecological receptors; and
- Based on the historical filling activities undertaken within the Site, it is the opinion of ERM that the primary contamination risk within the Site would be associated with unexpected finds of asbestos. While it is noted that the results of all soil samples collected from within the Site did not identify asbestos, due to the limited sampling density within operational roadways that may have been subject to historical filling works the potential for unexpected finds of asbestos to be present requires consideration during subsequent development works.

Prior to any works being undertaken within the Site a Construction Environmental Management Plan (CEMP) and Contamination and Materials Management Plan (CMMP) including appropriate controls for the management of unexpected finds of contamination, materials handling, surface water / sediment controls and requirements for importing / disposing fill materials should be prepared and endorsed as suitable for use the Site Auditor and ACT EPA.

In developing the CEMP, consideration should be given to the adoption of the ACT EPA sustainability hierarchy in the management of soils requiring excavation including:

- Avoid products becoming waste (reduce and reuse);
- find an alternative use for waste (recycle and recover); and
- ensure safe and appropriate disposal as a last resort.

While the requirements for remediation of soil and groundwater within the site is considered to be unlikely, where the requirement for remediation is identified, during appraisal of potential options consideration should be given to the sustainability indicators detailed within Table 1 of “A framework for Assessing the Sustainability of Soil and Groundwater Remediation”.

Upon completion of construction activities, the contractor or their nominated representative will be responsible for preparation of an environmental compliance report that demonstrates all works were undertaken in accordance with Site Auditor / ACT EPA approved plans and that that the Site (including currently unassessed staging / compound areas) are suitable for the proposed future intended land uses.

8. RISK FRAMEWORK

To assess the potential risk to construction from potential contamination within the Site, ERM utilised the risk framework adopted within the AECOM Environmental Assessment detailed below:

Table 13: Risk Likelihood Descriptors

Likelihood	Description
Remote	■ Extremely rare/unprecedented
Unlikely	■ Not expected to occur in most circumstances
Possible	■ Could occur
Likely	■ Probably would occur
Almost Certain	■ Expected to occur

Table 14: Risk Consequence Descriptors

Consequence	Environment	Economic	Social
Insignificant	■ No environmental damage.	■ Minimal losses	■ No noticeable change experienced by people in the locality
Minor	■ Minor instances of environmental damage that could be reversed. I.e. negative impact on a specific species.	■ Several thousand dollars lost revenue or remediation costs	■ Mild deterioration, for a reasonably short time, for a small number of people who are generally adaptable and not vulnerable
Moderate	■ Isolated but significant instances of environmental damage that might be reversed with intense efforts.	■ Half million dollars lost revenue or remediation costs	■ Noticeable deterioration to something that people value highly, either lasting for an extensive time, or affecting a group of people
Major	■ Severe loss of environmental amenities and a danger of continuing	■ One million dollars lost revenue or remediation costs	■ Substantial deterioration to something that people value highly, either lasting for an indefinite time, or affecting many people in a widespread area
Catastrophic	■ Major widespread loss of environmental amenity and progressive irrecoverable environmental damage.	■ Several million dollars in lost revenue or remediation costs	■ Substantial change experienced in community wellbeing, livelihood, amenity, infrastructure, services, health, and/or heritage values; permanent displacement or addition of at least 20% of a community

Table 15: Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Medium	High	Very High	Significant	Significant
Likely	Low	Medium	High	Very High	Significant
Possible	Very Low	Low	Medium	High	Very High
Unlikely	Negligible	Very Low	Low	Medium	High
Rare	Negligible	Negligible	Very Low	Low	Medium

9. EVALUATION OF ENVIRONMENTAL RISK – PRE-RISK MITIGATION

Based on information reviewed as part of this assessment, it is considered that the Site in its current form is unlikely to pose a significant risk of harm to human health or ecological receptors.

Specific risks relating to construction activities associated with the LRS2A project are detailed within the table below:

Table 16: Qualitative Evaluation of Environmental Risk (Pre Risk-Mitigation)

Project Construction Phase	Potential Risk	Comment	Likelihood	Consequence	Risk Rating (Prior to Risk Mitigations)
Temporary site facilities and traffic management set-up	<ul style="list-style-type: none"> ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Low risk of encountering groundwater during works ■ Potential ACM service pits and conduits present within the Site. ■ Potential for uncontrolled fill materials to be encountered during trenching works for new site services. ■ Materials requiring offsite disposal may require further assessment for waste classification. ■ ERM notes that the location of services and conduits is understood and relocation can be undertaken in a controlled manner minimising the risk to surrounding receptors and potential cross contamination of surrounding soil. 	Likely	Moderate	High
Detailed survey and existing services investigation & locating	<ul style="list-style-type: none"> ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Low risk of encountering groundwater during works ■ Potential ACM service pits and conduits present within the Site. ■ Potential for uncontrolled fill materials to be encountered during potholing works. ■ Materials requiring offsite disposal may require further assessment for waste classification. ■ ERM notes that the location of services and conduits is understood and relocation can be undertaken in a controlled manner minimising the risk to surrounding receptors and potential cross contamination of surrounding soil. 	Likely	Moderate	High

Project Construction Phase	Potential Risk	Comment	Likelihood	Consequence	Risk Rating (Prior to Risk Mitigations)
Site preparation, demolition of affected existing infrastructure and vegetation clearing	<ul style="list-style-type: none"> ■ Risk of hazardous materials within former structures. ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Low risk of encountering groundwater during works ■ Potential for uncontrolled fill materials to be encountered during excavation works. ■ Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. ■ Bituminous subgrade may require assessment / disposal / treatment ■ Materials requiring offsite disposal may require further assessment for waste classification ■ Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 	Likely	Moderate	High
Stormwater and utility work for new and existing assets	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Low risk of encountering groundwater during works ■ Potential for uncontrolled fill materials to be encountered during excavation works. ■ Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. ■ Bituminous subgrade may require assessment / disposal / treatment ■ Materials requiring offsite disposal may require further assessment for waste classification 	Likely	Moderate	High

Project Construction Phase	Potential Risk	Comment	Likelihood	Consequence	Risk Rating (Prior to Risk Mitigations)
		<ul style="list-style-type: none"> Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 			
Construction of approximately 1.7 km of light rail track and associated infrastructure	<ul style="list-style-type: none"> Risk of importing unsuitable fill materials Potential ACM service pits and conduits present within the Site. Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> Low risk of encountering groundwater during works Potential for uncontrolled fill materials to be encountered during excavation works. Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. Bituminous subgrade may require assessment / disposal / treatment Materials requiring offsite disposal may require further assessment for waste classification Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 	Likely	Moderate	High
Construction of 2 new signalised intersections (at West Row & University Avenue) and upgrade integration of existing signalised intersections along the LRS2A alignment	<ul style="list-style-type: none"> Risk of importing unsuitable fill materials Potential ACM service pits and conduits present within the Site. Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> Low risk of encountering groundwater during works Potential for uncontrolled fill materials to be encountered during excavation works. Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. 	Likely	Moderate	High

Project Construction Phase	Potential Risk	Comment	Likelihood	Consequence	Risk Rating (Prior to Risk Mitigations)
		<ul style="list-style-type: none"> ■ Bituminous subgrade may require assessment / disposal / treatment ■ Materials requiring offsite disposal may require further assessment for waste classification ■ Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 			
Construction of 3 new light rail stops at Edinburgh Avenue, City South, and Commonwealth Park	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Low risk of encountering groundwater during works ■ Potential for uncontrolled fill materials to be encountered during excavation works. ■ Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. ■ Bituminous subgrade may require assessment / disposal / treatment ■ Materials requiring offsite disposal may require further assessment for waste classification ■ Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 	Likely	Moderate	High

Project Construction Phase	Potential Risk	Comment	Likelihood	Consequence	Risk Rating (Prior to Risk Mitigations)
Construction of 1 new light rail bridge across Parkes Way	<ul style="list-style-type: none"> ■ Risk of hazardous materials within former structures ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Potential for uncontrolled fill materials to be encountered during excavation works. ■ Potential for hazardous materials in construction materials may require consideration during demolition of any existing structures to prevent cross contamination ■ Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. ■ Materials requiring offsite disposal may require further assessment for waste classification and receipt at a suitably licensed receiving facility ■ Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 	Likely	Moderate	High
Construction & re-sheeting of new and existing sections of carriageway/roads	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Low risk of encountering groundwater during works ■ Potential for uncontrolled fill materials to be encountered during excavation works. ■ Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. ■ Bituminous subgrade may require assessment / disposal / treatment ■ Materials requiring offsite disposal may require further assessment for waste classification 	Likely	Moderate	High

Project Construction Phase	Potential Risk	Comment	Likelihood	Consequence	Risk Rating (Prior to Risk Mitigations)
		<ul style="list-style-type: none"> Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 			
Irrigation system, landscape and hardscape works	<ul style="list-style-type: none"> Risk of importing unsuitable fill materials Potential ACM service pits and conduits present within the Site. Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> Low risk of encountering groundwater during works Potential for uncontrolled fill materials to be encountered during excavation works. Imported fill materials will require strict controls to ensure suitability for use within the Site. This will also include Site Auditor and EPA approvals. Where materials are brought to site that have not been appropriately screened, materials may require assessment onsite or removal from site resulting in delays to project and potential limitations due to excess stockpiles of soils. Bituminous subgrade may require assessment / disposal / treatment Materials requiring offsite disposal may require further assessment for waste classification Potential for asbestos to be present in fill that requires onsite management plans to be implemented including dust suppression / air monitoring. 	Likely	Moderate	High
Testing and commissioning of the light rail system	<ul style="list-style-type: none"> NA 	<ul style="list-style-type: none"> Unlikely to present a risk from contamination during testing and commissioning 	Remote	Insignificant	Negligible

10. RISK MITIGATION APPROACH

Based on the risks identified within Section 9, ERM recommends the below risk mitigation measures be implemented prior to, during and post construction:

Table 17: Risk Mitigation Approach

Ref	Mitigation measure	Timing	Responsibility
C1	<ul style="list-style-type: none"> Development and implementation of sampling and analysis quality plan (SAQP) for further assessment of soils requiring offsite disposal including areas where temporary construction structures such as stormwater / sediment basin may require excavation 	Pre-construction	MPC / ERM
C2	<ul style="list-style-type: none"> Development and implementation of sampling and analysis quality plan (SAQP) for further assessment of potential residual fill within the Site that may require management post construction due to the presence of hazardous materials 	Pre-construction	MPC / ERM
C3	<ul style="list-style-type: none"> Hazardous materials survey of structures requiring demolition. 	Pre-construction	MPC / ERM
C4	<ul style="list-style-type: none"> Where hazardous materials are identified, preparation of a hazardous materials management plan 	Pre-construction	MPC / ERM
C5	<ul style="list-style-type: none"> Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. The document is to detail specific requirements for the importation of any material onto the Site including environmental properties, tracking requirements, reporting / record keeping requirements. It is noted that this document and the requirements detailed within, will form a key part of the final requirements for EPA and Auditor sign off of the Site 	Pre-construction	MPC / ERM
C6	<ul style="list-style-type: none"> Development of a materials tracking methodology for all offsite disposal and imported fill materials. It is noted that this document and the requirements detailed within, will form a key part of the final requirements for auditor sign off on the Site 	Pre-construction	MPC / ERM
C7	<ul style="list-style-type: none"> Development of a detailed Unexpected Finds Protocol that outlines the roles and responsibilities where unexpected finds of potential contamination are identified during any works within the Site Where the requirement for remediation of unexpected finds is identified, all remedial options should consider suitability objectives detailed within Table 1 of “A framework for Assessing the Sustainability of Soil and Groundwater Remediation”. 	Pre-construction	MPC / ERM
C8	<ul style="list-style-type: none"> Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials, surface water management etc. As part of development of the CEMP, measures for the separation and appropriate handling of soils are to be included. 	Pre-construction	MPC and Construction Company

Ref	Mitigation measure	Timing	Responsibility
C9	<ul style="list-style-type: none"> Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) 	Construction	MPC / ERM and Construction Company
C10	<ul style="list-style-type: none"> Where residual contamination is present following completion of works, preparation of a Long term EMP outlining roles / responsibilities for management of any residual contamination (ACM etc.) 	Post-construction	MPC
C11	<ul style="list-style-type: none"> Post construction validation report detailing compliance with all approved plans / procedures implemented during works. The validation report will form a key part of the final requirements for EPA and auditor sign off of the Site 	Post-construction	MPC / ERM
C11	<ul style="list-style-type: none"> Preparation of a Site Audit Statement / Site Audit Report and ACT EPA approval of all reports. ERM notes that this is required as the final stage in attaining project completion from EPA. 	Post-construction	MPC / Site Auditor

11. EVALUATION OF ENVIRONMENTAL RISK – POST RISK MITIGATION (RESIDUAL RISK)

Post risk mitigation (residual risks) relating to construction activities associated with the LRS2A project are detailed within the table below:

Table 18: Qualitative Evaluation of Environmental Risk (Residual Risk)

Project Construction Stage	Potential Risk	Implemented Risk Mitigation	Likelihood	Consequence	Risk Rating (Post Risk Mitigations)
Temporary site facilities and traffic management set-up	<ul style="list-style-type: none"> ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ The location / extent of services and conduits is understood and relocation can be undertaken in a controlled manner minimising the risk to surrounding receptors and potential cross contamination of surrounding soil. ■ Preparation of a hazardous materials management plan. ■ Development and implementation of sampling and analysis quality plan (SAQP) for further assessment of potential residual fill within the Site that may require offsite disposal during works (pot holing waste etc). ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Detailed survey and existing services investigation & locating	<ul style="list-style-type: none"> ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ The location / extent of services and conduits is understood and relocation can be undertaken in a controlled manner minimising the risk to surrounding receptors and potential cross contamination of surrounding soil. ■ Development and implementation of sampling and analysis quality plan (SAQP) for further assessment of potential residual fill within the Site that may require offsite disposal during works (pot holing waste etc). ■ Preparation of a hazardous materials management plan. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Site preparation, demolition of affected existing infrastructure and vegetation clearing	<ul style="list-style-type: none"> ■ Risk of hazardous materials within former structures. ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development and implementation of sampling and analysis quality plan (SAQP) for further assessment of potential residual fill within the Site that may require management post construction due to the presence of hazardous materials ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Stormwater and utility work for new and existing assets	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development and implementation of sampling and analysis quality plan (SAQP) for further assessment of potential residual fill within the Site that may require management post construction due to the presence of hazardous materials. ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low

Project Construction Stage	Potential Risk	Implemented Risk Mitigation	Likelihood	Consequence	Risk Rating (Post Risk Mitigations)
Construction of approximately 1.7 km of light rail track and associated infrastructure	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Construction of 2 new signalised intersections (at West Row & University Avenue) and upgrade integration of existing signalised intersections along the LRS2A alignment	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Construction of 3 new light rail stops at Edinburgh Avenue, City South, and Commonwealth Park	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Construction of 1 new light rail bridge across Parkes Way	<ul style="list-style-type: none"> ■ Risk of hazardous materials within former structures ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Undertake hazardous materials survey. ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Construction & re-sheeting of new and existing sections of carriageway/roads	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low

Project Construction Stage	Potential Risk	Implemented Risk Mitigation	Likelihood	Consequence	Risk Rating (Post Risk Mitigations)
Irrigation system, landscape and hardscape works	<ul style="list-style-type: none"> ■ Risk of importing unsuitable fill materials ■ Potential ACM service pits and conduits present within the Site. ■ Potential contamination within surrounding fill materials 	<ul style="list-style-type: none"> ■ Development of a Construction Environmental Management Plan (CEMP) detailing requirements and responsibilities to mitigate potential risks of contamination arising during works from leaks / spills of construction equipment, cross contamination from materials etc. ■ Ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.) ■ Development of an imported fill material standard including requirements for re-use of onsite construction materials such as asphalt millings. ■ Post construction validation report detailing compliance with all approved plans / procedures implemented during works. 	Unlikely	Minor	Very Low
Testing and commissioning of the light rail system	NA	NA	NA	NA	NA

12. CONCLUSIONS

A review of historical information indicates the potential for contamination to be present at the Site primarily associated with historical / uncontrolled filling (ACM) and potential residual soil contamination identified during previous waste classification assessment (heavy metals, PAH, TRH):

- While records indicate the potential for offsite sources of contamination that may have the potential to impact groundwater based on the nature of construction activities within the Site it is considered that there is a low potential for contaminated groundwater to pose a risk to current / future receptors during construction and ongoing use of the Site; and
- While the beneficial use of groundwater during construction works is considered unlikely, where groundwater is to be utilised for beneficial re-use purposes or extracted and disposed during construction of LRS2A site, assessment of groundwater conditions may be required to inform specific re-use / offsite disposal requirements.

Based on information reviewed as part of this assessment including results from previous investigations, ERM identified a number of potential risks to construction associated with potential contamination located within the Site. Identified risks are primarily associated with:

- Hazardous materials within existing building structures / underground services; and
- Uncontrolled fill material containing elevated concentrations of various CoPCs.

The Site in its current / undisturbed form is unlikely to pose a risk of harm to identified human health and sensitive ecological receptors. ERM notes however, that where construction activities are undertaken within the Site that disturb sub-surface structures and / or on-site fill materials, the potential for risk to human health and sensitive ecological receptors will require consideration due to potential exposure to hazardous materials and potentially contaminated fill materials.

ERM considers that the identified potential risks from onsite contamination can be effectively managed prior to and during construction through the implementation of the following risk mitigations including:

- Development and Site Auditor / EPA endorsement of sampling plans for further assessment of soil conditions within the Site;
- undertaking additional investigations to assess the vertical / lateral extent of contamination within soils and the preparation and Site Auditor / EPA endorsement of investigation reports;
- the preparation, Site Auditor / EPA endorsement and implementation of unexpected finds / materials tracking plans; and
- the preparation Site Auditor / EPA endorsement and implementation of various environmental / construction management plans for implementation; and
- ongoing / routine compliance inspections and record keeping to be undertaken during construction works to assess compliance with CEMP and other approved plans (imported fill, unexpected finds etc.).

In developing the CEMP, consideration should be given to the adoption of the ACT EPA sustainability hierarchy in the management of soils requiring excavation including:

- Avoid products becoming waste (reduce and reuse);
- find an alternative use for waste (recycle and recover); and
- ensure safe and appropriate disposal as a last resort.

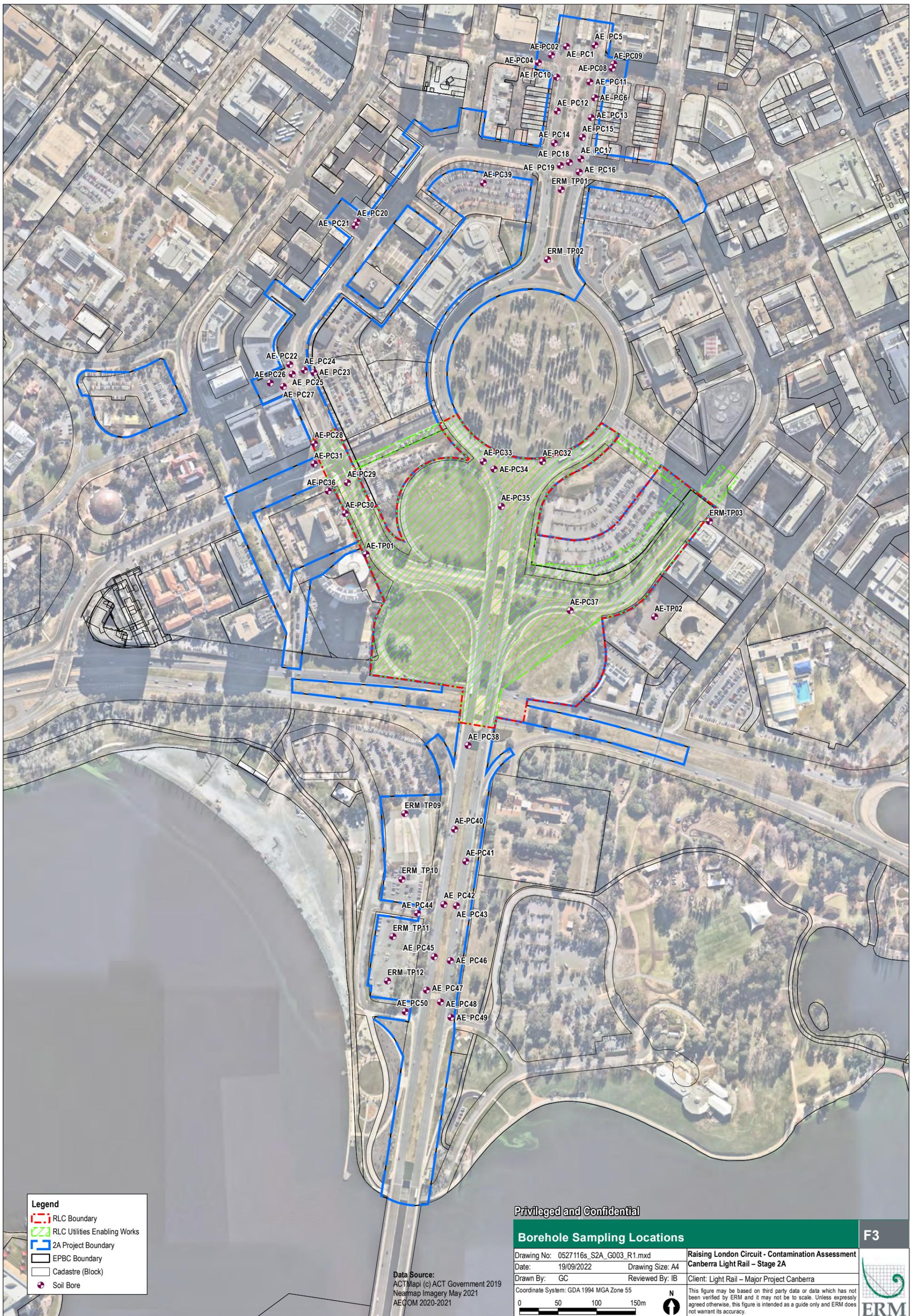
While the requirements for remediation of soil and groundwater within the site is considered to be unlikely, where the requirement for remediation is identified, during appraisal of potential options consideration should be given to the sustainability indicators detailed within Table 1 of “A framework for Assessing the Sustainability of Soil and Groundwater Remediation”.

