ERM

Level 15 309 Kent Street
Sydney NSW 2000
Locked Bag 3012
Australia Square NSW 1215

Telephone: +61 2 8584 8888
Fax: +61 2 9299 7502

www.erm.com

Paul Hedge
Director Delivery
Western Parkland City Authority
Level 2, 10 Valentine Avenue
Parramatta, NSW, 2150

9 November 2021

Reference: 0571466 (Rev2)

Dear Paul

Subject: Contamination Investigation: First Building Development Area, Bradfield NSW

1. INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by Western Parkland City Authority (WPCA) to undertake a review of potential contamination of the site identified as the First Building Development (the Site) within the Bradfield development area, located at 215 Badgerys Creek Road, Bringelly, NSW (the Site).

- The Site is located within the north western portion of Lot 10 in DP DP1235662 which forms part of the broader Bradfield site area as illustrated on **Figure 1**. The current layout of the Site and surrounds is presented on **Figure 2.**

1.1 Site Identification

Site identification information is presented within the table below:

Item	Description
Site Address	■ 215 Badgerys Creek Road, Bringelly, NSW 2556
Lot and Deposited Plan	■ Part Lot 10 DP1235662
Local Government Area	■ Liverpool
Zoning	■ The site area is zoned as ENT – Enterprise.
Site Area	■ Approximately 7.7 hectares (ha)
Geographic Co-Ordinates	■ Site boundary co-ordinates are as illustrated in Figure 2
Site Location and Site Layout	■ Figure 1 – Site Location ■ Figure 2 – Site Layout

1.2 Project Objective

To assist with planning requirements, ERM undertook a Preliminary Site Investigation (PSI) of the broader 114.9 hectare (ha) Bradfield site in June 2021 (as summarised in Annex B). The objective of the PSI was to refine the understanding of potential contamination resulting from current and historical land use practices undertaken within the Commonwealth Land and surrounding area and to aid WPCA in assessing potential contamination issues that may require consideration during future redevelopment works.

Following completion of the ERM (2021) PSI, ERM undertook a Targeted Site Investigation (TSI) of certain portions of the broader 114.9 ha (summarised in Annex B). The TSI was undertaken specifically to further the understanding of potential key constraints to future development works outside of the Site but within the broader 114.9 ha site area, and to enable collection of additional data to supplement existing information relating to PFAS and potential uncontrolled filling in those areas.

Based on information reviewed as part of the ERM (2021) PSI and information collected as part of the ERM (2021) TSI, ERM considered there were some potential risks to human health and / or sensitive ecological receptors associated with a number of current and historical land use practices undertaken within the Site. ERM therefore recommended the completion of a Detailed Site Investigation (DSI) to further assess the potential for soil and / or groundwater contamination to be present.

- The ERM (2021) PSI was reviewed and endorsed by the NSW EPA accredited Site Auditor (Mr Andrew Lau).

To define the requirements for the DSI, ERM developed the ERM (2021) Aerotropolis Core Precinct, Priority Area 1 Sampling and Analysis Quality Plan, 6th July 2021 herein referred to as the (ERM 2021a SAQP). This SAQP was developed to describe the Data Quality Objectives (DQOs) and required investigation methodology for undertaking the proposed DSI of the Site including sampling, analytical and reporting requirements.

- The ERM (2021) SAQP was reviewed and endorsed by the NSW EPA accredited Site Auditor (Mr Andrew Lau).

The overall objectives of the subsequent DSI (now in progress) will be to assess the potential distribution / extent of contamination in soil and groundwater and potential remediation / site management requirements to inform and facilitate subsequent redevelopment works at the Site.

ERM notes that the DSI and any subsequent recommendations for site management / remediation will require review and endorsement by the NSW EPA accredited Site Auditor (Mr Andrew Lau). Upon completion of investigation and subsequent remediation / site management works (where required) within the Site and confirmation that the site is suitable for the intended land use, the site auditor will prepare Statutory Site Audit Statement / Site Audit Report confirming suitability of the Site for the proposed development.

2. SUMMARY OF PREVIOUSLY IDENTIFIED CONTAMINATION

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

Location	Area of Environmental Concern	Comment
Onsite - Priority 1 Site Area	**Unexpected finds / buried waste / fill materials**	■ ERM notes the potential for additional fill materials to have been placed within the roadways or other burial areas located within the Site. ■ This area may require further assessment to assess the potential for site management / remediation requirements prior to the commencement of development.
	Potential Weed Spraying and General Site Area	■ Potential historical land uses may have included weed spraying and other land uses to control weeds / pests within the Site.
	Asbestos service pits / conduits:	■ Onsite service pits / conduits require a survey to be completed to assess the potential for additional asbestos to be present which may require management and / or remediation to enable the Site to be suitable for the future proposed development.
Offsite (but within remainder of Bradfield Site)	**Central Compound Fuel storage:**	■ Groundwater monitoring undertaken to date has not identified elevated hydrocarbons within groundwater wells located within the vicinity of existing USTs. ■ Reports indicate that fuel tanks still contain diesel / petrol products with the last investigation undertaken in 2011. ■ There is the potential for leaks of fuels to have occurred within the intervening period as tanks are unlikely to have been maintained during this period or assessed for loss / leaks. ■ Fill materials adjacent to USTs identified to be stained (green colouring) and containing hydrocarbon odours.
	Central Compound Hazardous building materials:	■ Hazardous materials identified within building structures require removal / management and may have impacted localised surrounding surface soils (through degrading materials) ■ Where buildings are to be demolished, removal of hazardous building materials as per relevant regulatory requirements (including validation of surrounding surface soils). Validation of successful removal and confirmation that additional impact to surface soils did not occur during removal works; and ■ Where buildings are to be retained, removal and / or management of identified hazardous materials as per relevant guidelines / standards. Where materials are to remain onsite, update and maintain

Location	Area of Environmental Concern	Comment
		hazardous materials register for all future users. Validation of surrounding soils may also be required to demonstrate suitability for the proposed development.
	Central Compound Septic tank	■ Previous investigation identified the presence of a septic tank within the central compound. While ERM notes that results from previous investigations did not identify concentrations of CoPCs to exceed screening criteria, as the septic tank was not targeted during investigation works, the potential exists for contamination of surrounding soils etc. to have occurred.
	Married Quarters - Identified asbestos surface impact	■ Previous investigations identified surficial asbestos within the vicinity of the former married quarters. ■ The identified asbestos impact may differ from distribution within Golder investigation. Potential for additional impact from degrading building structures etc. Fill was observed to 0.5 m bgl therefore potential exists for deeper asbestos materials to be present.
	Identified asbestos impacted stockpile:	■ Approximately 1600 m^3 of asbestos impacted fill has been identified within a stockpile located south of the administration building.
	General Area - PFAS	■ Concentrations of PFOS + PFHxS in soil exceed the screening risk criteria for residential land use at two surface soil locations near the chemical storage shed and USTs. ■ Concentrations of PFOS surface water samples exceeded the PFAS NEMP Freshwater 99% Species Protection criteria.
	Adjacent Residential Dwellings	■ ERM notes that residential blocks located adjacent to the Bradfield site area land were not inspected during works. ■ The potential exists for contamination associated with residential land uses such as weed spraying, pesticides, fertilisers, septic tanks, etc., minor vehicle maintenance activities and degrading hazardous building materials (asbestos, lead paints etc). ■ This area may require further assessment to assess the potential for site management / remediation requirements prior to the commencement of development.
	Unexpected finds / buried waste / fill materials	■ ERM notes the potential for additional fill materials to have been placed within the gully located within the southern portion of the Bradfield site area.