Following completion of construction activities, a validation report will be prepared documenting the successful completion of contamination management works undertaken during construction works and the suitability of the Site for the proposed land use.

The report will be reviewed / endorsed by the Site Auditor with subsequent site audit report / statements demonstrating completion of works and compliance with relevant environmental management requirements to be reviewed / endorsed by the ACT EPA.

Based on the information reviewed in relation to contamination as part of this EA, it is considered that the identified potential contamination within the LRS2A site can be effectively managed to mitigate the risk to potential receptors and enable the Site to be suitable for the proposed ongoing land uses. It is therefore considered that pending implementation of the above risk mitigation approach, contamination poses a low risk to the overall LRS2A project.

APPENDIX A FIGURES



Legend	
	RLC Boundary
	RLC Utilities Enabling Works
	2A Project Boundary
	EPBC Boundary
	Cadastre (Block)
	Soil Bore

Data Source:
 ACT/Mapi (c) ACT Government 2019
 Nearmap Imagery May 2021
 AECOM 2020-2021

Privileged and Confidential

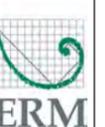
Borehole Sampling Locations

Drawing No: 0527116s_S2A_G003_R1.mxd	Drawing Size: A4
Date: 19/09/2022	Reviewed By: IB
Drawn By: GC	Client: Light Rail - Major Project Canberra
Coordinate System: GDA 1994 MGA Zone 55	

**Raising London Circuit - Contamination Assessment
 Canberra Light Rail - Stage 2A**

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

F3



Data Source:
 ACTMapi (c) ACT Government 2019
 Nearmap Imagery May 2021
 AECOM 2020-2021

AE-PC04	Depth (m)	Cd	Pb
	0.1-0.5	23	1900

AE-PC10	Depth (m)	B(a) p
	0.1-0.2	7.1

AE-PC14	Depth (m)	B(a) p
	0.4-0.7	13

AE-PC39	Depth (m)	B(a) p
	0.2-0.35	2.6

AE_PC21	Depth (m)	B(a) p
	0.1-0.2	3

AE_PC24	Depth (m)	Ni
	0.1-0.3	42
	0.4-0.5	91

AE_PC23	Depth (m)	Ni	B(a) p
	0-0.4	-	0.8
	0.4-0.6	70	-

AE_PC26	Depth (m)	B(a) p
	0.05-0.3	1.3

AE-PC36	Depth (m)	B(a) p
	0.2-0.35	0.7

AE-PC32	Depth (m)	Ni
	0.3-0.8	41

ERM-TP03	Depth (m)	Ni
	0.2-1.2	42

AE-TP02	Depth (m)	Ni
	1.1-1.5	120

AE-PC37	Depth (m)	Ni	B(a) p
	0.2-0.5	-	0.8
	0.5-0.7	41	-

AE-PC40	Depth (m)	Ni
	0.2-0.4	45

AE-PC41	Depth (m)	Ni	B(a) p
	0.2-0.35	-	0.8
	0.35-0.5	52	-

AE_PC43	Depth (m)	Ni	B(a) p
	0.15-0.3	-	0.8
	0.35-0.6	49	-

AE_PC42	Depth (m)	Ni
	0.4-0.6	53

AE_PC46	Depth (m)	Ni
	0.4-0.5	60

AE_PC44	Depth (m)	Ni
	0.3-0.7	55

AE_PC45	Depth (m)	Ni
	0.4-0.7	45

AE_PC50	Depth (m)	Ni
	0.5-0.7	140

AE_PC49	Depth (m)	Ni
	0.3-0.75	48

AE_PC48	Depth (m)	Ni
	0.4-0.5	94

Legend

- RLC Boundary
- RLC Utilities Enabling Works
- 2A Project Boundary
- EPBC Boundary
- Soil Bore
- AECOM Investigation Locations:
 - Geotech Borehole, Original Scope (ARUP)
 - Geotech Borehole, Additional Scope
 - Augmented Additional Auger Hole, Potential Uncontrolled Fill
 - Augmented Additional Auger Hole, Dry Cleaning / Storage Tanks
 - Pavement Core
 - Test Pit
 - Pavement Core, Excluded
 - Solid Waste for benzo(a)pyrene within poly aromatic hydrocarbons (PAHs)
 - Industrial
 - Inert Waste for benzo(a)pyrene within poly aromatic hydrocarbons (PAHs)
 - Beneficial Reuse for reuse criteria within the metals

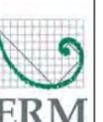
Analytes	Metals			PAH	
	Units	Cadmium mg/kg	Lead mg/kg	Nickel mg/kg	Benzo(a) pyrene mg/kg
Environment ACT 2021 General Solid Waste CT1		20	100	40	0.8
Environment ACT 2021 Restricted Solid Waste CT2		80	400	160	3.2
Environment ACT 2021 Specific Contaminant Concentration SSC1		100	1500	1050	10
Environment ACT 2021 Specific Contaminant Concentration SSC2		400	6000	4200	23
CRC Care (2011) Direct Contact Intrusive Maint Worker					
CRC Care (2011) Intrusive Maint Worker - VI Sand 0 to <2 m					
CRC Care (2011) Intrusive Maint Worker - VI Sand 2 to <4 m					
CRC Care (2011) Intrusive Maint Worker - VI Sand 4 m+					
NEPM (1999) EIL - Commercial/Industrial			1800		
NEPM (1999) ESL - Commercial/Industrial (coarse)				0.7	
NEPM (1999) HIL D - Commercial/Industrial		900	1500	6000	
NEPM (1999) Management Limits - Commercial/Industrial (coarse)					
NEPM (1999) Management Limits - Urban residential & open space (coarse)					

Privileged and Confidential

Soil Exceedances

Drawing No: 0527116s_S2A_G004_R3.mxd	Raising London Circuit - Contamination Assessment
Date: 19/09/2022	Canberra Light Rail - Stage 2A
Drawn By: GC	Reviewed By: IB
Client: Light Rail - Major Project Canberra	
Coordinate System: GDA 1994 MGA Zone 55	
0 50 100 150m	
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.	

F4



APPENDIX B PROJECT DESCRIPTION

Environmental Assessment

Technical reports project description

14-Dec-2022
Light Rail City to Commonwealth Park

Environmental Assessment

Technical reports project description

Client: Major Projects Canberra

ABN: 66 676 633 401

Prepared by

AECOM Australia Pty Ltd

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14-Dec-2022

Job No.: 60656949

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1.0 Project description

Major Projects Canberra (MPC) proposes to extend the Canberra Light Rail (CLR) network from its current southern terminus at Alinga Street, Canberra City, to Woden (Light Rail to Woden). Light Rail to Woden is being progressed in two, self-contained stages for a faster project delivery: Stage 2A City to Commonwealth Park (the Project, the subject of this Assessment), and Stage 2B Commonwealth Park to Woden.

The Project is needed as part of a coordinated and holistic delivery of a series of major projects in Canberra City and surrounds, to realise the strategic planning and development for Canberra City presented in the Territory Plan, the Transport for Canberra Plan and the National Capital Plan (NCP). The Project also supports the ACT Government's vision for a compact and efficient city and reaching net zero by 2045. Furthermore, the Project is a specific directive identified as a key strategy for developing and delivering an efficient, compact and sustainable Canberra City within the Moving Canberra Plan, The Light Rail Network Plan and The ACT Planning Strategy.

The Project would involve extending the light rail network from the current southern terminus at Alinga Street to a proposed stop at Commonwealth Park. A full project description for the Project is provided in Chapter 3.0 of the Environmental Assessment.

The Project would include the following key elements:

- An extension of approximately 1.7 km of track, extending southbound via the western side of London Circuit before continuing on Commonwealth Avenue
- A new bridge across Parkes Way
- Three stops are proposed to be located at key points along the alignment to provide access to the light rail where there is expected to be high demand: Edinburgh Avenue Stop, City South Stop and Commonwealth Park Stop.
- One scissor crossover (crossover of railway tracks) to allow LRVs to reverse direction
- Utility, stormwater drainage and streetlighting adjustments, relocations and provisions
- Landscaping features sympathetic with Canberra's design as envisioned by the Griffins' along with requirements set out in other Territory and Australian Government policy
- 'Green tracks' running along Commonwealth Avenue and Northbourne Place that involve planting grass or shrubs between and besides the alignment
- Intersection layout, traffic signal phasing and road traffic speed changes along the alignment, including new intersections and modifications to existing intersections
- Pedestrian footpaths and crossing modifications
- Road widening and verge and kerb line changes.

The completed Project, including its key features and elements, is shown on **Figure 1**.

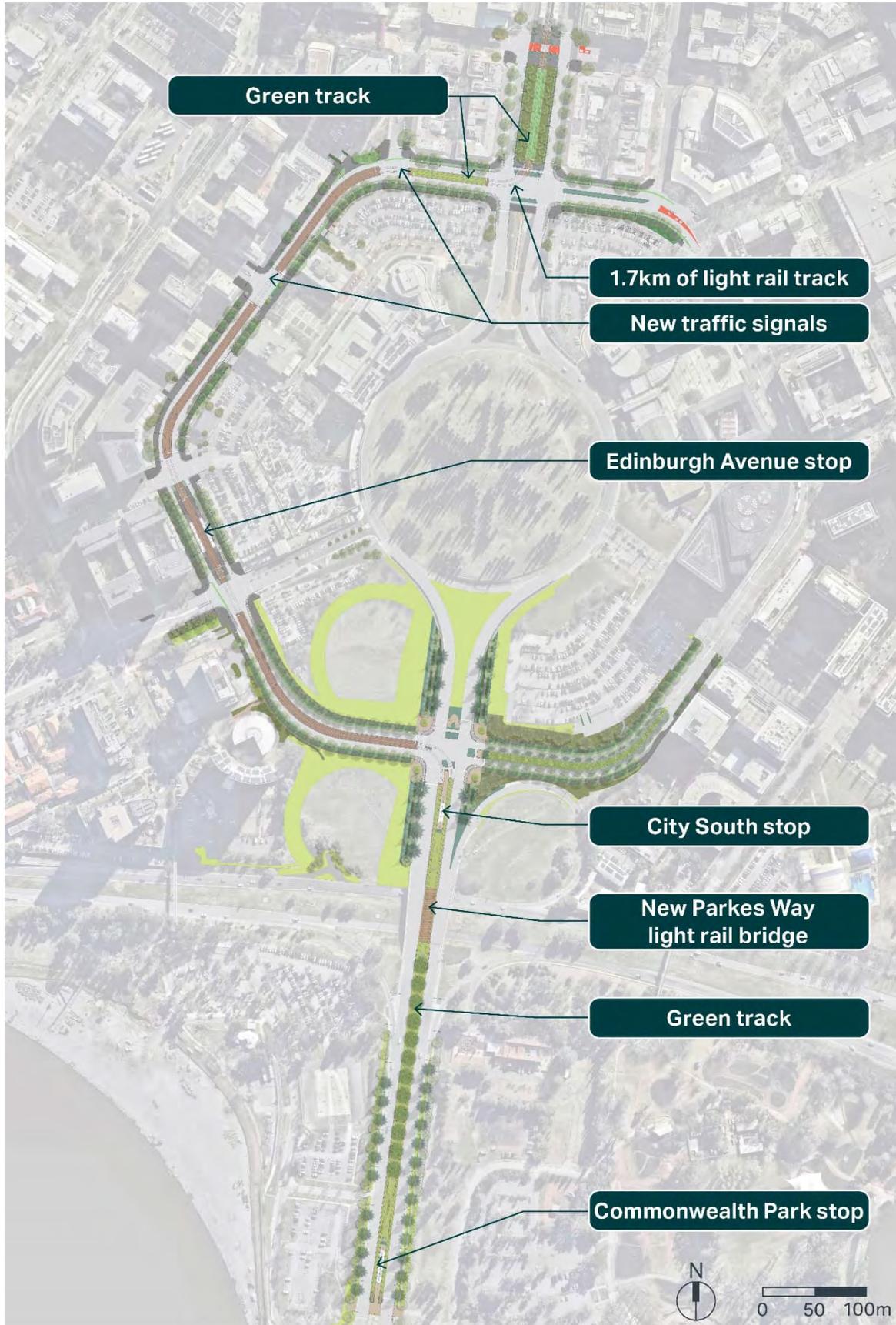


Figure 1 The Project and its key features

1.1 Construction

Construction activities associated with the Project would occur within a footprint referred to as the 'delivery phase area' (**Figure 2**). The operation of the Project would occur within a subset of the delivery phase area. The delivery phase area includes both Designated Land and Territory land. This Assessment addresses the Project in its entirety to allow for consideration of the Project as a whole.

Construction of the Project is anticipated to commence in 2024 with completion of construction planned in 2026. However, the duration of the construction would be dependent on final construction methodology and staging selected by the delivery contractor, as well as any efficiencies identified during the program. Testing and commissioning would commence in the latter stages of construction and continue for a period of up to nine months following the conclusion of main works. Successful completion of the testing and commissioning programme would allow the Project Contractor to obtain accreditation from the Office of the National Rail Safety Regulator (ONRSR). Once complete, the system would be ready to be handed over for operation.

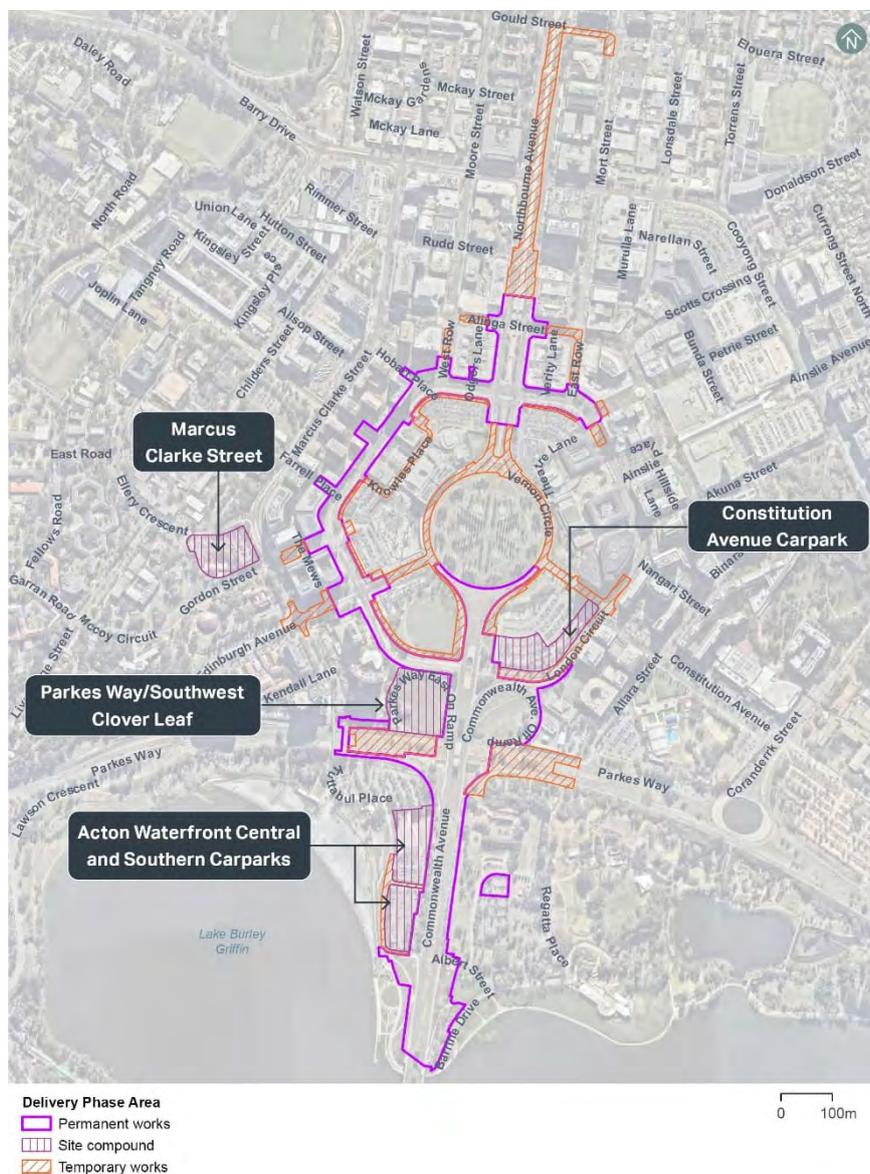


Figure 2 Delivery phase area

1.1.1 Site establishment and preparatory works

There would be four major compound sites, as shown on **Figure 2**. Several temporary construction compounds, stockpile sites and laydown areas would also be required as part of the Project. Upon completion of the works all established site compounds would be reinstated prior to handing back to the respective land owners.

There are utilities within the delivery phase area which are affected to various degrees by the Project. Most protection, decommissioning and removal of utilities would be completed early in the Project construction period, but may also be staged during the construction period depending on construction planning requirements.

Traffic management arrangements would include full and partial road closures and would introduce necessary traffic detours to direct the travelling public around work sites and construction access and egress points. Notification of these closures would be advertised in advance and sufficient time to deliver written notice would be required for the local businesses and residents. All temporary traffic management arrangements and diversionary routes would be agreed and approved by TCCS (RoadsACT) prior to implementation.

1.1.2 Construction strategy

The construction strategy of the Project has been divided by construction zones, major intersections and the Parkes Way Bridge.

Table 1 Construction staging locations

Location	Description
Block closures	<p>These are construction areas between major intersections. Block closures would be used to close off entire sections of the road network, typically between blocks to allow the Project contractor full access to the worksite and the best opportunity to complete the Project most efficiently. Stops would be constructed upon the occupation of the block section where it is located. Blocks include:</p> <ul style="list-style-type: none"> • Northbourne Avenue (between Alinga Street and London Circuit) • London Circuit (between Northbourne Avenue and Petrie Plaza) • London Circuit (between Northbourne Avenue and West Row) • London Circuit (West Row to Knowles Place North) • London Circuit (between Knowles Place North and Gordon Street) • London Circuit (between Gordon Street and Edinburgh Avenue) • London Circuit (between Edinburgh Avenue and Commonwealth Avenue) • Commonwealth Avenue (between London Circuit and Parkes Way) • Commonwealth Avenue (between Parkes Way and Lake Burley Griffin).
Major intersections	<p>The major intersections include Northbourne Avenue and Alinga Street, Northbourne Avenue and London Circuit, London Circuit and Edinburgh Avenue, London Circuit and Gordon Street and Commonwealth Avenue and London Circuit.</p> <p>For works within major intersections, wherever possible the construction of the intersection would be carried out during normal working hours, within the confines of a protected worksite. Closures, where required, are expected to be carried out over several weekends (typically from Friday 10pm to Monday 6am) for a maximum of 56 hours at a time, except during construction of track slab where a continuous 80 hours would be required to facilitate concrete curing and ensure adequate concrete strength is achieved prior to intersection reopening and eventual trafficking.</p> <p>The Commonwealth Avenue and London Circuit intersection would not require full closure, and would be subject to a contraflow arrangement for several weeks.</p>

Location	Description
Parkes Way bridge	A new bridge would be built between the two road bridges on Commonwealth Avenue over Parkes Way. In appearance, the gap would be infilled to create a single surface. The new rail bridge would be supported on 8 concrete piles (four piles for each bridge abutment) and concrete-walled abutments. The construction of temporary roads allows for the continued movement of traffic during bridge construction activities, with the location of temporary roads selected by the contractor in line with the Roads ACT requirements.

1.2 Operation

The Project would be an extension of the City to Gungahlin service and would therefore have the same frequency. It would take approximately six to nine minutes to travel between Alinga Street and Commonwealth Park.

A minimum of five LRVs would be required for the expansion of the CLR network. The new LRVs would be similar in appearance, size and performance to those that operate on the current CLR network. These LRVs and modifications to the stabling yard at the Mitchell Depot would be complete prior to the operation of this Project.

A wire free track is proposed for the Project alignment with LRVs operating using onboard battery power supply between the current Alinga Street southern terminus and the proposed Commonwealth Park terminus. Battery storage capacity for additional and existing LRVs has been proposed to minimise visual impact in landscape and visual sensitive zones, such as Commonwealth Avenue.

Two track forms, a permanent form of rail infrastructure that provides a surface for rail vehicles to move, are required for the Project. One trackform would operate northbound and the other southbound, with a crossover installed on Commonwealth Avenue to allow LRVs to change direction. Green track would also be included as part of the Project, in three locations: Northbourne Place, London Circuit between Northbourne Avenue and West Row, and Commonwealth Avenue between London Circuit and Albert Street. Non-potable water would be used for the irrigation of the Commonwealth Avenue green track.

1.2.1 Changes to the road network

The proposed light rail track would run within a median between opposing vehicular traffic flows for the entire length of the proposed alignment. The median would be between 80-150 mm high between intersections to minimise the possibility of road vehicles straying into the rail corridor. The median height would transition to be at grade just before each signalised intersection. This would facilitate vehicular and pedestrian movement across the track.

Road network changes required to accommodate the Project's median light rail alignment and associated stops are provided in Table 2.

Table 2 Lane configuration

Road	Proposed lane configuration
London Circuit	<ul style="list-style-type: none"> The lane arrangement on London Circuit between Edinburgh Avenue and Commonwealth Avenue would remain unchanged Two 3.3m wide traffic lanes in each direction along London Circuit between Northbourne Avenue and West Row, including a dedicated westbound right turn lane to West Row A single 3.7m wide traffic lane in each direction along London Circuit between West Row and Edinburgh Avenue, except on the southbound approach to Gordon Street which would have a dedicated right turn lane. The posted speed limit along London Circuit would remain 40km/h except in the vicinity of the Edinburgh Avenue stop where the speed would be reduced to 20km/h because of the high pedestrian activity expected at the stop All on street parking and loading along London Circuit would be removed.

Road	Proposed lane configuration
	<ul style="list-style-type: none"> Two new signalised intersections on London Circuit to facilitate right turns across the Project's alignment at West Row and University Avenue. The remaining unsignalised intersections along London Circuit would be converted to left-in/left-out out¹.
Alinga Street	One lane in each direction on Alinga Street within the median on Northbourne Avenue. These lanes would be for buses only.
Commonwealth Avenue	No change
Northbourne Avenue	No change

1.2.2 Active transport infrastructure

The Project includes walking and cycling facilities or upgrades that aim to improve pedestrian and cyclist safety, connectivity and amenity within the study area, and in particular along London Circuit West and Commonwealth Avenue. Active transport infrastructure includes dedicated and separate pedestrian and cycling paths.

¹ Right turn out from Knowles Place south permitted by emergency vehicles under signals

APPENDIX D INFRASTRUCTURE SUSTAINABILITY RATING SCHEME

Infrastructure Sustainability rating scheme

The Infrastructure Sustainability Council (ISC) Infrastructure Sustainability (IS) rating scheme is Australia's only comprehensive rating scheme for evaluating sustainability for infrastructure. The Project is seeking an As-Built IS ratings. As part of this process, alignment with the Lan-2 (Conservation of on-site resources) and Lan-3 (Contamination and remediation) credits is required. This table outlines how the *Soil and Contamination Technical Report* aligns with the IS criteria and additional guidance where relevant to the scope of the assessment.

Table G-1 outlines specific requirements as part of Lan-2 to demonstrate achievement of the required target levels and where these are addressed in the *Soil and Contamination Technical Report*.

Table G-1: ISC Lan-2 requirements

ISCA requirement	Section addressed
Lvl 1: Conservation of topsoil and subsoil has been considered.	<ul style="list-style-type: none"> • <i>Based on the identified CoPCs within previous investigations it was the opinion of ERM that there is a low risk of potential harm to identified ecological / human health receptors and as such there is a high potential for re-use of soils onsite during works (providing geotechnical suitability).</i> • Section 6.4 – Conceptual Site Model • Section 7.0 – Qualitative Evaluation of Environmental Risk and Mitigations • <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the onsite reuse of soils will be included.</i> • Section 10 – Risk Mitigation Approach
Lvl 2: All subsoil and topsoil impacted by the project is separated and protected from degradation, erosion or mixing with fill or waste;	<ul style="list-style-type: none"> • <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the separation and appropriate handling of soils are to be included.</i> • Section 10 – Risk Mitigation Approach
Lvl 2: 95% of all topsoil (by volume) retains its productivity and is beneficially re-used on or nearby to the project.	<ul style="list-style-type: none"> • <i>Based on the identified CoPCs within previous investigations it was the opinion of ERM that there is a low risk of potential harm to identified ecological / human health receptors and as such there is a high potential for re-use of soils onsite during works (providing geotechnical suitability).</i> • Section 6.4 – Conceptual Site Model • Section 7.0 – Qualitative Evaluation of Environmental Risk and Mitigations • <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the onsite reuse of soils will be included.</i> • Section 10 – Risk Mitigation Approach

ISCA requirement	Section addressed
Correct separation, handling and storage of topsoil and subsoil must be demonstrated. Evidence could be the existence of instructions on soil handling, a soil handling and management strategy, or minutes of site meetings etc. referring to handling and storage	<ul style="list-style-type: none"> • <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the appropriate handling of soils and subsequent record keeping will be required.</i> • Section 10 – Risk Mitigation Approach (TABLE 17)
It must be demonstrated that the integrity of the site's topsoil was not compromised during construction works and that at least 95% of it remains productive at completion of construction. To remain productive, the topsoil must not be covered by permanent hard surfaces.	<ul style="list-style-type: none"> • The works are largely being undertaken within portions of the Site that are already subject to permanent hardstand.
Lvl 3: Opportunities to improve topsoil productivity of previously disturbed areas have been identified and incorporated into the project	<ul style="list-style-type: none"> • The soils currently within the Site are unlikely to currently retain any productive value. During sampling works undertaken by ERM and previous investigations surface materials were generally characterised as "fill" containing a range of anthropogenic materials. • During works, fill materials will be retained (where possible) onsite. • <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the appropriate handling of soils and subsequent record keeping will be required.</i> • Section 10 – Risk Mitigation Approach (TABLE 17)

Table G-1 outlines specific requirements as part of Lan-3 to demonstrate achievement of the required target levels and where these are addressed in the *Soil and Contamination Technical Report*.

Table G-2: ISC Lan-3 requirements

ISCA requirement	Section addressed
Lvl 1: Site assessment follows the recommended approach in Schedule A 'Recommended general process for assessment of site contamination' of National Environment Protection (Assessment of Site Contamination) Measure 1999.	<ul style="list-style-type: none"> • As outlined within Section 1.2 - The assessment of potential contamination within the Site was undertaken in accordance with the following key guidance. • <i>National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM (1999)) (as amended May 2013) - herein referred to as the ASC NEPM (2013).</i> • <i>Australian Capital Territory (1997) Environment Protection Act 1997 – herein referred to as the Act.</i> • <i>ACT EPA (2017) Contaminated Sites Environment Protection Policy (December 2017) – herein referred to as the Contaminated Sites EPP.</i>

ISCA requirement	Section addressed
	<ul style="list-style-type: none"> All subsequent management plans will require review and endorsement by an ACT EPA accredited site auditor and the ACT EPA to ensure they meet the requirements outlined within the ASC NEPM. Requirement for auditor approval of subsequent plans detailed within Section 10, 11 and 12
<p>Lvl 1: Remediation options are identified and selected using a sustainability hierarchy.*</p>	<ul style="list-style-type: none"> No remediation is required within the Site. It is noted that where soils are to be excavated for construction purposes, the primary objective will be to maximise onsite re-use of soils. <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the appropriate handling of soils and subsequent record keeping will be required.</i> Section 10 – Risk Mitigation Approach (TABLE 17)
<p>Contamination reports must demonstrate how the guidance in the National Environment Protection (Assessment of Site Contamination) Measure (1999) (NEPM 1999 (as amended 2013)) (NEPC 1999) was followed.</p>	<ul style="list-style-type: none"> All contamination reports and subsequent plans will require review and endorsement by an ACT EPA accredited site auditor and the ACT EPA to ensure they meet the requirements outlined within the ASC NEPM. Requirement for auditor approval of subsequent plans detailed within Section 10, 11 and 12
<p>* The sustainability hierarchy for remediation is:</p> <ol style="list-style-type: none"> If practicable, on-site treatment of the contamination so that it is destroyed or the associated risk is reduced to an acceptable level. Off-site treatment of excavated soil, so that the contamination is destroyed or the associated risk is reduced to an acceptable level, after which soil is returned to the site. Consolidation and isolation of the soil on site by containment with a properly designed barrier. Removal of contaminated material to an approved site or facility, followed, where necessary, by replacement with appropriate material. Where the assessment indicates remediation would have no net environmental benefit or would have a net adverse environmental effect, implementation of an appropriate management strategy. <p>If an option less favourable than the first option is selected, then justification for not selecting options higher on the hierarchy must be provided</p>	<ul style="list-style-type: none"> ERM notes that no contamination has been identified within the Site that requires remediation. It is noted that where soils are to be excavated for construction purposes, the primary objective will be to maximise onsite re-use of soils. <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the appropriate handling of soils and subsequent record keeping will be required.</i> Section 10 – Risk Mitigation Approach (TABLE 17)
<p>Contamination reports must demonstrate how the guidance in the National Environment Protection (Assessment of Site Contamination) Measure (1999) (NEPM 1999 (as amended 2013)) (NEPC 1999) was followed.</p>	<ul style="list-style-type: none"> All contamination reports and subsequent plans will require review and endorsement by an ACT EPA accredited site auditor and the ACT EPA to ensure they meet the requirements outlined within the ASC NEPM.

ISCA requirement	Section addressed
	<ul style="list-style-type: none"> • Requirement for auditor approval of subsequent plans detailed within Section 10, 11 and 12
<p>Lvl 2: Contamination reports must demonstrate how the guidance in the National Environment Protection (Assessment of Site Contamination) Measure (1999) (NEPM 1999 (as amended 2013)) (NEPC 1999) was followed.</p>	<ul style="list-style-type: none"> • All contamination reports and subsequent plans will require review and endorsement by an ACT EPA accredited site auditor and the ACT EPA to ensure they meet the requirements outlined within the ASC NEPM. • Requirement for auditor approval of subsequent plans detailed within Section 10, 11 and 12
<p>For Levels 2 and 3, the sustainability appraisal of remediation options must include at least one indicator from each of the sustainability dimensions – environmental, social and economic, as described in Table 1 of 'A Framework for Assessing the Sustainability of Soil and Groundwater Remediation' (SuRF 2009).</p>	<ul style="list-style-type: none"> • No remediation is required within the Site. It is noted that where soils are to be excavated for construction purposes, the primary objective will be to maximise onsite re-use of soils. • <i>The onsite re-use of soils ins considered the most environmentally sustainable option for managing spoil generated during works.</i> • <i>Prior to works a Construction Environmental Management Plan (CEMP) will be prepared that specifies all appropriate controls for the management of any unsuitable materials. As part of development of the CEMP, measures for the appropriate handling of soils and subsequent record keeping will be required.</i> • Section 10 – Risk Mitigation Approach (TABLE 17)
<p>Lvl 3: The effectiveness and durability of the remedial solution, and maintenance and monitoring, have been considered over the lifetime of the infrastructure and beyond.</p>	<ul style="list-style-type: none"> • No remediation is required within the Site.
<p>For Level 3, evidence should be available regarding the longevity of the remedial solution and normal maintenance requirements. The forecast useful life of the asset should not be greater than the lifetime of the remedial solution. Long-term monitoring may be required to ensure the continued effectiveness of some solutions, including natural attenuation, permeable reactive barriers, slurry walls, ongoing process-based treatments for groundwater, etc. Monitoring arrangements will depend on the type of remediation method chosen and its projected lifetime. Where monitoring is necessary, there should also be contingency plans in case monitoring data should demonstrate any fault or deterioration in the remedial solution.</p>	<ul style="list-style-type: none"> • No remediation is required within the Site.
<p>The site assessment and remediation appraisal should be managed, reviewed or audited by a suitably qualified professional. For the purposes of this credit, an suitably qualified professional should meet the requirements of Schedule B(9) of the NEPM 1999 (as amended 2013). While a contaminated land auditor accredited by the relevant state authority would be acceptable, others who meet the NEPM requirements would also be acceptable.</p>	<ul style="list-style-type: none"> • All reports and subsequent plans will require review and endorsement by an ACT EPA accredited site auditor and the ACT EPA to ensure they meet the requirements outlined within the ASC NEPM. • Requirement for auditor approval of subsequent plans detailed within Section 10, 11 and 12

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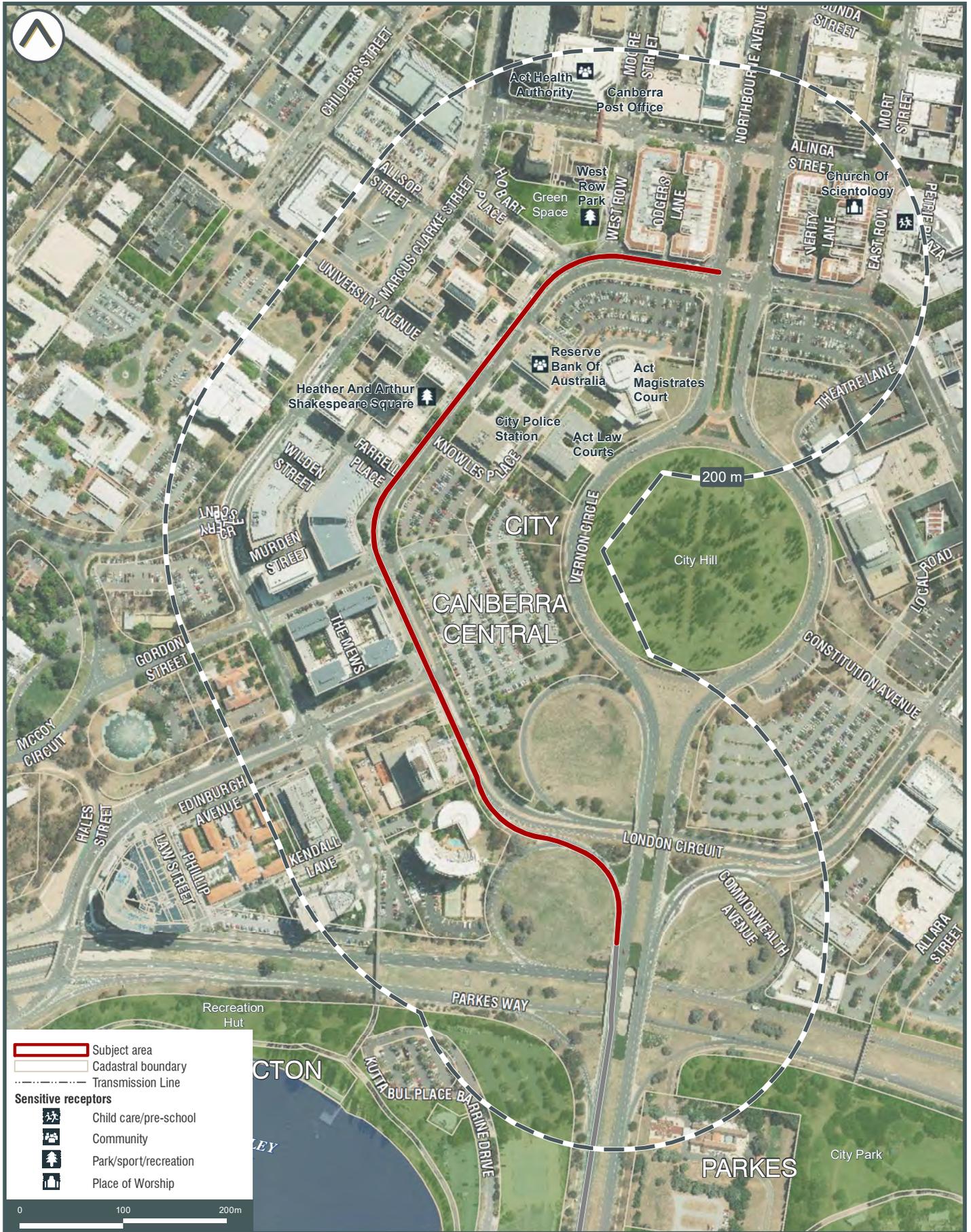
**APPENDIX C DESKTOP SEARCH RESULTS AND AERIAL
PHOTOGRAPHY**



ATTACHMENT A

Report Maps

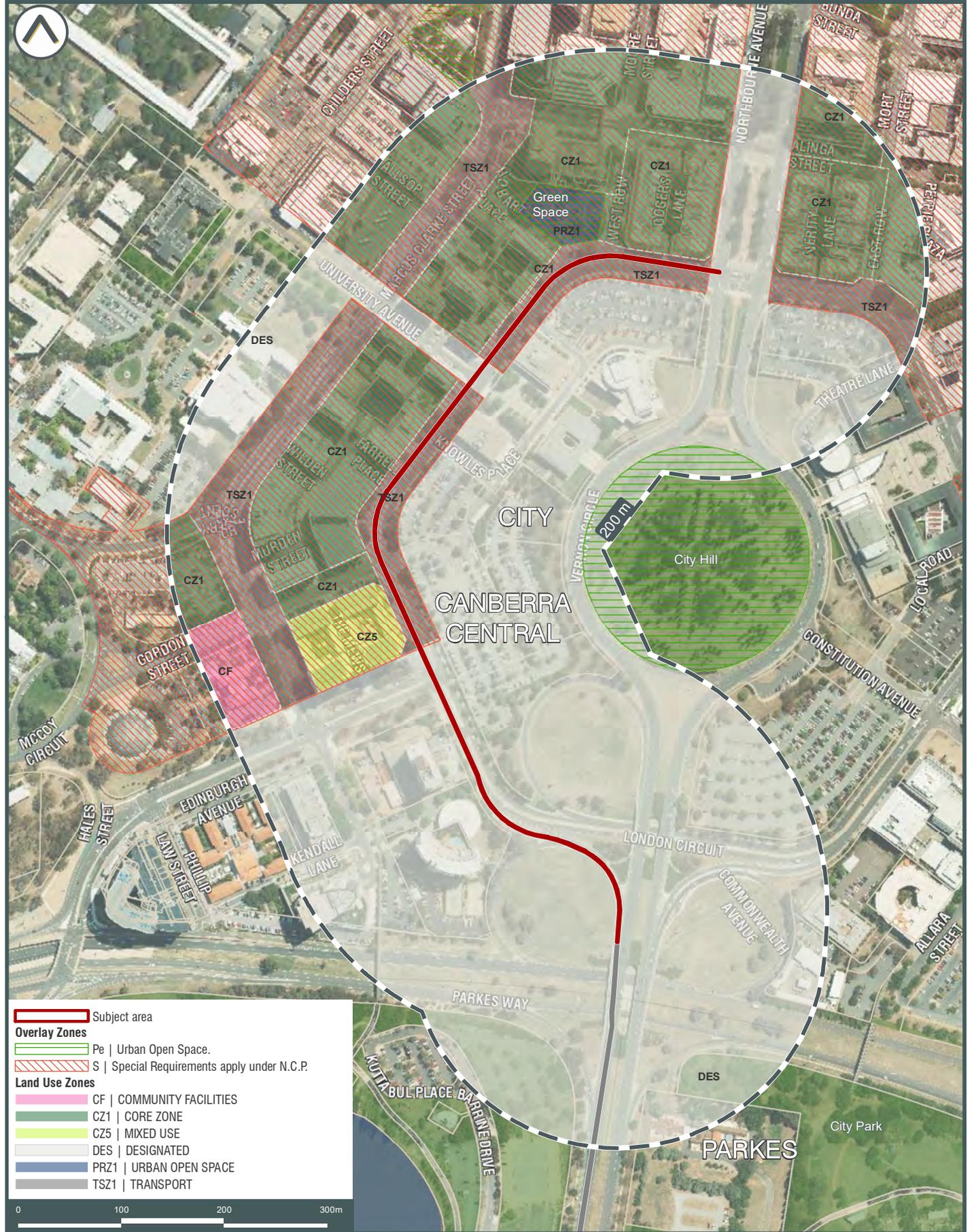




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SUBJECT AREA AND SENSITIVE RECEPTORS