3. PROPOSED INVESTIGATION

To investigate potential contamination identified within the ERM (2021) PSI, and inform the potential requirements for site management and / or remediation, ERM developed the ERM (2021a) SAQP, The sampling rationale / strategy adopted is described in the table below and sample locations are presented on **Figure 3 in Annex A**.

- ERM notes that the works outlined below are being undertaken in November 2021 with subsequent reporting expected to be completed by January 2022,

Media	Sample Location	Sampling Rationale
Soil	Test Pits	■ Test pits will be excavated in a grid based approach within areas of open space and portions of the site in accordance with the NSW EPA sampling density requirements. ■ The purpose of test-pit sampling is to visually assess the potential composition and extent of fill materials / potential asbestos within accessible portions of the Site and to enable sample collection. ■ Visual observations will be recorded for all excavated test pits with soil samples to be obtained to assess potential site management requirements during construction and to aid in determining potential future waste classification requirements.
	Soil Bores (contingency)	■ Where trees / dense vegetation is present that may preclude undertaking test pits soil bores will be utilised to assess ground conditions. ■ While ERM notes that soil bores are not the preferred method for assessing the potential for asbestos, key indicators such as depth of fill and other signs of anthropogenic inclusions can be used as key indicators for potential asbestos.
Groundwater	Groundwater Monitoring Wells	■ Based on a review of site history, it is the opinion of ERM that the potential for underground storage of fuels or onsite chemical storage is low, the potential for onsite migration of groundwater contamination does however require consideration. ■ Six groundwater monitoring wells will be installed in a general grid based pattern across the site to assess groundwater conditions and potential for on and off-site migration.
Surface Water / Sediments	Surface Water / Sediments	■ Due to the potential re-use of surface water within the Site and broader Aerotropolis Core for recreational uses, surface water and sediment samples will be collected from drainage lines that flow onto and within the site to aid in the assessment o potential for re-use requirements. ■ Surface water / sediment samples will be collected opportunistically from onsite drainage lines to assess the potential for migration of PFAS and other key CoPCs from adjacent sites.

On completion of investigative works, ERM will summarise the findings of the investigation in a report consistent with NSW EPA made or approved guidelines and reporting requirements.

- ERM notes that the DSI will be require review / endorsement by the NSW EPA accredited Site Auditor (Mr Andrew Lau).

4. CONCLUSIONS

ERM was engaged by WPCA to undertake a review of potential contamination of the site identified as the First Building Development (the Site) within the Bradfield development area, located at 215 Badgerys Creek Road, Bringelly, NSW (the Site).

Based on information reviewed as part of the ERM (2021) PSI, including previous investigations, historical aerial photographs and relevant database searches, ERM considered that further investigation was required to assess the potential for soil and groundwater contamination at the Site and the broader Bradfield site area 114 ha site area that may present a risk to human health or sensitive ecological receptors.

To define the requirements for the DSI, ERM developed the ERM (2021a) SAQP to describe the Data Quality Objectives (DQOs) and required investigation methodology for undertaking the proposed DSI including sampling, analytical and reporting requirements.

- The ERM (2021) SAQP was reviewed and endorsed by the NSW EPA accredited Site Auditor (Mr Andrew Lau).

The overall objective of the DSI is therefore to assess the potential distribution / extent of contamination in soil and groundwater and identify potential remediation / site management requirements to enable subsequent redevelopment works at the Site.

Following completion of the DSI, ERM considers that the Site can be made suitable for the proposed development subject to development of an updated Remedial Action Plan (RAP) and / or Site Management Plan (SMP) to outline the required processes / procedures to be adopted for the remediation and / or management of any identified contamination.

- Based on potential contaminants identified within the ERM(2021) PSI, there is considered to be a low risk of contamination being present within the Site that would preclude the proposed future development following implementation of an auditor approved RAP / SMP.

Upon completion of any remedial / site management works, a Validation Report will be prepared in accordance with NSW EPA requirements outlining the remedial / site management works undertaken within the site and confirmation of the suitability of the Site for the intended future land use.

- ERM notes that any developed remedial / site management approach and subsequent validation reporting will require review / endorsement by the Site Auditor (Mr Andrew Lau) prior to completion.