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	Subject area
Overlay Zones	
	Pe Urban Open Space.
	S Special Requirements apply under N.C.P.
Land Use Zones	
	CF COMMUNITY FACILITIES
	CZ1 CORE ZONE
	CZ5 MIXED USE
	DES DESIGNATED
	PRZ1 URBAN OPEN SPACE
	TSZ1 TRANSPORT

PLANNING CONTROLS





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SOIL LANDSCAPES AND ACID SULFATE SOIL RISK





ATLAS OF AUSTRALIAN ACID SULFATE SOILS AND SALINITY



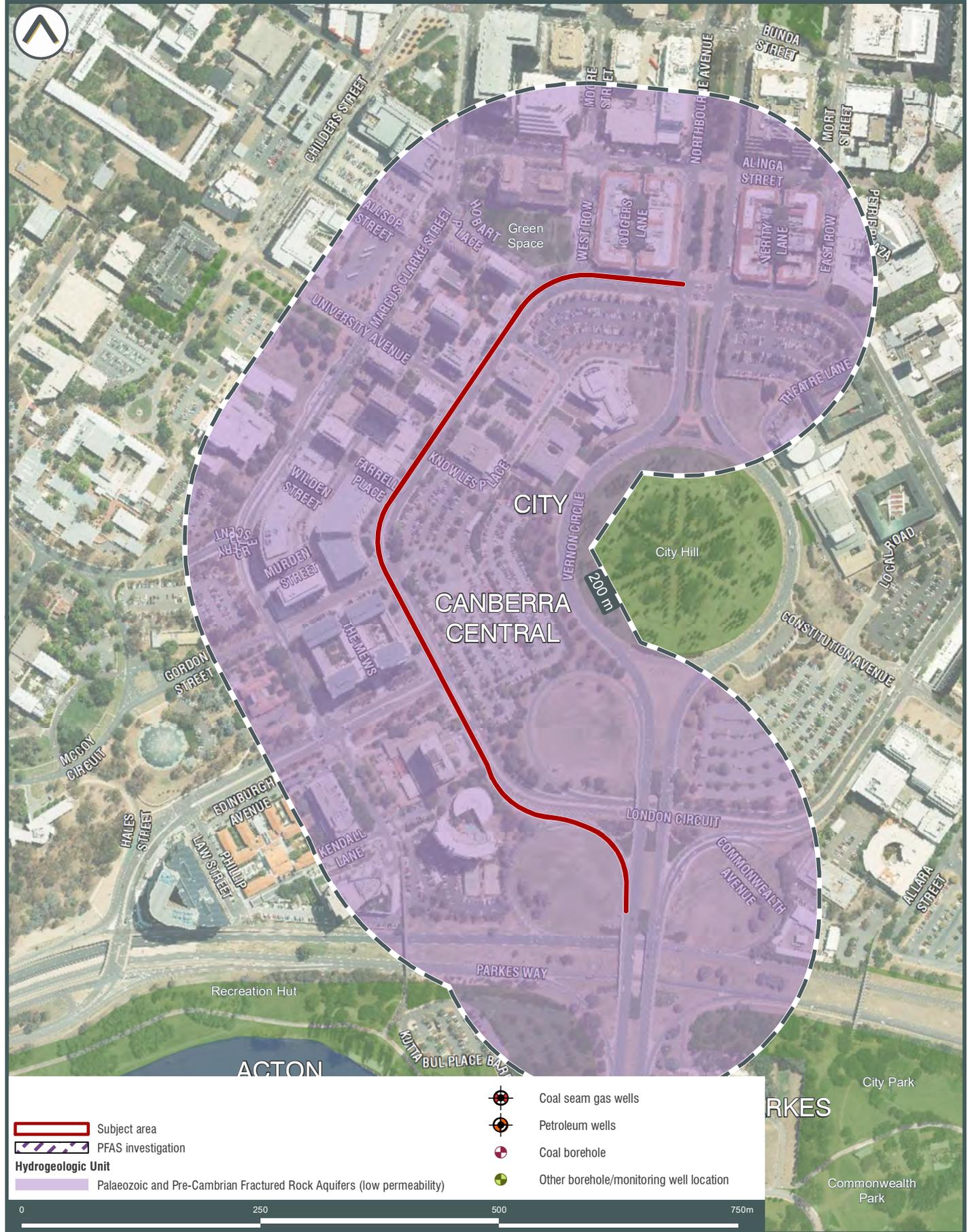
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GEOLOGY AND TOPOGRAPHY

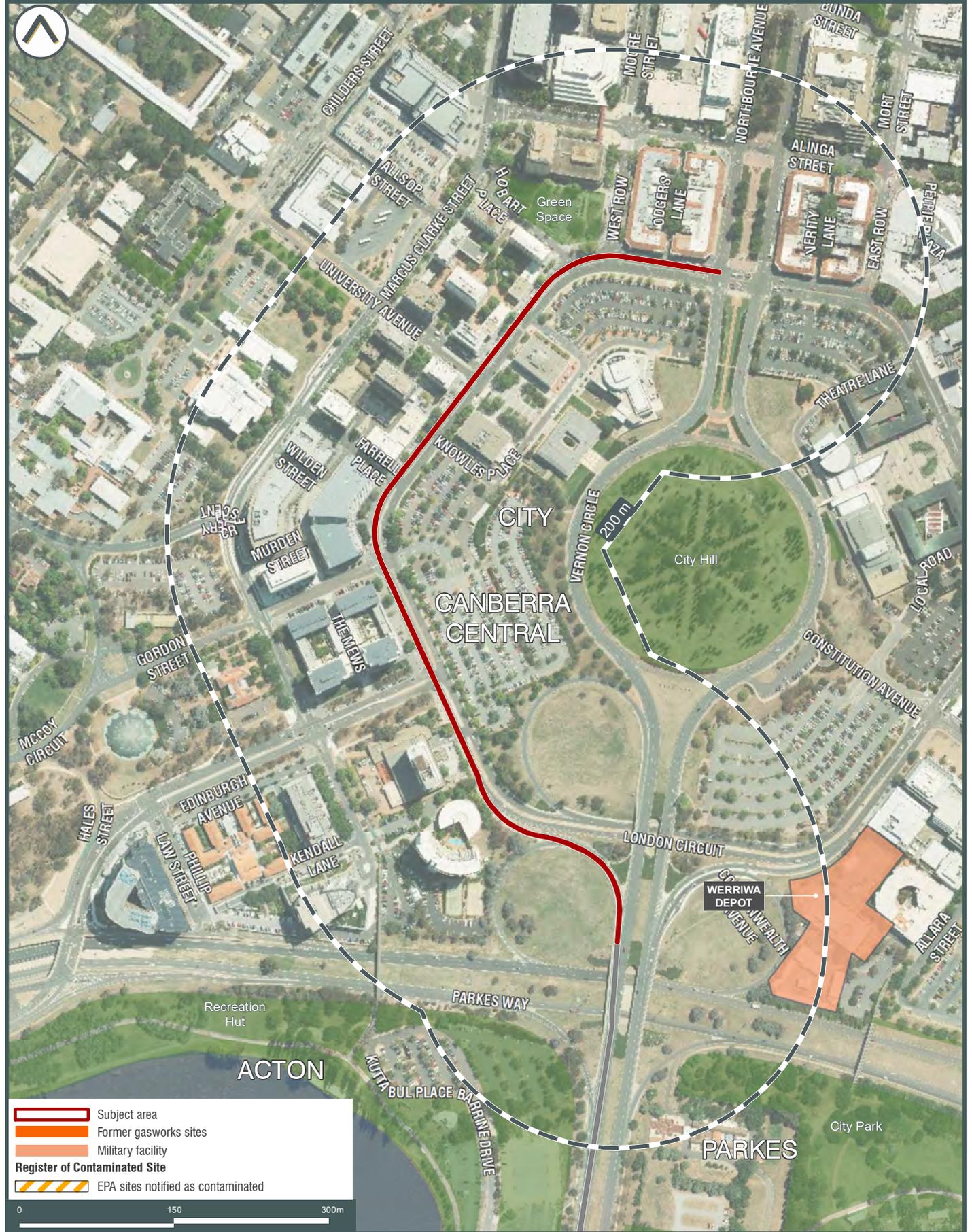




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HYDROGEOLOGY AND OTHER BOREHOLES





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EPA RECORDS AND OTHER REGULATORY CONTAMINATION ISSUES



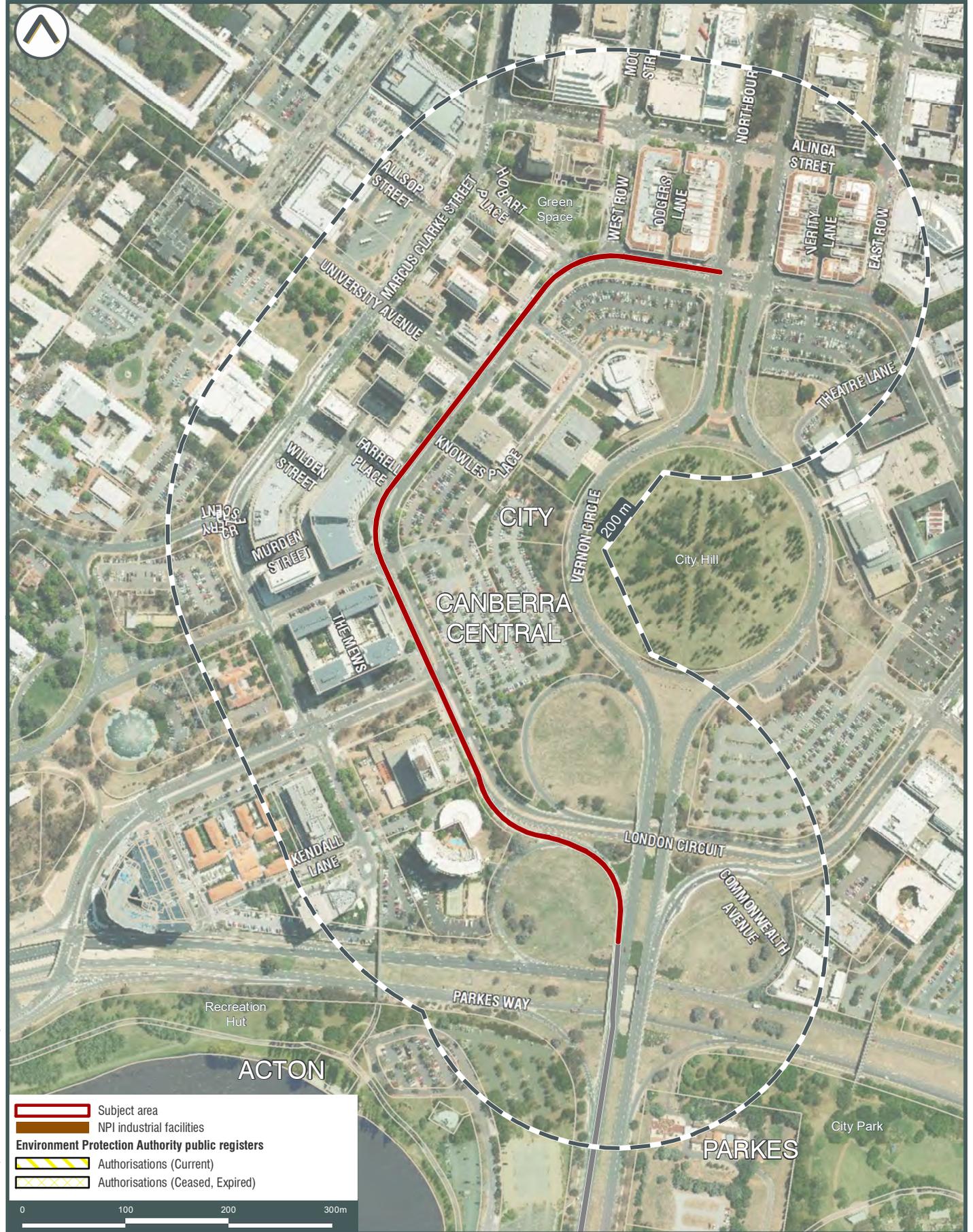


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	Subject area		Aviation fuel depots		Dry cleaners		Substation locations
	Historical (Legacy) Landfills		Aviation rescue and fire fighting facilities		Liquid fuel depots		Telephone exchanges
	Operational Service stations		Cattle dip		Liquid fuel terminals		Waste management facilities
	Former Service stations		Derelict mine/quarry		Power stations		Wastewater Treatment Facility

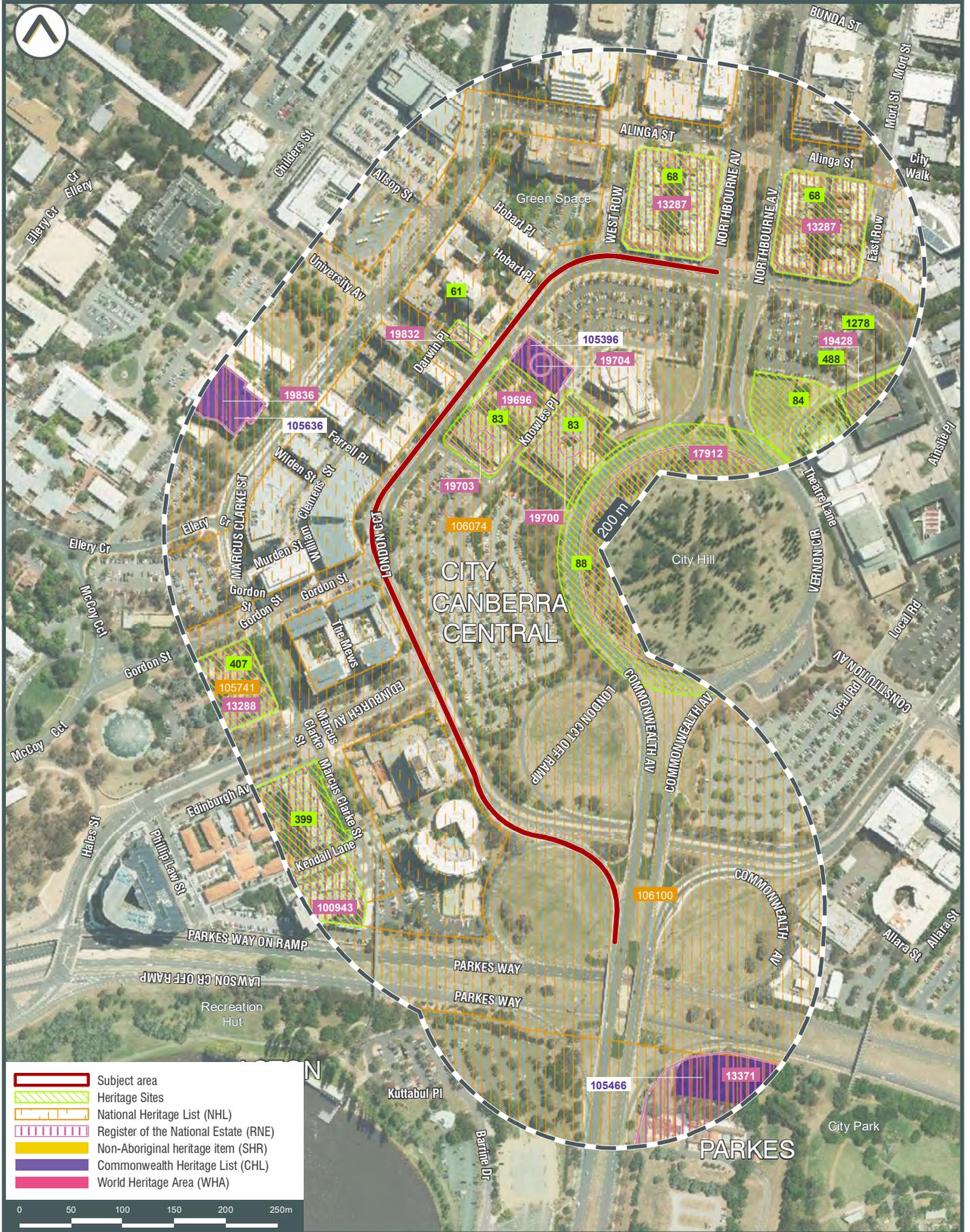
POTENTIALLY CONTAMINATING ACTIVITIES





EPA PUBLIC REGISTERS AND NPI FACILITIES

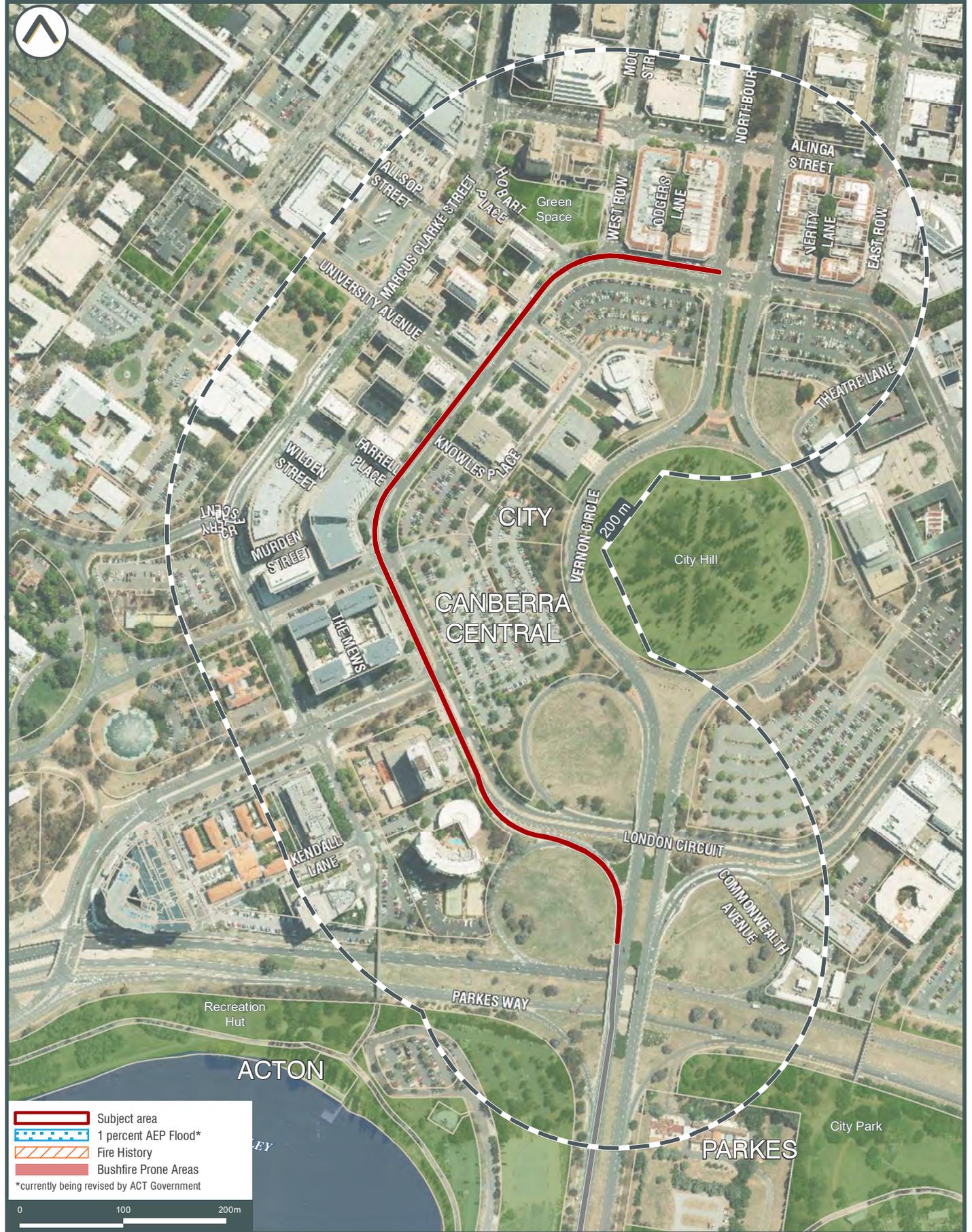




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HERITAGE





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NATURAL HAZARD AND COASTAL MANAGEMENT

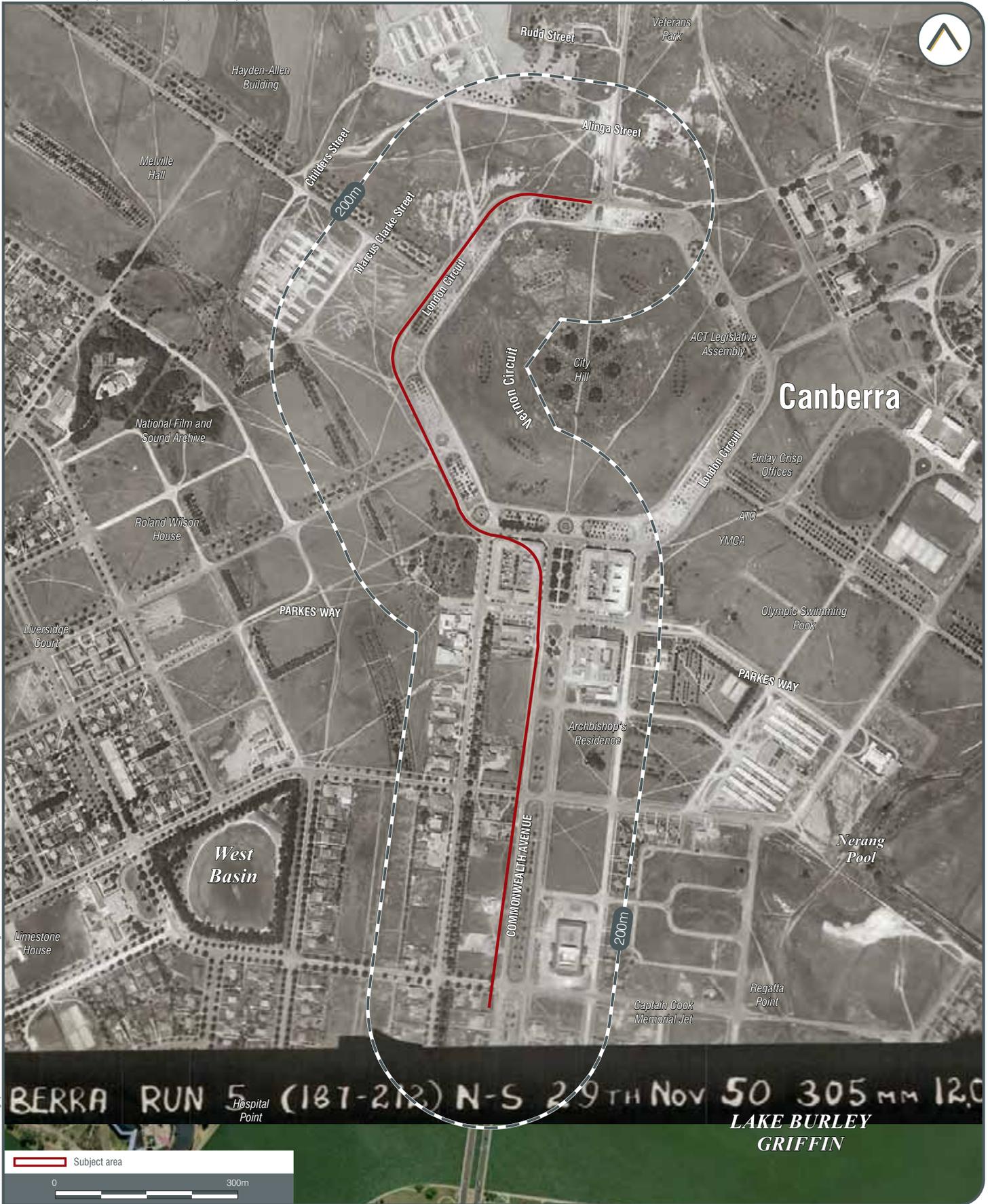




ATTACHMENT B

Historical Imagery

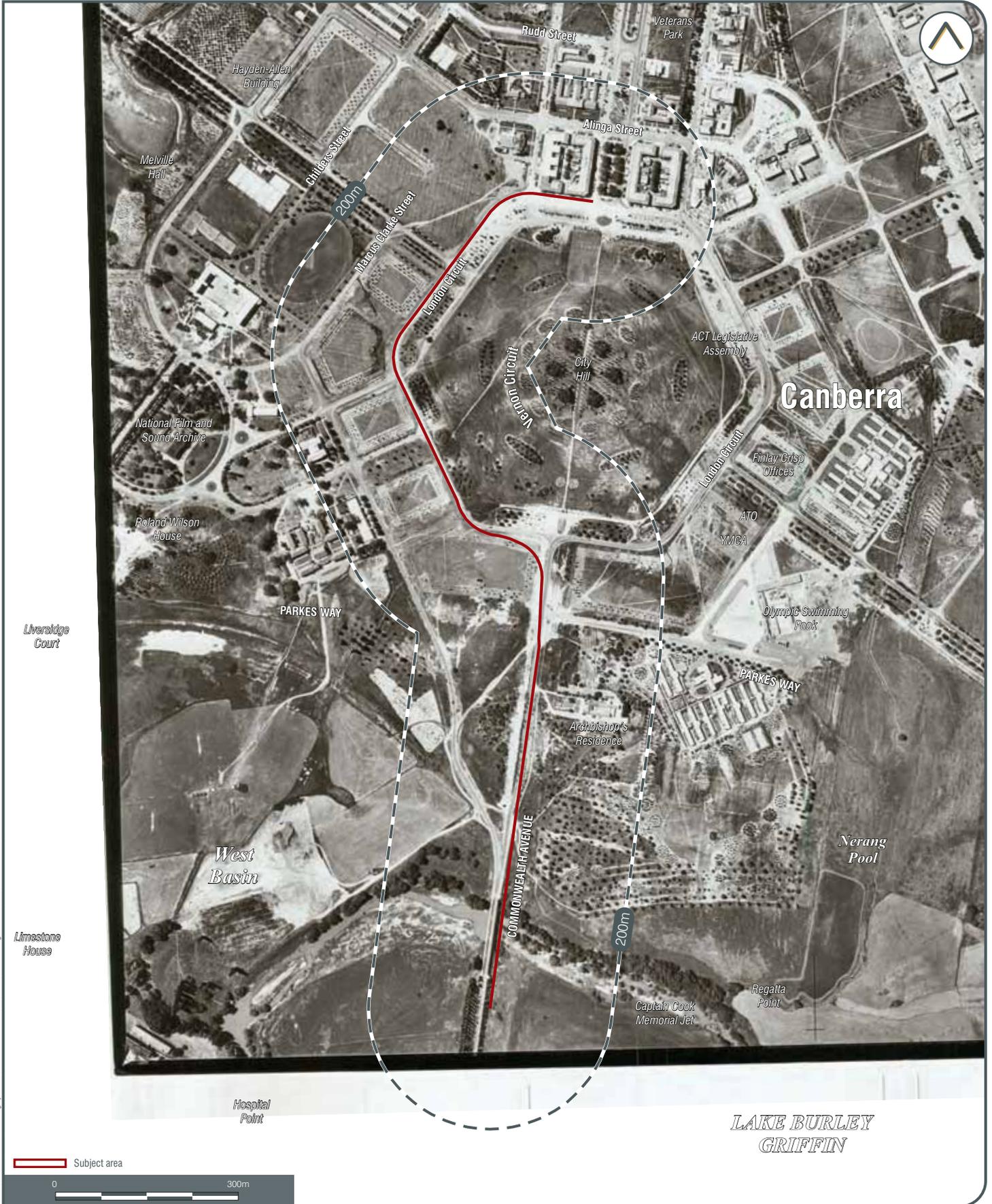




LIR-0082: Historical Aerial Photograph - 1951. 08:10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide.

HISTORICAL AERIAL PHOTOGRAPH - 1951





LIR-0082: Historical Aerial Photograph - 1955.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 1955

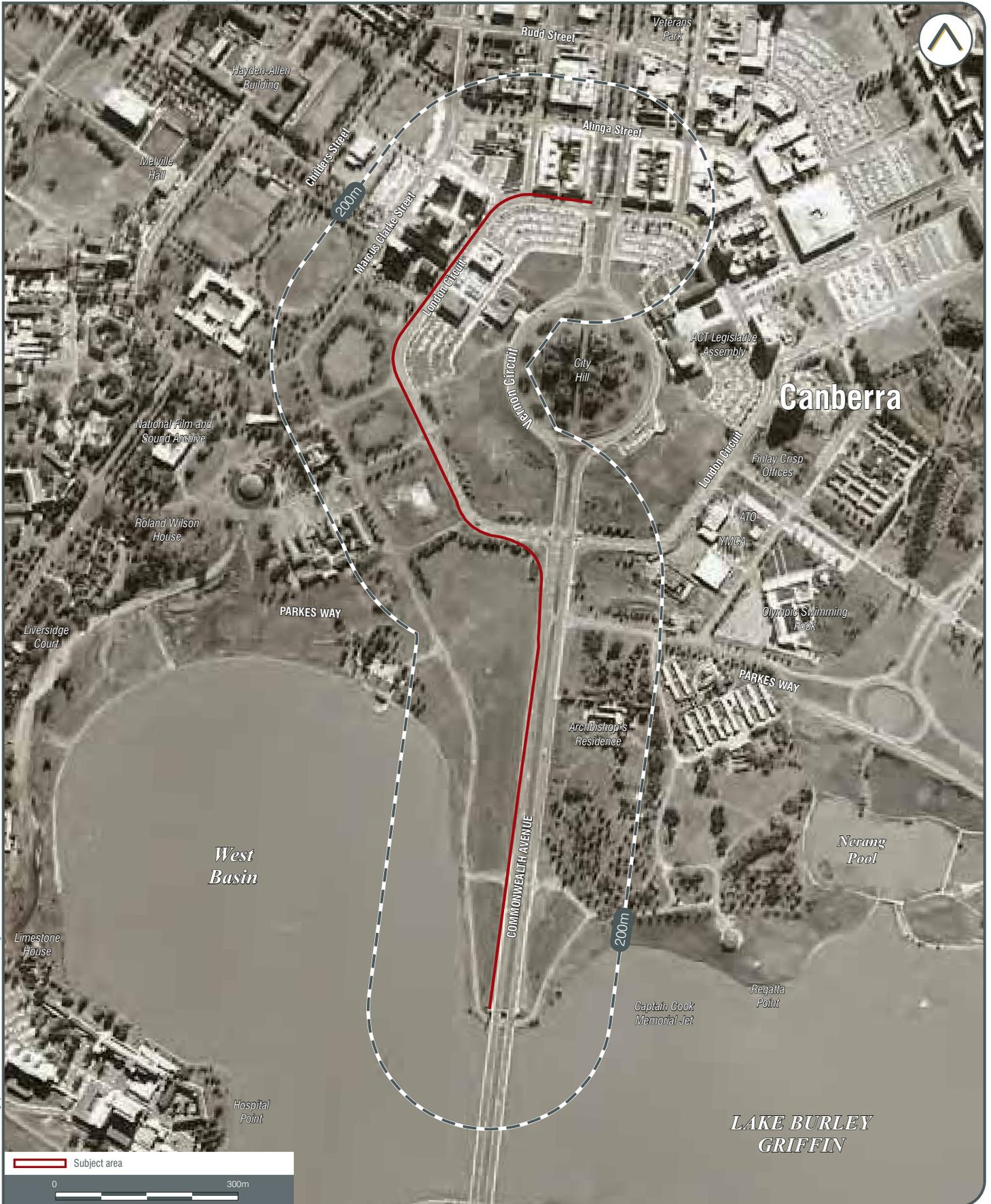




LIR-00892: Historical Aerial Photograph - 1961: 08:10:2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 1961





LIR-0082: Historical Aerial Photograph - 1968.08.10.2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide.

HISTORICAL AERIAL PHOTOGRAPH - 1968



MAP 14





LIR-00892: Historical Aerial Photograph - 1975.08.10.2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 1975



MAP 15





LIR-0082: Historical Aerial Photograph - 1978.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide.

HISTORICAL AERIAL PHOTOGRAPH - 1978





LIR-0082: Historical Aerial Photograph - 1980.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide.

HISTORICAL AERIAL PHOTOGRAPH - 1980



MAP 17





LIR-00892: Historical Aerial Photograph - 1986.08.10.2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 1986



MAP 18





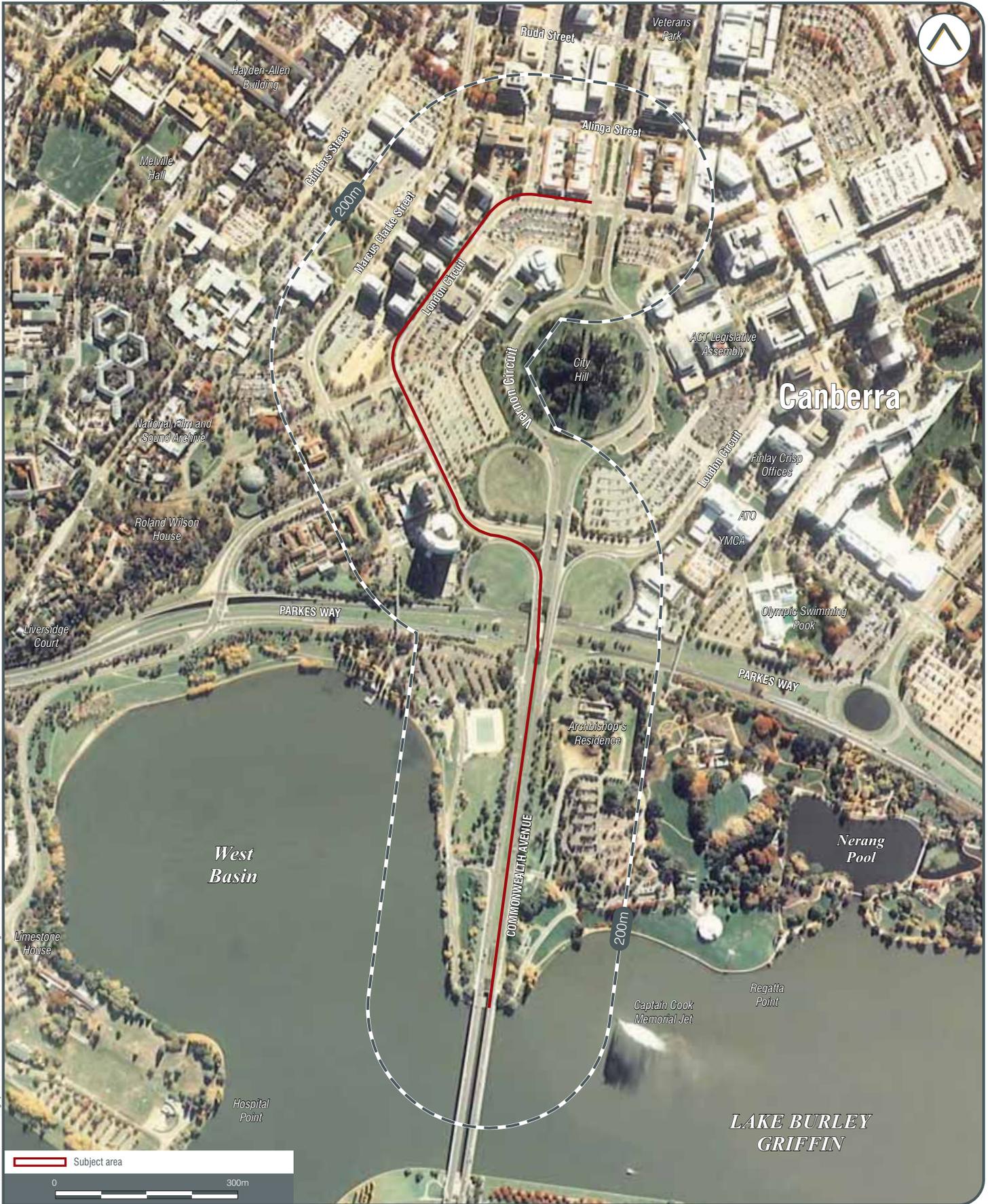
LIR-00892: Historical Aerial Photograph - 1993.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide.

HISTORICAL AERIAL PHOTOGRAPH - 1993



MAP 19





LIR-00892: Historical Aerial Photograph - 1998.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 1998





LIR-0082: Historical Aerial Photograph - 2008.08.10.2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 2008





LIR-0082: Historical Aerial Photograph - 2010.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 2010



MAP 22





LIR-00892: Historical Aerial Photograph - 2013.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 2013



MAP 23





LR-0082: Historical Aerial Photograph - 2016.08.10.2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 2016



MAP 24





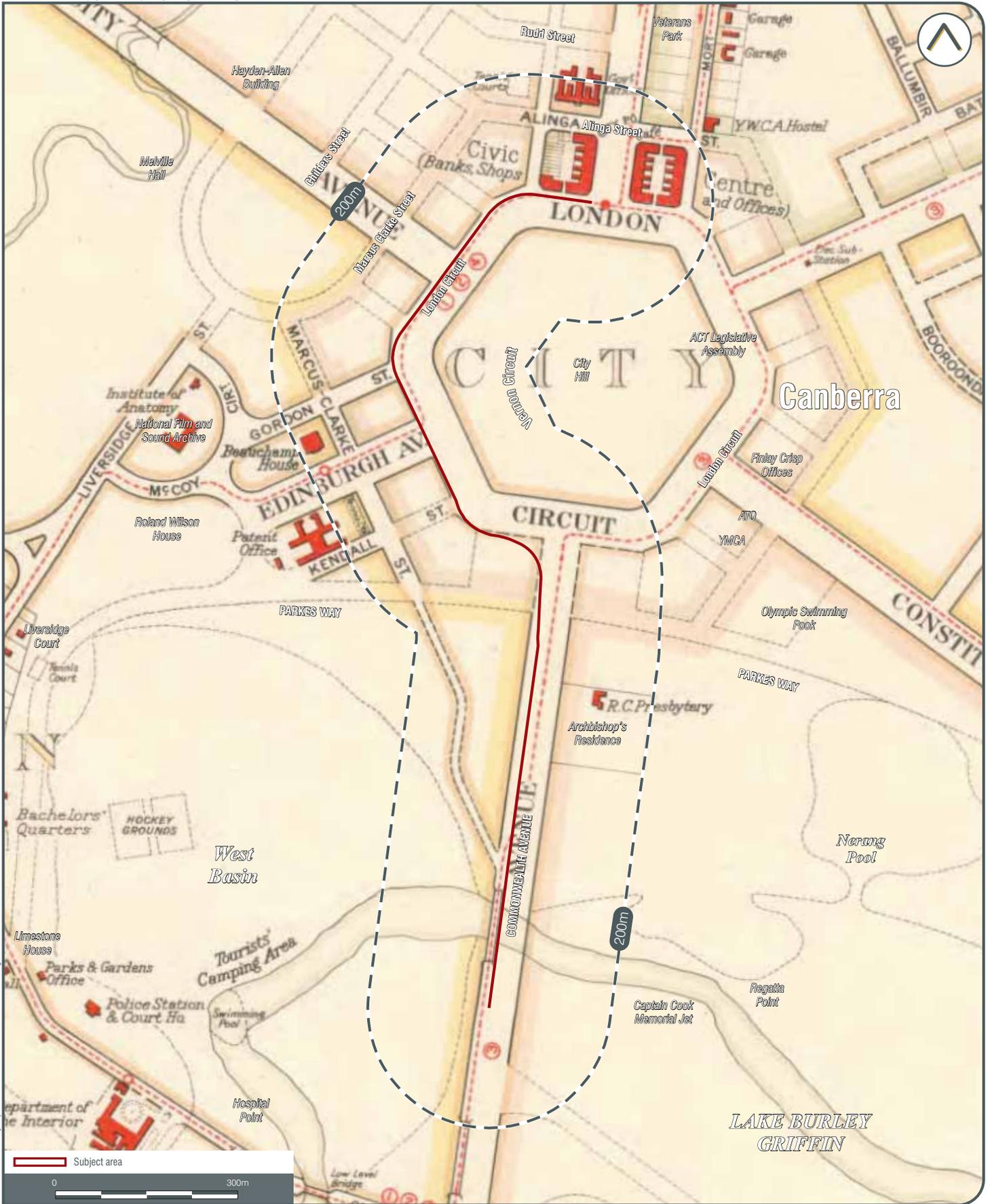
LIR-0082: Historical Aerial Photograph - 2019.08.10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORICAL AERIAL PHOTOGRAPH - 2019



MAP 25





LIR-0082: Historic Survey Map 1933 08 10 2019. Data source: Please refer to 'Digital Data Sources' in the Product Guide

HISTORIC SURVEY MAP - 1933



MAP 26





ENVIRO-SCREEN

Property Details

Canberra Light Rail 0 - 1km, Canberra ACT

Search Date: 03 October 2019

Understanding your Report

Your Report has been produced by Land Insight and Resources (LIR).