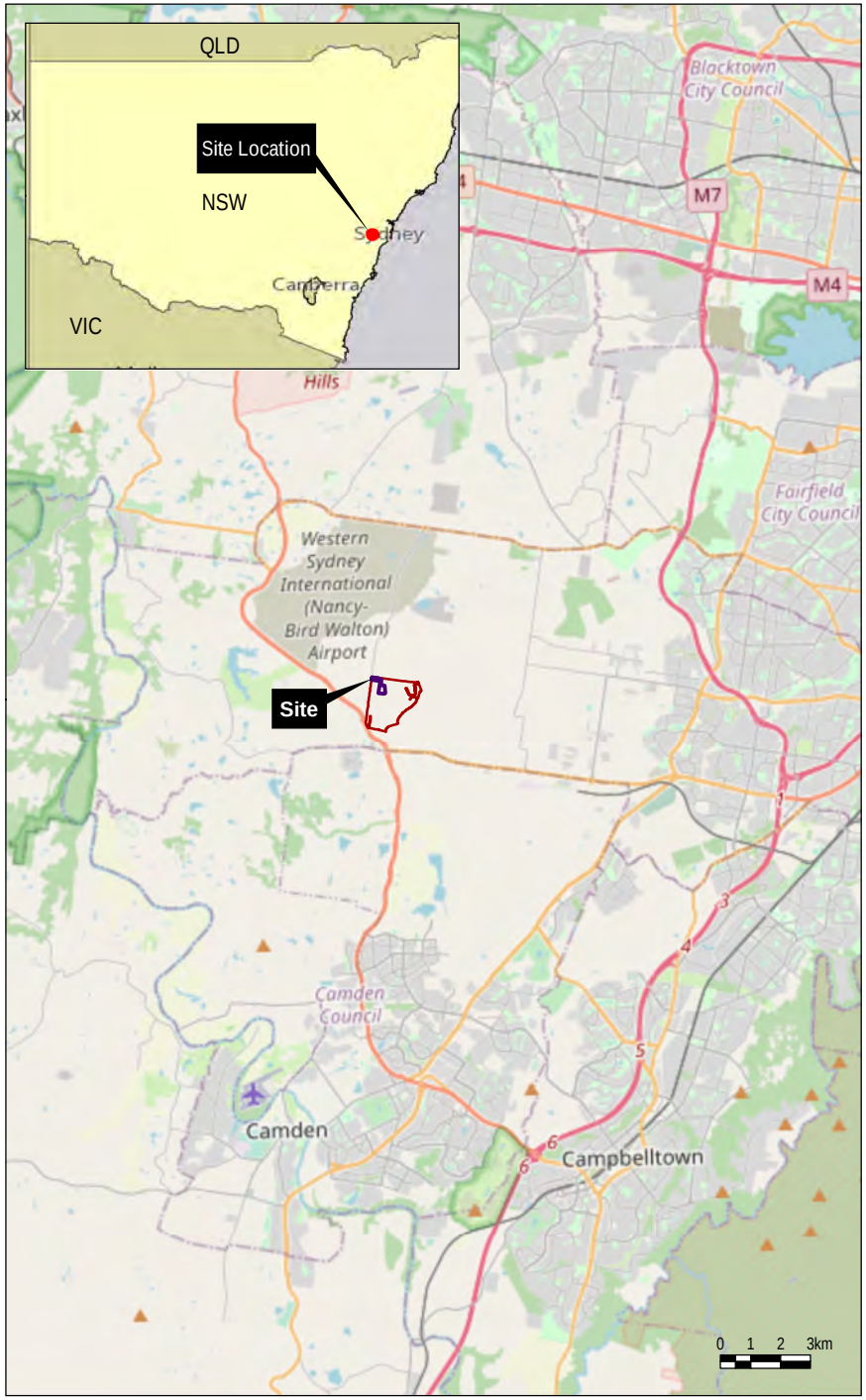
Upon completion of investigation and subsequent remediation / site management works (where required) within the Site and confirmation that the site is suitable for the intended land use, the site auditor will prepare Statutory Site Audit Statement / Site Audit Report confirming suitability of the Site for the proposed development.

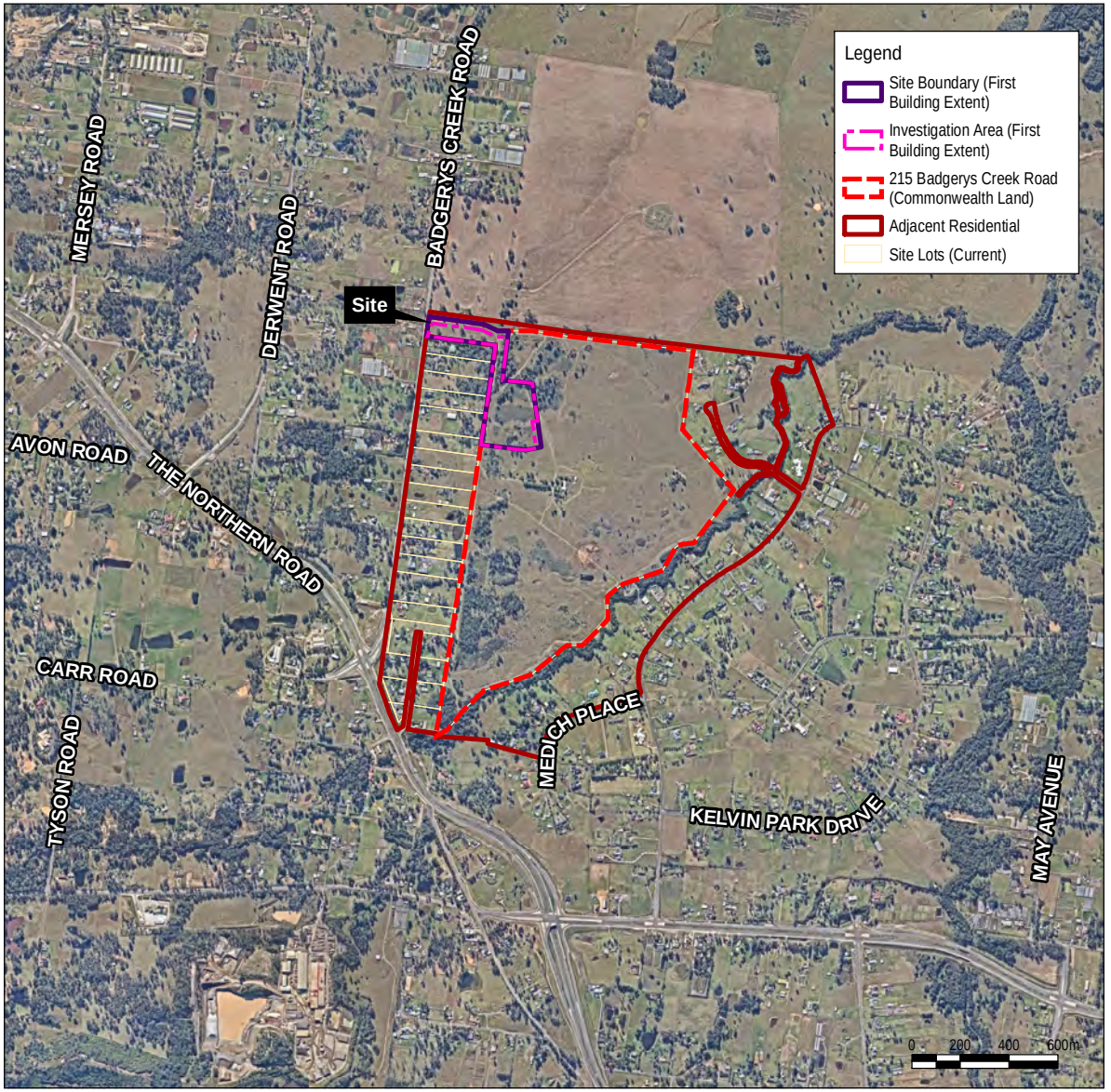
for Environmental Resources Management Australia Pty Ltd

Ian Batterley
Partner

Peter Lavelle
Partner

ATTACHMENT A FIGURES





Data Source:
NSW DFSI - DCDB / DTDB 2021
Nearmap Imagery May 2021
Esri OpenStreetMap 2021

Site Location

F1

Drawing No:	0571466s_SAQP1_G001_R0.mxd		WPCA Aerotropolis SAQP 1
Date:	30/06/2021	Drawing Size: A4	
Drawn By:	GC	Reviewed By: IB	Client: Western Parkland City Authority