Your Report is based on information available from public databases and sources at the date of reporting. The information gathered relates to land that is within a **200 to 2000 m radius** (buffer zone) from the boundaries of the Property. A smaller or larger radius may be applied for certain records (as listed under records and as shown in report maps).

While every effort is made to ensure the details in your Report are correct, LIR cannot guarantee the accuracy or completeness of the information or data provided.

The report provided by LIR includes data listed on page 3 (table of contents). All sources of data and definitions are provided on the report maps and as listed in the Product Guide (Attached). For a full list of references, metadata, publications or additional information not provided in this report, please contact LIR at info@liresources.com.au.

The report does not include title searches; dangerous good searches or; property certificates (unless requested); or information derived from a physical inspection, such as hazardous building materials, areas of infilling or dumping/spilling of potentially contaminated materials. It is important to note that these documents and an inspection can contain information relevant to contamination that may not be identified by this Report.

This Report, and your use of it, is regulated by LIR Terms and Conditions (See LIR Product Guide).

Land Insight and Resources

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ATTACHMENTS

Attachment A - Report Maps

Attachment B - Historical Imagery

LIR Product Guide and Terms and Conditions

Section 1 - Property Setting

1.1 SITE LOCATION MAP AND SENSITIVE RECEPTORS

Map 1 (200m Buffer)

Sensitive receptor	Category	Distance (m)*	Direction
Heather And Arthur Shakespeare Square	Park	20	west
West Row Park	Park	39	north
Reserve Bank Of Australia	Community Facility	47	east
Church Of Scientology	Place of Worship	145	north-east
Act Health Authority	Community Facility	182	north
KU Canberra City AMEP Child Care Centre	Child Care Centre	186	north-east

*Distance from the sensitive receptor point feature to the site boundary centroid.

1.2 PLANNING CONTROLS

Map 2 (onsite)

Land Use Zone	TSZ1 DES	TRANSPORT DESIGNATED
Overlay Zones	S	Special Requirements apply under N.C.P.

1.3 SOIL LANDSCAPE

Map 3a (onsite)

Soil Landscape	wiw	Williamsdale	Soil Group	TRANSFERRAL
Description	<p>Landscape— undulating rises, fans, valley flats and depressions on Silurian Volcanics of the Canberra Lowlands. Includes significant areas of pediplain. Local relief 5 - 50 m; elevation 550 - 650 m; waning footslopes (< 10%). Little or no rock outcrop. The original woodland has been cleared. Grassland areas have been extensively altered.</p> <p>Soils— moderately deep, moderately well-drained Yellow Chromosols (Yellow Podzolic Soils) on Red and Brown Kandosols (Red and Yellow Earths) on upper rises and fan elements. Moderately to very deep, poorly to imperfectly drained Sodosols (Solodic Soils and Solodized Solonetz Soils) on lower rises and fan elements.</p> <p>Limitations— hardsetting, erodible, dispersible soils (localised). Acidic topsoils. Seasonal waterlogging; complex terrain; flood hazard (localised); run-on; dieback.</p>			

1.4 ATLAS OF AUSTRALIAN ACID SULFATE SOIL AND SALINITY

Map 3b (onsite)

ASRIS Atlas of Australian Sulfate Soils (Table 1.5.2)	Cq(p4)	ASS in inland lakes, waterways, wetlands and riparian zones	Probability of Occurrence	Extremely low probability of occurrence
Hydrologic Soil Group (Table 1.5.3)	C – slow rate			
Salinity Hazard	Not identified			

Table 1.4.2. Australian Atlas of Acid Sulfate Soils¹ (ASS) map (CSIRO/NatCASS)

Code	Distinguishing soil/sediment properties, vegetation, landforms, or other characteristics
Probability of Occurrence of ASS¹	
A	High Probability of occurrence - (> 70% chance of occurrence in mapping unit)
B	Low Probability of occurrence - (6-70% chance of occurrence in mapping unit)

Code	Distinguishing soil/sediment properties, vegetation, landforms, or other characteristics
Probability of Occurrence of ASS¹	
C	Extremely low probability of occurrence - (1-5% chance of occurrence in mapping unit)
D	No probability of occurrence - (<1% chance of occurrence in mapping unit)
x	Disturbed ASS¹ terrain - (ASS ¹ material present below urban development).
u	Unclassified - (Insufficient information to classify map unit)
Zones	
a	Potential acid sulfate soil material and/or Monosulfidic Black Ooze (MBO).
b, c	Potential acid sulfate soil generally within upper 1 m.
c, d, e	ASS ¹ generally within upper 1 m.
f	ASS ¹ generally below 1 m from the surface
g	ASS ¹ , generally below 3 m from the surface.
h	ASS ¹ generally within 1 m of the surface.
i, j	ASS ¹ generally below 1 m of the surface.
k	ASS ¹ material and/or Monosulfidic Black Ooze (MBO).
l, m, n, o, p, q	ASS ¹ generally within upper 1 m in wet / riparian areas.
Subscripts to codes	
(a)	Actual acid sulfate soil (AASS) = sulfuric material.
(p)	Potential acid sulfate soil (PASS) = sulfidic material.
(q)	Monosulfidic Black Ooze (MBO) is organic ooze enriched by iron monosulfides.
Confidence levels	
(1)	All necessary analytical and morphological data are available
(2)	Analytical data are incomplete but are sufficient to classify the soil with a reasonable degree of confidence
(3)	No necessary analytical data are available, but confidence is fair, based on a knowledge of similar soils in similar environments
(4)	No necessary analytical data are available, and classifier has little knowledge or experience with ASS, hence classification is provisional

¹Acid Sulfate Soils (ASS) are all those soils in which sulfuric acid may be produced, is being produced, or has been produced in amounts that have a lasting effect on main soil characteristics (Pons 1973). Acid sulfate soil (ASS) may include PASS or AASS + PASS. Potential acid sulfate soil (PASS) = sulfidic material. Actual acid sulfate soil (AASS) = sulfuric material.

Table 1.4.3. Hydrologic Soil Group

Code	Soil Group Characteristics
A	Soils having high infiltration rates, even when thoroughly wetted and consisting chiefly of deep, well to excessively-drained sands or gravels. These soils have a high rate of water transmission.
B	Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.
C	Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.
D	Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

1.5 GEOLOGY AND TOPOGRAPHY

Map 4 (onsite)

Geology

Map Sheet	Symbol	Formation	Group	Era	Period	Description
Geological Map	Sua	Canberra Formation	unknown	Palaeozoic	Silurian	mudstone, siltstone, minor sandstone, limestone, hornfels, dacitic ignimbrite, and volcanoclastic sediments

Topography

Topography	561-569mAHD
------------	-------------

1.6 HYDROGEOLOGY AND GROUNDWATER BORES

Map 5a (500m - 2000m Buffer)

	On the Property?	Within Record Search Buffer?
Aquifer Type	Fractured or fissured, extensive aquifers of low to moderate productivity	Fractured or fissured, extensive aquifers of low to moderate productivity
Drinking Water Catchments	Not identified	Not identified
Protected Riparian Corridor	Not identified	Not identified
Wetlands	Not identified	Not identified
Groundwater Bores	Not identified	Yes, see 1.7.1 and 1.7.2

Table 1.6.1. Groundwater Bore Details

Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL ¹ (m)	Salinity ¹	Yield ¹ (L/s)	Distance (m)	Direction
473	Unknown	25-Jan-79	15.1	15.1	-	-	-	142	south

¹The most recent data available from NSW Department of Industry – Lands & Water Division.

Table 1.6.2. Groundwater Bore Driller Lithology Details

Groundwater Bore ID	From Depth (m)	To Depth (m)	Lithology	Distance (m)	Direction
473	0.00	1.80	No core	142	south
	1.80	2.40	Highly weathered mudstone (city hill shale)	142	south
	2.40	15.10	Moderately weathered mudstone with some highly weathered zones	142	south

1.7 HYDROGEOLOGY AND OTHER BOREHOLES

Map 5b (200m Buffer)

	On the Property?	Within Record Search Buffer?
Hydrogeologic Unit	Palaeozoic and Pre-Cambrian Fractured Rock Aquifers (low permeability)	Palaeozoic and Pre-Cambrian Fractured Rock Aquifers (low permeability)
Other known borehole investigations (200m Buffer)	Not identified	Not identified

Groundwater Dependent Ecosystems

Name	On the Property?	Within Record Search Buffer?
Ecosystems that rely on the Surface expression of Groundwater	Not identified	Not identified
Ecosystems that rely on Subsurface presence of Groundwater	Not identified	Not identified

Table 1.7.1. Other known borehole investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes) (200m Buffer)

Borehole ID	Purpose	Project	Client/License	Date Drilled	Depth (m)	Distance (m)	Direction
Not identified	-	-	-	-	-	-	-

Section 2 Environmental Records Summary – Contamination and Potentially Contaminating Activities

2.1 PFAS INVESTIGATIONS

Map 5b (2000m Buffer)

Site	Address	Distance (m)	Direction
Not identified	-	-	-

2.2 EPA REGISTER OF CONTAMINATED SITES

Map 6 (1000m Buffer)

District	Location	Notified under Section	Description	Distance (m)	Direction
Canberra Central	-	76A(1)	Capital Metro audit area - Northbourne Ave within the District of Canberra Central	Not mapped	-

1. Former sites that have been removed from Register of Contaminated Sites are kept here for information purposes only.

2.3 OTHER CONTAMINATION ISSUES

Map 6 (1000m Buffer)

Defence Sites (current and former)

Site name	Address	Description	RCIP code*	Distance (m)	Direction
WERRIWA DEPOT	Civic, Australian Capital Territory	There are not known contamination issues at the depot. A disused underground fuel storage tank (associated with heating oil) was removed from the site in 2006, with no contamination evident in surrounding soils	0250	150	South-east

*RCIP (Regional Contamination Investigation Program)

Former Gasworks Sites

Site	Location	Distance (m)	Direction
Not identified	-	-	-

2.4 POTENTIALLY CONTAMINATING ACTIVITIES

Map 7a (200m Buffer)

Aviation Fuel Depots/Terminals

Site name	Description	Status	Distance (m)	Direction
Not identified	-	-	-	-

Aviation Rescue Fire Fighting Facilities (ARFF)

Site name	Class	Status	Distance (m)	Direction
Not identified	-	-	-	-

Derelict Mines and Quarries

Deposit Name	Method	Description	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Dry Cleaners

Site name	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-

Landfills (Legacy)

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

Note: This is not an exhaustive list of all legacy landfills.

Liquid Fuel Depots/Terminals

Site name	Owner	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Power Stations

Site name	Owner	Primary Fuel Type	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Service Stations

Site name	Owner	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Substation / Switching Stations

Site name	Owner	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Telephone Exchanges

Site name	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-

Waste Management Facilities

Site name	Owner	Class	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Wastewater Treatment Facilities

Site name	Operator	Class	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Unexploded Ordnance (UXO) Sites - Department of Defence (DoD)

Site name	Site ID	Category	Description	Distance (m)	Direction
Not identified	-	-	-	-	-

2.5 OTHER CURRENT POTENTIALLY CONTAMINATING ACTIVITIES

Map 7b (200m Buffer)

Current Commercial and Trade Data

Site name	Category	Location	Status*	Distance (m)	Direction
Canberra City Police Station	Police Station	16-18 London Cct, Canberra ACT 2601	Operating	27	east

*Data is current as when this report was created. However due to the turnover of business locations, some addresses may be former.

Underground Storage Tank (UST)

Premises	Tank type	Status*	Distance (m)	Direction
Not identified	-	-	-	-

Note: This is not an exhaustive list of all UST's.

2.6 NPI INDUSTRIAL FACILITIES

Map 8 (200m Buffer)

Facility name	Address	Primary ANZSIC Class	Latest report	Distance (m)	Direction
Not identified	-	-	-	-	-

2.7 ENVIRONMENTAL PROTECTION AUTHORITY PUBLIC REGISTERS

Map 8 (200m Buffer)

EPA Authorisations (current)

ID number	Business Name	Suburb	Location	Activity	Status	Distance (m)	Direction
1128	Director General, ACT Government	Canberra City ACT	Various locations within Australian Capital Territory	Commercial use of chemicals (Activity 29)	Current	Not mapped	-
1165	City Pest Control Service Pty Ltd	Canberra City ACT	Various locations within Australian Capital Territory	Commercial use of chemicals (Activity 29)	Current	Not mapped	-

1. Some sites do not contain specific addresses. Records identified as being in the surrounding area have been added for information.

2.8 ACT ASBESTOS RESPONSE TASKFORCE LIST

Map 8 (onsite)

Division	Section	Block	Unit	Street Address	Alternate Street Address
Not identified		-	-	-	

HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

1971 HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

(200m Buffer)

Activity	Name	Address	Positional accuracy	Distance (m) *	Direction
Air Services & Agents	Pan American World Airways Inc	63 London Circuit, Canberra	Address	4m	North
Bus Services-Charter & Tours	Capital City Mini Tours Pty Ltd	63 London Circuit, Canberra	Address	4m	North
Radio Distributors-W'sale	Gray Simon Pty Ltd	31 London Circuit, Canberra	Address	7m	North
Earth-Moving Equipment	Noyes Bros Pty Ltd	19 London Circuit, Canberra	Address	7m	West
Electric Motors & Generators	Noyes Bros Pty Ltd	19 London Circuit, Canberra	Address	7m	West
Metal Merchants	Noyes Bros Pty Ltd	19 London Court, Canberra	Address	7m	West
Elevating & Conveying Engineers	Noyes Bros Pty Ltd	19 London Circuit, Canberra	Address	7m	West
Engineers - General	Noyes Bros Pty Ltd	19 London Circuit, Canberra	Address	7m	West
Builders & Contractors	Stocks & Holdings Pty Ltd	19 London Circuit, Canberra	Address	7m	West
Builders & Contractors	Customcraft Homes	25 London Circuit, Canberra	Address	7m	West
Customs Agents	Cremen Kevin J & Asscsts Pty Ltd	21 London Circuit, Canberra	Address	7m	West
Carpets & Linoleums - Mfrs. &/or W'salers	F. & T. Carpets Pty Ltd	39 Northbourne Avenue, Canberra	Address	45m	North
Dental Supplies &/or Equipment	Harcourt Niel Ltd	43 Northbourne Avenue, Canberra	Address	52m	North
Office Requisites	Capital Business Supplies	26 Northbourne Avenue, Canberra	Address	62m	North East
Dictating Machines	Capital Business Supplies	26 Northbourne Avenue, Canberra	Address	62m	North East
Rubber &/or Metal Stamp Makers	Capital Business Supplies	26 Northbourne Avenue, Canberra	Address	62m	North East
Photo Copies &/or Copying Equipment	Capital Business Supplies	26 Northbourne Avenue, Canberra	Address	62m	North East
Duplicating Machines &/or Supplies	Capital Business Supplies	26 Northbourne Avenue, Canberra	Address	62m	North East
Printers-Letterpress	Capital Business Supplies	26 Northbourne Avenue, Canberra	Address	62m	North East
Schools-Business	Canberra Coaching College	55 Northbourne Avenue, Canberra	Address	70m	North
Grocers-Retail	Katy's Supermarket	55 Northbourne Avenue, Canberra	Address	70m	North

Photographic Supplies-Retail &/or Repairs	Photographic Illustrators Pty Ltd	36 Northbourne Avenue, Canberra	Address	73m	North East
Radio Broadcasting & Transmitting Equipment	Standard Telephones & Cables Pty Ltd	Moresby House, London Circuit, Canberra	Street		
Radio Communication Equipment & Systems	Standard Telephones & Cables Pty Ltd	Moresby House, London Circuit, Civic Center, Canberra	Street		
Radio Engineers	Standard Telephones Cables Pty Ltd	Moresby House, London Circuit, Canberra	Street		
Electrical Engineers	Standard Telephones & Cables Pty Ltd	Moresby House, London Circuit, Canberra	Street		
Electronic Engineers	Standard Telephones & Cables Pty Ltd	Moresby House, London Circuit, Canberra	Street		
Electronic Parts Mfrs &/or W'salers	Standard Telephones & Cables Pty Ltd	Moresby House, London Circuit, Canberra	Street		
Air Services & Agents	Air New Zealand Ltd	London Circuit, Canberra	Street		
Aircraft Mfrs &/or Distributors	Lockheed Aircraft Pty Ltd	London Circuit, Canberra	Street		
Aircraft Mfrs &/or Distributors	O.F.E.M.A.	London Circuit, Canberra	Street		
Sewing Machines-Industrial	Singer Aust Ltd	London Circuit, Canberra	Street		
Builders & Contractors	Civil & Civic Pty Ltd	London Circuit, Canberra	Street		
Chemists - Pharmaceutical	Leggotts Pharmacy	London Circuit, Canberra	Street		
Chemists - Pharmaceutical	Roberts B R	London Circuit, Canberra	Street		
Laundries	Civic Self Service Laundry	Northbourne Avenue, Canberra	Street		
Grocers-Retail	Notaras Foodland Supermarket	Northbourne Avenue, Canberra	Street		
Chemists - Pharmaceutical	Chew R W	Northbourne Avenue, Canberra	Street		
Floor Coverings	Civic Floorcovering Co Pty Ltd	Northbourne Avenue, Canberra	Street		
Hospital Equipment &/or Suppliers	Bendix Consolidated Industries Ltd	C.M.L. Building, Hobart Place, Canberra	Street		
Air Services & Agents	Summerland Travel Centre	Hobart Place, Canberra	Street		
Lunch Services	Potiri E	Hobart Place, Canberra	Street		
Dry Cleaners & Dyers	R. & R. Laundry & Dry Cleaning Co Pty Ltd	Tasman House, Hobart Place, Canberra	Street		
Chemists - Pharmaceutical	Hobart Place Pharmacy	Hobart Place, Canberra	Street		
Furniture Mfrs. &/or Wholesalers	Bendix Consolidated Industries Ltd	Hobart Place, Canberra	Street		
Furniture-Metal-Mfrs &/or Wholesalers	Bendix Consolidated Industries Ltd	Hobart Place, Canberra	Street		

General Stores	Coles G J & Coy Ltd	Alinga Street, Canberra	Street		
Air Services & Agents	T.A.A.	Alinga Street, Canberra	Street		
Air Services & Agents	Trans Australia Airlines	Alinga Street, Canberra	Street		
Grocers-Retail	Woolworths Ltd	Alinga Street, Canberra	Street		

* If no distance is provided, address no longer exists.