Coordinate System: GDA 1994 MGA Zone 56

N

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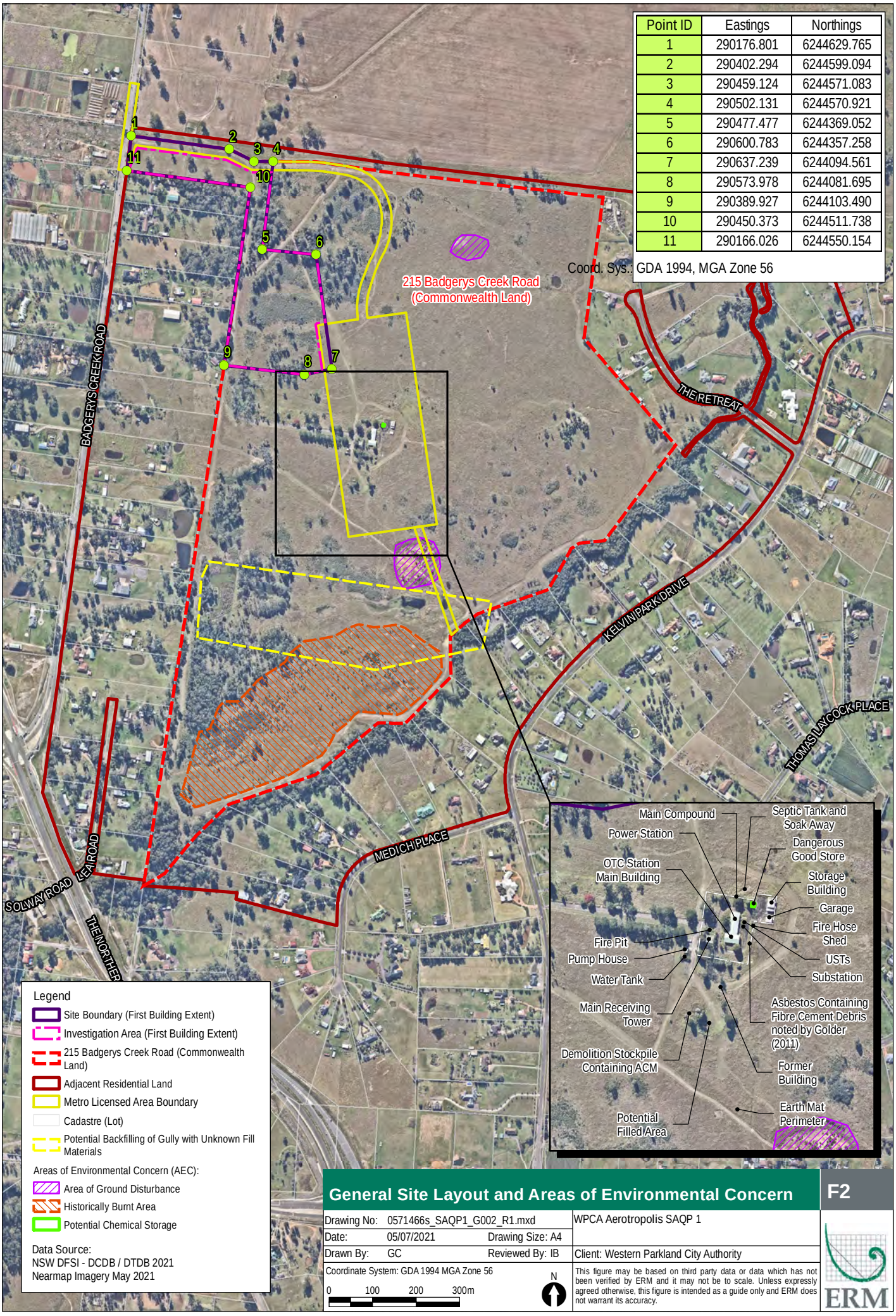
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5 | 290477.477 | 6244369.052
6 | 290600.783 | 6244357.258
7 | 290637.239 | 6244094.561
8 | 290573.978 | 6244081.695
9 | 290389.927 | 6244103.490
10 | 290450.373 | 6244511.738
11 | 290166.026 | 6244550.154
Coord. Sys.: GDA 1994, MGA Zone 56
215 Badgerys Creek Road (Commonwealth Land)
BADGERYS CREEK ROAD
THE RETREAT
KELVIN PARK DRIVE
THOMAS LAYCOCK PLACE
MEDICI PLACE
SOLWAY ROAD
LEA ROAD
THE NORTHERN
Main Compound
Septic Tank and Soak Away
Power Station
Dangerous Good Store
OTC Station Main Building
Storage Building
Garage
Fire Hose Shed
Fire Pit
Pump House
USTs
Water Tank
Substation
Main Receiving Tower
Asbestos Containing Fibre Cement Debris noted by Golder (2011)
Demolition Stockpile Containing ACM
Former Building
Potential Filled Area
Earth Mat Perimeter
Legend
Site Boundary (First Building Extent)
Investigation Area (First Building Extent)
215 Badgerys Creek Road (Commonwealth Land)
Adjacent Residential Land
Metro Licensed Area Boundary
Cadastre (Lot)
Potential Backfilling of Gully with Unknown Fill Materials
Areas of Environmental Concern (AEC):
Area of Ground Disturbance
Historically Burnt Area
Potential Chemical Storage
Data Source:
NSW DFSI - DCDB / DTDB 2021
Nearmap Imagery May 2021
General Site Layout and Areas of Environmental Concern
F2
Drawing No: 0571466s_SAQP1_G002_R1.mxd
WPCA Aerotropolis SAQP 1
Date: 05/07/2021
Drawing Size: A4
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Reviewed By: IB
Client: Western Parkland City Authority
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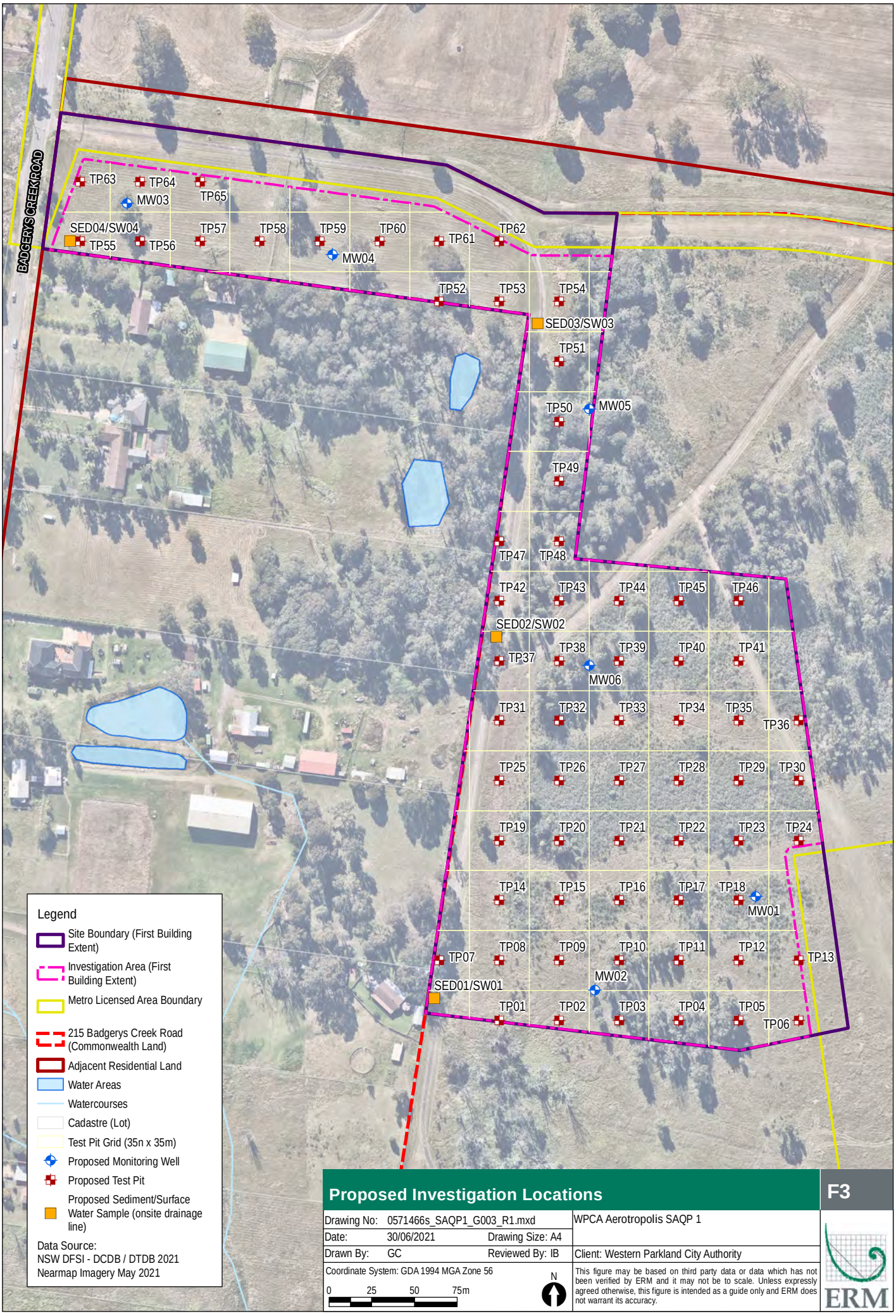
BADGERYS CREEK ROAD
TP63
TP64
TP65
MW03
SED04/SW04
TP55
TP56
TP57
TP58
TP59
TP60
MW04
TP61
TP62
TP52
TP53
TP54
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TP50
MW05
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TP07
TP08
TP09
TP10
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TP12
TP13
MW02
SED01/SW01
TP01
TP02
TP03
TP04
TP05
TP06
Legend
Site Boundary (First Building Extent)
Investigation Area (First Building Extent)
Metro Licensed Area Boundary
215 Badgerys Creek Road (Commonwealth Land)
Adjacent Residential Land
Water Areas
Watercourses
Cadastre (Lot)
Test Pit Grid (35n x 35m)
Proposed Monitoring Well
Proposed Test Pit
Proposed Sediment/Surface Water Sample (onsite drainage line)
Data Source:
NSW DFSI - DCDB / DTDB 2021
Nearmap Imagery May 2021
Proposed Investigation Locations
F3
Drawing No: 0571466s_SAQP1_G003_R1.mxd
WPCA Aerotropolis SAQP 1
Date: 30/06/2021
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Drawn By: GC
Reviewed By: IB
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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ATTACHMENT B SUMMARY OF PREVIOUS INVESTIGATIONS

The primary and most recent previous investigation relied upon in developing the ERM (2021) SAQP was the ERM (2021) Aerotropolis Core Precinct – Review of Contamination Issues, 17th June 2021 (ERM 2021 PSI), a summary of which is presented later in this section.

To inform the preparation of that document, ERM undertook a review of the following previous reports relevant to the Site and broader Aerotropolis Core Precinct:

- Environmental Resources Management Pty Ltd (2011) RAAF Bringelly Receiving Station NSW,
  Heritage Assessment, 18 April 2011 (ERM 2011);
- GHD (2011) Department of Defence Support Group, Bringelly RAAF Receiving Station, Infrastructure Assessment Report, April 2011 (GHD 2011);
- Golder Associates (2011) Detailed Site Investigation, Former RAAF Bringelly Receiving Station, October 2011 (Golder 2011);
- Golder Associates (2011a) Hazardous Building Materials Assessment, Former RAAF Bringelly Receiving Station, April 2011 (Golder 2011);
- Sweett Group Pty Ltd (2011) Bringelly RAAF Receiving Station, Bringelly, NSW. Stage 1 Overarching Report – Summary Outcomes of Due Diligence Investigations, August 2011 (Sweett 2011);
- GTek Pty Ltd (2011) Post Activity Report Unexploded Ordnance (UXO) Consultancy Services RAAF Receiving Station Site Bringelly, NSW, 13th January 2011 (GTek 2011);
- Golder Associates (2014) Remedial Action Plan, Former RAAF Bringelly Receiving Station, April 2014 (Golder 2014);
- Deloitte Pty Ltd (2015) Defence Housing Australia Bringelly RAAF Receiving Station, 13th March 2015 (Deloitte 2015);
- Western Environmental Pty Ltd (2019) 215 Badgerys Creek Road, Bringelly, NSW, Detailed Site Investigation Report, 12 December 2019 (Western Environmental 2019);
- Thuroona Services Pty Ltd (2019) Cost Estimate Report - 215 Badgerys Creek Road, Bringelly, NSW, 24 December 2019 (Thuroona 2019);
- Arup Australia Pty Ltd (2020) Sydney Metro Greater West Technical Paper 7: Groundwater, 4th June 2020 (Arup 2020);
- M2A Pty Ltd (2020) Sydney Metro Greater West Technical Paper 6: Flooding, Hydrology and Water Quality (M2A 2020);
- M2A Pty Ltd (2020) Sydney Metro Greater West Technical paper 8: Contamination (M2A 2020a);
- Aerocon Australia Pty Ltd (2020) Western Sydney Aerotropolis Constraints and Land Capability Assessment – Stage 1 Report, September 2020 (Aurecon 2020); and
- Sydney Water Pty Ltd (2020), Aerotropolis Initial Precincts Stormwater and Water Cycle Management Study Interim Report, September 2020 (Sydney Water 2020).

A summary of the above reports is presented within the following table.