1981 HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

(200m Buffer)

Activity	Name	Address	Positional accuracy	Distance (m) *	Direction
Photo Copying Services	A.C.T. Copying Service	69 London Circuit, Canberra	Address	4m	North
Air Services & Agents	ACT Government Tourist Bureau	Corner London Circuit & West Row, Canberra	Address	4m	North
Publishers - Magazines & Periodicals	Pathfinder Publications	35 London Circuit, Canberra	Address	7m	North
Dental Supplies &/or Equipment	Harcourt Neil Ltd	39 Northbourne Avenue, Canberra	Address	45m	North
Instruments - Scientific	Harcourt Neil Ltd	39 Northbourne Avenue, Canberra	Address	45m	North
Electroplating	Silver Service A.C.T.	43 Northbourne Avenue, Canberra	Address	52m	North
Motor Accessories - Retail	A.R.I.E.S.	43 Northbourne Avenue, Canberra	Address	52m	North
Motor Schools	International Driving School	43 Northbourne Avenue, Canberra	Address	52m	North
Repair Services-General	Dial-A-Tradesman	43 Northbourne Avenue, Canberra	Address	52m	North
Sheepskin Products	A.R.I.E.S.	43 Northbourne Avenue, Canberra	Address	52m	North
Silver Plating	Silver Service A.C.T.	43 Northbourne Avenue, Canberra	Address	52m	North
Builders & Contractors	P.G. Constructions Pty Ltd	99 London Circuit, Canberra	Address	62m	North East
Aeronautical Engineers	General Dynamics Pty Ltd	99 London Circuit , Canberra	Address	62m	North East
Bakers	Croissant D'or	30 Northbourne Avenue, Canberra	Address	65m	North East
Cake & Pastry Shops	Croissant D'Or	30 Northbourne Avenue, Canberra	Address	65m	North East
Dry Cleaners & Dyers	Civic Self Service Laundry	32 Northbourne Avenue, Canberra	Address	70m	North East
Laundries	Civic Self Service Laundry	32 Northbourne Avenue, Canberra	Address	70m	North East

Telecommunication Equipment & Systems	Ford Aerospace & Communications of Australia Pty Ltd	40 Marcus Clarke Street, Canberra	Address	72m	North
Bicycles &/or Repairs & Accessories	Emerton Geof Sports & Cycles Pty Ltd	34 Northbourne Avenue, Canberra	Address	73m	North East
Jewellers - Mfrg &/or W'sale	Camelot Jewellers	36 Northbourne Avenue, Canberra	Address	73m	North East
Photographers - Commercial & Industrial	Turnbull's John Photographic	36 Northbourne Avenue, Canberra	Address	73m	North East
Photographers - Portrait & Wedding	Photographic Illustrators Pty Ltd	36 Northbourne Avenue, Canberra	Address	73m	North East
Leather & Grindery Supplies	Civic Craft Centre	101 London Circuit, Canberra	Address	84m	North East
Sheepskin Products	Civic Craft Centre	101 London Circuit, Canberra	Address	84m	North East
Camping Equipment - Retail	Paddy Pallin	46 Northbourne Avenue, Canberra	Address	92m	North
Ski Equipment-Snow-Retail &/or For Hire	Paddy Pallin	46 Northbourne Avenue, Canberra	Address	92m	North
Builders & Contractors	Matrix Management Pty Ltd	London Circuit, Canberra	Street		
Aircraft Mfrs &/or Distributors	Grumman International Inc	London Circuit, Canberra	Street		
Chemists-Consulting &/or Industrial	Leonard A Doyle & Associates	London Circuit, Canberra	Street		
Clothing - Uniforms - Mfrs &/or Wholesalers	Fletcher Jones & Staff Pty Ltd	London Circuit, Canberra	Street		
Knitting Machines	Singer Sewing & Knitting Centre	London Circuit, Canberra	Street		
Telecommunication Equipment & Systems	Telecom Australia	MLC Building, London Circuit, Canberra	Street		
Carriers-Heavy	Tradex Transport Pty Ltd	1st Floor MLC Building, London Circuit, Canberra	Street		
Air Services & Agents	Tradex Transport Pty Ltd	1st Floor Mlc Building, London Circuit , Canberra	Street		
Transport & Forwarding Agents	Tradex Transport Pty Ltd	1st Floor MLC Building, London Circuit, Canberra	Street		
Customs Agents	Tradex Transport Pty Ltd	1st Floor, M.L.C. Building, London Circuit, Canberra	Street		
Advertising Contractors	O'Brien Edward H Pty Ltd	2nd Floor MLC Building, London Circuit, Canberra	Street		
Air Conditioning Consultants	Environ Mechanical Services Pty Ltd	National Mutual Centre, Darwin Place, Canberra	Street		
Air Conditioning Engineers	Envirom Mechanical Services Pty Ltd	Darwin Place, Canberra	Street		
Builders & Contractors	Civil & Civic Pty Ltd	Darwin Place, Canberra	Street		
Fire Protection Equipment & Consultants	Environ Mechanical Services Pty Ltd	Darwin Place, Canberra	Street		

Telecommunication Equipment & Systems	Amalgamated Wireless Ltd	Darwin Place, Canberra	Street		
Glass Merchants &/or Glaziers	A.C.I. Australian Consolidated Industries Ltd	Hobart Place, Canberra	Street		
Chemists - Pharmaceutical	Canberra After Hours Dispensary	Marcus Clarke Street, Canberra	Street		
Electronic Equipment Mfrs &/or W'salers	Rockwell-Collins A/asia	Marcus Clarke Street, Canberra	Street		
Publishers - Book	Butterworth Pty Ltd	Canberra House, Marcus Clarke Street, Canberra	Street		
Publishers - Magazines & Periodicals	Butterworths Pty Ltd	Marcus Clarke Street, Canberra	Street		
Chemists - Pharmaceutical	Chew R W	Northbourne Avenue, Canberra	Street		
Air Services & Agents	Alitalia Airlines	Alinga Street, Canberra	Street		
Air Services & Agents	TAA (Trans-Australia Airlines)	Alinga Street, Canberra	Street		
General Stores	Woolworths Ltd	Alinga Street, Canberra	Street		
Shopping Centres	Monaro Shopping Mall	Alinga Street, Canberra	Street		

* If no distance is provided, address no longer exists.

1991 HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

(200m Buffer)

Activity	Name	Address	Positional accuracy	Distance (m) *	Direction
Airlines & Airline Agents	Civic Travel Service Pty Ltd	73 London Circuit, Canberra	Address	4m	North
Carriers - Light	M.T. Couriers	11 London Circuit, Canberra	Address	7m	West
Courier Services	M.T. Couriers	11 London Circuit, Canberra	Address	7m	West
Taxi Truck Services	M.T. Couriers	11 London Circuit, Canberra	Address	7m	West
Computer Equipment - Hardware	CAF Computers	13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Hardware	Impact Office Automation Ltd	13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Hardware	Toshiba - Specialised Technology	13 London Circuit, Canberra	Address	7m	West
Frozen Foods - Mfrs. &/or W'salers	McCain Foods (Australia) Pty Ltd	13 London Circuit, Canberra	Address	7m	West
Electronic Equipment Mfrs &/or W'salers	GEC Marconi	13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Hardware	Data Products	London Court 13 London Circuit, Canberra	Address	7m	West

Computer Equipment - Hardware	Protech Microsystems	London Court 13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Hardware	Texas Instruments	London Court 13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Installation &/or Services	Protech Microsystems	London Court 13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Installation &/or Services	Specialised technology Group Pty Ltd	London Court 13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Repairs & Service	Protech Microsystems	London Court 13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Repairs & Service	Specialised Technology Group Pty Ltd	London Court 13 London Circuit, Canberra	Address	7m	West
Computer Equipment - Hardware	Specialised Technology Group Pty Ltd	London Court 13 London Circuit, Canberra	Address	7m	West
Printers - General	Panther Publishing & Printing	31 London Circuit, Canberra	Address	7m	North
Printers Supplies & Services	Pink Panther Instant Printing	31 London Circuit, Canberra	Address	7m	North
Clothing - Uniforms - Mfrs &/or Wholesalers	Fletcher Jones & Staff	Corner Northbourne Avenue & London Circuit, Canberra	Address	30m	East
Photographic Equipment & Supplies - Retail &/or Repairs	Civic Fast Photo	43 Northbourne Avenue, Canberra	Address	52m	North
Photographic Processing Services	Civic Fast Photo	43 Northbourne Avenue, Canberra	Address	52m	North
Advertising Promotional Products	Pascall Principal The	99 London Circuit, Canberra	Address	62m	North East
Advertising Agencies	Metrographics	53-55 Northbourne Avenue, Canberra	Address	70m	North
Computer Equipment - Hardware	Peripheral Enhancements Computer	55 Northbourne Avenue, Canberra	Address	70m	North
Research - Industrial &/or Scientific	Time-Space Research Pty Ltd	40 Marcus Clarke, Canberra	Address	72m	North
Building Consultants	P.C.M. Development Consultants Pty Ltd	40 Marcus Clarke Street, Canberra	Address	72m	North
Computer Equipment - Hardware	Eracom Pty Ltd	40 Marcus Clarke Street, Canberra	Address	72m	North
Computer Equipment - Hardware	Pyramid Technology Corporation Pty Ltd	40 Marcus Clarke Street, Canberra	Address	72m	North
Motor Service Stations & Garages	Caltex Oil (Aust) Pty Ltd	40 Marcus Clarke Street, Canberra	Address	72m	North
Facsimile Communication Equipment & Supplies	Voca Communications Pty Ltd	24 Marcus Clarke Street, Canberra	Address	78m	West
Telephone Switching & Switchboard Equipment	Voca Communications Pty Ltd	24 Marcus Clarke Street, Canberra	Address	78m	West
Knitting - Wool &/or Accessories - Mfrs. &/or W'salers	Pots 'N' Stitches	101 London Circuit, Canberra	Address	84m	North East

Calculators & Adding Machines	Phillip Photographics	74 Alinga Street, Canberra	Address	85m	North
Computer Equipment - Hardware	J C J Computer Systems Pty Ltd	74 Alinga Street, Canberra	Address	85m	North
Computer Equipment - Installation &/or Services	Sharp - J C J Computer Systems Pty Ltd	74 Alinga Street, Canberra	Address	85m	North
Photographers - General	Phillip Photographics	Melbourne Building, 74 Alinga Street, Canberra	Address	85m	North
Photographic Equipment & Supplies - Retail &/or Repairs	Phillip Photographics	74 Alinga Street, Canberra	Address	85m	North
Photographic Processing Services	Phillip Photographics	74 Alinga Street, Canberra	Address	85m	North
Cake & Pastry Shops	Waffles Patisserie	46 Northbourne Avenue, Canberra	Address	92m	North
Bus & Coach Scheduled Services	ACTION	Darwin Place, Canberra	Street		
Bus & Coach Services - Charter &/or Tours	Action	Darwin Place, Canberra	Street		
Advertising - Direct Mail Services	Security Mailing Services Pty Ltd	Hobart Place, Canberra	Street		
Computer Equipment - Hardware	Dataflex Pty Ltd	Hobart Place, Canberra	Street		
Computer Equipment - Hardware	Ferntree Computer Systems	7th Floor, Capital Building, Hobart Place, Canberra	Street		
Computer Equipment - Hardware	Toshiba - Ferntree	Hobart Place, Canberra	Street		
Computer Equipment - Installation &/or Services	Ferntree Computer Systems	Hobart Place, Canberra	Street		
Data Preparation &/or Processing Services	Ferntree Computer Systems	Hobart Place, Canberra	Street		
Printers - General	Security Mailing Services Pty Ltd	Hobart Place, Canberra	Street		
Electric Lighting & Power Advisory Services	ACT Electricity & Water	Electricity House, London Circuit, Canberra	Street		
Hire - Builders', Contractors' & Handyman's Equipment	Canberra Festival	London Circuit, Canberra	Street		
Burglar Alarm Systems	Capital Security	London Court, Canberra	Street		
Chemists - Pharmaceutical	Canberra After Hours Dispensary	Marcus Clarke Street, Canberra	Street		
Airlines & Airline Agents	Ansett Airlines Of Australia	Jolimont Centre, Northbourne Avenue, Canberra	Street		

* If no distance is provided, address no longer exists.

Land Insight and Resources use a number of different address georeferencing methods and characterised them according to the following criteria: completeness (match rates) and positional accuracy. When address do not contain specific street numbers or a match is not found, records identified as being in the surrounding areas are included for reference.

Historical dataset positional accuracy and georeferencing results explanation

Positional accuracy	Georeferenced	Description
Address	Located to the address level	<i>When street address and names fully matched.</i>
Street	Located to the street centroid	<i>When street names match but no exact address was found. Location is approximate.</i>
Place	Located to the structure, building or complex	<i>When building, residential complex or structure name match but no exact address was found. Location is approximate.</i>
Suburb	Located to the suburb area	<i>When suburb name match but no exact address was found. Location is approximate.</i>
Not georeferenced	Not found	<i>When it was not georeferenced, and address could not be found.</i>

Section 3 - Other Environmental Constraints

3.1 FEDERAL, STATE AND LOCAL HERITAGE

Map 9 (200m Buffer)

Heritage Sites

Heritage ID	Site Name	Type	Status	Distance (m)*	Direction
68	Melbourne Building	Historic	Final Registration	7	north
61	ANZ Bank Building	Historic	Final Registration	18	west
83	Law Courts Precinct	Historic	Nominated for Provisional Registration	24	east
68	Sydney Building	Historic	Final Registration	53	north-east
83	Law Courts Precinct	Historic	Nominated for Provisional Registration	98	east
84	Civic Square	Historic	Nominated for Provisional Registration	102	south-east
1278	Armorial Bearings of the City of Canberra	Restricted	Final Registration	164	south-east
488	Map of Lanyon	Restricted	Final Registration	164	south-east
407	Ian Potter House	Historic	Final Registration	165	west
399	Hotel Acton	Historic	Final Registration	167	west
88	City Hill	Historic	Final Registration	203	east

National Heritage List (NHL)

Site ID	Site Name	Class	Status	Distance (m)	Direction
106074	Canberra and Surrounding Areas	Historic	Minister considering decision within extended period	0	onsite
106100	Canberra - Central National Area and Inner Hills/ Canberra the Planned .	Historic	Minister considering decision within extended period	0	onsite
106287	Lake Burley Griffin and Lakeshore Landscape	Historic	Nominated place	97	south
106221	Lake Burley Griffin and Lakeshore Parklands	Historic	Request for emergency listing	97	south

Register of the National Estate (RNE)

Site ID	Site Name	Class	Status	Distance (m)	Direction
13287	Sydney and Melbourne Buildings	Historic	Registered	7	north
19832	ANZ Bank	Historic	Indicative Place	18	west
19696	Law Courts of the ACT Precinct	Historic	Registered	24	east

Site ID	Site Name	Class	Status	Distance (m)	Direction
19703	ACT Police Headquarters Building (former)	Historic	Registered	54	east
19704	Reserve Bank of Australia	Historic	Registered	67	east
19700	Law Courts of the ACT (former)	Historic	Registered	117	east
13371	Parliament House Vista	Historic	Registered	132	South-east
19836	Canberra School of Music	Historic	Interim List	160	west
13288	Ian Potter House & Surrounds	Historic	Registered	165	west
19428	Civic Square Complex	Historic	Registered	167	south-east
100943	Hotel Acton	Historic	Registered	167	west
17912	City Hill	Historic	Registered	203	east

Non-Aboriginal heritage item (Local)

Site ID	Site Name	Class	Status	Distance (m)	Direction
106074	Canberra and Surrounding Areas	Historic	Nominated place	0	onsite
106100	Canberra - Central National Area and Inner Hills	Historic	Nominated place	0	onsite

Non-Aboriginal heritage item (SHR)*

Site ID	Site Name	Listing n°	Plan n°	Distance (m)	Direction
Not identified	-	-	-	-	-

*State Heritage Register

Commonwealth Heritage List (CHL)

Site ID	Site Name	Class	Status	Distance (m)	Direction
105396	Reserve Bank of Australia	Historic	Listed place	25	east
105466	Parliament House Vista	Historic	Listed place	132	South-east
105636	Canberra School of Music	Historic	Listed place	160	west

World Heritage Area (WHA)

Site ID	Site Name	IUCN	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Bush Fire Prone Land (BPL)

Category	On the Property?	Within Record Search Buffer?
Not identified	-	-

Fire History (Wildfires and Prescribed Burns)

Category	On the Property?	Within Record Search Buffer?
Not identified	-	-

Flood Hazard Area

Name	On the Property?	Within Record Search Buffer?
1 percent AEP Flood* (currently being revised by ACT Government)	-	-



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ATTACHMENT A

Report Maps





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SUBJECT AREA AND SENSITIVE RECEPTORS





PLANNING CONTROLS





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SOIL LANDSCAPES AND ACID SULFATE SOIL RISK





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ATLAS OF AUSTRALIAN ACID SULFATE SOILS AND SALINITY





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GEOLOGY AND TOPOGRAPHY

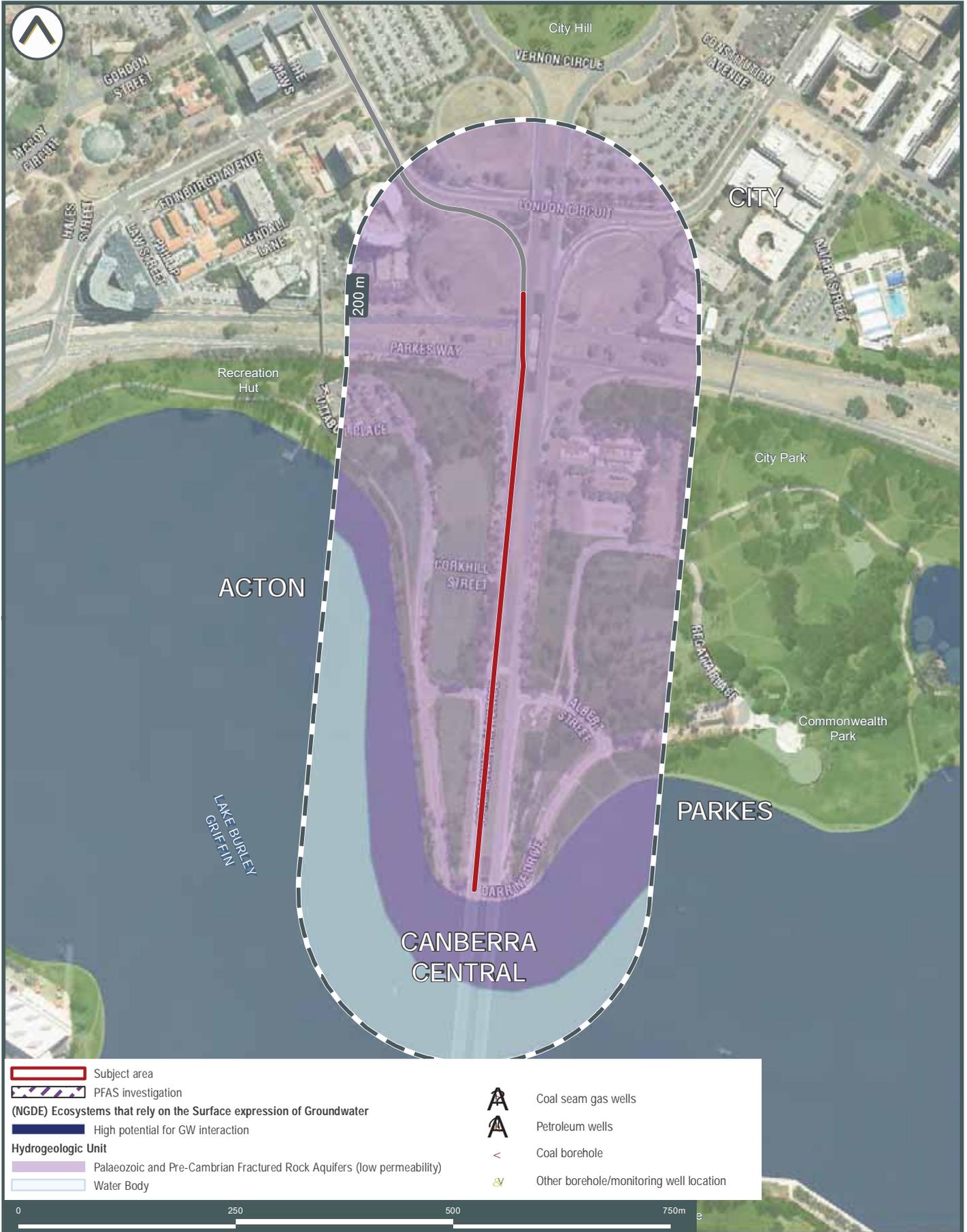




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HYDROGEOLOGY AND GROUNDWATER BORES





HYDROGEOLOGY AND OTHER BOREHOLES





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EPA RECORDS AND OTHER REGULATORY CONTAMINATION ISSUES





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POTENTIALLY CONTAMINATING ACTIVITIES





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CURRENT COMMERCIAL AND TRADE DATA



MAP 7

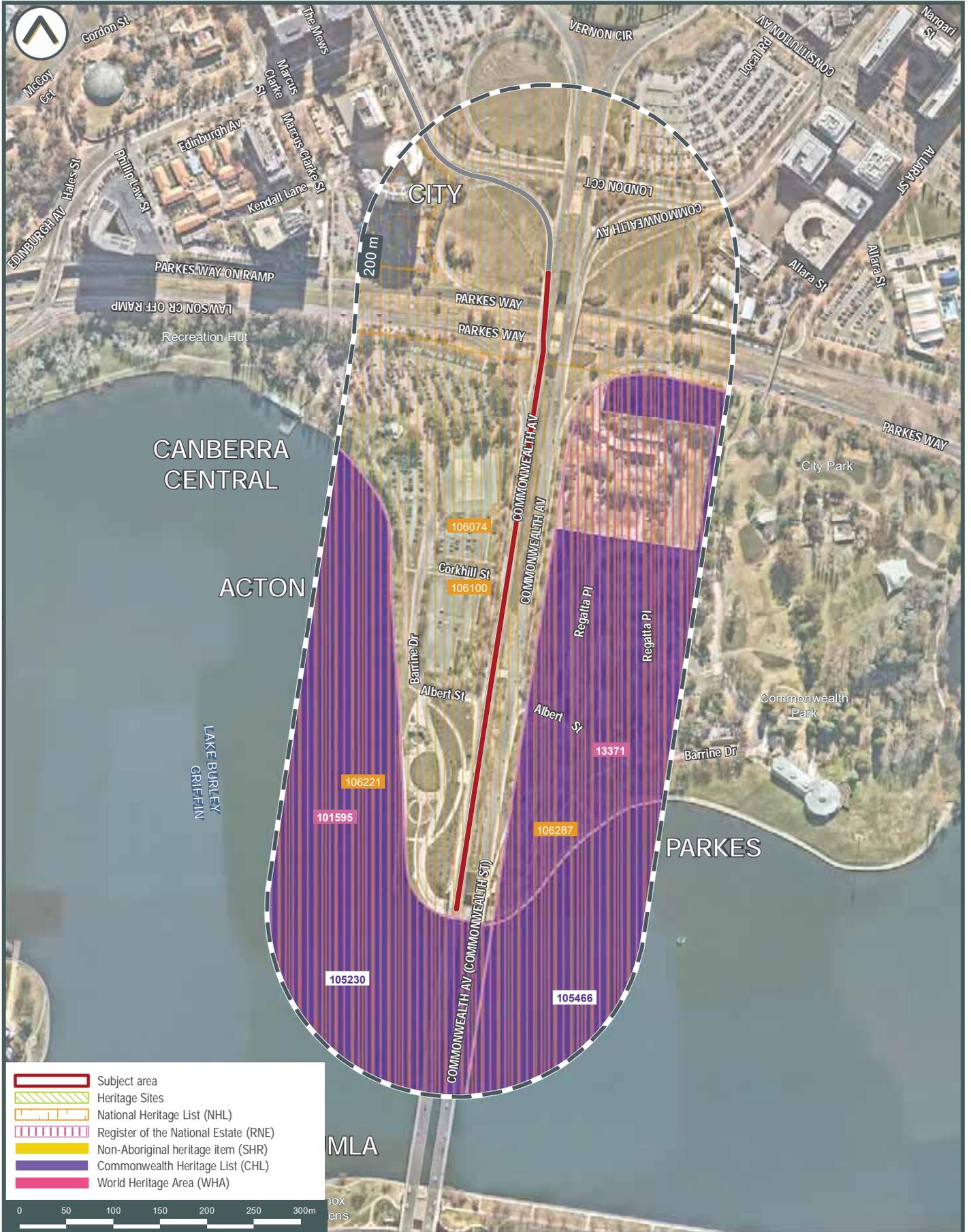




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EPA PUBLIC REGISTERS AND NPI FACILITIES





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HERITAGE





NATURAL HAZARD AND COASTAL MANAGEMENT





ENVIRO-SCREEN

Property Details

Canberra Light Rail 1 - 2km, Canberra ACT

Search Date: 03 October 2019

Understanding your Report

Your Report has been produced by Land Insight and Resources (LIR).

Your Report is based on information available from public databases and sources at the date of reporting. The information gathered relates to land that is within a **200 to 2000 m radius** (buffer zone) from the boundaries of the Property. A smaller or larger radius may be applied for certain records (as listed under records and as shown in report maps).

While every effort is made to ensure the details in your Report are correct, LIR cannot guarantee the accuracy or completeness of the information or data provided.

The report provided by LIR includes data listed on page 3 (table of contents). All sources of data and definitions are provided on the report maps and as listed in the Product Guide (Attached). For a full list of references, metadata, publications or additional information not provided in this report, please contact LIR at info@liresources.com.au.

The report does not include historical or aerial photographs; title searches; dangerous good searches or; property certificates (unless requested); or information derived from a physical inspection, such as hazardous building materials, areas of infilling or dumping/spilling of potentially contaminated materials. It is important to note that these documents and an inspection can contain information relevant to contamination that may not be identified by this Report.

This Report, and your use of it, is regulated by LIR Terms and Conditions (See LIR Product Guide).

Land Insight and Resources

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3.2 NATURAL HAZARDS & COASTAL MANAGEMENT Map 10 (200m Buffer)

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Bush Fire Prone Land (BPL)

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Fire History (Wildfires and Prescribed Burns)

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Flood Hazard Area

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Attachment A - Report Maps

Attachment B - Historical Imagery

LIR Product Guide and Terms and Conditions

Section 1 - Property Setting

1.1 SITE LOCATION MAP AND SENSITIVE RECEPTORS

Map 1 (200m Buffer)

Sensitive receptor	Category	Distance (m)*	Direction
Henry Rolland Park	Park	38	west
Acton Park	Park	48	west
Archbishops Residence	Community Facility	95	east

*Distance from the sensitive receptor point feature to the site boundary centroid.

1.2 PLANNING CONTROLS

Map 2 (onsite)

Land Use Zone	DES	DESIGNATED
Overlay Zones	-	Not identified

1.3 SOIL LANDSCAPE

Map 3a (onsite)

Soil Landscape	wiw	Williamsdale	Soil Group	TRANSFERRAL
Description	<p>Landscape— undulating rises, fans, valley flats and depressions on Silurian Volcanics of the Canberra Lowlands. Includes significant areas of pediplain. Local relief 5 - 50 m; elevation 550 - 650 m; waning footslopes (< 10%). Little or no rock outcrop. The original woodland has been cleared. Grassland areas have been extensively altered.</p> <p>Soils— moderately deep, moderately well-drained Yellow Chromosols (Yellow Podzolic Soils) on Red and Brown Kandosols (Red and Yellow Earths) on upper rises and fan elements. Moderately to very deep, poorly to imperfectly drained Sodosols (Solodic Soils and Solodized Solonetz Soils) on lower rises and fan elements.</p> <p>Limitations— hardsetting, erodible, dispersible soils (localised). Acidic topsoils. Seasonal waterlogging; complex terrain; flood hazard (localised); run-on; dieback.</p>			

1.4 ATLAS OF AUSTRALIAN ACID SULFATE SOIL AND SALINITY

Map 3b (onsite)

ASRIS Atlas of Australian Sulfate Soils (Table 1.5.2)	Aq(p4)	ASS in inland lakes, waterways, wetlands and riparian zones	Probability of Occurrence	High Probability of occurrence
	Cq(p4)	ASS in inland lakes, waterways, wetlands and riparian zones		Extremely low probability of occurrence
Hydrologic Soil Group (Table 1.5.3)	C – slow rate			
Salinity Hazard	Not identified			

Table 1.4.2. Australian Atlas of Acid Sulfate Soils¹ (ASS) map (CSIRO/NatCASS)

Code	Distinguishing soil/sediment properties, vegetation, landforms, or other characteristics
Probability of Occurrence of ASS¹	
A	High Probability of occurrence - (> 70% chance of occurrence in mapping unit)
B	Low Probability of occurrence - (6-70% chance of occurrence in mapping unit)
C	Extremely low probability of occurrence - (1-5% chance of occurrence in mapping unit)
D	No probability of occurrence - (< 1% chance of occurrence in mapping unit)
x	Disturbed ASS ¹ terrain - (ASS ¹ material present below urban development).

Code	Distinguishing soil/sediment properties, vegetation, landforms, or other characteristics
Probability of Occurrence of ASS¹	
u	Unclassified - (Insufficient information to classify map unit)
Zones	
a	Potential acid sulfate soil material and/or Monosulfidic Black Ooze (MBO).
b, c	Potential acid sulfate soil generally within upper 1 m.
c, d, e	ASS ¹ generally within upper 1 m.
f	ASS ¹ generally below 1 m from the surface
g	ASS ¹ , generally below 3 m from the surface.
h	ASS ¹ generally within 1 m of the surface.
i, j	ASS ¹ generally below 1 m of the surface.
k	ASS ¹ material and/or Monosulfidic Black Ooze (MBO).
l, m, n, o, p, q	ASS ¹ generally within upper 1 m in wet / riparian areas.
Subscripts to codes	
(a)	Actual acid sulfate soil (AASS) = sulfuric material.
(p)	Potential acid sulfate soil (PASS) = sulfidic material.
(q)	Monosulfidic Black Ooze (MBO) is organic ooze enriched by iron monosulfides.
Confidence levels	
(1)	All necessary analytical and morphological data are available
(2)	Analytical data are incomplete but are sufficient to classify the soil with a reasonable degree of confidence
(3)	No necessary analytical data are available, but confidence is fair, based on a knowledge of similar soils in similar environments
(4)	No necessary analytical data are available, and classifier has little knowledge or experience with ASS, hence classification is provisional

¹Acid Sulfate Soils (ASS) are all those soils in which sulfuric acid may be produced, is being produced, or has been produced in amounts that have a lasting effect on main soil characteristics (Pons 1973). Acid sulfate soil (ASS) may include PASS or AASS + PASS. Potential acid sulfate soil (PASS) = sulfidic material. Actual acid sulfate soil (AASS) = sulfuric material.

Table 1.4.3. Hydrologic Soil Group

Code	Soil Group Characteristics
A	Soils having high infiltration rates, even when thoroughly wetted and consisting chiefly of deep, well to excessively-drained sands or gravels. These soils have a high rate of water transmission.
B	Soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.
C	Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.
D	Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

1.5 GEOLOGY AND TOPOGRAPHY

Map 4 (onsite)

Geology

Map Sheet	Symbol	Formation	Group	Era	Period	Description
Geological Map	Sua	Canberra Formation	unknown	Palaeozoic	Silurian	mudstone, siltstone, minor sandstone, limestone, hornfels, dacitic ignimbrite, and volcanoclastic sediments

Topography

Topography	557-566mAHD
------------	-------------

1.6 HYDROGEOLOGY AND GROUNDWATER BORES

Map 5a (500m - 2000m Buffer)

	On the Property?	Within Record Search Buffer?
Aquifer Type	Fractured or fissured, extensive aquifers of low to moderate productivity	Fractured or fissured, extensive aquifers of low to moderate productivity
Drinking Water Catchments	Not identified	Not identified
Protected Riparian Corridor	Not identified	Not identified
Wetlands	Not identified	Lake Burley Griffin
Groundwater Bores	Not identified	Yes, see 1.7.1 and 1.7.2

Table 1.6.1. Groundwater Bore Details

Groundwater Bore ID	Authorised Purpose	Completion Date	Drilled Depth (m)	Final Depth (m)	SWL ¹ (m)	Salinity ¹	Yield ¹ (L/s)	Distance (m)	Direction
473	Unknown	25-Jan-79	15.1	15.1	-	-	-	3	west

¹The most recent data available from NSW Department of Industry – Lands & Water Division.

Table 1.6.2. Groundwater Bore Driller Lithology Details

Groundwater Bore ID	From Depth (m)	To Depth (m)	Lithology	Distance (m)	Direction
473	0.00	1.80	No core	3	west
	1.80	2.40	Highly weathered mudstone (city hill shale)	3	west
	2.40	15.10	Moderately weathered mudstone with some highly weathered zones	3	west

1.7 HYDROGEOLOGY AND OTHER BOREHOLES

Map 5b (200m Buffer)

	On the Property?	Within Record Search Buffer?
Hydrogeologic Unit	Palaeozoic and Pre-Cambrian Fractured Rock Aquifers (low permeability)	Palaeozoic and Pre-Cambrian Fractured Rock Aquifers (low permeability)
Other known borehole investigations (200m Buffer)	Not identified	Not identified

Groundwater Dependent Ecosystems

Name	On the Property?	Within Record Search Buffer?
Ecosystems that rely on the Surface expression of Groundwater	Not identified	Not identified
Ecosystems that rely on Subsurface presence of Groundwater	Not identified	Not identified

Table 1.7.1. Other known borehole investigations (Coal Seam Gas (CSG), Petroleum Wells and Other Boreholes) (200m Buffer)

Borehole ID	Purpose	Project	Client/License	Date Drilled	Depth (m)	Distance (m)	Direction
Not identified	-	-	-	-	-	-	-

Section 2 Environmental Records Summary – Contamination and Potentially Contaminating Activities

2.1 PFAS INVESTIGATIONS

Map 5b (2000m Buffer)

Site	Address	Distance (m)	Direction
Not identified	-	-	-

2.2 EPA REGISTER OF CONTAMINATED SITES

Map 6 (1000m Buffer)

District	Location	Notified under Section	Description	Distance (m)	Direction
Not identified	-	-	-	-	-

1. Former sites that have been removed from Register of Contaminated Sites are kept here for information purposes only.

2.3 OTHER CONTAMINATION ISSUES

Map 6 (1000m Buffer)

Defence Sites (current and former)

Site name	Address	Description	RCIP code*	Distance (m)	Direction
WERRIWA DEPOT	Civic, Australian Capital Territory	There are not known contamination issues at the depot. A disused underground fuel storage tank (associated with heating oil) was removed from the site in 2006, with no contamination evident in surrounding soils	0250	154	North-east

*RCIP (Regional Contamination Investigation Program)

Former Gasworks Sites

Site	Location	Distance (m)	Direction
Not identified	-	-	-

2.4 POTENTIALLY CONTAMINATING ACTIVITIES

Map 7a (200m Buffer)

Aviation Fuel Depots/Terminals

Site name	Description	Status	Distance (m)	Direction
Not identified	-	-	-	-

Aviation Rescue Fire Fighting Facilities (ARFF)

Site name	Class	Status	Distance (m)	Direction
Not identified	-	-	-	-

Derelict Mines and Quarries

Deposit Name	Method	Description	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Dry Cleaners

Site name	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-

Landfills (Legacy)

Site name	Description	Distance (m)	Direction
Not identified	-	-	-

Note: This is not an exhaustive list of all legacy landfills.

Liquid Fuel Depots/Terminals

Site name	Owner	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Power Stations

Site name	Owner	Primary Fuel Type	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Service Stations

Site name	Owner	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Substation / Switching Stations

Site name	Owner	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Telephone Exchanges

Site name	Location	Status	Distance (m)	Direction
Not identified	-	-	-	-

Waste Management Facilities

Site name	Owner	Class	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Wastewater Treatment Facilities

Site name	Operator	Class	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Unexploded Ordnance (UXO) Sites - Department of Defence (DoD)

Site name	Site ID	Category	Description	Distance (m)	Direction
Not identified	-	-	-	-	-

2.5 OTHER CURRENT POTENTIALLY CONTAMINATING ACTIVITIES

Map 7b (200m Buffer)

Current Commercial and Trade Data

Site name	Category	Location	Status*	Distance (m)	Direction
Not identified	-	-	-	-	-

*Data is current as when this report was created. However due to the turnover of business locations, some addresses may be former.

Underground Storage Tank (UST)

Premises	Tank type	Status*	Distance (m)	Direction
Not identified	-	-	-	-

Note: This is not an exhaustive list of all UST's.

2.6 NPI INDUSTRIAL FACILITIES

Map 8 (200m Buffer)

Facility name	Address	Primary ANZSIC Class	Latest report	Distance (m)	Direction
Not identified	-	-	-	-	-

2.7 ENVIRONMENTAL PROTECTION AUTHORITY PUBLIC REGISTERS

Map 8 (200m Buffer)

EPA Authorisations

ID number	Business Name	Suburb	Location	Activity	Status	Distance (m)	Direction
1128	Director General, ACT Government	Canberra City ACT	Various locations within Australian Capital Territory	Commercial use of chemicals (Activity 29)	Current	Not mapped	-
1165	City Pest Control Service Pty Ltd	Canberra City ACT	Various locations within Australian Capital Territory	Commercial use of chemicals (Activity 29)	Current	Not mapped	-

1. Some sites do not contain specific addresses. Records identified as being in the surrounding area have been added for information.

2.8 ACT ASBESTOS RESPONSE TASKFORCE LIST

Map 8 (onsite)

Division	Section	Block	Unit	Street Address	Alternate Street Address
Not identified		-	-	-	

HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

1971 HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

(200m Buffer)

Activity	Name	Address	Positional accuracy	Distance (m) *	Direction
Air Services & Agents	Air New Zealand Ltd	London Circuit, Canberra	Street		
Aircraft Mfrs &/or Distributors	Lockheed Aircraft Pty Ltd	London Circuit, Canberra	Street		
Aircraft Mfrs &/or Distributors	O.F.E.M.A.	London Circuit, Canberra	Street		
Builders & Contractors	Civil & Civic Pty Ltd	London Circuit, Canberra	Street		
Chemists - Pharmaceutical	Leggotts Pharmacy	London Circuit, Canberra	Street		
Chemists - Pharmaceutical	Roberts B R	London Circuit, Canberra	Street		
Sewing Machines- Industrial	Singer Aust Ltd	London Circuit, Canberra	Street		

* If no distance is provided, address no longer exists.

1981 HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

(200m Buffer)

Activity	Name	Address	Positional accuracy	Distance (m) *	Direction
Aircraft Mfrs &/or Distributors	Grumman International Inc	London Circuit, Canberra	Street		
Builders & Contractors	Matrix Management Pty Ltd	London Circuit, Canberra	Street		
Chemists-Consulting &/or Industrial	Leonard A Doyle & Associates	London Circuit, Canberra	Street		
Clothing - Uniforms - Mfrs &/or Wholesalers	Fletcher Jones & Staff Pty Ltd	London Circuit, Canberra	Street		
Knitting Machines	Singer Sewing & Knitting Centre	London Circuit, Canberra	Street		

* If no distance is provided, address no longer exists.

1991 HISTORICAL COMMERCIAL & TRADE DIRECTORY DATA

(200m Buffer)

Activity	Name	Address	Positional accuracy	Distance (m) *	Direction
Burglar Alarm Systems	Capital Security	London Court, Canberra	Street		
Hire - Builders', Contractors' & Handyman's Equipment	Canberra Festival	London Circuit, Canberra	Street		

* If no distance is provided, address no longer exists.

Land Insight and Resources use a number of different address georeferencing methods and characterised them according to the following criteria: completeness (match rates) and positional accuracy. When address do not contain specific street numbers or a match is not found, records identified as being in the surrounding areas are included for reference.

Historical dataset positional accuracy and georeferencing results explanation

Positional accuracy	Georeferenced	Description
Address	Located to the address level	<i>When street address and names fully matched.</i>
Street	Located to the street centroid	<i>When street names match but no exact address was found. Location is approximate.</i>
Place	Located to the structure, building or complex	<i>When building, residential complex or structure name match but no exact address was found. Location is approximate.</i>
Suburb	Located to the suburb area	<i>When suburb name match but no exact address was found. Location is approximate.</i>
Not georeferenced	Not found	<i>When it was not georeferenced, and address could not be found.</i>

Section 3 - Other Environmental Constraints

3.1 FEDERAL, STATE AND LOCAL HERITAGE

Map 9 (200m Buffer)

Heritage Sites

Heritage ID	Site Name	Type	Status	Distance (m)*	Direction
Not identified	-	-	-	-	-

National Heritage List (NHL)

Site ID	Site Name	Class	Status	Distance (m)	Direction
106074	Canberra and Surrounding Areas	Historic	Minister considering decision within extended period	0	onsite
106100	Canberra - Central National Area and Inner Hills/ Canberra the Planned .	Historic	Minister considering decision within extended period	0	onsite
106287	Lake Burley Griffin and Lakeshore Landscape	Historic	Nominated place	97	south
106221	Lake Burley Griffin and Lakeshore Parklands	Historic	Request for emergency listing	97	south

Register of the National Estate (RNE)

Site ID	Site Name	Class	Status	Distance (m)	Direction
101595	Lake Burley Griffin Conservation Area	Historic	Indicative Place	9	south
13371	Parliament House Vista	Historic	Registered	132	east

Non-Aboriginal heritage item (Local)

Site ID	Site Name	Class	Status	Distance (m)	Direction
106074	Canberra and Surrounding Areas	Historic	Nominated place	0	onsite
106100	Canberra - Central National Area and Inner Hills	Historic	Nominated place	0	onsite
106206	Lake Burley Griffin and Lakeshore Parklands	Natural	Request for Emergency Listing	0	onsite

Non-Aboriginal heritage item (SHR)*

Site ID	Site Name	Listing n°	Plan n°	Distance (m)	Direction
Not identified	-	-	-	-	-

*State Heritage Register

Commonwealth Heritage List (CHL)

Site ID	Site Name	Class	Status	Distance (m)	Direction
105230	Lake Burley Griffin and Adjacent Lands	Historic	Nominated place	9	south
105466	Parliament House Vista	Historic	Listed place	132	east

World Heritage Area (WHA)

Site ID	Site Name	IUCN	Status	Distance (m)	Direction
Not identified	-	-	-	-	-

Bush Fire Prone Land (BPL)

Category	On the Property?	Within Record Search Buffer?
Not identified	-	-

Fire History (Wildfires and Prescribed Burns)

Category	On the Property?	Within Record Search Buffer?
Not identified	-	-

Flood Hazard Area

Name	On the Property?	Within Record Search Buffer?
1 percent AEP Flood* (currently being revised by ACT Government)	Not identified	Yes



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