Report	Details
Sweett 2011	Sweett Group was engaged by the Department of Defence, Property Disposals, Defence Support Group as Project Manager / Contract Administrator to prepare a Stage 1 Overarching Report and manage sub-consultancies for the preparation of due diligence investigations for the Site. Based on the result of the Stage 1 Report, Sweett Group identified the following: ■ The soil investigation program identified lead and C10-C36 Total Petroleum Hydrocarbons (TPH) above the adopted residential land use criteria at one location each. These concentrations were not considered to warrant further investigation or remediation; ■ Exceedances of the provisional phytotoxicity based PILs for metals in surface or near surface soils were identified on the site; The locations exceeding the PILs were not considered to warrant further investigation or remediation; ■ Soil sampling and groundwater samples collected from the vicinity of the Underground Storage Tanks (USTs) adjacent to Building 1 containing petrol and diesel were below the adopted site criteria for hydrocarbon fuel related contaminants. However, there is a potential for hydrocarbon contamination of backfill sand and UST pit walls associated with the USTs; ■ Concentrations of cadmium, copper and zinc in groundwater exceeded the adopted site criteria. It was considered that the reported concentrations were indicative of background concentrations and that no further investigations of metals in groundwater is warranted; and ■ Fragments of asbestos cement were identified on the ground in the former Married Quarters and in a stockpile of soil and demolition material located in the area of the former Barracks. A larger fragment of asbestos sheeting was observed on the ground surface between Badgerys Creek Road and the main section of the site. A suspected asbestos cement cable pit was observed on the eastern side of the Compound area. ■ There was the potential for asbestos cement debris to be present elsewhere on the site. <u>Recommendations:</u> ■ The report recommended that a Remedial Action Plan (RAP) be developed to manage or remove the asbestos onsite and to address disposal of the contents of the UST adjacent to Building 1 and the decommissioning or removal of the UST. <u>Hazardous Materials:</u> ■ Asbestos was present throughout the Site in cement, assumed to be present in electrical distribution boards, vinyl tiles. ■ Lead paint was present onsite in Building 1 and 5, and lead flashing of roof. ■ PCBs were present in fluorescent lights. ■ Potential Ozone Depleting Substances (ODS) used as refrigerants associated with air-conditioning plant. ■ Mercury was present in fluorescent light tubes throughout buildings and in vapour lamps in Building 15.
GHD 2011	■ GHD identified a former fire hose shed (building 20) and stated that the sites firefighting infrastructure is designed to be independent from the Sydney Water Supply. ■ ERM noted that there was no mention of firefighting foam storage areas or foam storage tanks etc. However as the site contained fuel storage, it is the opinion of ERM that it would be reasonable to assume that AFFF was stored onsite for firefighting purposes.

	■ Telstra pits and service infrastructure were mapped however ERM notes that there was no mention of materials type (i.e. potential asbestos pits).
G-Tek 2011	G-tek Australia Pty Limited (G-tek) was commissioned by the Department of Defence (Defence) to provide unexploded ordnance (UXO) consultancy services as part of overall environmental review and, if required, remediation of this Site prior to disposal. The report identified the following: ■ No additional assessment or remediation works associated with UXO were required within this Site; ■ No review or monitoring of any intrusive remedial works required to be conducted by other consultants is required; ■ The risk of remnant ordnance related material within the eastern water easement is minimal; ■ Defence has no legislative remediation or management obligations within the Site; and ■ The Site is suitable for any future use or development
Golder 2011	Golder was engaged to undertake a Detailed Site Investigation (DSI) of the Site including soil and groundwater assessment. Results of the DSI indicated the following: ■ Soil analysis results were generally below the adopted site criteria. The soil investigation program identified lead and C10-C36 TPH above the adopted residential land use criteria at one location each. These concentrations were not considered to be significant, and not to warrant further investigation or remediation. ■ Exceedances of the provisional phytotoxicity based Pl Ls for metals in surface or near surface soils were identified on the site. The majority of the reported exceedances are located in the vicinity of the Compound area, and were considered to be of anthropogenic origin. The locations exceeding the Pl Ls were not considered to warrant further investigation or remediation. ■ Fragments of asbestos cement were identified on the ground surface in the former Married Quarters and in a stockpile of soil and demolition material located in the area of the former Barracks. A larger fragment of asbestos sheeting was observed on the ground surface between Badgerys Creek Road and the main section of the site. Free asbestos fibres were not identified in the soil or stockpile samples analysed during the investigation. A suspected asbestos cement cable pit was observed on the eastern side of the Compound area. Golder identified the potential for asbestos cement debris to be present elsewhere on the site. ■ The results of soil sampling and groundwater samples collected from the vicinity of the USTs adjacent to Building 1 containing petrol and diesel were below the adopted site criteria for hydrocarbon fuel related contaminants. However, Golder concluded that there was the potential for hydrocarbon contamination of backfill sand and UST pit walls associated with the USTs ■ TPH, Benzene, toluene, ethylbenzene and xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAH), Volatile Aromatic Hydrocarbons (VOC) and Semi Volatile Aromatic Hydrocarbons (SVOC) were not present in groundwater samples collected from the site. It was considered that the reported concentrations of cadmium, copper and zinc are indicative of background concentrations and that no further investigation of metals in groundwater is warranted Based on the outcomes of the DSI, Golder recommended that a RAP be prepared to address the following: ■ Develop a strategy for management or removal of the asbestos cement impacted stockpile to the south of Building 1 and asbestos cement debris on the surface of the former Married Quarters;

	■ Prepare a methodology for the disposal of the contents of the USTs adjacent to Building 1 and the decommissioning or removal the USTs in accordance with NSW WorkCover and Australian Institute of Petroleum (AIP) guidance; and ■ Preparation of an unexpected finds protocol to address the potential for e.g. asbestos containing materials, burial areas or UXO to be identified on the site in the future. The unexpected finds protocol could be included in environmental management plans for the future development of the site.
Golder 2011	Golder was engaged to undertake a hazardous materials assessment of the Site. Results of the assessment indicated the following: ■ Hazardous materials (asbestos, lead, PCBs, SMF, Mercury and Ozone Depleting Substances) were identified in a number of locations throughout the buildings located onsite site. ■ Asbestos identified in eaves and ceiling liners. ■ Asbestos debris within the area of the former “married quarters” and in a stockpile to the south of the compound ■ Lead paint identified on various items around the site No inspection of service pits / conduits was undertaken. ERM notes the potential for additional asbestos to be present within underground service lines etc.
Golder 2014	Golder was engaged to prepare a RAP for the identified contaminated areas at the Site. While analysis from investigations undertaken within the site was generally below the adopted site criteria, the following remedial works were recommended: ■ USTs – removal / in-situ abandonment followed by a soil vapour survey where USTs were abandoned in-situ; ■ Former married quarters – emu pick of asbestos materials and surface scrape to 0.1 m bgl; and ■ Stockpiled material – remove stockpiled materials and disposal at a licenced landfill facility
Deloitte, 2015	Defence Housing Australia (DHA) was considering the acquisition of the Site for potential future development. The vendor, Department of Defence, commissioned various reports on the Site prior to divestment in order to provide a degree of clarity to some of the Site’s potential issues. This report consolidated the key finding of these reports. ■ Golder identified asbestos onsite as described in GA 2011. ■ The Site contained two underground storage tanks (USTs) containing diesel and petrol. Golder noted that there was potential for hydrocarbon contamination of backfill sand and UST pit walls associated with the USTs. Golder noted that removal of the two USTs (and their associated pipework and infrastructure) would be undertaken, including the potential excavation of the backfill. No cost was provided for these works. ■ A septic tank is located to the north of the compound area. Whilst it is possible to decommission the septic tank in-situ, Golder considered that removal of the septic tank was the preferred option as it will reduce associated environmental liabilities. No cost was provided for these works. ■ Elevated concentrations of lead in paint were identified on the tower and the portable generator in the compound, and on the water tank to the west of the compound (med- high risk). Golder recommended that abatement of lead paint be performed as soon as practicable, such as: removal of the structure or item; paint removal; over-painting; or, encapsulation. No evidence of these measures were observed during the site visit. <u>Hazardous materials:</u> <u>Asbestos:</u>

	■ The risk assessment indicates that there is generally a low risk from ACM identified on the site. A medium risk was identified for the lining of the incinerator door located in the north western corner of the compound. It is recommended that ACM be identified by signage and that access to ACM is restricted (e.g. by installing a lock on the compound gate). It is also recommended that the incinerator lining be removed as soon as practicable. Disturbance of asbestos cement debris identified in the location of the former Married Quarters and in a stockpile to the south of the compound should be minimised until removal during site remediation works. <u>Lead:</u> ■ Elevated concentrations of lead in paint were identified on the tower and the portable generator in the compound, and on the water tank to the west of the compound, which pose a medium to high risk. It is recommended that lead paints be identified by signage and that access to lead paint in poor condition is restricted. It is recommended that abatement of lead paint be performed as soon as practicable. <u>Polychlorinated Biphenyls (PCBs), Synthetic Mineral Fibres (SMF) Ozone Depleting Substances (ODF) and Mercury</u> ■ Occurrences of these on Site were deemed unlikely to pose a health risk during any building assessment, stabilisation or management works prior to divestment. ■ Building 6 is a brick flammables store with a metal roof. The interior of the fire door was damaged, with the insulating door core visible at the base of the door and the location of a former lock. Partially full 200 L drums of engine oil and isopropyl alcohol were stored in the building.
WE and Thuroona 2019	The Department of Infrastructure, Transport, Cities and Regional Development (DITCRD, the Department) engaged Thuroona Services (Thuroona) with Western Environmental Pty Ltd (WEPL) sub-contracted by Thuroona, to undertake a Detailed Site Investigation at the Site. Based on the results of the investigation, WE identified the following: ■ <u>PFAS - Human health risk:</u> Concentrations of PFOS + PFHxS in soil exceed the screening risk criteria for residential land use at two surface soil locations (TP26 and TP27) near the chemical storage shed and USTs. ■ <u>PFAS - Ecological risk:</u> Concentrations of PFOS in all six surface water samples collected on-site and off-site exceeded the PFAS NEMP Freshwater 99% Species Protection criteria. Concentrations were however below the NEMP Freshwater 95% species protection criteria, which applies to slightly to moderately disturbed systems. ○ ERM notes that due to the bioaccumulative nature of PFAS the 99% criteria should be used as the default screening criteria, ■ A review of the data indicates that surface water entering the Site has elevated PFAS concentrations above the NEMP Freshwater 99% Species Protection criteria, and these are commensurate with PFAS concentrations in surface water leaving the Site. This suggests that there is an off-site up-hydraulic gradient PFAS source, and that the Site itself is not contributing to observed PFAS concentrations in surface water. ■ A review of identified surface water bodies in the area suggests that surface water entering the Site passes through areas further west, south-west and potentially northwest of the Site. Potential source sites exist in these areas; specifically, the Bringelly Fire Station (west / south-west of the Site) and the Bringelly Landfill (north-west of the Site). It is arguable that the surface water bodies should not be considered of such high ecological value given the current and proposed land use of the Site, and the regional setting of the Site. There is therefore little value in pursuing remediation or management of surface water at the Site. ■ In terms of the current land use with livestock grazing occasionally occurring on Site, there is a potential risk given the exposure pathways via surface water and feed (i.e. grasses). A site-specific risk assessment could be undertaken to refine the likely degree of potential risk to livestock and subsequently the potential secondary risk to human health via consumption of milk and/or meat from these livestock.

	■ Asbestos: An area of stockpiled soil was observed south of the building Compound within the Site. At the time of the inspection the soil appeared to be relatively clear of demolition waste (the stockpile was largely covered in vegetation); however, fragments of asbestos containing material (ACM) have been noted to be present within the stockpile. The stockpile has a total estimated volume of approximately 1,600 m^3.
M2A 2020	This technical paper documented the potential impacts of the Western Sydney airport Project from contamination, salinity and acid sulfate soils (ASS). Potential existing areas of contamination were identified within the off airport construction footprint that could have an adverse impact on human or ecological health if disturbed during construction or remain during operation of the Project. The sources of contamination surrounding the airport area included past industrial land uses, former dry cleaners and service stations, landfills, defence activities, illegal waste dumping, fuel, oil or chemical storage and use and historical use of hazardous building materials. Areas of concern specifically relating to the Aerocore precinct (identified as AEC-48) included: ■ Former fuel/oil and chemical storage; ■ Underground Storage Tanks (IUSTs); ■ Substation / power station; ■ historical use of hazardous building materials in and around the OTC compound; ■ ACM fragments in surface soils; and ■ Potential historical use of AFFF on site or from up-gradient source. The paper estimated that during construction drawdown of groundwater within the Aerocore may occur between 10 metres at the deepest part of the excavation to 1 metre up to 315 metres from the excavation. Flow direction change from the north/ northwest towards Badgerys Creek to towards the excavation cutting. There were no potential significant sources of groundwater contamination identified within 500 m of the Aerotropolis Core Station construction site. The risk to changes in groundwater flow in context of groundwater contamination migration and impacts to sensitive receptors was considered to be low

ERM notes that following completion of the ERM (2021) PSI, ERM completed the ERM (2021) Aerotropolis Core Precinct Targeted Site Investigation, 21 May 2021 (ERM 2021a) to assess the potential for PFAS and uncontrolled fill material to be present within targeted areas of the Commonwealth Land.

It is noted that as part of the ERM 2021a investigation, no samples were collected from the Priority Stage 1 area, however ERM has considered the results from this investigation, in particular the potential for onsite migration of PFAS from the adjacent portions of the Commonwealth Land.

ERM 2021 PSI

ERM was engaged by WPCA to undertake a PSI of the Aerotropolis Core Precinct. The PSI was undertaken to assist in the development of a master plan being prepared by the WPCA.

The objective of the PSI was to undertake a review of previously identified contamination issues and refine the current understanding of site conditions to aid WPCA in assessing potential liabilities and constraints associated with site contamination that may require consideration during master planning and subsequent development works.

Information provided to ERM as part of the PSI indicated that the current concept plan for the proposed redevelopment of the Aerotropolis Core Precinct included the following key features:

- The Moore Gully Billabongs, Thompson Park and a Waterfront Precinct located within the southern portion of the Aerotropolis Core;
- Educational facilities, a metro plaza, green gateways and sports fields located within the central portion of the Aerotropolis Core;
- Manufacturing / industrial lands, CSIRO facility, TAFE / multiversity and hotel located within the northern portion of the Aerotropolis Core; and
- Proposed landscaping which would include open water bodies for flood water storage / adaptive re-use, swimming and play area within the existing Moore Gully alignment and planted native vegetation throughout.

Scope of Works

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

- Review of background information (previous investigations, relevant database searches); and
- Targeted groundwater, surface water and sediment sampling to aid in refining the understanding of potential PFAS impacts.

Discussion of Results

The Commonwealth Land and the Site are located within an area surrounded by rural residential, low density residential and commercial / industrial development. At the time of the PSI the land was largely vacant with the exception of former Defence infrastructure located within the central portion of the Commonwealth Land.

- Information from previous investigations indicated that the current Commonwealth lands were first granted to private owners by the Crown in 1818. From this time until 1957 the Commonwealth land underwent various ownerships and was utilized for agricultural purposes. In 1957 the land was transferred to the Commonwealth of Australia. The

Commonwealth Land was used for Department of Defence purposes as a radar installation from 1957 until prior to 2005;

- Results from the desktop assessment indicated that the Site and Commonwealth Land are primarily underlain by the Bringelly Shale which is described as shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff from the Middle Triassic age. Groundwater within the Commonwealth Land was identified during previous investigations and gauging undertaken as part of the PSI to be present at depths of approximately 2.5 – 7.5 metres below ground level (m bgl);

- Previous investigations identified a range of potential contamination issues in the Commonwealth Land that require remediation and / or site management including former fuel storage USTs and asbestos impacted fill located within stockpiled fill to the south of the main compound and within the vicinity of the former married quarters:

- During the site inspection undertaken as part of the PSI, ERM noted the potential for additional fill material to be present within Moore Gully. Fill within this area was noted to contain bricks and other demolition wastes. ERM noted that, at that time, no samples had been collected from this material to assess the potential for contamination to be present;

- Analytical results from collected sediment, surface water and groundwater samples as part of the PSI, returned concentrations of PFAS compounds less than the laboratory Limit of Reporting (LOR) and / or the adopted assessment criteria with the exception of surface water samples SW2, SW8 and SW11 (located within the eastern portion of the Commonwealth Land). These samples returned results that exceeded the adopted drinking water criteria and the adopted 99% freshwater criteria for protection of aquatic ecosystems:
  - It was considered that the above results were generally consistent with previous investigations of PFAS undertaken as part of the Western Environmental (2020) investigation. While the specific source of PFAS was unclear, the results of the PSI sampling indicated the potential for PFAS to be migrating from offsite sources; and
  - ERM noted that further assessment of potential PFAS should be undertaken within the Commonwealth Landto assess the potential for historical sources of PFAS to be located within the main compound area (chemical storage area / firefighting system etc.).

As outlined within the preliminary Conceptual Site Model (CSM), ERM considered there may be a potential risk to human health and / or ecological receptors due to a number of potentially complete pollutant linkages identified by the PSI. Further investigation was therefore considered to be required to assess the potential risk to human health and sensitive ecological receptors.

- ERM recommended that a detailed site investigation (DSI) should be undertaken to assess the contamination status of the Aerotropois core (including the Site), to further characterise volumes of fill materials i that may require management and / or remediation and aid in the planning for future development works (offsite disposal, site management requirements etc.).

ERM noted that the DSI should be undertaken in consideration of previous investigations undertaken within and the identified contaminants of potential concern (CoPCs) and include an assessment of soil, sediment, surface water and groundwater.

Based on the outcomes of the PSI, including the review of previous investigations, previous approved remediation plans and Site Audit Statements, it was considered that the Commonwealth Land could be made suitable for the proposed development following further investigations and completion of any subsequent required remedial / site management works.

ERM (2021a)

ERM was engaged by WPCA to undertake a Targeted Site Investigation (TSI) of certain portions of the Commonwealth Land. This targeted investigation was undertaken specifically to further the understanding of potential key constraints to future development works, and to enable collection of additional data to supplement existing information relating PFAS throughout the Commonwealth Land and potential uncontrolled filling within a portion of Moore Gully

To achieve the above objectives, ERM undertook a TSI including the completion of a Ground Penetrating Radar (GPR) survey and test pitting within Moore Gully, and targeted soil, sediment and water sampling. The targeted sampling included the completion of shallow soil bores within overland flow paths located downgradient of the central compound area, installation of monitoring wells located on the periphery of the central compound area and the collection of surface water / sediment samples from offsite surface waters located adjacent to the Commonwealth Land.

Results of this investigation indicated the following:

- During investigation works, fill materials were generally observed to be comprised of brown – dark brown top soil materials containing a range of organic materials (roots etc.) to a maximum depth of 1.0 m below ground level (bgl) within Moore Gully and 0.2 – 0.5 m bgl within the central and eastern portions of the Commonwealth Land;
  - PID measurements collected during soil investigation works returned concentrations ranging from 0 – 1.7 parts per million by volume (ppm v) which were considered consistent with background conditions and not indicative of potential anthropogenic volatile contamination;
  - ERM noted that isolated anthropogenic inclusions (trace plastics etc.) were identified within fill materials encountered during excavations undertaken within Moore Gully;
  - During soil investigation works, no evidence of asbestos Containing Materials (ACM) or other indicators of significant / widespread anthropogenic wastes were identified within the advanced test pits or soils bores;
- Natural materials were typically encountered at depths of 1.0 m bgl and comprised sandy silty clay (red brown, medium firm / medium plasticity) to the maximum depth of test pit excavation (2.0 m bgl) overlying natural shales to the maximum depth of investigation works (20.5 m bgl);
- Groundwater was identified at depths ranging from 5.545 m btoc (MW206) to 12.111 m btoc (MW202); and
- Surface water and sediment sampling indicated low levels of water present within adjacent accessible drainage lines. Where surface water was present field observations did not identify sheen / odour or other visual / olfactory indicators of anthropogenic contamination. Sediments were noted to be generally comprised of silty / sandy materials free from visual / olfactory indicators of anthropogenic contamination.

Laboratory analysis of collected samples returned concentrations of CoPCs less than LOR and or the adopted assessment criteria with the exception of the following:

- PFAS exceeding the adopted low density residential criteria within surface soils located on the eastern boundary of the site compound / TfNSW site (BH211); and
- Laboratory analysis of collected surface water / sediment samples returned concentrations less than the adopted assessment criteria with the exception of surface water sample SW-3 which exceeded the adopted 99% freshwater ecological criteria for PFOS (0.00002 ug/l).